PUBLIC DOCUMENTS OF MAINE

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

Public Officers and Institutions

FOR THE YEAR

1891.

VOLUME II.

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

ROCKEFELLER, 6121.

Full brother to CAMPBELL'S ELECTIONEER, 3-year-old, 2.22 1-2; Sire, ELECTIONEER, 1.25; Dam, EDITH CARR, (dam of Campbell's Electioneer, 3-year-old, 2.22 1-2,) by CLARK CHIEF, 89; owned by

B. F. & F. H. BRIGGS, Maple Grove Farm, Auburn, Me.

AGRICULTURE OF MAINE.

THIRTY-FOURTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

Maine Board of Agriculture,

FOR THE YEAR

1890-91.

PRINTED BY ORDER OF THE LEGISLATURE.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1891.

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 1890.

Z. A. GILBERT, *Secretary.*

AUGUSTA, January 21, 1891.

MAINE BOARD OF AGRICULTURE—1890.

OFFICERS.

THOMAS DAGGETT, President.

B. W. McKEEN, Vice President.

Z. A. GILBERT, Secretary.

Members Chosen by County Societies.

			Term expires Dec. 31.
Cumberland County,	W. W. Harris,	Portland,	1890
Oxford "	B. W. McKeen,	West Fryeburg,	1890
York "	J. M. Deering,	Saco,	1890
Somerset "	G. J. Shaw,	Hartland,	1890
Sagadahoc "	F. S. Adams,	Bowdoin,	1890
Piscataquis "	Thomas Daggett,	Foxcroft,	1891
Penobscot "	B. A. Burr,	Bangor,	1891
Franklin "	*S. R. Leland,	Farmington,	1891
Knox "	F. L. Mansfield,	Hope,	1891
Aroostook "	A. L. Haines,	Maple Grove,	1891
Androscoggin "	B. F. Briggs,	Auburn,	1892
Waldo "	Freeman Atwood,	Monroe,	1892
Lincoln "	E. W. Stetson,	Damariscotta,	1892
Kennebec "	H. O. Nickerson,	Readfield,	1892
Washington "	Edward A. Moore,	Machiasport,	1892
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.

*Deceased.

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 Dec. 31
Piscataquis County,	Thomas Daggett,	Foxcroft,	1891
Penobscot "	*B. A. Burr,	Bangor,	1891
Franklin "	Charles E. Wheeler,	Chesterville,	1891
Knox "	F. L. Mansfield,	Hope,	1891
Aroostook "	A. L. Haines,	Maple Grove,	1891
Androscoggin "	B. F. Briggs,	Auburn,	1892
Waldo "	Freeman Atwood,	Monroe,	1892
Lincoln "	E. W. Stetson,	Damariscotta,	1892
Kennebec "	H. O. Nickerson,	Readfield,	1892
Washington "	*Edward A. Moore,	Machiasport,	1892
Cumberland "	W. H. Vinton,	Gray,	1893
Oxford "	B. W. McKeen,	West Fryeburg,	1893
York "	B. F. Pease,	Cornish,	1893
Somerset "	A. R. Smiley,	Skowhegan,	1893
Sagadahoc "	F. S. Adams,	Bowdoin,	1893
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.

*Deceased.

REPORT.

ANNUAL MEETING, 1891.

The annual meeting of the Maine Board of Agriculture was held at the office of the Board, at the State House, Augusta, January 21 and 22, 1891, agreeably to the provisions of the statutes, and in accordance with the following order of business:

WEDNESDAY.

11.00 A. M. Qualification of Members and Organization of Board. Presentation of Business.

2.00 P. M. Review of the work of the Board for the year.

Report of Executive Committee on "Enlarging the work of the Board."

THURSDAY.

9.30 A. M. New business.

Report on the new apportionment to Agricultural Societies, by the Secretary of the Board.

Should the present tendency to multiply Agricultural Societies be encouraged?

2.00 P. M. The new course in Agriculture at the State College, by President M. C. Fernald.

3.00 P. M. Hearing before the Committee on Agriculture of the Legislature on the "Extension of the work of the Board."

Closing business.

The meeting was called to order by President Daggett at 11 o'clock in the forenoon and the call for the meeting was read by the Secretary, and on motion of the member from Androscoggin, it was

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

B. F. Briggs, Walter Balentine, H. O. Nickerson,	*Committee on Credentials.*

The committee subsequently reported the following members duly elected and qualified to take seats on the board:

Charles E. Wheeler, Chesterville, Franklin county, for one year to fill the vacancy in that county.

Warren H. Vinton, Gray, Cumberland county, for the term of three years.

B. Walker McKeen, Fryeburg, Oxford county for the term of three years.

A. R. Smiley, Skowhegan, Somerset county, for the term of three years.

F. S. Adams, Bowdoin, Sagadahoc county, for the term of three years.

B. F. Pease, Cornish, York county, for the term of three years.

On motion of the member from Kennebec, proceeded to the election of president and vice president and the following were unanimously elected:

B. W. McKeen, *President.*

B. F. Briggs, *Vice President.*

On motion of member from Sagadahoc, a messenger was elected as follows:

A. H. Whitmore, *Messenger.*

On motion of member from Piscataquis the following were appointed a Committee on Pay-Roll:

Thomas Daggett,
F. L. Mansfield,
Freeman Atwood, } *Committee on Pay-Roll.*

On motion of member from State College an Executive Committee was elected as follows:

B. W. McKeen,
B. F. Briggs, } *Executive Committee.*

The member from Franklin county pronounced the following eulogy on S. R. Leland, deceased, late member of the board from that county.

Mr. President: I rise to announce the death of Solomon R. Leland, late a member of the Board of Agriculture from Franklin county, which occurred at his home in Farmington, on the 13th day of August last, the result of disease superinduced by la grippe, which attacked him while attending to his duties as a member of the board at its annual meeting one year ago.

Mr. Leland was a self-made man. Born and reared on a rugged, upland farm in the town of Dixfield, with few privileges for obtaining an education save those found in the common schools of that period, yet in the intervals of farm labor he made such good use of his time he was fitted to become an instructor of youth and was also qualified to have the supervision of the schools in his native town, which duties he earnestly performed and with a fidelity that characterized all of his acts. After settling in life he continued the business of farming for several years, but failing health induced him to change his vocation to that of dealer in general merchandise, locating at Chesterville. A few years after this he removed to Farmington in order to receive the advantages of its excellent schools for his family, and which was ever after his home. At first he was engaged in other business, but his early love for farming returned with increased ardor, and he soon found himself in possession of a tract of land adjacent to the village, upon which he erected commodious buildings, and also immediately commenced the setting of standard apple trees, the Baldwin variety predominating, the soil being peculiarly adapted to its successful cultivation. The result proving so satisfactory, Mr. Leland gave his premises the name of "Mt. Baldwin," by which it was favorably known throughout all that region.

Mr. Leland's life was singularly happy and prosperous. His two daughters took high rank in scholarship, were subsequently united in marriage with worthy men, and olive branches sprang up to carry cheer into the old home by their frequent visits. The wife and mother always aided by her wise counsel, and at all times was his constant friend and companion. A generous public often required his aid in important interests, and his faithfulness and integrity were equal to the demand. His associates at this board, I have no doubt, will join all others with whom he walked in the business or social relations of life, in attesting to his warm and unvarying friendship, his earnestness and zeal while performing the duties of the day, and his strict adherence to those principles which underlie the fabric of true morality.

Mr. President: I desire further to submit the following:

Resolved, That in the death of S. R. Leland, the Maine Board of Agriculture has lost a worthy member, the cause of agriculture an earnest and consistent 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 family of the deceased.

President Fernald of the State College seconded the motion, attesting to the fact that Mr. Leland was a valued member of the board, and was devoted to the cause of agriculture in his town and State. The resolutions were unanimously passed by a rising vote.

Adjourned to 2 P. M.

AFTERNOON.

Met according to adjournment. The Secretary presented a review of the public work of the Board for the year as follows:

REPORT OF THE SECRETARY TO THE BOARD.

The work of the Secretary of the Board during the year since the last annual meeting has been chiefly of such a nature as to be familiar to most of the members, and in fact much of it has been done in connection with more or less of the different county members of which the Board is made up.

The present annual meeting occurs six days later than last year so that the time covered between the two meetings is that much more than one year. In that time there have been held nineteen county institutes, one three days joint State Pomological meeting, and the three days Dairy Conference recently held at Winthrop. In the holding of the nineteen institutes there was expended the sum of $1,464.23 besides the expenses of the Secretary, averaging $77.06 to an institute. In addition to this the Executive Committee have been called together at the Capitol at two different times at an expense of $54.80, making the total expenditures for the time $1,519 03. This expenditure being larger than the appropriation there remains bills unpaid of $20.50 to be drawn from the present year's appropriation.

The expenses at the Dairy Conference are not yet all adjusted and cannot therefore be given. These are to be drawn from the appropriation for the present year.

The preparation of copy for the annual report was begun early in April, the first copy being delivered April 25, and this work occupied the chief time of the Secretary till the first of July. The first installment of books was received from the bindery August 11.

Recognizing the importance of the autumn cattle shows as exponents of the condition and progress of agriculture among us, the opportunity is improved of visiting as many exhibitions as circumstances and conditions will admit. Opportunity was improved to visit the New England Fair at Worcester, Eastern Maine at Bangor, State Fair at Lewiston and the Provincial Fair at St. John; also the Franklin county at Farmington, Sagadahoc at Topsham, and Androscoggin at East Livermore.

In the organization of the Board at its last annual meeting the adoption of the plan of an Executive Committee to act for the Board in an executive capacity when such authority might be needed, has proved highly acceptable to the Secretary and of much advantage in the transaction of important business. Twice during the year they have been called to the aid of the Secretary, and have also been consulted at various other times as opportunity occurred. This relieves the Secretary of a measure of responsibility, while it brings to his aid the counsel of executive authority. It is recommended that this arrangement be continued.

Since the meeting of the Board one year ago, the Franklin county member has been taken from our ranks by the hand of death. A faithful and efficient member, a devoted friend of agriculture—the absence of his wise counsel is a loss which every member must greatly deplore!

In addition to the work handed down from last year to this meeting there are some matters to which I wish to call your attention. A grand exposition of the world's industries is to be held in Chicago in 1893. It is fitting that our State in common with others be represented. Among our varied industries agriculture stands at the head. Whatever, therefore, is to be done in aid of a representation at Chicago, it devolves upon this Board to see to it that the agriculture of the State, including the kindred branches of Horticulture and Pomology, be granted a share of this aid proportionate to its needs in the case. Whatever of aid the State renders must be provided by the legislature now in session. Your attention is called to the matter, trusting you will see to it that all needed steps will be taken. In this connection I will read the following communication:

OFFICE OF THE DIRECTOR-GENERAL,
WORLD'S COLUMBIAN EXPOSITION,
CHICAGO, Ill., U. S. A., January 9, 1891.

Hon. Z. A. Gilbert, Secretary State Board of Agriculture,

SIR:—The attention of your board is called to the great opportunity presented by the World's Columbian Exposition of showing, practically, the results of your work in the various branches of agriculture fostered and encouraged by your Board.

One of the great purposes of the Exposition is to fittingly present to the world, in the most complete manner possible, a picture of the wonderful growth, development and the unlimited resources of our country.

The interests represented by you are so varied and cover so large a part of the wealth of your State that they should have such attention and care in regard to their proper presentation as their importance merits.

The international character of the Exposition will add greatly to the interest taken in exhibits in this department, and those engaged in agricultural pursuits in this country should be urged to make such a showing as will give just evidence of the great productiveness of our varied climates, soils, the advancement made, and the skill shown in every department of farm work.

The close relation of your Board to these interests is such that your unqualified indorsement and vigorous presentation of the matter, is necessary to insure success.

This department confidently relies on you to do everything you can in aid of the work, and hopes that your Board will present to your legislature, at its coming session, a strong and convincing appeal for an appropriation that will adequately represent the agricultural interests of your State.

In almost all states where legislation has been enacted, in aid of a state exhibit, the initiation was taken and the measures passed largely by the earnest work done by the State Board of Agriculture.

In several states great preparation is already being made for an exhibit, and it rests with the different associations and societies, directly interested, to make this exposition, in every way, the most memorable epoch in the history of our country.

This department has been organized to give such character and completeness to the agricultural exhibit as shall make it the wonder of the Exposition, and with the hearty co-operation and assistance of your Board I believe this can be done, and to that end I earnestly hope you will at once take steps to see that such legislation is enacted by your State legislature as will ensure a complete and perfect exhibit of the resources of your State at the World's Columbian Exposition.

I shall be glad to hear from you and to assist you in any way I can in this work.

I have the honor to be yours very respectfully,

W. I. BUCHANAN,
Chief, Department of Agriculture.

Your attention is called to the tendency made apparent for several years to multiply agricultural societies representing limited territory, and going before the legislature asking for the full rights and privileges of the larger societies from which their territory is drawn. It is for you to consider whether this tendency shall be encouraged, and to give to your Secretary instructions which shall guide him in in his attitude towards these matters.

Important measures bearing directly upon the agriculture of the State are to be brought before the present legislature. Without action on the part of the Board at this session this representative body of the farmers of the State can have no commissioned authority before that body, only as it is assumed by its Secretary. While possibly he may be disposed to do all you can wish in this direction, yet it will add much of strength to any such effort for the members of the Board to take such action connected therewith as will add their weight to any measures that may call for support.

In this connection it is a pleasure to be able to congratulate you on the views, favorable in all respects to the interests of agriculture, expressed by our chief executive in his inaugural address. Through these utterances you get the assurance that the necessity of the work the Board is carrying on is fully recognized, and that all reasonable demands for the needed aid to carry it on will receive cordial support. These facts may well receive your recognition.

Following the reading of his review of the year by the secretary, the subject matter of the same was referred to a committee consisting of Messrs. Wheeler, Smiley and Haines for examination, with instructions to report on Thursday morning.

The Executive Committee of the Board, Messrs. Daggett and McKeen, made report of their official work for the year.

REPORT OF EXECUTIVE COMMITTEE.

The work of arranging for and securing such legislation as may be called for in a proposed enlargement of the work of the Board was transmitted to our hands through the passage of the following resolutions at the annual meeting of the Board held one year ago:

WHEREAS, The institutes in the different counties of the State, under the auspices of the Board of Agriculture, have largely promoted our agricultural interest, and

WHEREAS, A small percentage of improvement in our varied agricultural industries, insures large aggregate returns to the farmers of Maine, therefore

Be it resolved, That the scope and educational work of the Board through Farmers' Institutes can be largely increased with manifest advantage to the agriculture of the State; and

Be it further resolved, That the Executive Committee of this Board be a committee, with discretionary powers, to present the importance of this subject to the people of the State, and to arrange for such legislation as they shall deem necessary to give effect to the foregoing resolves.

Acting in accordance with these instructions we have had the matter under consideration and hereby recommend the following changes in the law governing our work.

AN ACT to amend chapter fifty-eight of the Revised Statutes, relating to the Board of Agriculture.

SECT. 1. Section three of said chapter is hereby amended as follows: Strike out all between the word "session" in the first line and the word "at" in the second line, and insert the word 'commencing' before the word "on" in the second line, so that said section as amended, shall read as follows:

'Section 3. The board shall hold a business session at the capitol, 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. 2. Section four of said chapter is hereby amended as follows: Strike out the word "one" in the second line and insert in lieu thereof, the word 'two,' also in the thirteenth line of said section strike out the words "fourteen hundred" and insert in lieu thereof the words 'three thousand,' so that said section as amended, shall read as follows:

'Section 4. 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 his 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.

AN ACT to amend chapter one hundred and fifteen of the Revised Statutes entitled "Salaries of Public Officers and Compensation of Members of the Government."

SECT. 1. Section one of said chapter is hereby amended in that paragraph which provides for the salary of the secretary of the board of agriculture, by striking out the word "six" and inserting in lieu thereof the word "fifteen," so that said paragraph shall read as follows :—

'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.

This report was adopted and pending its passage was tabled for further consideration, and later was adopted unanimously as the sense of the Board, and a bill embodying these changes in the law was ordered to be drawn for presentation to the Committee on Agriculture of the legislatnre.

Adjourned to Thursday.

[The above acts were passed by the legislature, approved by the governor, and are now the law.]

THURSDAY.

Met according to adjournment. The committee to whom was referred the report of the Secretary on the work of the year, made report as follows :

Mr. President:—Your committee, to whom was assigned the report of the Secretary, beg to report as follows :

In consideration of the great privileges that will be given at the Exposition to be held in Chicago for the furtherance of the various branches of agriculture and horticulture, we would recommend that this legislature appropriate such an amount as its importance demands for an exhibit of the products of Maine in these departments.

We would recommend that a representative of this Board be selected and commissioned to act in conjunction with the committees raised by the State Grange and Farmers' Protective Union on the matter of equalization of taxes within the State, and that such committee shall look after any other measures related to agricultural affairs as may call for attention.

And your committee further recommend that this Board wait upon the Governor, and express to him its thanks for the interest he has manifested in the agriculture of the State.

Chas. E. Wheeler,
A. R. Smiley,
A. L. Haines,
} *Committee.*

In accordance with the above recommendation it was

Voted, That the President of the Board be a committee to appear before the Governor and express the thanks of the Board for his recognition of the interests of agriculture and the work of the Board through his inaugural address.

The President, after performing that duty, returned with an invitation to the Board to call upon the Governor in a body at the executive chamber, and a recess for that purpose was taken, and the members were presented to the Governor.

Returning to business the member from Cumberland presented the following:

WHEREAS, It is provided by law that this Board shall prescribe the duties of its Secretary, therefore

Resolved, That it is the sense of this Board that the Secretary give his entire time to the duties and labors of his office, and that the legislature be requested to so increase his compensation therefor, as will enable him to comply with these requirements.

This resolution was discussed fully and freely, after which it received the unanimous support of the members.

The member from Aroostook presented the following resolution, with remarks explanatory of its import and its purpose, and the same was passed as the expression of the members of the Board:

Voted, That appreciating the advantages to the agricultural sections of the State of direct and available communication with our principal markets for agricultural products, the members of the State Board of Agriculture have approved of plans for the construction of a line of railway through Aroostook county, on Aroostook soil, by which transportation of her abundant products to ready markets can be greatly facilitated.

Adjourned to afternoon.

AFTERNOON.

Met at time of adjournment.

On assembling in the afternoon, the member from the State College, President Fernald, gave an explanatory discourse on the proposed new courses in agriculture and horticulture. Previous to its opening, the Valuation Commission, in session at the State House, were invited to be present on the occasion, and the commission appeared and listened to the address.

At three o'clock a recess was taken for the purpose of a hearing which had been arranged with the Committee on Agriculture on the extension of the work of the Board. This hearing attracted wide attention, and a large number of prominent men, interested in the promotion of agriculture, were present from different sections of the State, together with a large delegation from both houses of the legislature and from the departments in the State House.

The President of the Board presented the claims to be made upon the legislature, through the committee, substantially as follows:

Mr. Chairman, and Gentlemen of the Committee:

It affords me much pleasure to stand before you at this time in the interest of the Maine Board of Agriculture. It is needless to remind you that the agricultural interests of the State are paramount to all others. More than sixty per cent. of our entire population is engaged in agricultural pursuits, more than twenty million dollars being produced annually from our farms. The Board of Agriculture was created by enactment, for the improvement of agriculture and the advancement of the general interests of husbandry. It is the only institution in the State having authority in matters pertaining to our agriculture. It has been invested with duties that tend to make it useful to our farmers. Among those duties is that of holding Farmers' Institutes in every county in the State each year, and by its Secretary to report to the Governor and Council the doings of the Board. It is needless at this time to go into any extended history of the work of the Board. Suffice it to say that the work set for it to do has been done in such a manner as to cause it to become thoroughly a part of our farming, the meetings held the past years tending in a marked degree to encourage our farmers, and to create a desire for further knowledge on their part. Special branches have been started as an outcome of its work.

It is of course admitted that there is a general advance in intelligence on the part of our people. The farmers are not behind in this march of progress. They are to-day demanding not only more, but better work from the Board. The work in the past has been acceptable, and has fulfilled its mission. But the general advance of intelligence all along the line has led to a call for advanced thought, more experienced and better speakers. These demands must be met promptly if the Board would sustain its reputation and keep the confidence of the farmers. These extensions will call for more money, and a larger outlay of labor on the part of the Board. That these demands are made, and the proposed extension asked for by our farmers, I have only to call your attention to the fact that there is a large demand for Institute work that cannot be met with our present facilities. I could place at least two Institutes in Oxford county this season to good advantage, besides the ones already held there. I have no doubt other members of the Board would answer this question the same, that the demand for Institutes in their counties far exceeds what it is possible for them to grant. We have also, in further proof of our position, the petitions that have come to your honorable body from all sections of the State asking for this extension. The board is alive to its duty, and feels that it would be delinquent if it failed to present to this legislature the demands of the class it has the honor to represent.

As we look over the different departments of State, we find them officered with men paid to devote their entire attention to the duties of their office. We find that they are all well represented in our State government by those having their highest benefit in view, and are constantly at their post of duty. We find them well paid for doing this, a fact which reflects credit upon our State. The total amount placed at the disposal of the Board of Agriculture, including amount for Institute work, salary of Secretary and clerk, and expenses, is $2,700. An examination into the salaries and expenses of the different departments will still further convince you that the amount placed at the disposal of the Board is not only totally inadequate to the duties of the Board, but in no wise equal to the importance of the industry it represents, in comparison to the other departments of State.

His Excellency, Gov. Burleigh, who takes an active interest in the welfare of the State, calls your attention to the necessity and advisability of extending the work of the Board of Agriculture. The

State is now in a prosperous condition. New industries are springing up in all sections. There is before us, I believe, one of the most promising outlooks for the future in the history of the State; and shall not agriculture, the greatest of all industries, receive its just dues at your hands? It would seem not only just, but wise that it should.

Did you ever think that of all departments of labor, from the rudest to the most skilled, the farmer is the only one that *produces?* All others simply change the character of the matter on which they labor.

An increase in the productiveness of the farms of Maine will increase travel and freight on our railroad lines, as well as develop manufacturing all over the State. Let the State encourage it, therefore, by liberal appropriations for the Board of Agriculture. The pride of any State should be its agriculture, as its future wealth and its position among other states is largely dependent upon the intelligence, comfort and thrift of its farmers. Every field rescued from a condition of unproductiveness, and made to produce precious grains which wave in the summer winds and ripen in its sunshine, puts money into the treasury of the State.

It, therefore, becomes your duty as representatives of the citizens of the whole State to so legislate as to place at the disposal of our farmers every possible inducement to extend their labors; every possible aid toward attaining a higher knowledge of the best and most approved methods of cultivating their land, improving their condition, and beautifying their homes.

The amendments on the original bill offered for your consideration, receive the unanimous support of the Board now in session. They propose but few changes, and, we believe, are very moderate in their demands. It is the universal demand among farmers that the office of the Board be kept open at all times. The Board, which may define his duties, has voted unanimously that the Secretary be required to devote his entire time to the duties of the office. This requirement absolutely calls for more pay in proportion to the increased labor. Shall the wish of our farmers, as expressed by their representative body, be disregarded? Shall you, their representatives, refuse to grant their wishes when thus expressed? I know that you, each and every one, are keenly alive, not only to your duty, but to the future welfare of our grand State and the prosperity of the farmers of Maine. We ask you to carefully investigate our proposed amendments, and if in your judgment they are wise, report favorably upon them.

The member from Cumberland, Hon. W. H. Vinton of Gray, followed in a presentation in detail of the changes in the law asked for, and substantiated each point in a manner that could not fail of carrying conviction as to the propriety and justness of the changes asked for. Farmers, he said, had been modest in asserting their rights, but they were awaking to activity, and now had come forward to claim a share of that which was their just right and their pressing need. He proceeded to show what other departments of State were receiving, and the liberal pay freely granted to their officers. These comparisons were convincing testimony in the case.

After the close of the hearing the Board passed a vote of thanks to the railroads for reduced rates and to the messenger for kindly attentions, after which it adjourned finally.

Z. A. GILBERT, *Secretary.*

WORK OF THE BOARD.

OBITUARY.

Solomon R. Leland, member of the Board of Agriculture for Franklin county, died at his residence at Farmington, August 13, 1890. (See pages 2, 3 and 4.)

Edward A. Moore of Machiasport, member of the Board for Washington county, died on March 4, 1891, from the effects of an accident which befell him the evening before. Mr. Moore took his seat at the Board at the annual meeting of January, 1891. Coming directly from a large farm, where by the application of business methods and a love of the business he had established himself on a substantial basis and had won the respect of the community in which he lived, he soon demonstrated to his associates on the Board that he was alive to the agricultural interests of the county he was chosen to represent. Every one who met him was impressed with his sterling qualities, his interest in the progressive agriculture of the day, and his determination to do all in his power to advance the same. His labors on the Board were at all times characterized by faithfulness to duty and fidelity to the trust imposed on him. Such men are a loss to the State. The members of the Board feel that in the death of Mr. Moore they have lost a tried friend and a valued counselor.

Benjamin A. Burr, member of the Board for Penobscot county, died at Bangor, April 22, 1891, after a lingering sickness of twelve weeks. He was not well when at the annual meeting of the Board at Augusta, and hastened from the meeting and its business to his home on that account, and from which he did not again go out to engage in business. The present year was the sixth of his service on the Board, having been elected to a second term. One year of this time he served as its President. In his connection with the Board he shrunk from no duty, but sought to faithfully aid in advancing the interest he was commissioned to serve. He loved the country, the farm, the work and its people.

Mr. Burr was an active member of Queen City Grange, and was for some years its Master. No man had a higher estimate of the mission of the order of Patrons of Husbandry, or labored more faithfully to carry on the work in which the organization is engaged. Among his last public efforts was his assistance in securing the winter session of the State Pomological Society in Bangor, and for which he prepared a paper—his last—welcoming his co-workers to that city, but which, on account of his illness, was read by proxy. He owned a farm in Brewer, every acre of which he was attached to.

At an early age Mr. Burr learned the printer's trade, and made this his leading business through life. For seventeen years he had been a partner in the publication of the Bangor *Whig and Courier* and its business manager during that time.

While a very quiet man, pleasant and agreeable in all his ways, he was nevertheless possessed of much firmness, and was strong and pronounced in his convictions. He was always genial in conversation, sunny in his temperament, and popular among his acquaintances. He was the soul of honor and integrity, a solid, substantial, safe citizen such as constitute the conservators of society, and that help forward every good word and work.

In accordance with the requirements of the Board of Agriculture, laid down at its annual meeting one year ago, measures have been taken to secure a change in the laws governing the Board and its work and to obtain office room at the State House suited to its wants and provided with the needed furnishings for carrying on that work. The committee having the matter in charge were successful in accomplishing all that was asked. The Board is now furnished with ample office room in the new extension of the State House, convenient for its work, inviting in appearance, and in every way meeting its full wants. The work of the Secretary and the business pertaining to the Board are now established and carried on at this permanent office.

The office is to be at all times kept open for business, and a clerk is provided to aid in carrying out this plan.

The record of the work of the Board as given in this report covers the time from June 1, 1890, to June 1, 1891. Its public work has been largely the holding of farmers' institutes as required by law. Much attention has been given by the Secretary to observations on the condition of the agriculture of the State as found in different sections, and to a study of its wants with the view to make the institute work useful in the highest possible degree. Encouragement is needed and also the cultivation of an appreciation of the possibilities of the business, but with it there is a call for instruction in methods and practices. This cannot be overlooked. This demands for assistants skilled men qualified to give advance instruction in the methods and practices of the farm and the stable. With so much of this work being carried on as is now being done in the different states the securing of competent men for the purpose is becoming a difficult matter, and is one that at least is not likely to be less embarrassing in the future. Advance knowledge must be given or the work will fail to meet its purpose.

Institutes have been held as follows:

Penobscot,	at Patten, October 9.
Washington,	at Cherryfield, November 7.
	Machias November 8.
Piscataquis,	at Parkman, November 11.
Somerset,	at Madison, November 13.
	Pittsfield, April 4.
Aroostook,	at Presque Isle, December 4.
Oxford,	at Buckfield, December 9.
	Fryeburg December 10.
Cumberland,	at Gray, December 11.
Sagadahoc,	at Bowdoin, December 12.
Androscoggin,	at Auburn, December 13.
Kennebec,	at Winthrop, January 15, 16.
	Windsor, April 2.
Franklin,	at Jay, February 13.
Knox,	at Rockland, February 18.
	Hope, February 19.
Lincoln,	at Waldoboro', February 20.
Penobscot,	at Bangor, Pomological Society, February 23, 24.
York,	at Limerick, March 11.

These institutes have been well attended throughout and have commanded a deep interest from those in attendance. In no time since the plan was first instituted has the work commanded so much attention or met so hearty an interest as during the year for which this report is the record. In view of these facts the enlarged facilities for carrying on the work now provided come at an oppo - tune time.

AGRICULTURAL EDUCATION.

In none of the industrial arts of life is education more needed than in connection with the business of farming. Just what kind of an education is called for in this relation has not been well defined, and even at the present time there still is found a difference of opinion among its most earnest advocates in regard to the matter. A year ago, at its annual meeting, the Board took steps to encourage the introduction of elementary instruction in agriculture into the common schools of the State and a committee was selected to act in conjunction with a committee of the State grange to that end. That work has been attended to so far as seemed called for. To this end the law of the State governing such matters has been so changed that the principles of agriculture is now added to the list of studies laid down for the common schools of the State. An elementary text-book for the use of schools has been prepared and will soon be ready for use. Thus all the preliminary steps seem to have been taken, and in order for this new movement to take effect it only remains to awaken among the people a demand for its introduction.

Under the enlarged facilities for carrying on educational work at the State College an effort is being made to bring that work into more intimate relation with the soil and its production. A Chair of Horticulture has been established, a course of study outlined to be pursued, and a green-house and other needed provisions provided to aid in carrying on instruction.

A short course in general agriculture has also been established, instruction in which will open at the beginning of the college year in August next. The following is the outline of the work to be pursued:

SPECIAL COURSES IN AGRICULTURE.

In addition to the full course in agriculture requiring four years for its completion, the college proposes to give special or short courses in agriculture, arranged to meet the wants of young men who desire to extend their knowledge in their chosen vocation, but who can devote only a limited amount of time to preparation or study.

In order to adapt them to varying conditions of earlier acquirement and of time that can be given to special study, two courses are offered, one extending over a period of two college years and the other over a single year of thirty-six weeks. Both are designed to be intensely practical. While the former affords the wider range of study and practice, the latter, in its narrower range offers also a plan of systematic study of prominent and important agricultural subjects.

OUTLINE OF COURSE OF TWO YEARS IN AGRICULTURE.

First Year.

First Term.	Second Term.
Structural and Physiological Botany.	Plant Analysis and Horticulture.
General Chemistry.	Agricultural Chemistry.
Farm Accounts and Rural and Business Law.	Drainage and Road Construction.
Plane Geometry, or Agricultural Physics.	Plane Trigonometry and Surveying, or Entomology.

Second Year.

First Term.	Second Term.
Horticulture.	Stock Feeding and Dairying.
Agricultural Chemistry.	Stock Breeding and Veterinary Science.
Animal Anatomy and Physiology.	Civil Government.
Political Economy.	Geology and Meteorology.

OUTLINE OF COURSE OF ONE YEAR IN AGRICULTURE.

First Term.	Second Term.
Botany and Horticulture.	Plant Analysis and Horticulture.
General and Agricultural Chemistry.	Agricultural Chemistry.
Animal Anatomy and Physiology.	Stock Feeding and Dairying.
Farm Accounts and Rural and Business Law.	Stock Breeding and Veterinary Science.

Without presenting a complete analysis of the sub-divisions of these courses, a few general statements relating to some of the more prominent agricultural topics are submitted.

BOTANY AND HORTICULTURE.

The course of instruction in Botany, both structural and physiological, and in plant analysis, serves as a fitting preparation for the successful prosecution of horticultural study and practice. Under the latter division, instruction will be given in the methods of propagation, planting, cultivation, pruning, grafting, and in the other processes involved in practical horticulture.

The growing of garden vegetables, the construction and management of hot beds, the culture and adaptation of green-house plants, the laying out of grounds, the management of lawns, the principles of ornamental planting and allied topics will also receive requisite attention.

AGRICULTURAL CHEMISTRY.

Under this division are considered such topics as, origin, formation and composition of soils; classification of soils and their physical characteristics; chemical composition of plants; sources of plant food; tillage; farm manures, their composition, preservation and application; commercial fertilizers, their origin, composition, preparation and use, rotation of crops; fermentation and decay.

STOCK-FEEDING AND DAIRYING.

The subject of stock-feeding includes the treatment of such topics as, animal nutrition; foods and fodders, their composition, digestibility and comparative values; the calculation of rations for working animals, also for growth, for fattening and for milk production.

Under the latter subject above named, will be considered,—milk, its composition and properties; milk testing by Babcock's, Patrick's, and Cockran's methods, and the principles and processes of practical dairying. In connection with the class-room work, provision will be made for instruction in butter and cheese making by various processes under the supervision of expert butter and cheese makers.

STOCK-BREEDING AND VETERINARY SCIENCE.

Stock-breeding will be taken up under such divisions as, heredity; atavism; fecundity; in-and-in breeding; cross-breeding; and connected with the teaching of this subject, studies will be made of the various breeds of animals represented on the college farm, and instruction will be given in the scaling of animals. The course of veterinary instruction will include the presentation of the principles of the science with the practical information necessary to enable the student to recognize and treat the more common diseases of our domestic animals, and to meet intelligently emergencies which frequently arise among live-stock requiring the aid of the veterinarian.

ENTOMOLOGY.

A knowledge of the habits of insects beneficial and injurious to vegetation is of great practical value to the farmer. Especial attention will, therefore, be given to injuries done by insects to the products of the farmer, the gardener and the fruit grower, as well as to our forests and building materials, and instruction will be given as to the best known means of keeping such insects in check.

DRAINAGE, AGRICULTURAL PHYSICS AND METEOROLOGY.

Drainage of land, water supply for stock and for the household, road construction, the relations of water to soil, its movements in the soil, the purposes, methods and instruments of tillage, soil temperatures and methods of modifying them, meteorological and climatic conditions, are among the important subjects on which instruction will be given.

REQUIREMENTS, EXPENSES, CERTIFICATES.

Students in these courses should be at least sixteen years of age and have a good common school education. While no formal entrance examination is required, the Professor in charge will satisfy himself of the fitness of candidates to pursue the course selected with success. Young men considerably older than the minimum age named, and who have a practical knowledge of farming, will find one of these short courses especially valuable.

The expense of table board is about $3 00 a week. Board and room are from $3.50 to $4.00 a week. Students in the short courses will be provided with rooms and board at the college so far as practicable, but for the most part, will, of necessity, find accommodations at the village of Orono one mile from the college. Tuition will be *free* to students in these special courses.

Certificates will be given those completing either of the courses successfully and passing a satisfactory examination. Certificates will also be given on completion of the practical course in dairying, to those who have attained proficiency therein.

The opening of these courses will be on August 4, 1891. The first term will end November 24, 1891.

If arrangements can be made for it, a special course in practical dairying will also be given in the autumn of 1891, commencing and ending on the dates above named.

Persons designing to take any of these short courses should make definite arrangements for the same, prior to the first date above given.

For particulars regarding the Special Courses in Agriculture or the Course in Dairying, address

PROF. WALTER BALENTINE,
Orono, Maine.

For particulars regarding other courses in the College, address

PRESIDENT M. C FERNALD,
State College, Orono, Maine.

REVIEW OF THE SEASON.

The productive season of 1890 was in many respects unfavorable for the farmer. The snow disappeared in good season and the farm work came on with every promise of a favorable season for the spring seeding. This was soon followed, however, by heavy and frequent rains which greatly interferred with farm work and delayed the seeding of wet lands, both sowing and planting, to a late and unseasonable date and so far obstructed the farmers in their work as to essentially cut down the aggregate area which under more favorable conditions would have been devoted to crops.

Grass throughout the State went through the winter without killing or thinning to any degree, and with the advent of warm weather started out, in field and pasture, to give a good crop. The too frequent rains which had worked damage with the plowed lands, were favorable for the grass crop. The favoring conditions were kept up till the crop was fully grown. Again the elements favored, and a season of fair weather followed specially favorable for the work of haying. As a result the crop was secured in first-class condition throughout the State. A year ago the record of the Board was to the effect that the crop of 1889 was probably the heaviest crop of hay ever harvested in the State. The crop of '90 was more uniformly superior over the entire State than that of the year before, and fully up to that in any section. The crop of '90 must therefore be set down as in excess in the aggregate of the crop of '89. It was also far superior in quality.

The price of shipping hay has ruled the lowest for many years, the highest price in Boston for the brightest and best lots being $14.00 a ton, and remaining at that figure through most of the season. As a result shipments have been slow and light and much of the crop intended for sale is still in first hands. The situation with this crop has been seriously felt among the farmers in those sections of the State where the crop is largely sold. If the embarrassments coming out of it shall induce the growers to keep more stock and feed their hay out on the farm a present calamity would be an advantage in the end. The selling of hay at the low prices of six to ten dollars a ton returns but a small income to the owner of the farm producing it.

Grain of all kinds throughout the State came near to a failure. Much of it on account of the wet was sown late and out of season, and late sowing of grain in this State is at best a partial failure from the start. Much of it was drowned with an excess of water after being sown; and to cap the climax of calamity none of it seemed to grow after coming up with any degree of vigor. Nearly throughout the State and almost universally, grain of all kinds was attacked in its early stages of growth and long before heading out with a species of rust which greatly weakened the plants and retarded its growth and final development. Only in the case of a few exceptional cases of dry land sown early did the yield approximate, even, to an average. The yield for the State cannot be set at over one-third of a good crop in quantity, and with the quality as inferior as the quantity was small. No such sweeping failure of the grain crop has been known for many years.

Oats are taking the lead in extent grown. Of late years, however, mixed oats and barley, and sometimes wheat, are being grown for a grain feed for stock. It is being claimed that a better yield of the mixed grain can be depended upon than of either kind separate, while the value for feeding purposes is much improved over the oats alone. Peas and oats mixed are also being grown to some extent and are probably on the increase.

Wheat production has greatly fallen off throughout the State, with the exception of Aroostook county and along the northern border.

Corn is receiving a large measure of attention throughout that part of the State adapted to its production. The pack of sweet corn was about up to the average in quantity. Yellow corn is planted in somewhat larger area than formerly and is on the increase from year to year. The growing of this crop for the silo has not been done in this State to a large extent, though the practice is slightly on the increase. The year was not favorable for corn, and the crop was about an average.

Potatoes were planted in larger breadth than ever before. In Aroostook county and in other parts of the State where this crop is made a specialty the high prices of the year before stimulated farmers to greater effort. The yield throughout the State was extremely heavy, and the quality of this great crop was of the highest order. Without question the aggregate crop of the State was the largest on record. Unfortunately, however, in the south-westerly half of the State this great crop was cut off with the rot to the extent of fully one-fourth of the crop. In the eastern portion of the State and in Aroostook county the loss was not so great, although there too the loss from rot was considerable. The price has ruled high the year through and the sale of the crop brought a large amount of money into the State. This crop is becoming of great importance to the State, and methods and practices involved in its production may well be intelligently and critically studied.

The apple crop of the State was about one-half that of 1889 in quantity. The scarcity of this fruit in other states left a quick market for our product. The inferior fruit was sold to go into other states for cider while the wind-falls were canned up at the canning factories. Prices ruled very steady at about $4.00 a barrel for good fruit through the winter and still higher for extra and fancy. With two good years in succession for fruit growers, the business has been greatly stimulated and orders for trees for spring planting have been given on a larger scale than for many years. The business is increasing rapidly.

The cattle interests of the State have been seriously depressed on account of continued low prices. During the year of 1890 there was no improvement in the beef market over that of a year ago. The opening of the new year, however, brings an upward movement that bids fair to be of permanent standing. Nothing could give more stimulus to Maine farming than a substantial and well sustained advance in the price of beef.

Dairying, especially butter making, in the State is still on the increase. The prices for the early part of the year ruled low and this tended somewhat to abate the interest for the time. But prices advanced with the season which has put the business in better favor. Those who are making a specialty of this line of work are well satisfied with the business.

Sheep have been in quick demand among farmers during the year. Though the price of wool has remained at last year's low figures yet the demand for lambs has been such as to command favor, and out of the two sources of income the sheep are proving profitable.

The breeding of horses is still on the increase in the State, though the increase is chiefly among specialists rather than with the common farmer. Men of means and men engaged in different kinds of business are putting money into horses and filling up many breeding stables.

There is room for good work of this kind and so long as people admire a good horse the business is likely to have many followers. The breeding and rearing of the heavier class of horses adapted to heavy work is also claiming more attention from year to year. The State is now purchasing vast numbers of this class of horses to be used in carrying on its work which ought to be reared here where they are needed.

As another year opens the prospect is brighter for better prices in all the round of our stock interests. Farmers should then shape their plans to fill their barns with good stock, and feed out the low priced hay that is now awaiting a market.

From the returns from the several agricultural societies doing business in the State, given herewith, it is shown that they have been carrying on their work in the usual way and with a fair measure of success. Some of their shows were interrupted by the prevailing stormy weather which cut down receipts and otherwise interferred with their business. Three new societies have been incorpoated during the year, the Farmers' and Mechanics' Exhibition Association with show grounds at Springvale, the North Cumberland Agricultural Society with grounds at Harrison, and the West Waldo Agricultural Society with grounds at Liberty.

OFFICERS OF AGRICULTURAL SOCIETIES.

Societies.	President.	Post Office.	Secretary.	Post Office.	Treasurer.	Post Office.
State Agricultural	S. G. Jerrard	Kenduskeag	G. M Twitchell	Augusta	E. G. Eveleth	Auburn.
Eastern Me. Fair Association	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	Ira J. Porter	Houlton	A. H. Fogg	Houlton.
Androscoggin County	D. P. Field	Auburn	E. G. Woodside	Lewiston	J. G. Ham	Livermore Falls.
Aroostook, North	Geo. M. Park	Presque Isle	R. J. Smith	Presque Isle	James W. Bolton	Presque Isle.
Cumberland County	Warren H. Vinton	Gray	D. F. Whittier	Gorham	Fred D. Scammon	Gorham.
Franklin County	Mellen Hayes	Farmington	E. A. Hall	Chesterville	Geo. M. Currier	Farmington.
Franklin, North	T. B. Hunter	Strong	J. W. Butterfield	Phillips	M. C. Kelley	Phillips.
Kennebec County	J. B. Lowe	Readfield	Geo. E Coleman	Readfield	C H Stevens	Readfield.
Kennebec, North	S. C. Watson	Oakland	E. C. Wyman	Waterville	C. G. Carleton	Waterville.
Kennebec, South	David Given	South Windsor	F. H. Mooers	Pittston	Chas. E. Coombs	Windsor.
Knox County	T. C. Atwick	Camden	C. K. Miller.	Camden	C O. Montgomery	Camden.
Knox, North	L. N. Simmons	Appleton	Fred E. Burkett	Union	F. H. Pratt	Union.
Lincoln County	Thomas J. York	Damariscotta M's	E. E. Dunbar	Damariscotta	Geo. H. Weeks	Damariscotta.
Oxford County	Albert F. Andrews	Norway	A. C. T. King	South Paris	A. C. T King	South Paris.
Oxford, West	C. H. Walker	Fryeburg	B. Walker McKeen	West Fryeburg.	W. R. Tarbox	Fryeburg.
Oxford, Androscoggin Valley	T. B. W. Stetson	Canton	H. T Terrill	Canton	H. T. Terrill	Canton.
Oxford, Andover	Geo. O. Huse	Andover	John F. Talbot	Andover	G W. Abbott	Andover.
Penobscot County	J. W Green	Bangor	Geo. N. Holland	Hampden	Geo. N Holland	Hampden.
Penobscot and Aroostook	Alfred Cushman, Jr.	Sherman	Luther B. Rogers	Patten	C. W. Stephens	Patten.
Penobscot, West	S. W L Chase	Exeter Mills	T. P. Batchelder	Kenduskeag	T. P. Batchelder	Kenduskeag.
Penobscot, North	E A. Reed	Springfield	N. Averill	Lee	F. M. Johnson	Lee.
Piscataquis, East	I. F. Hobbs	Milo	W. H. Snow	Milo	W. H. Snow	Milo.
Piscataquis, Central	A. M. Ayer	Dover	D. E. Dinsmore	Dover	D. E. Dinsmore	Dover.
Piscataquis, West	J. D. Draper	Monson	J. F. Thombs	Howard	J. F. Thombs	Howard
Sagadahoc County	Thomas Scoffield	North Harpswell,	W S. Roggers.	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. Smiley	Skowhegan.

Somerset, West	John M. Hilton	Anson	Ben Moore	North Anson	Ben Moore	North Anson.
Waldo County	D. A. Wadlin	Belfast	H. B. Ellis	Belfast	A. S. Redman	Belfast.
Waldo and Penobscot	F. W. Richie	Winterport	E. H Nealey	Monroe	F. L. Palmer	Monroe.
Waldo, North	Fred Conforth	Unity	J H Cook	Unity	H. B. Rice	Unity.
Waldo, West			W. H. Moody	Liberty.		
Washington County	Lyman G Smith	Pembroke	H. F. Porter	Pembroke	Wm W. McLauchlan,	Pembroke.
Washington, West	J. L Bucknam	Columbia Falls	Eben F. Allen	Columbia Falls	Frank 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	J. M. Deering	Saco	Asa L. Ricker	Biddeford	Geo. H. Boothby	Saco.
York, Buxton and Hollis	A L. Berry	Bar Mills	Ira W. Milliken	Hollis	J. W. Meserve	Bar Mills.
York, Ossipee Valley	Howard Brackett	Cornish	James C. Ayer	Cornish	Walter P. Perkins	Cornish.
York, Ramshackle	C. A. Goodwin	Woodmans, N. H.	C L. Wentworth.	West Newfield.	C E. Pinkham	West Newfield.
York, Shapleigh and Acton,	A. H. Brackett	Shapleigh	Horace Bodwell	Acton	H. A. Stanley	Shapleigh.

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1890.

	Amount of State bounty, apportioned 1891.	Amount received from State, 1890.	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.	Am't expended during the year on improvements on grounds and fixtures.	General expenses of society during the year.	Total amount paid out during the year.	Value of property belonging to Society.
	$	$	$	$	$	$	$	$	$	$	$	$	$
Maine State Pomological	500 00	500 00	94 00	500 00	16 96	1110 96	-	-	633 50	-	562 18	1195 68	457 78
Androscoggin	382 56	357 81	89 00	1208 50	500 00	2710 16	554 85	1153 87	1714 87	766 20	-	400 83	1500 00
Aroostook County	142 28	116 95	-	622 79	200 00	939 74	141 67	350 00	637 80	-	144 14	923 19	379 55
Aroostook, North........ ...	150 58	213 97	52 00	434 90	-	748 87	48 00	276 00	675 01	-	205 00	880 00	1023 00
Cumberland..................	462 08	422 70	20 00	4036 32	-	4479 02	421 25	1200 00	2071 46	1170 00	781 96	4151 26	2600 00
Franklin County	441 48	206 24	450 00	1550 79	-	2207 03	257 00	557 00	1979 00	275 00	324 43	2710 17	5000 00
Franklin, North.............	67 27	99 83	273 50	656 85	200 00	1229 68	43 90	125 00	301 54	113 33	213 03	948 72	1000 00
Kennebec County.............	222 16	244 82	-	1566 58	-	1811 40	156 00	337 50	995 85	638 09	468 13	2102 07	1650 00
Kennebec, North.............													
Kennebec, South	80 39	68 41	9 00	860 44	-	987 85	72 50	209 00	360 37	238 79	163 69	762 85	1000 00
Knox County	89 11	81 92	-	267 52	-	349 44	67 50	175 00	399 45	35 00	230 11	380 36	-
Knox, North.................	69 57	77 99	86 75	404 95	3 00	572 69	-	-	311 89	-	249 35	561 24	
Lincoln County..............	155 44	153 08	135 00	730 25	-	1019 33	191 25	496 00	696 80	75 00	411 61	1261 49	1500 00
Oxford County	430 39	456 16	22 00	3435 38	82 11	3913 84	446 75	941 00	1929 30	-	928 56	3780 05	7000 00
Oxford, West	249 84	276 64	51 00	1912 81	-	2230 45	268 00	665 00	1119 95	119 03	496 63	1735 61	6000 00
Oxford, Androscoggin Valley,	216 18	195 59	21 00	1222 00	-	1438 59	171 25	534 00	969 05	418 82	332 27	1509 39	2111 01
Oxford, Andover	91 34	91 37	5 00	614 54	14 00	816 91	92 00	242 00	409 42	259 94	259 82	929 18	1331 00
Penobscot County	14 23	40 00	-	92 19	-	52 19	-	-	63 75	-	52 19	52 19	
Penobscot and Aroostook.....	100 00	100 00	91 00	258 85	869 11	1318 96	108 00	108 00	245 50	919 11	45 14	1209 75	1500 00
Penobscot, West.............	382 89	220 44	51 00	2350 78	-	2622 22	618 50	1322 50	1716 35	188 40	490 00	2305 60	2000 00
Penobscot, North	122 47	50 33	15 00	61 00	-	126 33	46 00	549 00	549 00	40 00	39 50	177 79	1000 00
Piscataquis, East	9 00	13 53	-	37 00	18 00	68 53	3 00	5 00	40 80	-	19 75	59 75	5 00
Piscataquis, Central	66 20	125 14	78 00	161 55	75 00	439 69	28 80	96 00	296 75	21 50	69 19	336 44	300 00

Piscataquis, West	20 57	21 42	38 00	44 62	-	104 04	8 00	8 00	92 30	-	31 12	116 87	
Sagadahoc	430 00	396 19	730 00	3641 61	500 00	4214 61	622 50	967 50	1958 42	1023 06	700 00	4150 00	5300 00
Somerset, East	192 20	191 67	99 62	1187 06	175 00	1653 35	218 75	565 25	861 10	100 00	424 47	1619 58	4700 00
Somerset, Central	152 36	207 94	51 00	750 00	-	1008 94	242 50	450 00	683 00	100 00	455 35	1238 35	4000 00
Somerset, West	57 55		33 00	114 16	-	171 16	24 00	72 00	257 94	43 50	65 56	144 56	700 00
Waldo County	223 65	228 88	-	922 00	-	1150 88	65 25	385 00	1002 50	-	32 25	954 00	3300 00
Waldo and Penobscot	250 00	130 00	190 00	2247 88	15 00	2582 88	372 00	596 00	1260 50	604 17	500 00	2364 67	3500 00
Waldo, North	100 97	108 46	-	450 56	-	559 02	81 30	231 00	452 60	30 40	86 55	569 55	75 00
Washington County	200 00	243 01	7 00	1270 63	-	1520 64	167 00	451 00	896 15	17 90	371 21	1598 64	1800 00
Washington, West	291 42	344 70	1 00	1975 11	-	2320 80	176 50	500 00	1306 35	200 00	814 46	2388 45	1268 75
Washington, Central	221 93	219 86	9 00	985 32	-	1214 18	206 00	585 00	971 65	-	383 08	1354 73	-
Washington, North	142 09	164 10	-	1002 31	-	1166 41	114 00	310 00	636 95	130 63	398 83	1166 41	2500 00
York County	248 96	416 26	2 00	1669 86	-	2088 12	265 25	762 50	1116 00	350 00	575 44	2041 44	2000 00
York, Buxton and Hollis	200 04	215 78	24 00	998 00	500 00	1737 78	213 50	500 00	664 60	500 00	405 00	1569 60	3500 00
York, Shapleigh and Acton	161 07	93 50	161 00	-	68 36	322 86	220 00	450 00	722 00	-	25 00	25 00	3000 00
York, Ossipee Valley Associa'n,	200 00	200 00	2 25	1584 49	1000 00	2786 74	241 00	610 00	937 90	93 00	352 95	2732 07	5500 00
York, Ramshackle Park	126 66	124 22	80 25	579 21	-	783 68	151 00	295 00	567 75	50 00	126 50	714 00	2000 00

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1890—*Continued.*

	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.	For swine.	For sheep.	For poultry.	Total amount awarded for live stock.	Total amount awarded for horses—not purses.	Amount awarded for Indian corn	For wheat.
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Maine State Pomological...........	250 00																	
Androscoggin.....................	1207 45	-	33 00	62 00	51 00	23 00	38 00	4 00	29 00	17 00	59 00	2 00	17 00	10 00	231 50	105 00	12 00	
Aroostook County.................	215 00	-	28 75	7 00	5 00	33 00	29 25		21 50	9 00	43 50	10 75	13 50	20 10	147 35	74 00	50	1 75
Aroostook, North.................	-	-	21 25	4 00	4 00	32 00	23 25	-	14 00	18 00	48 00	11 00	18 00	-	114 00	80 00	1 25	1 00
Cumberland	800 00	-	41 00	169 00	22 00	89 00	73 00	10 00	39 00	8 00	101 50	18 00	25 70	49 19	496 89	148 50	1 00	
Franklin County..................	400 00	-	37 00	48 00	44 00	23 50	29 00	10 00	28 00	11 00	36 50	9 00	108 00	10 75	267 50	74 00	2 25	
Franklin, North..................	311 54	-	6 50	31 25	22 40	12 75	10 40	3 50	1 50	4 50	21 35	1 00	13 50	3 05	104 35	27 35	50	
Kennebec County..................	554 77	-	19 00	70 00	36 50	34 50	32 25	5 50	26 00	6 00	58 50	11 00	29 50	12 00	239 25	86 00	16 00	
Kennebec, North..................	-																	
Kennebec, South..................	-	-	1 50	26 85	11 55	10 15	4 50	3 25	11 65	3 50	15 25	2 50	1 00	2 00	57 80	30 40	00	
Knox County......................	224 40	-	2 00	13 50	-	23 00	4 20	-	3 00	3 00	14 00	-	6 00	4 00	52 70	20 00	6 50	50
Knox, North......................	-	-	10 00	25 00	19 00	24 50	11 50	5 00	8 00	9 00	21 50	7 00	13 25	6 75	122 00	41 50	1 50	
Lincoln County...................	550 00	-	16 00	9 00	7 50	13 00	5 50	3 75	22 00	5 00	11 25	4 00	8 00	2 50	69 25	38 28	5 00	
Oxford County....................	350 00	-	88 00	87 00	60 00	65 00	102 00	12 00	35 00	27 00	80 00	19 00	46 00	5 50	587 50	142 00	1 75	75
Oxford, West.....................	2500 00	-	37 00	70 00	23 00	15 00	24 00	7 00	20 00	6 00	51 50	21 00	-	6 25	196 00	77 50	9 00	
Oxford, Androscoggin Valley......	2261 61	-	34 00	47 00	56 00	50 00	31 00	8 00	35 00	18 00	31 00	5 00	12 00	7 75	271 25	84 00	1 20	
Oxford, Andover..................	-	-	3 50	24 00	12 00	10 50	8 50	-	4 70	3 50	7 50	8 00	7 50	3 50	77 50	37 50	75	60
Penobscot County.................	-	-	-	-	-	-	-	-	11 00	6 00	18 00	-		-	-	35 00	1 00	
Penobscot and Aroostook..........	300 00	-	-	-	3 75	9 00	4 50	-	10 00	6 00	22 00	4 00	8 00	-	45 25	38 00		
Penobscot, West..................	87 98	-	11 00	35 00	17 50	24 00	17 75	6 00	19 00	6 00	43 50	11 00	24 25	15 20	164 20	68 50	4 55	1 75
Penobscot, North.................	-	-	4 00	13 00	5 00	6 00	1 50	-	3 50	3 00	17 00	-	-	3 50	33 00	23 50	1 00	
Piscataquis, East................	-	-	5 00	7 00	8 00	7 50	-	-	10 00	10 00	27 00	5 00	5 50	-	31 50	13 00		
Piscataquis, Central.............	292 46	-	10 00	32 00	7 50	22 00	4 00	3 00	16 00	12 00	132 00	7 00	9 00	5 50	90 20	64 00	75	

Piscataquis, West	-	-	3 00	20 50	4 25	3 50	1 25	-	3 00	2 25	29 75	-	2 25	50	35 25	38 00		
Sagadahoc	-	-	32 00	115 00	39 00	50 00	35 00	6 00	34 00	15 00	71 00	13 00	17 00	55 00	492 00	120 00	9	1
Somerset, East	2137 45	-	20 50	31 00	11 75	19 00	14 75	-	-	-	81 00	5 00	27 00	-	124 00	81 00		
Somerset, Central	437 35	-	9 00	-	12 00	18 00	36 00	-	27 00	18 00	30 50	-	-	-	75 00	75 50	2 75	
Somerset, West	500 00	-	5 00	18 00	13 50	13 00	2 00	10 50	6 00	6 00	35 00	2 00	8 50	2 00	85 50	47 06		
Waldo County	-	-	18 00	28 00	14 00	34 00	18 00	13 25	12 00	11 50	-	8 00	10 00	5 00	148 25	23 60		
Waldo and Penobscot	-	-	35 00	58 00	34 00	39 00	17 00	28 00	60 00	14 00	105 00	6 00	11 00	10 00	238 00	179 00	7 50	1
Waldo, North	-	-	9 00	7 00	14 00	12 00	12 00	9 00	20 50	6 00	24 75	1 00	11 75	2 00	72 75	51 25	5 50	
Washington County	200 00	-	15 00	9 00	13 50	42 00	27 50	11 00	11 00	21 00	49 00	15 00	15 00	10 75	158 75	81 00	4 50	
Washington, West	67 64	-	39 00	17 00	45 00	25 00	54 00	-	84 00	17 00	78 00	13 00	10 00	22 00	225 00	179 00	1 50	2 00
Washington, Central	575 00	-	31 00	5 00	10 00	33 00	27 00	-	26 00	16 00	33 00	19 00	14 00	16 50	155 50	75 00	2 00	
Washington, North	1200 00	-	25 50	11 00	10 00	18 00	30 50	-	6 00	6 00	50 00	14 00	12 00	6 25	127 25	62 00	1 00	25
York County	150 00	-	27 50	122 00	11 00	19 50	11 50	4 00	-	6 00	30 00	2 00	2 00	31 50	230 50	36 00	1 00	
York, Buxton and Hollis	2000 00	-	6 00	28 00	4 00	13 00	12 00	2 00	8 00	5 00	12 00	4 00	4 00	5 00	78 00	25 00	1 50	
York, Shapleigh and Acton	-	-	8 25	49 00	10 00	8 00	5 50	6 00	3 50	3 50	17 00	13 50	5 25	7 50	144 50	28 00	5 00	2 50
York Ossipee Valley Association	2089 50	-	19 00	69 00	34 00	41 00	30 00	5 00	12 00	9 00	22 00	14 00	17 00	3 00	232 00	43 00	3 00	
York Ramshackle Park	55 32	-	13 00	37 00	10 75	20 00	9 50	6 00	12 00	6 00	52 00	8 00	9 00	2 00	115 00	70 00	1 50	

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1889—*Continued.*

	For rye.	For barley.	For oats.	For buckwheat.	For beans.	For peas.	For potatoes.	For carrots.	For beets.	For onions.	For turnips.	For herds.	For cabbage.	For squashes.	Total amount awarded for grain and beet crops.	Am't awarded for any other cultivated crops.	For fruits and flowers.
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Maine State Pomological	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	633 50
Androscoggin	50	5 50	3 50	-	-	75	7 75	50	1 50	75	1 00	-	-	75	34 50	23 50	48 00
Aroostook County	-	80	1 05	75	50	-	8 00	75	1 50	40	1 25		25	1 50	19 60	10 25	16 95
Aroostook, North	50	-	50	15	8 00	75	58 25	1 50	1 50	1 50	-	-	75	2 25	83 90	28 00	35 25
Cumberland	-	1 00	-	1 00	-	1 00	2 00	-	-	-	-	-	-	3 00	6 00	3 00	30 01
Franklin County	-	-	-	-	-	-	65	20	50	20	40	-	60	75	6 55	15 00	45 00
Franklin, North	-	-	-	-	-	-	5 10	-	45	45	45	-	45	45	7 20	-	8 60
Kennebec County	-	-	-	-	-	-	5 00	1 46	1 46	1 46	1 45	-	1 46	1 46	32 75	-	51 75
Kennebec, North																	
Kennebec, South	-	-	-	-	-	-	1 25	-	-	65	25	-	-	90	2 85	3 05	10 10
Knox County	-	-	50	-	1 25	1 00	4 00	50	75	1 00	1 50	-	5 50	7 25	30 25	13 50	22 75
Knox, North	-	-	75	-	1 00	-	3 25	-	75	50	75	-	1 25	1 25	11 00	3 50	36 00
Lincoln County	-	-	-	-	1 00	-	3 50	50	1 50	1 00	50	-	50	50	14 00	2 00	24 40
Oxford County	-	-	-	-	-	-	2 50	50	75	75	75	-	50	50	12 50	-	27 00
Oxford, West	-	-	-	-	-	-	2 25	1 50	1 75	1 25	50	-	-	1 50	17 75	3 50	16 50
Oxford, Androscoggin Valley	-	-	-	-	-	-	2 25	25	35	50	25	-	25	1 75	6 70	13 95	21 35
Oxford, Andover	-	-	-	60	-	75	35	35	35	25	35	-	40	40	4 80	50	12 00
Penobscot County	-	-	-	-	50	-	1 75	1 00	50	25	1 00	-	25		6 75	-	11 45
Penobscot and Aroostook	-	-	-	-	-	-	1 00	-	-	-	-	-	1 00	1 00	5 00	-	11 50
Penobscot, West	75	-	50	-	-	75	1 90	-	1 40	1 00	-	-	-	4 85	17 45	25	20 50
Penobscot, North	-	-	-	-	25	-	50	25	25	25	25	-	25	25	3 25	-	4 00
Piscataquis, East	-	-	-	75	-	-	75	-	75	-	75	-	75	75	-	-	
Piscataquis, Central	-	-	-	-	-	-	25	25	25	25	25	-	25	25	2 50	2 60	4 40

Piscataquis, West	-	-	-	-	-	-	25	-	-	-	-	-	-	-	25	80	3 50
Sagadahoc	1 50	1 00	2 50	1 50	4 75	-	9 25	1 25	1 75	1 25	1 50	-	1 50	2 50	88 00	-	72 00
Somerset, East	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3 60
Somerset, Central	-	-	-	-	-	-	3 00	75	75	-	75	-	1 50	1 00	10 50	-	16 50
Somerset, West										-	-	-	-	-	-	-	
Waldo County	-	-	-	-	-	-	-	-	-	-	-	-		-	189 50	20 00	10 00
Waldo and Penobscot	-	1 00	1 50	-	1 50	1 50	6 75	1 50	3 00	3 00	3 00	-	1 50	5 50	37 25	3 00	26 75
Waldo, North	-	1 00	1 75	-	3 00	-	3 00	1 25	1 25	1 25	1 25	-	1 25	1 25	21 75	-	7 50
Washington County	-	2 25	2 25	2 25	4 50	2 75	12 75	1 75	2 25	4 50	2 25	-	2 25	7 75	63 50	11 75	24 20
Washington, West	-	4 50	5 00	-	10 50	5 75	25 00	3 75	3 75	2 50	2 50	-	1 75	2 75	83 65	-	27 95
Washington Central	-	1 00	-	-	2 00	-	16 50	1 50	3 00	2 00	75	-	1 00	4 50	41 15	-	19 00
Washington North	-	-	50	75	5 00	75	13 00	75	1 25	-	1 50	-	75	2 00	27 50	5 00	4 25
York County	1 50	-	-	-	1 50	-	1 50	-	-	-	-	-	1 00	1 00	10 50	-	5 75
York, Buxton and Hollis	-	-	-	-	2 00	-	1 50	-	-	-	-	-	-	-	5 00	1 50	3 25
York, Shapleigh and Acton	2 50	2 50	2 50	-	7 50	2 50	1 50	1 50	1 50	1 50	3 00	-	1 50	3 00	39 00	15 50	10 25
York Ossipee Valley Association	-	-	-	-	-	-	3 00	-	-	-	-	-	-	-	6 00	-	17 50
York Ramshackle Park	-	-	50	-	50	75	1 50	50	-	1 00	-	-	1 50	1 00	7 25	-	3 00

Financial Statement of Agricultural Societies for the Year 1890—*Concluded.*

	Bread, honey, sugar and syrup.	For butter and cheese.	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																			
Androscoggin	3 75	20 00	8 00	16 00	7 50	-	4 00	25	20	42	15	30	17	10	206	71	36	11	18
Aroostook County	1 50	3 00	-	12 75	-	2 40	-	16	26	19	6	2	2	-	71	117	20	7	26
Aroostook, North	8 50	10 75	-	20 10	-	-	18 57	25	34	14	13	4	2	-	98	85	50	7	
Cumberland	3 25	12 00	-	21 25	-	-	11 00	23	38	14	13	17	5	10	123	81	25	23	24
Franklin County	10 75	10 00	14 50	32 50	4 75	6 00	19 60	18	23	25	10	31	24	10	218	62	140	6	12
Franklin, North	85	3 00	-	12 90	-	-	9 75	5	20	15	3	43	39	11	218	65	90	10	20
Kennebec County	-	47 50	5 00	66 31	1 00	-	-	20	50	40	15	32	34	4	261	150	127	72	44
Kennebec, North																			
Kennebec, South	1 75	9 25	-	18 10	-	-	12 57	1	11	8	1	44	14	4	141	67	1	9	5
Knox County	-	13 00	-	-	-	-	-	1	20	6	4	6	1	3	41	20	16	-	2
Knox, North	5 50	15 25	4 50	19 50	1 00	3 00	49 14	10	30	27	10	18	17	5	117	60	63	23	13
Lincoln County	2 00	3 00	1 00	22 45	-	-	24 25	8	18	11	3	31	14	10	95	32	14	13	6
Oxford County	14 75	22 00	6 00	25 30	-	-	142 80	23	37	48	16	42	37	6	339	166	160	35	14
Oxford, West	16 45	15 75	2 50	55 46	-	-	53 55	15	10	12	8	50	12	8	115	46	-	30	5
Oxford, Androscoggin Valley	4 75	11 50	3 00	10 95	3 00	-	5 60	9	55	29	20	41	45	8	293	106	21	21	11
Oxford, Andover	2 50	6 00	-	20 00	-	-	6 62	4	20	16	4	15	12	-	98	40	25	10	6
Penobscot County	-	-	-	16 50	-	-	-	-	-	-	-	-	-	-	-	35			
Penobscot and Aroostook	1 50	5 00	-	21 50	2 00	-	5 00	5	9	10	2	3	6	-	44	56	21	2	
Penobscot, West	10 20	22 75	2 00	80 50	-	5 00	2 25	10	30	23	3	16	13	4	128	96	114	20	21
Penobscot, North	1 00	9 00	1 00	10 79	-	-	9 00	2	10	8	2	5	5	-	32	42	-	-	7
Piscataquis, East	-	2 00	-	3 00															
Piscataquis, Central	3 00	7 25	1 00	14 50	-	-	1 50	6	24	5	1	19	6	2	63	72	31	3	8

Piscataquis, West	40	2 25	-	3 10	-	-	3 75	4	25	7	5	5	4	-	60	40	11	-	1
Sagadahoc	8 25	26 00	8 00	102 75	-	-	216 38	9	25	24	10	50	15	6	200	75	42	30	50
Somerset, East	9 00	18 45	-	29 85	-	-	29 95	10	74	10	12	11	6	-	140	75	48	22	-
Somerset, Central	4 50	12 00	-	11 00	8 00	-	25 00	5	13	17	6	8	5	-	67	25			
Somerset, West	1 50	2 00	-	-	-	-	-	3	6	4	-	15	10	9	83	39	34	-	4
Waldo County	-	8 00	-	7 50	5 00	5 00	140 00	9	25	10	7	10	8	16	92	67	27	18	4
Waldo and Penobscot	1 50	8 25	-	122 25	-	-	48 50	16	19	19	10	16	10	13	125	80	38	10	225
Waldo, North	75	5 50	-	35 00	-	3 00	11 00	5	18	9	1	13	14	12	102	35	20	6	2
Washington County	3 25	10 25	-	84 50	7 00	-	25	7	27	15	7	7	7	11	88	47	48	57	17
Washington, West	6 75	22 00	-	79 85	11 50	21 00	649 65	8	5	13	3	12	10	-	73	62	10	16	23
Washington, Central	2 15	8 00	-	55 10	11 25	14 50	-	8	17	10	6	2	3	-	51	32	17	29	25
Washington, North	1 75	4 50	-	44 20	-	-	50 00	13	15	22	7	4	7	-	79	49	31	25	10
York County	1 00	7 00	-	60 75	-	-	-	8	16	6	2	40	10	2	84	134	48	1	20
York, Buxton and Hollis	2 25	1 50	-	40 00	-	-	3 11	10	42	34	6	19	14	12	170	25	18	6	9
York, Shapleigh and Acton	3 25	7 50	-	6 75	-	-	29 25	10	15	17	4	45	19	8	182	43	10	16	12
York, Ossipee Valley Association	5 35	1 50	-	22 55	-	-	-	13	46	28	9	72	47	18	352	37	28	24	7
York, Ramshackle Park	2 00	3 00	-	27 50	-	6 00	-	18	24	14	8	30	22	12	180	64	23	7	4

PAPERS AND LECTURES.

AN HONEST HORSE INDUSTRY.

By B. F. Briggs, Maple Grove Farm, Auburn, Member of Board for Androscoggin County.

Honest horsemen; honest horse industry; honest horse trades; honest horse races.

I do not wonder you start and look strange at the utterance of words like these, as did the people of old when they exclamed, "Can any good thing come out of Nazareth!" So now, after the practices we have seen for these many years by the majority of the men engaged in the horse industry, I say it is not strange that many of our good fathers and mothers shudder at the mention of the thought that a son of theirs has a taste for and an inclination to engage in this business. But, thank God, we have our Stanford, our Gen. Withers, our Gen. Tracy, our Major McDowell, and a host of others I might mention engaged in this business whose names are above reproach, and whose presence in our homes would dignify and honor them. My purpose in this paper is not only to suggest some of the ways and means by which the horse industry of our State may be given the respectability it ought to have, and would be entitled to, could it be rid of the stigma brought upon it by the wicked and mean practices of some who are engaged in it, but also to suggest some ideas that may be of interest and profit to farmers who are either contemplating, or are already engaged in the raising of horses.

DUTIES OF PARENTS.

Our children at an early age show their natural inclination and fitness for this or that industry or vocation, and it should be our first duty as parents, after supplying their physical wants, to so nurture this inclination by education and home influence, that when the boy becomes of age, he may be fitted and anxious to enter at once upon his chosen vocation, and not feel that he must spend four or five years roaming through the country in trying to decide what to do, at the risk of being at the end of that time wholly unfit for any honorable pursuit.

I would like to occupy the time of one paper on this much neglected subject. Parents are so anxious that their sons should become great in the fashionable acceptation of the term, that they, instead of encouraging their boys to commence on the lower rounds of the ladder to success and steadily climb towards the top, seem to wish them to start at the top, forgetting that it is dangerous to stand at that height before they have had experience with the ways of the world, and have learned by that experience that success is only obtained by effort. And right here let me say is in my opinion one great cause of so many of our boys' discontent on our farms, and the reason so many of them leave their homes and seek employment in our cities. It is an almost invariable rule that our successful men in business or in character building were boys that started with nothing but a well stored mind and a steadfast purpose instilled into their minds by kind and loving parents, that have started with this one idea in mind, that whatever they attempted to do they would do it well.

Parents should study the inclination and adaptability of their children. If the boy has a love for the so-called neat stock in any of its branches, such as dairying, beef-raising, raising of fancy stock or sheep husbandry, cultivate that love by your approval and advice. Provide for him books and papers adapted expressly to his desires and needs. Do not discourage him, do not express doubts of his success, for confidence in one's ability to succeed is a great help to success. If the boy is inclined to the horse do not try too hard to turn his mind from it, but use the same care and good judgment you would were he otherwise inclined.

Now, I imagine some of our good fathers and mothers are thinking of some scape-grace in their vicinity who is getting what he calls a living by trading old, worthless horses. This class of people we have in every pursuit in life, people who are trying to get something out of nothing, which is an impossibility. But we must so educate and train our boys that they will be above all this meanness, prepare them to live in a realm above this class, so much so that the class mentioned would no more think of mingling with them, than they would with men of the professions.

If the boy wants a colt get him one; get him a good one. Don't get him a cheap, worthless one that no one else wants; for his love for his business and his success in it will depend in a great measure on how he starts.

When he has the colt, give him the time necessary for its care, and the opportunity to learn its needs, and you will find that your boy will do more and better work on the farm for his thus having an interest in this one direction, having something of his own to think of and care for. And when the fairs come, as they will in the fall, (and of their value and usefulness I shall speak later,) let him take his colt, for you remember he has a good one. I assure you he will not spend his time and money visiting the side shows that usually are at full blast trying to humbug the idler and loafer, for he has something to do, and when not engaged in caring for his colt he is conversing with or listening to others who are discussing ways and means of advancing the industry he has adopted as his pursuit. Cultivate principles of sobriety in your boys. Right here lies a great difficulty in encouraging our boys to enter the horse business. So many of those engaged in it are men who use intoxicating liquors, that it requires more diligence on the part of parents to see that their children should have the principle of total abstinence so instilled into their minds that they will not touch liquor under any combination of circumstances. It is not needed in the horse business more than any other. If we cannot run our business at Maple Grove without it, we shall not run it. Who wants to trust valuable horses in the hands of men accustomed to the use of it? We do not, and will not if we know it, hire a man who has anything to do with it, unless he will pledge himself to abstain from the use of it entirely while in our employ.

THE PART THE BOARD OF AGRICULTURE SHOULD TAKE.

Of all the reports we read in our journals and agricultural papers of the doings of our institutes, every other industry is taken up and discussed over and over again, but seldom do we see the horse business mentioned. One can hardly take up an agricultural paper but you will see the dairy interest, beef industry, milk production, market gardening, orcharding, poultry-raising, bee-keeping, in fact, every industry attempted by our farmers in the State of Maine faithfully discussed, but with the horse left out.

Now, I believe the horse industry second to none when thoroughly understood and judiciously managed. And I think the Board of Agriculture negligent of its duty, until it takes up this neglected subject and discusses it intelligently and with the same object in view they have in discussing other subjects, namely, benefiting our farmers, making life for them more pleasant, more profitable, more attractive to the young men, because of more knowledge of their business. The trouble is, farmers have been doing their horse business just as they did their dairy business before we had our Board of Agriculture that has labored so assiduously to enlighten farmers on this much abused industry. Why, the average price of butter is certainly thirty-three per cent higher now than before this question was agitated, and more than thirty-three per cent better quality, and just because farmers have found out by these discussions, that to succeed they must have in the first place good cows; that the cows must have good feed, comfortable shelter, careful and gentle attendants, good milkers, and that the milk and cream must be properly handled until the butter is made and sold, when it will be found, if all these requirements are faithfully carried out, the balance sheet of the farmer will be an interesting document.

Farmers have thought if they raised a colt at all, any old mare unfit for other business was good enough for that. So they have bred her to some horse in the neighborhood whose service could be had for five or ten dollars. They have their colt, and then they must keep it cheap, so let it run in the open shed, perhaps with the sheep, and eat what the sheep will not, allow it to get lousy, and take no care of its feet. He lives, in fact, at a poor, dying rate, until four or five years old, and is worth just about the same as the old mare—*good for nothing*. He can't sell it, for there is no market for such. He curses the horse business and don't try again. He had better not, at least in the same way—he can't afford to; it "don't pay."

Now, what is needed is that our Institutes and Agricultural journals so discuss this business in the light of common sense and good judgment, that when we attempt to raise another colt, we shall find as we have in the dairy business, that it pays. And, as I said before, I sincerely believe that there is no one branch of farming that promises more and better results than the raising of horses when properly understood and judiciously managed.

There is one great danger in doing this business. People are apt in their eagerness to raise a trotter to lose sight of the general purpose or gentleman's driving horse. This they should guard against for the fast trotters that bring very high prices are not and will not be plenty, but the gentleman's driving horse, of good size, good color, good style and pure gait, with fair amount of speed, can be bred almost to a certainty, and this horse so bred will command a ready sale at a price that will pay the farmer well. And if, as is likely the case, if properly bred, the colt should be speedy, his price will be enhanced in proportion that he possesses this quality. So, breed from the sires and dams of the best trotting families, possessing the essential qualities of style, size, color, disposition and gait, and your success is sure.

In this way you have three chances. First, of getting a speedy horse that will sell readily at a fancy price, and second, of getting the gentleman's driving horse that will bring a good profit to the breeder; third, the good business horse that has been unfortunate in getting blemishes that unfit him for bringing a high price, but not for the general purpose horse that is worth the cost for general business purposes.

I imagine some one is thinking, and wants to ask, if there is not danger that the business will be overdone, and that when we get these horses raised ready for sale, there will be a scarcity of purchasers? I think not. So long as there is a fast growing tendency in our large cities to own and drive a good looking speedy horse, and as the State of Maine is fast growing in public favor as a horse breeding State, I think there is little or no danger of a surplus of this kind of horses. It is the man that breeds the cheap horse that will get left. Probably some of you are thinking that should you raise such a horse as I have pictured, you could not sell him for anything like the price that larger breeders could get for the same animal. This is a mistake. When we first started in the business and went to Kentucky to purchase a stallion, we thought as you do, so concluded to take time and look the farms over before purchasing. But we soon learned that when we found a colt equally well bred and equally good individually, it made no difference who owned him, whether it was the farmer with one or two colts, or the large breeders with their hundreds. We found that if the farmer was inclined to undersell, the larger breeders would at once buy the colt themselves. And we also found the farmers smart enough to get all their colts were worth when compared with others. *It is a fact* that there is a scarcity of good gentlemen's driving horses. One engaged in the business when asked where to find such is obliged to answer, "I don't know." They are bought up as fast as old enough, at prices that pay for raising better than any other stock farmers can raise.

THE PART AGRICULTURAL SOCIETIES SHOULD TAKE IN ADVANCING THIS INDUSTRY.

It is a fact that the success of our fairs is dependent largely on the horse interest. I very much doubt if a fair could be financially successful if the horse industry should be left out. Now, what can agricultural societies do to rid this department of the stigma that rests upon it and give it the degree of respectability it deserves? Our fairs must be made so unobjectionable that our best, most intelligent and conscientious people can not only attend them and not witness practices revolting to their sense of propriety and honesty, but that they can feel that everything is being done in accordance with rules of prudence and integrity.

In the first place, the societies should be very careful in the selection of their officers; they should be practical men, men of experience, men of intelligence, men whose reputation for honest dealing is unquestioned. And in the second place, these men when elected should be very particular in their appointments. None but high-minded men should be employed in any of its many departments. Judges of races should be men of keen insight, men who would not be influenced by fear or favor. And they should be backed up with authority to remove or punish any driver for violating any rule laid down to protect the public against imposition and fraud. We have such rules, and a violation of them subject drivers to punishment, and a society or board of officers ignoring them is negligent of duty and gives its influence on the side of lawlessness.

Again, officers of agricultural societies should not allow any of the many questionable amusements on their grounds, such as chance games calculated to attract the young and do them incalculable harm. As soon as the better class of the community find out that such things are not allowed, and that everything is expected to be done on the square, the revenue from this class will far exceed the land rent received from these impostors.

I consider these fairs might be, and indeed are, of great importance to our farmers, and the more they become interested in them the more good they will derive from them. We are so constituted by nature that a little rivalry stimulates us to greater effort, more of thought, and to better results. But let us bear in mind that for them to do us the most good possible, they must be rid of all that tends to dishonesty and meanness in every other department as well as the horse department. I believe it is just as easy to do an honest horse business as an honest dry goods business, or grocery business. Why not; what is there in the breeding and rearing of horses, the noblest animal of God's creating, that tends to stimulate dishonesty? Nothing. I believe the reverse of this true. The more we become acquainted with Nature and Nature's laws in regard to the growth and development of animals or plants, or in fact any of Nature's laws, the more likely we shall be to become like them, *true*, *reliable*, answering the needs and demands of man in every emergency of life. A dishonest man in the horse business, would if in the dry good's business sell by a short yard stick, or if in the grocery business use two sets of scales. So, do not attribute the mean, crooked practices of some in the horse business to the influence of the business itself or to the man, but to Mother Eve or some other influence equally effectual, making them inferior to the horse himself because of natural endowments misdirected.

So, then, let us do all in our power to put the horse industry of the good old Pine Tree State on so sound and reliable a basis, that others will say of us engaged in it as they now do of our horses, that we are the most honest, most reliable, and best acting people in the world.

In conclusion I wish to say that there is an excellent opening for good, honest, reliable, intelligent, capable, temperate young men who have a liking for horses and a desire to become proficient in in handling them, as a large per cent of those engaged in the business throughout our county are to-day looking for just this sort of a man, and at a salary equal to those commanded in the professions. The same business principles are applicable to horse business as to all other business. The more intelligence put into it, the better the results. The more knowledge we have of affairs outside of our business the better able we are to steer clear of the rocks and shoals on which so many are wrecked. So I would say to the boys, improve all your time in acquiring an education that will enable you to cope successfully with others in the battle of life, for life is indeed a battle. But if you are armed with a well stored mind and an honest purpose, and are rid of all that tends to drag you down, such as intemperance, licentiousness, profanity, untruthfulness and the like, your victory is sure.

THE BRIGHT SIDE OF FARM LIFE.

By A. W. CHEEVER, Dedham, Massachusetts.

No one I think will deny that there *is* a bright side to farm life, but there are many who can see no enchantment in the business unless viewed at a considerable distance. Farming has ever been considered a noble occupation when the work could be done by slaves or willing servants, but not until the settlement of this country by intelligent freemen drawn from the common people of the old world, has the manual labor of the farm been looked upon as quite respectable by those engaged in it.

In the early history of New England, agriculture was the chief occupation, and the smartest and best men were none too smart and none too good to till the soil with their own hands, and I believe there is at the present time no place on the face of the earth where intelligent farm-owners working the lands they own, with their own muscles, can maintain so high a position in society as here in New England. And yet, sometimes, when reading the agricultural papers or listening to the talk of farmers and members of farmers' families, the very atmosphere seems loaded with the wailings of discontent. The truth is, there are a great many people both on and off of farms, who do not look upon farm life as having any bright side at all, except to those who can see it from the *outside*, and at a distance. Within the past year a contributor to a prominent New York weekly devoted nearly four long columns to a discussion of the question, "Is village life worth preserving?" meaning by "village life," that which is so far removed from a great city that the inhabitants cannot conveniently traverse the distance each morning and evening. And he actually argued that all our small country homes ought to be abolished, that the people should move into the cities or their suburbs, that the country should be owned and managed by great corporations, and that all the labor performed in haying and harvesting, should be done by laborers carried out each morning on railroads and returned to the city at night—leaving only the few who would be needed to care for the stock and guard the property, each man taking his turn in this lonesome and disagreeable work.

"The country," he says, "should be kept as the mountains are kept, and as the seaside is kept, for the summer or winter excursions.

Then country life would be full of pleasure, recreation and satisfaction, but such it can be only to those who are disengaged from it."

This is the view of country life that a great many city people take, that the farm is a splendid place to visit in summer when fruits are ripe, but would be "awful" lonesome for a permanent home. And I have noticed that these city people who bring such excellent appetites to country tables are not at all bashful about expressing their views in regard to the advantages of the city over the country at all other times and for all other purposes except this annual summer picnic. And country people, especially the younger portion, are far too easily influenced by the remarks and insinuations of such visitors or boarders. They come to believe that a good deal that is told them is true, and that really there is no bright side to farm life. City people visiting or boarding in the country for a few weeks' vacation, do not, as a rule, talk a great deal about their own troubles; —of the many ways in which they pinch and scrimp to save enough to make the trip, nor of the disagreeable things that they in common with all mankind have to put up with, in the daily round of business and domestic cares and trials. No, they are off for a good time, and to forget their own troubles, which is a wise thing to do. But country people should not be deceived by these short visitations, for they give very little insight into the merits of the question whether farm life or city life has the brighter side in the long run.

In asking the question, is farm life worth living? I would first try to find out whether life itself is worth living. Different persons would give different answers, and would answer differently under differing conditions, and there comes a time in the life of every living being when to die is the only proper thing to do, but all Nature answers in a general way that life *is* worth living. Nature is full of life, it is everywhere and in everything. Life is one of her strongest forces. In a broad sense we could not help living if we would. But life is worth most to those beings who *best learn how to adapt themselves to surrounding conditions*. As a general rule those survive that are best fitted to perform their special part in the great work of Nature. It is the weaker that go to the wall. It is my firm belief that there was never a time since the earth took form when a man should rather live upon it than now. Reading history gives me no hankering for the "good old times" of our ancestors. So long as I am not responsible for the arrangement, I am glad they lived first and did what they could to smooth the way for us. But when we accept the fruits of their labors we are taking upon ourselves great responsibilities. The world should be made better for our having lived in it, otherwise the sufferings and privations of our fathers go largely for naught. The farmer who merely sows and reaps and consumes the harvest has not done his whole duty. If his ancestors have partially subdued the forest and planted the fruitful vine it is his duty to plant for others still to come, and in so doing will both make and see brightness in his labors. There certainly never was a time when a farmer could get more out of life than the present time, especially here in our own country. But I am afraid there was never a time when the farmer was so discontented as now, mainly because of the opportunity for estimating his condition as compared to that of men of certain other classes. The opportunity for a few exceptionally shrewd men to become immensely wealthy was never so great in any age of the world as during the past thirty or forty years, and our story books and newspapers are not backward in setting forth the exploits of such men for the excitement of readers. The farmer of to-day is constantly reminded of the financial success of the few millionaires, and of the princely way in which they and their families sometimes live, and by comparison he is made to feel poor and to ascribe the cause to his own bad choice of occupation.

But the farmer is not alone in this feeling of discontent, for it pervades all, or nearly all classes. The ideal standard of living is high—a little better for each, or a good deal better than present income will allow. Poverty, with many, is being unable to live as one might desire, or as the comparatively few are supposed to live. To be rich is to have a little more income than one can think of ways of spending, and to have the income without sweating for it. By this standard the proportion of rich to the poor is exceedingly small. But I have no sympathy with men who set up such a standard. Work, real hard work, with hand and brain, is a law of man's healthful existence, as it is the law of all animated nature. To every healthy person, not warped in mind by a false education, work is a pleasure as well as a necessity. We would be miserable without it. Think of going into a garden to live, where there would be nothing to do and nothing to be learned—no progress possible! Men are like some machines that will last longer in use than idle, for rust often eats away faster than friction. I have known a man to lose all interest in a farm after he had removed the last obstructing stone, built the last needed rod of drain, erected a complete set of buildings and filled them with choice stock and the most improved modern farm machinery. In making improvements there was real pleasure, but in merely making money there was none.

Nothing is drudgery that one likes to do and is successful in doing. Men's tastes are not all alike, and it is well they are not, and I am not going to advise all country-bred boys and girls to stay all their lives in the homes where they were born. As far as I am myself concerned, so long as I raise any kind of farm or garden crop to sell, I am willing the consumers of the goods I produce shall earn their living in some other way. The farmers are the last men in the world who should regret to see many of the young people about them going into other kinds of business, for all who live are going to eat, and for some time to come those who eat will be expected to pay for their food.

We all feel our own aches and pains, our own mishaps and disappointments, much more keenly than it is possible to feel those of our neighbors, and I suppose most of us remember the bad luck and the stormy days longer than we do the pleasant ones. If it were possible to compare our own lot in life with that of the millions who are faring worse, and by no real fault of their own, it would be a good deal easier to find a bright side to our own lives.

Let the discontented wife of almost any fairly well-to-do farmer follow him through his city or village route into the places where he sells milk or garden fruits and vegetables, and she will find plenty of homes, or what pass for homes, that will make hers look better on her return than it ever looked before. In this opportunity for comparing homes and how different people live the farmer has an advantage over the farmer's wife, who stays more by herself and sees less of other people's troubles and self-denials. I have seen a good deal of home life both on and off of farms, and I have no hesitation in asserting that on the average farmers live as well as any other class of like means and tastes.

The newspaper jokes about farmers living on food too poor to sell are not founded on facts, or if so, they are very exceptional ones. It is the city's poor that get the poor food, nor do the rich man's dollars always command the best; for with many things it is impossible to have them in perfection except very near the place of production. I know that, as a rule, farmers live well, and every body else knows it, if they know anything about it. Old "Mother Hubbard's" bare cupboard was not in a New England farm-house kitchen, nor do I believe her dog to have been a farmer's domestic animal, but was a poor city dog that had been kept so long away from his native haunts, that he had lost the art of finding his own dinner, just as too many people do who crowd the great centres of what is termed civilized life. The farm is the natural place to look for good living, and it is the place, too, to find it.

It is a weakness with some to imagine that *their* lot in life is much harder than that of their neighbors and acquaintances, and if country people have this weakness more than others it is chiefly because they see less of the misery of the world than do others who mingle more in it and travel more over it. I am not sure but the daily newspaper is partially responsible for the discontent and unrest of our American people. It prints all the bad as well as the good news, and exposes all the short-comings of everybody outside of "our party." It is a severe critic, and I fear makes the people of the world appear worse than they really are. To get a broad view of things one must read both sides. It doesn't take much of a tape line to measure the calibre of one whose reading is confined to a single party or denominational paper. Country people should read more books of travel, especially such as are written by authors who have made a study of the conditions of the common people in the countries visited. It is not enough to know about kings and queens, lords and nobles, nor how the few conspicuously wealthy live, but we want to know about the common people, the class we are all supposed to have the most interest in and sympathy for. We want to know how people are getting along in other parts of the world outside the little neighborhood we call home.

I have recently been reading "The Capitals of Spanish America," by Wm. E. Curtis, and I wish every discontented farmer and farmer's wife in New England could read the book, and see how their own lot in life compares with that of the average common people of South America. I have, too, a farmer friend who has been spending many months in this country and Europe studying the condition of the rural and city populations of places visited. He comes back to his farm in Massachusetts with the feeling that whoever grumbles about New England farm life doesn't know what he is talking about, for he finds that even the most shiftless and discontented among us have advantages and opportunities that are hardly known abroad.

The rent paid for the use of farm land in some portions of Europe would secure a deed in this country, and as to taxation we hardly know what the term means as compared with the people of many other countries.

Our taxes, too, are largely of our own voting or assessing, and are not imposed by lords or clergy, though some of our greatest burdens are self-imposed for such things as do us more harm than good. The cost of the intoxicating liquors consumed in the United States annually is more than double the expenditures of the government, including pensions and every form of internal improvements, and the tobacco tax equals ten dollars annually to each man, woman and child in the country. One has no business to complain of bad luck, hard times, or excessive taxation when his own action, or want of action, is the chief cause of his troubles. No employe has much of a show for having his wages raised, while his employer sees that what he does receive is being foolishly or criminally wasted.

Neither will the farmer get much sympathy from the rest of the world so long as he follows methods that ought to have been abandoned a generation or more ago. A farmer once came to me for assistance in securing a place as foreman on the estate of some wealthy business man who farms for pleasure. I asked him why he proposed giving up his own farm and a life of independence to take a second place on the farm of another.

"Because," said he, "I want to make money faster than I am making it on my own farm." I asked him how he expected to be able to earn for another more than he could earn for himself. He seemed to think the suburbs of Boston were full of fancy farmers who didn't care whether their foremen earned their wages or not. I could point him to none among my acquaintances, and he seemed greatly disappointed.

Another, coming with complaints of hard luck and no "show in the world," said his wife's brother was salesman in a meat-market in Boston, with a salary of two or three thousand dollars per year, and that his wife felt discouraged when she thought how much better her brother was doing than was her husband on the farm. I asked him if he didn't think that possibly the brother was a little smarter than the husband. Such questions are not always pleasing, but they are questions the world is constantly asking. Second rate men are not in demand for filling responsible positions, but first rate honest workers of ability are in demand everywhere and always, and it is no dark side view of farm life that one gets when he sees that the farm and the country home is the starting place for the production of a large majority of the country's most valuable men.

In recent conversation with two prominent business men of Boston, I asked what proportion of their acquaintances doing business in the city were city born boys. The reply from both was, "They are *all* from the country, with scarcely an exception." But if that is so, I asked, what becomes of the Boston born boys? Where are they, and what are they doing? "Oh, they go West, some of them, and can't get money enough to get back; a good many take up with inferior positions in business houses, where they seldom rise, or make any mark in the world. They draw their wages weekly, and spend all as fast as earned. They help make up that very large class to be found in every large city and manufacturing town, who if deprived of work, could not live a month without credit or charity." One of the best farmers I know in New England to-day was, a few years ago, a large owner in one of the most prosperous business houses in Boston. I asked him to tell me what induced him to give up business, withdraw from such a firm and devote his entire energies to the business of farming, for he is making it a business and not a plaything, as many have supposed. His reply was, "a business like ours in Boston is attended with too great risks. I have made money in it, and have no fault to find with the past, but the concern has grown to such proportions that its magnitude and risks have made me timid. I dared not longer risk my savings in my own business, so withdrew and invested part in a good farm." In comparing the two modes of life, he further said that "should anything occur to cause a stoppage of business among the business men of Boston's longest and richest street, it would be a very small percentage who could meet their engagements; they would have to fail, get extensions or discounts." "But," said he, "if I were obliged to close up my farming business, and sell my farm and stock at auction, I should have no fears of the consequences. The stock and crops of a good farm can always be sold for very nearly their actual value, but throw the stock of a great wholesale and retail dry goods house on Washington street on the market in a few days' time, and there is but one word that will express the operation and that word is "*slaughter*."

Is there not a bright side to farm life, when men of experience in other lines of industry turn to it as a refuge from danger or adversity? It seems so to me. It is not the lot of man, nor of any animated being, to live in perpetual sunshine in this world of ours. Difficulties are met in all pathways. Life demands continuous action as a means for securing health, comfort and happiness. But the mind must be active as well as the body. Unfortunate people whether on farms or elsewhere do too little good solid thinking. They do not sufficiently understand the relations they bear to surrounding conditions. They do not realize the importance of making themselves indispensable to others, or independent of them. Who cares for the habitual tramp? Who cares to help one who will not try to help himself, but who imagines that somebody else owes him a living? Ours is an age of great activity and much thinking. Men know more of one another the world over than at any previous time in the history of the race. I hope we know more of ourselves, though this is one of the hardest things to learn. The Yankees are a rushing, pushing people, full of invention and of schemes for accomplishing more with less brute force. Steam and electricity have multiplied man power many fold. Half the world can easily do now what it once took all to do. This ought to make every man's life easier or give him more comforts. It does do this in a measure. The luxuries of the past have become the common necessities of the present. The poorest laborer has comforts now which were entirely beyond the reach of the richest in the days of his ancestors.

But not all have learned how best to utilize the hours of leisure that machinery has brought them.

I was one of the first in my town to purchase and use a mowing machine. Besides cutting my own grass I cut enough for neighbors to pay for the machine. If I had been contented to just cut my own, and then use the time saved in going a-fishing or in talking "hard times" in the village store, I doubt very much if the introduction of machinery on my farm would have proved much of a blessing.

I remember the first time I mowed for one of my neighbors. He was so overcome with astonishment at the ease and rapidity with which the grass was being cut that he could hardly get up ambition enough to use his scythe in trimming out around the rocks and trees. He couldn't adapt himself to the new conditions in such a way as to be helped materially by the labor-saver. It took New England farmers a long time to learn that their business was not all blasted because they could buy corn from the West at fifty cents a bushel which they thought cost a dollar to raise here; and then it took another long time to learn that whatever the price, we can raise it as cheaply as we can buy. I suppose there are some who have not learned it yet. But it is these who see the dark side of farm life.

Did you never see a flock of farm-yard fowls crowded into a filthy, vermin-infected, hot hen house in summer, or roosting in some open shed in winter till every comb and wattle had been whitened by frost, or housed in some basement where every inch of ground surface was saturated with cold water? Have you never seen a herd of cold, lean, hungry cows standing in a stable loosely boarded, upon rough, hard, bare floors, with mangers empty and mows and scaffolds fearfully near to emptiness; or ranging wearily over dry, barren pastures with only a filthy mud-hole to drink from? And have you ever followed the milk product of such a herd through the vicissitudes of tainted milk-pails, mouldy cellars, bad smelling churns and butter workers, to the country store to learn the price received for butter? Have you never seen men plow, cultivate, mow and rake around a rock for forty years, and then not think to remove it, when it could have been sunk or dug out in a single hour? Have you never seen cultivation delayed in spring for want of drainage till the season was too far advanced for making a full crop? Have you not seen the same land producing only the poorest quality of swale grass, and not much of that, because of too much standing water on the surface? Have you never seen neglected old orchards mossy and rotten, with foliage and fruit annually destroyed by myriads of insects and fungi? I think some of you must have seen some of these things, and if so, I am very sure that if you will interview the owners or managers of such unthrifty and untidy establishments you will find that they don't see much bright side to farm life. If they do, their wives and children certainly do not.

I cannot think there is much sunshine in the lives of manufacturers, merchants, or professional men who are constantly outdone by competitors who plan better, or execute more efficiently. To see a bright side to farm life, one *must* have some taste for the occupation, and what is of equal or greater importance, *must know his business.* I care not what industry you name, from preaching down to sweeping streets or cobbling shoes, the man who learned his trade forty years ago and hasn't learned anything since, isn't in demand now, certainly not in New England.

As there are professional men and mechanics who cannot readily take to the modern ways, so there are farmers who cannot do things much differently from what they learned to do them as boys, but it is no fault of the occupation or calling in the one case more than in the other. From my own standpoint farm life has always looked bright. Do you ask if I like to clean out barn cellars? Let me tell you that I have had to cross city streets when they were as filthy as my barn cellar ever was, and I didn't have rubber boots on either. "Isn't farming generally dirty, dusty work," do you ask? Somewhat, at times, but how about the great manufacturing cities like Cleveland and Chicago; where the black smoke from thousands of furnaces lies so thickly over all as to completely obscure the sun in the fairest days, and where the whitest marble or linen takes on the color of mossy granite and plowed ground in an incredibly short time? Dust is everywhere, but I find it as disagreeable on Tremont street at the waiting station for horse cars near Park street church as it ever is in my own garden.

Yes, there are disagreeable things to do everywhere, but not more in agriculture than in other branches of industry. I like farming as do thousands of others because of the opportunities for observing nature from the opening of the buds in spring, to the gathering in of the varied harvests of autumn, but I like it more because I feel that it is an occupation that one can follow with a *perfectly clear conscience*, and a certainty that no one else is being made poorer by our gains. This may be equally true of some other vocations, but certainly not of all nor generally of those by which a few men acquire immense possessions. It used to be taught by old philosophers that what is one man's gain must be some other man's loss. In swapping horses or trading city lots in newly boomed places this may often be true, but the rule never applies to the honest cultivation of the soil. It does throw a good deal of sunshine into a man's life to feel that his occupation is a perfectly honest one. He who cultivates well a good piece of land has a feeling of security and independence that can rarely be felt by those who depend upon others for their income. Good farming encourages honesty and integrity of character in the farmer himself. His work is constantly reminding him that well doing pays better than ill doing. He learns that his land cannot be cheated with impunity.

But the farm is seen at its very brightest, when seen as the home and training school of youth. The character of every people depends upon the training of the children. Men and women are very much what their early years have made them. I know it is possible to produce a valuable citizen under city breeding and city influences, just as it is possible to have an only child grow up free from undue selfishness, but I know that it is not an easy thing to do. The country boy on a farm learns to be useful at a very early age. He brings in wood for the fire that cooks his dinner; he helps plant the seeds which in due time return the harvest; he helps feed and care for the farm animals and helps protect the crops from animal and insect enemies, and as he increases in years he cheerfully assumes the responsibilities of the mature worker and manager.

The farm boy early learns to connect cause and effect; to learn the relation of seed to product. He learns also to cultivate patience, for he knows that the seed planted to-day will not bear fruit for many days or weeks, perhaps for months or years. He learns to wait for the results of his labors. The city boy sees his wants supplied at the market or store, or from the peddler's cart by exchange for money, but he does not and cannot, as can the farm boy, see exactly how wealth is produced. He sees in the shop windows a great many things that he wants but which he can only obtain with father's money, or by stealing. The city boy is certainly sorely tempted. Nor is it possible for the city child ever to realize as can a country child, the charms of home. City houses are not only closely crowded, but they are all very much alike in any given locality. There is little individuality about them to make them different from all others. Then they are so contracted that there is little chance for turning round without stepping on the premises of others, or spilling over into the public street. The country child early learns the lines between "our" homestead and those of neighbors, but he finds ample room upon what he feels is his own, or rather, "ours." He very early learns to feel that he is to a considerable extent a partner in the concern, and has a hearty interest in the success of the firm, and as he approaches years of manhood he finds growing within him a love for that particular home, or neighborhood or town, that is the essence of real, true patriotism. No boy reared in a tenement house in factory village or large city can ever be depended upon to volunteer for the protection of native land as can the boy born and bred upon the land, for he learns as no other can the value of land and of a real home.

I know as well as you that the chances for accumulating millions of money are not on the farm, but of what value are millions of money compared to millions of true, intelligent, self-sustaining, patriotic citizens? The danger of the future of this country, I fear, is in the millions of money in the hands of a few, and the millions of men in cities who have no homes to enjoy, no homes to protect. I have previously said that I do not expect or desire that all country bred boys and girls should spend all their days on the farms where they were born. There is something to be said for the cities, but we all know that the best blood in them is and must be drawn from the country. And do not let us forget that the country is as truly the natural breeding place for valuable men and women as it is for valuable horses and cattle. The difficulty with the discontented people on farms, as it seems to me, is that they have somehow got the idea that farming is not a natural occupation nor a desirable one for men and women of a high degree of taste and intelligence. They also imagine that farming is harder than other kinds of business. An unsuccessful man thinks his business is hard whatever his calling, and a man who undertakes to do any kind of business in these days without the exercise of good taste and intelligence is absolutely sure to be crowded aside by the better fitted.

If we desire to have our farm life look bright we must keep abreast of the demands of the times. We must study our relations to our surroundings, and then manage to adapt ourselves to the constantly changing conditions. We must learn to realize that one acre well tilled is worth more than two acres that are badly cultivated and tended, and that if there is any profit to be derived from the cultivation of one acre, or the keeping of one cow, there should be four times as much from cultivating or keeping four times the number. I have no hesitation in asserting that the farm products of New England can easily be increased ten fold, and every one knows or ought to know that those farms are most profitable that produce the most according to their acreage. To see much brightness in farm life the farm must be so managed and stocked as to be full of life, life in the fields, life in the stables, and much life and love around the family hearthstone.

EDUCATION FOR FARMERS.

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

The subject upon which I am to speak is a little ambiguous, and at the outset requires an explanation.

The recent agitation in favor of more general agricultural education does not spring from an idea that farmers are more ignorant than other classes of people. Statistics show that in point of education and general intelligence our agricultural classes hold a high relative position.

The recent general awakening among farmers, and a better understanding of the fact, that in the last analysis, the welfare of all classes depends largely upon the prosperity and the efficiency of the producing classes, has led to the desire that farmers may be provided with, and may avail themselves of every assistance which will promote their advancement.

During the past few years there have been unmistakable signs, that all along the line farmers are coming to the front. The rapid organization of farmers into granges, leagues, alliances, wheels and unions, means something. Whether or not, these particular organizations are built upon an enduring foundation, the co-operative and organizing spirit has come to stay.

The newspapers, so quick to catch the throb of the public pulse, are beginning to be wisely cautious about criticising matters of an agricultural origin. Statesmen and legislators are finding it necessary to do honest work for the interests of their rural constituents in order to prevent the strength of their support from vanishing beneath them.

Since the agricultural classes of the country, including those indirectly interested in agricultural matters, comprise more than a majority of the voting population, it is not an unreasonable prediction that the time is not distant when farmers will not only hold a balance of power, but will wield the power itself.

With this prospect in view, it behooves us to turn our attention to educational matters. Free government is safe only in the hands of well educated and well informed people. To vote intelligently, and to legislate wisely, requires no little ability.

Our agricultural organizations have recently made demands for special legislation. While some of these are doubtless wise, there are others which the originators themselves have already seen reason to regret. Whether or not the free coinage of silver, would be beneficial to the country ; whether or not the government should own and control railroads and telegraph lines ; whether or not national banks should be abolished ; whether or not the government should loan money to farmers at low rates, are questions not to be decided by the dictates of partisan prejudice, or by a sudden wave of popular enthusiasm, but by the combined and unbiased wisdom of the most scholarly and experienced minds.

But to turn more directly to the subject before us, let us ask the question, "What kind of education does the farmer need?"

In the first place, we must say that the farmer, in common with all other people, needs a *general* education ; that which is popularly termed a *common school education.* Whatever propriety there may be in special education for different classes according to their tastes and pursuits, in the beginning education is necessarily the same for all. A thorough familiarity with the English language, a good understanding of the principles of arithmetic, a practical knowledge of geometry, and some acquaintance with history, are essential to all alike.

These fundamental branches are necessary both for the development of the intelligence, and as a decent preparation for active life. It is from this point that the problem of education begins to become interesting, and at this point the subject of my remarks most properly begins.

What kind of education should farmers receive in addition to the common school course of studies?

To what branches should our children turn their attention after they have completed the common branches mentioned? It is necessary to make some selection, and the opportunity for choice is somewhat wide.

I think I appreciate fully the general benefit of education for pure culture. In a broad sense, education may be defined as *a development of the power to think, produced by practice in thinking.* In this sense, any subject which engages the attention, and requires thought, contributes to the education of the mind. I have no sympathy with that extremely practical view of education which bases its value simply upon the assistance which it can directly afford in gaining a livelihood, or in multiplying wealth. This view cannot be laid to the charge of the illiterate rustic alone.

There is an increasing tendency among the tax-paying mercantile classes of our cities, to measure the value of all public education in United States currency. In the grand rush for the "mighty dollar," everything else is lost from sight. As if man were merely a combination of flesh and bones! As if there were no such thing as mind, or soul! As if the only purpose of life were to eat bread and butter, and then look about for more!

While it is wise, under certain circumstances, to devote some attention in a public way to strictly industrial education, this side of the matter should be held subordinate, rather than superior to, general education for mental training.

But in the line of general education, after the first rudiments have been acquired, there must be a choice made. Life is too short, and the field of knowledge too wide, to permit a single mind to comprehend the whole.

In making a selection of subjects for study, we should have regard for tastes and circumstances. To this extent, special education is certainly warrantable. From the different departments of study that should be chosen which is most intimately related to the pursuits and surroundings of the individual. For the merchant, the manufacturer, the lawyer, the clergyman and the physician, there are certain branches more interesting than any others. Each class naturally finds pleasure in their own peculiar line of studies.

But how about the farmer? Is there anything in the realm of education that can be interesting to him? According to the popular idea which has hitherto prevailed, the answer would generally be in the negative. It has not been customary to think of farming as having any educational connections. In order to obtain an extended education, and subsequently to lead a consistent life, it has been considered necessary to leave the farm.

Let us analyze the matter a little. The farmer lives in the midst of Nature's surroundings, with the earth beneath, the heavens above and life and animation on every hand. It would certainly seem that to him a knowledge of the natural sciences must be very important and especially interesting. The geologist or the botanist will travel many miles to find upon the premises of some farmer, that which to him has been of no more interest than the letters of a dead language.

The chemist in the laboratory of the city college takes pride in performing experiments, which the farmer, quite unawares, has repeatedly performed in the practice of his work.

With the rural inhabitants of the country generally there has been a radical mistake somewhere. As has been remarked, I have no reflections to cast upon the educational standard of the agricultural classes in general, but I believe that too frequently the subject matter of their education has been unwisely chosen. Many of our farmers have pursued their knowledge of mathematics, or language, or history, far beyond the limits of the common school course, and yet have no systematic knowledge of the natural sciences; dwelling in the midst of a sea of knowledge "with never a drop to drink."

As it seems to me a knowledge of these sciences is just what the farmer needs to make life more interesting. If there is any man on earth who needs that contentment which comes from an educated mind it is the farmer. His is necessarily a life of comparative loneliness. The ordinary man of business is brought into the company of his fellows. The inhabitant of the city is perpetually jostled by the bustling crowd, and has little time for subjective reflection. But the farmer often "drives his team afield" in the morning, with no companionship until noon or night. He must either commune with himself, or with Nature.

The great difficulty is, that in the want of a proper understanding of the lessons which Nature can teach, many are forced to turn their thought too much back upon themselves. This self destructive process is doing much to make farmers morose and discontented.

"A millstone and the human heart,
Are turning ever round.
If they have nothing else to grind,
They must themselves be ground."

Let us now advance one step further. We have shown that the farmer needs, first, a knowlege of the commom branches, and second, a knowledge of the natural sciences, and now we will add in the third place that he especially needs a knowledge of the science of agriculture.

Although this proposition is more generally accepted among farmers now than formerly, there is still a wide-spread prejudice against it. With many scientific farming means book-farming, and book-farming means farming according to the methods explained in books, without any practical experience. We often hear it said, "I don't believe in book-farming. We farmers must learn by experience. Success in farming cannot be obtained from books. My father always did so and so, and I have found it to be the best practice." This feeling springs from a misconception of the whole matter.

The principles set down in the books, which make up the science of agriculture, have been deduced from the most extended and pains-taking experience. There is no principle put forth by any reliable agricultural authority which has not been abundantly verified in practice.

The only difference between the scientific standpoint and the common standpoint, is, that in the former case, the experimental practice has been conducted with great care and accuracy. Farmers generally regard themselves too busy to spend much time experimenting. They frequently, however, *guess* at a great many things, forming hasty conclusions from superficial observations.

The science of agriculture means a knowledge of agriculture, no matter how obtained. The mere fact that this knowledge has been written, and printed in books, should not bring it into disgrace.

If there is anything worth knowing about farming; if the best methods are better than the poorest; if there is any opportunity for farmers to make improvement; if there are any theories and principles underlying the art of agriculture which are worth understanding for their own sake, then there certainly is a proper science of agriculture. I believe that the disinclination and failure of farmers to accept the teaching of science is an important cause of the present depression. Scientific farming is economical farming, and competition is rendering economy necessary in farming as in everything else.

The difference between proper and improper cultivation, fertilization, or feeding stock, amounts to enough upon the farm to yield a satisfactory margin of profit. During these dull and unprofitable years, there have been a few scattered farmers who do not hesitate to admit that they have been steadily accumulating money. Investigation will reveal the fact that, as a rule, these are the farmers who have been quick to avail themselves of improved methods, whether discovered by themselves or from the books.

But this question of agricultural education and improvement is of greater interest in its relation to young people. It is not so much for the farmers of the present time as for their children, that these matters should cause earnest solicitude. Reform of any kind, is most effectual when directed toward the young. On the one hand the habits and ideas of older people are more permanently fixed, and less susceptible of change, and on the other hand, the rapid march of time sweeps one generation away and brings another forward so quickly, that before any important change can be affected in the line of progress, the boys and the girls have become the men and the women of action.

Upon the whole, the most serious question connected with the agriculture of the country of to-day is, "What is to become of American farming, since so few of the brightest and best of our boys and girls are taking a fancy to it?" In the average country community there is a fearful absence of fresh and vigorous young blood. Go from house to house and from neighborhood to neighborhood, you will receive the same impression and obtain the same reply to enquiries after the grown up young people. Gone West, gone to the city, to some manufacturing business, to some profession or trade; "over the hills and far away;" anywhere to get away from the old farm. A majority of the stronger children have gone, and a majority of the weaker ones remain. Place as smooth a construction upon the matter as you can, it is still a deplorable situation.

If the prosperity of agriculture is at the basis of all public welfare, it is important that the agricultural class should contain and retain its due proportion of the best blood of the country. Would I strive to induce young people to remain upon the farm against their present inclinations? Certainly I would. Or, in other words I would hasten to bring about a state of affairs which would turn their inclinations to agricultural matters. There are naturally some whose inborn tastes lead them to other pursuits, from which they should not be restrained. This, however, is not sufficient to account for the general exodus. There must be some other reason and to me the proper explanation promptly suggests itself.

I believe this antipathy of the young to farming, is largely due to their training and education. It is a point which has generally escaped attention and comment, but in stopping to consider, we find abundant reason for saying that the whole tendency of the education of our young people is away from the farm rather than towards it.

During the past few years in particular the general cry of farmers has been "hard times; no money in farming." This general feeling in the homes has unconsciously, but certainly, produced its effect upon the children. At school influences are no better. In the text-books, and in the whole course of studies pursued in our common schools, respectful references to farming or to agricultural matters are rarely found. The illustrations and examples given in reading books, histories, grammars and geographies, are mostly taken from business or professional life. In the minds of the children there naturally springs up a feeling that all that is good, and noble, and profitable in life, is to be found somewhere away from the farm.

Nothing could be more natural. Our young people are thoughtful. They have a wholesome respect for education and for the realm of ideas. If it does not appear to them that the life of the farmer has some connection with intellectual and educational matters, farming falls out of the list of honorable and desirable employments.

There must be a radical revolution in this respect. The interests of the young people, the interests of agriculture, and the interests of the country demand that the course of education for the young shall be reconstructed. Something must be done to give the boys and girls a fair and correct view of life. They must learn that, to them, the science of agriculture is the most interesting and practical of all studies, that farming is, in some sense, the most honorable of all employments, and that there is in it an enjoyment of which they have never dreamed.

The practical question which now forces itself upon us is, "How shall this be done?" There are public means to this end already provided. Agricultural publications are not void of proper advice and instruction, but how few of the young people make a practice of reading these with understanding and enjoyment. The farmers' institutes might have a powerful influence, but the attendance of young people at these institutes is disproportionately small.

We have a State Agricultural College, but at present the agricultural course in that college is patronized by very few students. There seems to have arisen, of late, a general disposition to criticise this State College because it is apparently doing so little to provide for farmers an agricultural education.

Indeed, if we measure results, and especially if we take into consideration the number of those graduates who actually become farmers in after life there would seem to be some ground for the criticism. I suppose it is natural that the public should hold the authorities of the college responsible for the situation. I do not propose, in this connection, to raise that side of the question. I simply wish to show that under existing circumstances, this state of affairs is entirely natural.

A college course is supposed to be an advanced course. Every college course of instruction presupposes a preparatory school. When young men and young women enter college it is presumed that they have spent several years in climbing the ladder which leads to it.

For the agricultural department of the college however, there is no public preparation provided. The agricultural course is, in a sense, completely isolated. The authorities are expected to begin with the raw material, and to end with the finished product. Moreover, as a rule, the students when they enter the college have no taste for such studies. Under present circumstances, that class of young people who feel that they have the time and money to pursue a college course of four years are not the class who intend to follow the pursuit of farming. I believe it is proposed to obviate the difficulty somewhat by providing a more brief and elementary course, but even this will require some preparation.

The great difficulty is that those influences come too late. After the impressions and surroundings of the child have for years led him steadily in other directions, it is not to be expected that we should be able to transform him suddenly and at will. We must somehow begin sufficiently early to take part in forming the tastes and tendencies.

This line of reasoning brings us logically and irresistibly to the point toward which my remarks have purposely been tending. We must teach the elements of the science of agriculture as a regular study in our common public schools. The common schools are exerting a more powerful influence, in shaping the disposition and character of the young, than is ordinarily imagined. Their influence is brought to bear upon the children at that period when they are susceptible of lasting impressions. Next to *mother* comes *teacher*. Young people naturally have a respect for that which comes from their teacher and from their books. During this early period of active thought and imagination, the impressions which are daily dotted on the tablet of memory and of character are little thought of by us older people in our busy and practical sphere, but they are the impressions which tell in after life.

According to my idea one of the most serious public evils is our neglect to enquire into and understand what our children are doing.

at school. With true parental affection the fathers and mothers clothe the boys and girls with linen and ribbons, equip them with books and pencils, and start them off with "shining morning faces," towards the red school-house. But here their effort ends. The remainder is left to the teacher and to the school authorities. Very properly so, but unfortunately, in our system of management, teachers are too often figure-heads, and school officers generally have neither the ability nor the willingness to undertake much active work.

There is nothing that tends more to perpetuate itself than the system and methods of our public district schools. Reading, spelling, writing, arithmetic, geography and grammar make up substantially the round of studies day after day, week after week, year after year. The teacher asks the question from the book and the pupil guesses at the answer.

At the beginning of each term it is wisely supposed that pupils have had reasonable time to forget, during the intermission, what they learned the previous term, and they are generally started again, in the arithmetic and geography, at about the same point. It is considered quite satisfactory, at the end of the term, if they have succeeded in advancing only a few pages further than before. I have personal knowledge of a class of pupils studying fractions who were studying fractions eight years ago.

It is seldom in schools like these, that a pupil can be found who thoroughly, and genuinely, enjoys his studies. There are many who "like to attend school;" perhaps on account of the social companionship, or as a relief from the monotony of life, but seldom on account of the downright enjoyment of any ideas obtained.

You will say that this is an exaggerated picture, but an examination into the facts will find it not so very far from the truth after all. There is a fearful want of economy in the expenditure of money upon our public schools. There is not too much money expended, but too much of it is expended to no useful purpose.

What is the remedy? Revise the course of studies. Throw out that which is only formal, and which meets no response in the mind of the pupil, and add something fresh and practical, something that will awaken a lively interest. The ordinary fundamental studies which have been enumerated are indeed essential, but they should not be pushed so far, and to the exclusion of everything else.

I have already referred to the general absence of natural sciences from the schools. This criticism applies not only to the common district schools but also to many of our country high schools. I know of several such schools in which there is not a single class in any natural science. There are classes in algebra, geometry, advanced grammar, geography, Latin and Greek, but not a single allusion to the natural world around. Education of this kind is apt to reach the point where it will resemble the rattling of dry bones.

The science of agriculture necessarily embraces an elementary knowledge of several of the natural sciences, and applies to the principles and practices of agriculture and rural life. The introduction of this study into the common schools would therefore go far towards filling the vacancy left by the absence of those sciences. Give the child a little insight into the mysteries of nature; make to him the revelation that the commonplace work of the farm involves processes of thought and problems of science, and you will open to him a new world.

This new idea of teaching agriculture in the common schools is, in the nature of things, destined to become rapidly popular. Certain objections, however, have been made and will be made, all of which are without foundation. The subject is not too difficult for the comprehension of ordinary pupils. There is nothing in the elementary principles of natural science and agriculture more difficult than the studies commonly pursued. Any one who can understand that two and two make four, can understand the action of atoms and molecules. A pupil whose mind is sufficiently logical to understand the common principles of arithmetic and the grammatical construction of the English language can easily comprehend the ordinary problems of scientific agriculture.

I suppose that some teachers will be scared and their friends will endeavor to help them by advocating their inability to teach the subject. With a suitable text-book any teacher of average intelligence can prepare himself by reading the subject matter once or twice. No teacher can give this excuse without making confession of great weakness.

There is plenty of time in the course of studies for a subject like this. There is a popular cry, which some of the newspapers are very willing to take up, that the schools are too much crowded with studies, and that as a consequence education is not thorough, and the health of the pupils is undermined. There may be some justice in one side of the criticism, but if the schools are crowded, they are crowded with a class of matter which ought to be crowded out by something better. Of what practical use is it to spend a term of school endeavoring to learn the jaw-splitting names of rivers and towns in Africa and Asia, or in memorizing the exceptional intricacies of grammar and the unpractical rules of arithmetic? A systematic and judicious elimination of useless matter from the schools would in many cases leave the time of teachers and pupils a burden upon their hands.

The most strenuous objection will doubtless be, that the plan would be unfair, since it would call for public expenditure for the sole benefit of farmers as a class. "If we are to have industrial education in agriculture," say the objectors, "let us also have it for all other industries."

There are two reasons why this objection is not valid. In the first place education in the principles of agriculture is not strictly industrial education. While it certainly benefits the industry of farming, of itself, it is education pure and simple, and beneficial to all classes whether farmers or not.

We do not aim to teach in the schools how to conduct the operations of farming, but the reasons for them; not to teach boys and girls how to plant and hoe potatoes, but to give them such a fundamental knowledge of the principles involved that they may easily judge for themselves the advantages of particular methods.

In the second place, if we grant that the plan aims at the benefit of farmers and agriculture alone, there is still no logical objection. All public measures should seek to secure "the greatest good of the greatest number." The world moves by majorities. Should we exclude grammar and geography from the schools, because some of the pupils will be so situated in life as to receive no practical benefit from them in their business? In expending public money for educational purposes, the only question to be asked is, whether such expenditure is economical. If a class of pupils can be found in any school, whose line of life gives them a natural interest in any particular subject, by all means let them have it.

Because it is not easy to find some line of industrial education adapted to every pupil, why should industrial education be condemned as a whole? Because the science of agriculture may not be especially interesting or important to a small minority of our pupils, why should that branch of study be entirely condemned?

Moreover, our school laws requiring certain branches to be taught in the public schools, are flexible. They do not require that *every* pupil who attends the schools, shall necessarily pursue every branch of study upon the approved list. The proper selection is left to local school authorities. This fact is sufficient to prevent any pupil from being forced to study the principles of agriculture, for whom that subject is undesirable.

This agricultural education is something which farmers have a right to demand on the ground of taxation. At the present time public interest is aroused upon the subject of the excessive and unjust taxation of farm property. An important part of the tax paid by the farmer under compulsion goes for the support of public schools. Under these circumstances is it not reasonable for the farmer to expect that somewhere in the course of the school-life of his children, somewhere between infancy and manhood, they shall be taught something which has a connection with country life and rural pursuits?

We have here a movement of more than ordinary importance. This plan, if thoroughly carried out, will do as much to promote the interests of agriculture, for this, and especially for the next generation, as all other influences combined. With an elementary course of instruction in these matters in our common schools, supplemented by the new popular course at the State College, our young people will be subjected to an influence which will cause them to cease sighing for "the good things far away."

Our State Grange and other State agricultural organizations, are taking measures to put the plan into practical operation, and it is destined to succeed. We are not alone in the matter. Other states are working along in the same line.

The idea seems new and radical, but in this progressive age changes new and radical are often called for.

"New occasions teach new duties;
Time makes ancient good uncouth.
They must upward still and onward,
Who would keep abreast of truth."

OUR STOCK INDUSTRY.

By J. M. DEERING, Saco, Member of the Board for York County.

From time immemorial, to the present day, there has always been an agricultural industry, and there always will be one so long as there are people to inhabit the earth, because man's first daily necessity is food, and in all civilized countries food is drawn from the soil, or by the breeding and rearing of domestic animals. Inasmuch as agriculture is an industry absolutely essential to civilization, it cannot be killed in any country by any process short of the destruction of the inhabitants. It is, and of necessity must be, an eminently adaptive industry, conforming to processes, methods and products, to every changing condition of soil, society, or markets. Sensitive to every influence, and responding to action, it is perfectly plastic, receiving its shape from every surrounding pressure, whether physical, industrial, commercial, social, political or moral.

The history of American agriculture, particularly relating to animal industry and grain production, falls naturally into four periods.

The first is that of our colonial days, extending over about one hundred and seventy years, or from the first settlement down to the American Revolution, and may be called the period of experiment.

The second, beginning with the Declaration of Independence, extends over a period of about fifty years, or to the time when the cast-iron plow came into common use throughout the country. This was the period of awakening, of the formation of agricultural societies, and of the beginning of a science of agriculture.

The third, of about thirty years, began when the introduction of the cast-iron plow was complete, say about the year 1825, and extending to the time when the reaping machine and mower began to come into common use, about the year 1855. During this period threshing machines which had really been invented long before, became universally used, and advances were made in numerous other directions.

The fourth period began when the reaper and mower became common, and extends to the present time. It includes the introduction into general use of the steam threshers, mowing machines, harvesters, and reapers, and the further improvements of many labor-saving machines previously invented, a marked extension of land transportation of all kinds by steam, both agricultural and otherwise.

Each of these epochs or eras in our agricultural history, is correlated with political and social events happening here and elsewhere about the same time, which make these dates important ones in the history of the country's material and intellectual progress.

The agricultural changes in our country are but phases of a general progress in the industrial arts which have gone along with the growth and development of the physical sciences, and the spread of political and religious liberty.

The art of agriculture is older than history. The science of agriculture is entirely modern. The beginning of art dates with the beginning of civilization, and the condition, methods and prosperity of this industry, in any country, at any time, are related to the whole previous history of that country. As it is the essential of all productive industries, so it has been the most conservative, most adaptive and at the same time the most persistent.

The progress of agriculture walked along with the civilization and intelligence of the people slowly up to the beginning of the last century, getting a good foothold about the year 1850, and has made more progress since, or within the last forty years, than in the whole period before. Never before, within the history of our agriculture could there stand up and be counted, so many talking, thinking, intelligent farmers, as at the present time.

This encouraging state of things, has been brought about through the influence of farmers' organizations. Many farmers, however, as yet, have not enrolled their names upon the side of progress. Many have fallen out of the ranks, to their own detriment, but those who have stood faithful to the principles to-day stand in the front ranks, untrammeled with prejudice against any other industry, looking up, and adhering to the declaration of purposes of their organizations, not only ready and willing to labor in the interests of their own enlightenment, and upon matters concerning their *own* interests, but for the welfare of all mankind.

There are other things, however, that are essential in the advancement and development of our agricultural industries, and among these I note the introduction of pure blooded stock, the breeding up of our domestic animals, the invention and introduction of labor-saving machinery, the establishment of experiment stations, the germinating and purifying of seeds, the increase of our population demanding more and better farm products. The changes in the fashions and customs of the people, the sharp competition we are brought in contact with among ourselves, and also the fertile lands of the West, and the keen and sensitive shrewdness that has been growing upon the people as civilization and intelligence advances; these are some of the principal elements that have had their weight in the advancement of our agriculture, and these are the subject matters that I wish to call your attention to at this time.

I have always contended that our live stock interests should receive the widest attention on the part of the farmer, because upon its success depends that of the growth of all other farm products. I have always noticed that whenever there was an abundance of hay, grain, and other crops, and the price ran low, that it never seemed to be very seriously felt, providing the products from our live stock interest brought a fair price. But if it was the reverse of this, then farmers would complain. There has been a continual decline in prices since 1884 in the beef department of this industry, and farmers have become somewhat discouraged, and many have lost sight of the sleek, plump steers that once dotted the hillsides of Maine. Now if the vacancy has been filled with some other line of stock, such as good dairy cows or sheep, I can hardly see where the farmers have lost anything. But the question arises, have the farmers changed from beef growing to dairying or sheep raising fast enough to keep even with the decline in the first named? I venture to say that the farmers have not changed, that they have not increased in other lines of stock sufficiently to make good what they have lost in the beef interest. The cause for this may be partly on account of some not having any love or desire for the dairy or the sheep, and these have drifted along for six years, in hopes that prices would grow better. Some have changed partly from beef to dairying, and some have changed entirely and are doing their farm work with horses. I am mindful of the fact that there are some that have not lost all their love for a good pair of oxen, and still adhere to the practice of raising a few good steers. For their benefit, I will try to give this side of the question what encouragement it will bear.

A good team is very essential to the farm, and such a team must consist of either horses or oxen. A good pair of 2400 pound horses makes a splendid team, and will cost the farmer about $400 if he buys them. If he raises them upon his farm, they will cost him about the same, but he will not feel it as much. The pair of horses will depreciate very nearly forty dollars per year for a period of ten years, or until they are fifteen years old. If you wish to exchange them for a younger pair, they will be considered only a pair of old plugs and practically worthless. I believe if a farmer raises a good pair of colts and can sell them for $400, he had better let them go, and do his farm work with a one-hundred dollar pair of oxen, because even at the present prices of beef, if he will find a good, thrifty pair of steers, with the same feed he is obliged to feed his horses in order to keep them in good condition, the oxen will make a gain per year equal to the loss upon the horses, at least this is my experience. The difference between forty dollars gain and forty dollars loss makes the balance sheet look eighty dollars better at the end of the year. It is worth saving, my friends.

Perhaps we can glean a little encouragement if we review this interest a little by consulting the statistics as given by the United States Bureau of Animal Industry of 1889, which claims to give more accurate data than formerly, upon the annual production of the country.

We find that from the year 1880 to 1885, the increase of cattle per 1000 population was seventy-two, or 15 per cent. This was due to the remarkable development of the Western ranches. It is also safe to say that the increase was partly due from cattle being held back from market, for breeding purposes. From the years 1885 to 1890, cattle decreased thirty-nine per 1000 population, or seven per cent. This proves that while beef was rising, cattle were increasing. While it was falling they were decreasing. The mean price per 100 pounds for butchers' steers in Chicago in 1880, was $5.75, and there was a continued rise until 1885, when the mean price reached high water mark at $6.05. From 1885 to 1890, there has been a continual decrease in prices. Bed rock was touched at $4.35 per 100 pounds. Low prices in 1890 will show a slight increase in the mean, which seems to me to be an encouraging outlook for the future.

We must bear in mind that the future prices of beef will be governed considerably by the extent of the hog product and our export trade. It cannot be expected that beef will change very fast for the better; but there is another encouraging feature, however, and that is, that there is a better feeling existing among cattle men all over the country than there was two years ago. If I was satisfied that our live stock interest was as valuable to the farmers of our

State as it was six years ago, I would not attempt to bolster up the beef interest. But it really is not. It is plain to me that in my county we have lost very nearly as much in our live stock interest as the beef interest has shrunk in value. Mind now, that this loss is not all attributed to the shrinkage in price. We have lost in numbers, and the farmers have not increased in other lines of stock as fast as they have let go of the beef interest, hence I see the necessity of doing all we can to hold on to this industry and thus bridge over what is called by many, a depression in our agriculture.

How does the live stock interest compare in value with five years ago? Let us take a look at the dairy industry. This interest has had more done for it than any other. The Board of Agriculture has made strenuous efforts to bolster up, and advised farmers all over the State to increase their number of cows, to establish butter factories, and enter into this line of business by the wholesale. There has been a steady and healthy market for the butter product all the while, and no marked fluctuation in prices. What has been accomplished? We have increased the number of cows in the State ten thousand, which valued at $25 each, gives us a gain of $250,000. This is an actual gain. I could go on and give the estimated butter product that would naturally come from this increase in numbers, but I will leave that for the reader to do; but I tell you, farmers, we have not increased one-half we ought. There are millions in this department of our live stock interest, if properly conducted.

I wish to say that dairying is a profitable and healthy business, and it is not my purpose to figure for or against any department of our live-stock interest, because they are all favorites of mine. I believe, also, that the State of Maine is adapted to diversified industries, and it is my purpose to induce, if possible, the farmers to hold on to and not let our industries one after another fade and dwindle away.

We have lost in the beef department 30,000 head valued at twenty-three dollars each, making $690,000. Now, I am not going to take into consideration the loss in price because there always have been fluctuations and there always will be. Cows have decreased in value five dollars per head in this the last five years, and other cattle only six dollars, and really, if we don't have the numbers, the loss in price does not injure us, neither does the advance benefit us. It is the numbers that make the aggregate in either.

Can the farmers afford to grow beef at the present prices? I think I hear some one say no. Well, perhaps they cannot. Yet, I think that the farmers who have raised a few good steers upon their farms, and have had them to sell, are far better off financially than those who have had the idea that it did not pay to raise them, and whose tie-ups are empty. Some seem to think that they ought to receive just as much for their beef as they did when hay was worth twice as much as it is at the present time. If we figure the price of growing hay from the standpoint of what hay is worth in the barn, or even what it has been for the last two or three years, the present prices are far better for the farmer than selling his hay. I can sell my hay for a better price than it is bringing in Boston market, expenses deducted, by converting it into beef at present prices. Yet I don't say but one can do better raising milk and selling it for six cents per quart, or, that if any one is well equipped and well established in dairying, at the present prices of butter, he can do better at that, but farmers are not all inclined that way. There are not half of the farmers in the State carrying on the dairy business, practically, to-day, notwithstanding there has been considerable improvement. Why, private dairying is practically a thing of the past, but the farmers have not all found it out. If we don't keep up with the fashions and changes of the people, if we don't adhere to modern improvements, if we don't yield and enroll our names upon the side of progressive agriculture, and failure and depression stare us in the face, who is to blame? I can hardly see how we can have a successful agriculture without this diversified agriculture. And the more we let slip by and go out of our reach the poorer we shall grow as an agricultural State.

For instance, let me refer to one fact. A few years ago it was no uncommon thing to see in our principal cities two or three hundred loads of fine poultry on sale. Almost every farmer had a fine lot of turkeys to market, and thousands of dollars found their way back upon the farms. But alas! Western poultry came and the prices ran down, and the farmers, commenced to talk that it did not pay to raise turkeys, and one after another went out of the business, and last year there was hardly an Eastern turkey to be found in any city in the State of Maine. Turkeys selling for thirty cents per pound and the farmers with none to sell!

Here is the result of a lost industry. Ah! my friends, it is a good idea to be cautious, but it is a terrible mistake sometimes to be over-cautious.

It is plain to see that in these two departments of our live stock interest from a business standpoint, that the increase in the dairy interest fails to meet the depreciation in the beef interest by $440,-000. That is to say, that the value in the increase in numbers in the one, does not meet the depreciation of value in numbers of the other. To be sure it is not a very serious loss, yet it is a loss to this department of our agriculture. There is no necessity for this state of things with the abundant hay crop that has been raised in our State for the last few years. It has been brought about by farmers contending that it did not pay to grow cattle at the prices. I claim that it does pay, that it has paid, and that it *will pay*, provided they are grown from the grass, the hay and grain that may be produced upon the farm. If we suffer this depreciation in numbers to go on at the rate of five thousand head per year, it will be but a short time before we shall be all out of the business, just the same as we are out of the turkey business.

I don't intend to advise any one, but if we can't see a profit in raising steers after considering our condition, circumstances, and market facilities, then let us raise more heifers, for I tell you, friends, we cannot afford to lose this most important industry, neither can we afford to suffer it to depreciate more.

One word, if you please, in regard to the breeding up of our domestic animals, and we will pass on, and take up another industry. This is a whole subject of itself, and if intelligently discussed, would require all the time we have to spare to-day, but I wish to touch upon the importance of it.

It is a fact that the system of breeding and rearing farm stock is something that deeply interests all farmers. It is an important factor in determining the profits derived from farm labor. Really the life of the farmer at best, is one of toil and anxiety, and often with the most diligent industry and watchful care bestowed upon his farm, he fails to show a profit for his year's labor, yet I think in many instances when the balance is upon the wrong side of the ledger, it results from either lack of intelligence, or carelessness in reference to the best methods in rearing and caring for his stock, or in selecting the proper breeds, those best adapted to the purpose he is using them for. For instance, if we are going to grow beef, we should not accept the Jerseys, neither should we accept the full blood Hereford for the dairy.

In forming a herd, we should determine the purpose for which we breed. This settled, the various breeds suited to our purpose should be examined, because there are inferior animals in all breeds. Let us decide in our own minds which breed is best adapted to our conditions, that is our farm, our market facilities, and our liking, and then settle down to that one, endeavoring to demonstrate the wisdom of our choice. In selecting, let us bear in mind that the male is more than one-half of the herd, because it is a fact that an inferior female wisely crossed, frequently produces offspring very near perfection; but it is very seldom that we find choice females producing superior animals from inferior males. Generally, good breeders are good feeders, hence comes the common saying, that "good feed makes good breed." But I say that breed utilizes feed, and it is only good breed and good feed that wins success. I am aware that on account of low prices of stock there is not as much attention paid to breeding as there was a few years ago, when both beef and milch cows were bringing a good round price. The interest has surely fallen off with the price. This state of things is wrong. When prices are low, it is more essential to breed good cattle. I am continually hearing the statement made by both milk and dairymen, that it is almost impossible to purchase a good cow, and it is also very expensive.

This state of things proves that we have too many inferior cows in proportion to the numbers. Our only remedy is to breed up and raise the quality to a higher standard. The better the animal for either beef or milk and butter purposes, the more value there is attached to that animal, because the more we can receive for the feed consumed. What breeds are best adapted to our locality? Let me say that no one need hesitate about the choice of breeds where the individual condition and wants are intelligently appreciated. Science, research, and practice have established the fact that different breeds are made for different purposes. The Durham, Hereford, Sussex and Polled Argus for the shambles, the Jerseys, Ayrshires, Holsteins, Guernseys and Aberdeens for the dairy. These are the most important breeds, and they all have their friends and their proper places. It is very discouraging to the enterprising farmer who starts out and purchases a full-blood male of one of these mentioned breeds, after placing a reasonable fee for services to have his neighbors all drive by his door, and pronounce his fee too high, and accept the scrub, and claim that they do this from an economical standpoint. They fail to take into account that if they get a choice animal, it will be an increased revenue for them, and also the community, for years, and their economy is not economy. This has done more to hinder and obstruct the breeding up of our live stock than anything else. I wish to impress this fact that the lower the price, the more necessity there is for us to breed better cattle, because in these times, it is only the good ones that pay a profit.

SHEEP HUSBANDRY.

This department of our live stock interest has not been entirely neglected, yet I hardly think that it has received the attention it should from Maine farmers. Our State is well adapted to the growing of sheep, and we cannot point to any time within the last twenty years, when the future outlook for this industry was better than at the present. There has been a continual clamoring going on for the last five years, in regard to this interest, and to-day the American sheep stand proudly, well protected against foreign competition.

If the Maine farmers do not take advantage of this, if they do not grasp opportunities that are within their reach, who will be to blame? Will it be good policy for us not to increase our numbers, and allow the Canadian sheep growers to be able to pay one dollar and fifty cents duty upon their sheep, and ship them into our country, and sell them in our own home markets at a good profit?

We find that there has been a continual advance in the prices of sheep for the last five years. Have the farmers all found it out? I presume that the sheep growers have, because we have increased in numbers, five thousand, valued at three dollars each, upon the farms at the present time, making a gain in our sheep industry of the State, of fifteen thousand dollars. This is a healthy gain. Why, it is eighty-five cents per year, per farm, or $4.25, four dollars and twenty-five cents gain per farm for five years. I have known a ten year old boy to make a better showing in the hen business.

I don't wish to cast any reflections upon any other county in the State, but my own, but I think I can give a good reason for censuring it, because I know of one firm that has purchased twelve thousand dollars worth of lambs this last season, and every dollar has been paid to Canadian sheep growers, and every lamb has been consumed in York county. The point I wish to raise is this: If the farmers had increased their number of sheep in the same proportion that they decreased their beef cattle, they could have easily supplied this demand and they would have been to-day twelve thousand dollars better off financially.

Perhaps some one will ask the question, will it pay me to grow sheep? The answer must be the same as in other industries—market facilities, condition, liking for the business, etc., must determine. Almost any farm is adapted to this industry. Hillside pastures are the best. Sheep have an inclination to climb high. If anyone is favorably situated, and will pay strict attention to the business, they need not question for a moment the profitableness of the business, because when good lambs are worth four dollars apiece, and sheep five dollars, there is no question but what there is a profit. Nearly three-fourths of the wool manufactured before the McKinley bill passed, was grown in the United States, and the figures show that the manufacture of woolens have doubled within the last fifty years. The rate of consumption has also nearly doubled. People are better clothed as well as better fed. This advance represents fairly the progress of our civilization, and every true American should be proud of the fact that the proportion of foreign goods per head has been declining since 1860, and amounts to only seventy-four cents per head. No matter what political party holds the reins of power, there should be equal protection for both parties, the cloth makers and the wool growers. I believe that we are entering a period of unprecedented prosperity for sheep and wool growing, and farmers should bear in mind this fact, that if our flocks decrease, wool importation advances, and the money that we should receive reverts into the pockets of foreign growers. The only true policy for us to pursue is to increase our flocks and avail ourselves of the opportunities within our reach.

The horse department of our live-stock industry is upon the increase. We find that within the last five years we have added upwards of nine thousand in numbers, and in value upwards of one million dollars. Many farmers note this encouraging outlook with pride. If this increase had all been raised upon the farms of Maine we should have the courage to stand behind this industry, and claim it to be a profitable business. To be sure we have no data to prove it, but it seems to me that wherever there has been one horse raised, shipped out of the State and sold, there have been two shipped in, that were raised in the West. It is nothing uncommon to look into farmers' stables and see all the way from two to half a dozen horses and colts and a few cows. The stanchions where once were tied a good pair of oxen are vacated, and the sheep pen is empty.

If you inquire in regard to the pedigree of some of these small limbed, long haired colts you see in most every farmer's barnyard, you will be told that their ancestors were all trotters. I don't wish to speak disparagingly of the race horse. He is all right in his proper place, but what the common farmer needs most is a general purpose horse, and the farmers of Maine as a rule are not raising them. It is plain to me that they are placing too much confidence in speed. Why, a horse that cannot trot a mile in less than 2.40, is only worth what he will bring for a roadster, and there is only one in every twelve hundred that can make this record, and even then not without a great deal of time spent in training.

Perhaps I am taking too much liberty in making this statement, but it seems to me that if the farmers would raise more common purpose horses, more good sized team horses, instead of so many small ones, they could supply the demand in our cities for team horses, and the money would revert to the Maine farmer's pocket instead of the Kansas farmer's.

The worst feature in our horse department is that there are too many Western horses shipped into our State. Farmers are buying them to do their farm work when they ought to raise them. I believe that all the Western farm products, and other live stock and all the dressed beef put together, are not one-half as detrimental to the farms of Maine as the shipping in of Western horses. They are crowding out our sheep industry and steers, and if they continue to come in at the rate they have within the last two years, they will have a tendency to crowd our dairy interest also. This matter needs careful consideration. The time has come when we should call a halt in the prevailing system of breeding so large a proportion of small horses. Unless there is a change the profits in our horse industry will for the common farmer pass out of sight. Let the professional race-horse man raise the trotters and the farmers the common purpose horse.

FARM PRODUCTS.

I look back with pride to the year 1884, when the Board of Agriculture discussed and really established the cost of producing a ton of hay. I believe that the discussion brought out at that time has had a strong tendency in increasing the hay crop of the State.

Really, we know that it has increased. In 1880 it was estimated to be one million one hundred thousand tons. In 1889 it was estimated to be one million three hundred and fifty thousand. Of course this increase has been partly on account of good hay seasons. Notwithstanding this, there has been a marked improvement, and farmers have given more attention to this crop. This has been brought about by improved methods of applying manure. Farmers are abandoning the old method of dumping a small shovelful of manure under a hill of corn, and thinking it will produce a good hay crop. The recommendation of the Board of Agriculture of applying manure broadcast and incorporating it into the soil has really proved a success.

If this increase in the hay production has been brought about by fertilizers made from our live stock interests, then the farmers have made something, but if it has been done from the purchase and use of commercial fertilizers, I think at the present prices of hay they have lost. Unless commercial fertilizers decline in price so as to compare with the prices of farm products, we had better not use them. Barnyard manure is the cheapest because it comes to us naturally and we are never called upon to pay out the cash, while commercial fertilizers must be paid for in cash from the farmer's pocket.

I am satisfied that farmers cannot grow any farm crop upon partially worn out soil at a profit with commercial fertilizers at present prices. I don't say they are not good. They are, but they cost too much. The hay crop of the State of Maine is the same to the farmer as the cotton crop of South Carolina, and is of very much the same value. At least, it covers one-half of the value of all the farm products of our State, and therefore it is our most important crop. I occasionally hear farmers complain of the low price of hay, which is having a tendency to check the interest that has been manifested in increasing this important crop. I don't believe that it is the proper policy for us to pursue to suffer this crop to decrease, because a barn full of hay and a well selected herd of live stock to consume it, leaving the fertilizer upon the farm, is the only way that the farmers of Maine can tide over this present depression in our agriculture. This is a strong statement I will admit, but I believe my experience proves it a fact. I might go through the whole list of the products that are raised upon the farms of Maine, but time will not permit. I wish to say that with what authority we have at hand, that unquestionably the farm products of our State are on the increase, showing and proving the fact that there is a higher appreciation of more intensive work, but I fear that the increase has been brought about by the use of commercial fertilizers. and it has cost the farmer a little too much.

One of the worst features in our agricultural industries at the present time, is the abandonment and depreciation of farm property. It is somewhat discouraging and humiliating to the farmers in taking their inventory at the end of the year, to be obliged to cut it down from one to five hundred dollars, as has been the case for the last few years. Many have become disgusted with this state of things, and have sold out their effects or abandoned them, and have gone to seek their fortunes in that so-called beautiful "promised land" of the West. Very much has been said in regard to this matter by the agricultural press, and the wisest and ablest agriculturalists of New England have discussed and ventilated the subject in order to check if possible the calamity that has befallen our agriculture, of so many of our young men emigrating to other sections of the country, and thus depriving us of that young blood, which is one of the most essential elements in the future success and prosperity of our farming interests.

Old men are good in council if they are not too old-fashioned, but it requires the young, strong and willing hands to wield the hoe. Science and improved machinery would be a failure without the assistance of bone and muscle. Farming has been and always will be a laborious occupation, and the farmer, in order to make it a success, must be a careful, industrious and economical servant, whether his farm is located in the East or the West.

Right here let me say is where competition comes in right among ourselves. The old-fashioned farmer who plods along year after year, taking from his farm just what it will produce without much assistance, cannot possibly compete with the young, enterprising, modern farmers of to-day, who are grasping the opportunities that are within their reach. These are the men who are not growling, kicking and complaining about Western competition, and that it don't pay to raise sheep and beef, and that there is too much labor in dairying.

These are the farmers who are moving along about their business, notwithstanding their farms are not holding up in value. They owe no one, and are making a comfortable living and possibly something beside. I say that competition cannot be wholly attributed to the West, and I believe that this great cry that the farmers are not as well off financially, that they cannot grow farm products against the farms of the West, and receive as good a profit per acre, is all moonshine. To make this a little clearer I propose to place it in a different light by saying that the farmers of the West are competing against the farmers of the East, and prove in as few words as possible, they are having a hard struggle to down the Maine farms. I believe that the financial condition of the Western farmer as compared with that of the farmer of the East, is sufficient evidence to solve this problem. If you please, I will make the comparison with a few of those great and rich agricultural states. First, we will take a few states of what is termed the old West, Ohio, Indiana, Illinois and Missouri, and see if these states that had the advantages of high prices for their cattle, corn, hogs and wheat, during the war, and after having succeeded in clearing up their farm mortgage indebtedness. If they have not succeeded, how in the world can any one expect the farmers of the new states to ever pay off *their* indebtedness, when their only way out is by raising farm products and cattle, and shipping them East for market. Ohio was once a richly wooded country, now with ninety-five per cent of her broad domain under cultivation, and with her three million population, with good home markets, and after fifty years of raising cattle, sheep, corn and hogs, the farmers have failed to meet their indebtedness, and twenty-five per cent of these farms are under mortgage to-day. Indiana, the richest agricultural state in the country, is still worse off, with thirty-three per cent, and twenty-five of this to Eastern capitalists. Illinois comes in, boasting of her London of America, the great city of Chicago, with a stupendous home market, yet the farms of this great and rich producing state are thirty-three per cent under mortgage. Missouri has not held her own within the last ten years,and at present reaches thirty-five per cent. This is the condition of the old West. How is it with the new?

If any one should pass through those great, new corn-growing states, Kansas, Nebraska and Iowa, in a good corn season, they would think the world was made of corn. They would also think that there was no end to its value, and there would be no necessity, or even excuse for the farmers to be in debt. A gentleman whose home was in one of those young cities in central Kansas told me that the farmers were all in debt. We will not take his word for it, yet I think he knew as well, if not better, than some of the census enumerators. The report, shows, however, that fifty-five per cent of the farms of Kansas are under mortgage, and fifty per cent to Eastern capitalists, Iowa, twenty-seven, Nebraska, forty-one, and many others in the same condition.

How is it with the old sterile rock-bound State of Maine? Are the boys who have by honest toil kept the old farm as good and better than it was, as well off financially as those who have become discouraged, sold out the old homestead and exchanged it for a new Western ranch? We find that the farmers of Maine own in stocks, bank shares, money in savings banks and interest in other minor enterprises enough to offset every dollar of indebtedness that rests upon the farms of Maine to-day. Now, I ask, where is the cloud of depression in our agricultural industries of the country the darkest, and where does our competition come in?

There is no way under Heaven for the great farming community of the West to compete with the East, in the comforts and good things of life, unless they succeed in reducing their rate of interest upon their farm indebtedness, or repudiate their debts. Capitalists begin to see this and are drawing upon the farmers. The farmers are hedging and trembling, and calling upon the United States Congress for assistance and relief. Party lines hold no charms for them. It is only a question of friends with the masses of the common farmers of the West whether they can hold their farms with the improvements that they have by five, ten, or perhaps fifteen years of hard and honest toil obtained, or whether they will give them up to Eastern capitalists and go still farther West and once more try their lot upon a frontier farm.

My friends, it is not my purpose to speak disparagingly of any section of the country. We know well that the only way by which a country can prosper and grow rich is by its development, but I claim that it is the duty of every Maine citizen to see to it, that their own possibilities are not robbed by too highly colored pictures of misrepresentation. It is a fact that if you will start from any section of Maine and travel westward, upon entering New York state the buildings, the homes of the farmers grow smaller and smaller, until you reach the log house, the mud house, the dug outs upon the frontier of Dakota and western Kansas; and the smaller and the more meagre grows the homes of the farmers, the less and the more meagre grows the comforts, the luxuries, and even the necessities of life. We don't claim that the farmers of Maine are all wealthy by any means. Many are having a hard struggle, and I claim that it is caused by competition among ourselves more than by Western competition.

Our State is made up of diversified industries, not only among its farming interests, but among its manufacturing, its mercantile, its shipping, railroads, and various other newer industries, and it seems that all other industries outside of agriculture are prospering and receiving more assistance by our present system of legislation, both State and national. State laws are considered somewhat faulty concerning our present system of taxation. As a result the farm property has depreciated in value, while other kinds of property have held their own. The farm, the stock, the machinery, and every cent's worth of property connected with the farm, around the farm or about the farm lays out in open daylight to the tax gatherers' view. While upon the other hand, it is conceded that the stock, the bonds, the money at interest, the twelve million acres of timber land, located in the northern section of our State, the railroads, the savings banks, are paying better dividends than the same amount invested in farms. The professional men, the agents and overseers employed at the heads of the manufacturing and railroad industries whose income is twice and even thrice the income from some of our best cultivated farms, are not bearing their equal burdens of taxation. This state of things has been brought about through the medium of keen financial shrewdness that has been growing upon the people as civilization and intelligence have advanced.

While the farmers have been growing productions in order that our agriculture and all other industries might prosper, during all of these years of prosperity these keen and shrewd financiers at the heads of the different industries have been with the profits and margins derived from the products of our agricultural industries fortifying themselves against any depression or calamity that might befall our agriculture. Right here, among ourselves, is where competition comes in. We are competing with other industries, not in growing farm products, but in getting a living. It is proved by history as old as Rome, that when a nation's agriculture declines, all other industries decline also, hence agriculture is the foundation stone of a nation's prosperity, that on its success depends the success of all other industries. It is a fact that our agricultural industries are the greatest, the broadest and the most important, hence if there is a depression in the country the most important one, must according to natural laws, and it can be borne out in history, suffer the depression first. I ask the question, can we as a people afford to allow this industry to suffer a depression? Can those engaged in other industries afford to lay back with their uncounted millions of surplus and say, "oh it won't do to tax it," causing our agriculture to become crippled and depressed, when their own future success depends upon it?

We don't say that this industry or that is over taxed or under taxed, because we don't know. But we do say that there is a contention going on in regard to this matter, and we can see no other way out of this dilemma, but by a fair and impartial investigation. Is it not the duty of every true citizen of our State, to recognize these facts and lend a hand in equalizing the burdens of taxation in order that every industry and every citizen who receive the advantages, bear a just proportion of State and municipal expenses?

It is a fact that there has been a wonderful improvement in the educational status of the farmers of Maine within the last decade. They are appreciating the fact that it becomes necessary on their part to conform and adapt our agriculture to the changes and fashions of the people, but the question arises, are the farmers any better educated according to the requirements and needs than they were twenty, fifty or even one hundred years ago?

A great change has been wrought in our ideas of what education means. We have indeed learned or are fast learning that it means the acquisition of useful knowledge of that which can be applied and utilized; not that which simply polishes and embellishes, but that which best fits a man for his duties and calling.

I believe in knowledge, but no human mind is capable of proficiency in all the world now possesses, and we can only make progress by becoming specialists in some directions. The strength of the State, and the prosperity of its industries rest clearly upon the character of its citizens. It is their moral and intellectual powers which enable them to be a conscientious and liberty loving people.

Let us remember that we are not only farmers but citizens, and as the country grows older, and progress in other industries advances, the more responsibility will rest upon us. As our responsibilities increase the greater the necessity for us to be better informed upon all matters pertaining to our interests, that we may more readily grasp the opportunities continually making themselves visible to the keen and intelligent observer. I believe that the time has come when the nation's weal depends upon the intelligence of the farmers. What we need is intelligence sufficient to enable us to stand up boldly and unflinchingly for progress, and reform our agricultural industries without doing injustice to others.

Education can do wonders, but it cannot plow the ground, neither will it put the seed into the soil; it cannot milk the cows, make the butter, feed the steers or apply the manure. It is a great benefactor in pointing out correct methods by which these things may be done. Once, when the soil was new and contained all the elements that make plants grow, when the farmers had only to sow that they might reap, when there was no rivalry or competition, they had but little to contend with, and all that was required was, that they be industrious, moral, and just in their dealings. If this were the situation at the present time the standard of intelligence among the farmers would be sufficient.

The demand has been continually growing upon the farmer for more light and information, in order for them to more thoroughly master their business and elevate their occupation. Agriculture, like all other industries, has been passing through a radical change, consequently materials and methods must change.

Shall we as farmers stand idle, with our hands thrust deep into our pockets, and let men engaged in other callings do our thinking? Shall we, in our day, fail to arouse ourselves and grasp the opportunities? Indeed it seems to me that we have facilities and advantages sufficient to enable us to receive both a practical and scientific education, providing these are properly fostered and placed in such condition that the farmers can more readily and easily receive the benefits derived from them.

Methods in education should and must change in order to keep apace with the changes in other industries. We are about to enter an era when public sentiment will demand another step forward in the educational standard of the agricultural classes. Intelligence is one of the most important factors in our future success and prosperity. What we need is more knowledge and more faith in our calling and in ourselves.

I have briefly touched upon the different interests connected with our agriculture; each one a whole subject, if intelligently discussed. They are my thoughts as I pass along through my agricultural life. I have endeavored to deal fairly with each, and whenever I have found one that seemed to be behind, with but few friends, I have taken time to give it what encouragement I could. I have thought we could not afford to lose any. And really the weak ones are those that need fostering and encouraging the most. Are we going to live on, or are we going to fall back as years pass? Agriculture *must* and will live just as long as there are people to be fed and clothed. We have the evidence that the population of the country is growing denser as time goes on, showing that the responsibility rests upon us, and proving the necessity for being better informed in all matters pertaining to our agricultural interests.

It is claimed by some that there is a dullness at the present time in this great industry to which we are all devoted. Yet I claim that we have no reason to despair. In the whole line of interests we have considered, judged by the best authorities that can be produced, we find only one on the decline, and all the rest on the gain. Our hay crop this year is estimated at (1,500,000) one million and five hundred thousand tons, valued at $15,000,000. Our ice crop was as much more. Our State received $6,000,000 from summer visitors, and our sweet corn crop was 12,000,000 cans, giving us the best home market for the summer season in the country. We could still farther show increase after increase. To be sure our fruit crop was a partial failure, but no one is suffering from it very badly, because our diversified industries give us other branches to draw from, and we never knew a year when all crops were up to the average.

Many of our young men have turned their faces toward the setting sun. Still this grand old State of Maine has yet left just as good, just as active and intelligent men and women, who I trust are more and more appreciating the bright sunrise of the East, by acknowledging the fact that all the farmers of Maine require, to make them a prosperous and happy people, is intelligence sufficient to enable them to grasp the opportunities that are within their reach, and foster their own possibilities.

THE BUSINESS OF DAIRYING.

Read at Limerick by CHARLES E. WHEELER, Member from Franklin County.

It is an acknowledged fact that in order for one to succeed in any calling or vocation in life he must first become interested in it, and finally grow into a love for it. The uncertainties and disappointments that sometimes follow in the line of business transactions in the various matters pertaining to the operations on the farm, in the routine action of the common laborer, and indeed, in every walk and condition of life, are due more to the shiftlessness and slackness of the man than to the business itself. It may be indeed true that all classes of farmers throughout New England, who rely wholly upon the product of the soil for the support of their families, and to procure the means necessary to meet the further needs of the times, are passing through a period of extreme trial and doubt, although at the present moment there appears a slight rifting among the clouds which it is most earnestly hoped will broaden into a long cloudless day of universal prosperity. Your own recollection, Mr. President, will recall the events of the past when the average farmer, even, had no anxiety in viewing prospectively the result of the season's labor among the cultivated crops, no doubt about the profits growing out of a disposal of any surplus neat stock, or the gain in value of that retained on the farm in payment for the care and attention given to it.

But time has brought changes, and to keep pace with the inevitable law that governs the question of supply and demand is what the farmers of Maine are now expected to do. We do not use the implements of husbandry that satisfied our fathers in their labors on the farm, for we have caught the spirit of improvement and seek to purchase and use only those suited to the wants of a progressive age. Nor can we allow ourselves to follow in their footsteps in other matters. It is true that we may not be able to compete with that portion of our country which supplies, to so great an extent, the increasing demand for beef and other products. The severities of our climate cannot give us the luxuries that spring forth in such lavish abundance in more favored climes. Our rugged hillsides may not produce the large number of fattened beeves that are daily needed in our markets, and it is only the fancy farmer with an income derived from other sources, who ventures a promise to furnish an animal fed to the highest degree of attainment, for with the present cost of feed the result of the sale would place discouraging figures on the pages of the ledger. Yet there are many things we can do, and gain the ascendency in producing articles of every day need, and of a quality so entirely satisfactory that remunerative prices may be obtained, with a demand so steady as to encourage greater capabilities. If we will be in earnest in our plans, and in our work, we may become as noted for our farm productions as Maine's sons are noted for their integrity and high moral standing, for the thrift and frugality of their wives, and the beauty and intelligence of their daughters.

I now claim, and think I can prove to any intelligent observer, that the farmer who combines the raising of fruit with that of dairying, is in a better condition to meet financial success than any one can be with a like amount of capital invested in any other portion of our country. I know of but few farms in the State which cannot be utilized in a way that would in a few years bring the most satisfactory results to their owners. The raising of fruit is being more and better understood and treated, and the result has already proved wonderfully successful, and therefore no one need hesitate to engage in this most pleasant and lucrative adjunct of farm husbandry. In dairying, also, the present outlook is of a most gratifying character, and with the increased care and attention it is sure to receive, the near future will reveal a standard of excellence to which so many thoughtful and progressive farmers have been looking, and will prove that the changing of our herds into a grade distinguished for the production of butter had an underlying principle that was based on no doubtful or hesitating policy.

But I must hasten to the more practical part of my subject, and I trust that the points I may make can be made plain to your understanding, and that you will accept the figures I shall give concerning the herds to which I may refer, and the men who enjoy a pleasure and profit in their ownership. I have a personal knowledge and acquaintance, with these and the statements given are verified by tests from my own herd which are so satisfactory in their nature as to induce a further outlay, and to recommend others to pursue the same line of work.

Now, brother farmers of Limerick, I desire to interpose a remark personal, which is that the little word "Jersey" is imprinted on every page of my choicest agricultural books and papers; that my conclusions have been reached after a long and patient study of the most noted butter-producing breeds, tracing out their valuable and important characteristics, so now, if you cannot detect "Jersey" in my eye, you would most assuredly in the event of a visit with me to the barn where my choice herd of thoroughbreds receive that care and attention exceeded only by that bestowed upon my children. Because I am interested, and anticipate a steady growth from increased capabilities, it may be possible for me soon to be in love with the business, and I hope to succeed in a degree intimated in the opening lines of this paper.

In my own individual case I may say that the product of the herd for several years was furnished to customers near at hand, where the expense of handling was light, making the returns tolerably satisfactory. It was then sent out of the State with better results, and this course would probably have continued had not a butter factory been put in operation near at hand which made offers for cream that appeared so satisfactory as to be accepted. This continues to be the market for our supply. The herds furnishing cream for this factory are almost exclusively Jerseys, a majority being grades, but springing from excellent butter-producing cows, and the proprietor takes pride in the fact that his product compares well with any in the market, and that frequently he is able to pay a higher price per inch for cream than do those factories where other breeds predominate. This plan of associated dairying is most earnestly recommended as offering the most direct and satisfactory method of disposing of the dairy product, for, with the approved appliances of the present time, added to the skill and neatness of the operator, a superior article can surely be obtained.

There are localities undoubtedly where this method cannot be made feasible, for a farming district with a scattered population, or a town with a like disability, could not well arrange a concentrated effort, and would therefore be obliged to adhere to the old plan of raising money by private dairying, which is admitted to be successful in many instances, but is attended with a ceaseless amount of labor and care. The old method of setting milk in shallow pans, there to remain an indefinite length of time, or to be skimmed at a stated hour regardless of the condition of the atmosphere, which always has its effect on the milk and cream, is fast falling into disuse. And yet a few, who under very favorable circumstances, and exercising the most vigilant painstaking, succeed in producing a most desirable product, and with a class of customers who maintain a regular demand, have no difficulty in making the business a paying one. One of my neighbors comes under this class, and with a small herd of four cows has made them pay an average of twenty-eight dollars per month, with the addition of liberally supplying a family of seven persons.

But I must turn to the method of deep setting, for this is recognized as the most profitable way of treating milk, and the only way when connected with our large dairies. A farmer who makes dairying a specialty, with a herd of twenty cows, received from the sale of butter alone, the sum of $1,321.14 in one year, or an average of nearly $70 per cow, with the skim milk and dressing of sufficient value to pay for the time and labor expended, and his estimate for furnishing his own family for the year was $85, which adds materially to the income of his herd.

Another, working on a smaller scale, and which can be followed by many farmers of moderate means, gives these figures as a result of his experience. In 1889 he commenced with four cows, one having been fresh in December previous, the others in January and February. In April a heifer was added to the number, and in the two following months, two others, making seven in all which paid him an average of $36 per month for the year. In 1890, the same animals, with two additional heifers—all under similar circumstances with the previous year—gave him $44 per month.

Another farmer with four cows and a heifer found the product for 1889 to have brought him rising $200, in addition to one hundred pounds of cheese made during the hot season and a supply of milk for a family of four, while the year 1890 was more prosperous even than the previous one, so that now he is making arrangements to increase his herd to the full capacity of his farm, displacing some kinds of stock for cows possessing strains of blood well known for their production of butter. One more, and that must answer my present purpose. A herd of seven cows which is within the province of my personal acquaintance brought to its owner cash at the rate of $45 per month for the year 1890.

Now, Mr. President, and brother farmers of York county, I trust I may gather some facts at this meeting, or in this my first visit to this portion of the State, that may be of an encouraging nature, and which I can take with me to my own county to aid in the dissemination of correct principles in agriculture, and will be the means of strengthening the hands and hearts of the willing, earnest workers found there. I am a farmer, the son of a farmer, and we labor together on the same soil and rest under the same roof that has been the home of five succeeding generations of the name I bear. Every room in the house, every walk about the premises and every enclosure of the farm bear marks of ancestral labor and care, and as I follow in the footsteps of those who converted the wilderness into fertile fields, I have a feeling of reverential pride that spurs me on to greater activity and more zealous efforts. I think of the possibilities that lie before us; that upon us rests the responsibilities of an era fraught with important events.

Young men of York county! The prestige of power and influence may be in your hands to turn back the current of feeling which frowns upon any progressive idea in agriculture. May we all strive to safely hold all trusts committed to our care, and show to the world that the good old State of Maine is now and forever will be true to her motto, "Dirigo."

ON THE COMPARATIVE AGRICULTURAL VALUE OF SOLUBLE, REVERTED OR CITRATE SOLUBLE, AND INSOLUBLE PHOSPHORIC ACID.

By Prof. WALTER BALENTINE, State College.

There are known to the fertilizer trade three classes of salts of phosphoric acid, namely: monobasic phosphate, dibasic phosphate and tribasic phosphate. The first is soluble in water, the second is insoluble in water but soluble in a solution of citrate of ammonia, the third is insoluble in both water and citrate of ammonia.

The phosphoric acid found in these three salts is designated by the analytical chemist as soluble, reverted or citrate soluble, and insoluble respectively.

Within the last fifteen years the opinions held by agricultural chemists as to the comparative agricultural value of these three forms of phosphoric acid have been decidedly modified.

In 1876 reverted phosphoric acid was valued at about two-thirds as much as soluble phospheric acid in this country, while insoluble phosphoric acid was looked upon as being chiefly valuable as furnishing material from which the other forms could be manufactured.

Ten or twelve years ago many of the German experiment stations determined the soluble phosphoric acid only in superphosphates, leaving out of account the reverted and insoluble however great the amount might be. And in German markets plain superphosphates were bought and sold on the amount of soluble phosphoric acid they contained, ignoring entirely the other forms.

The basis for the commercial valuation of fertilizers adopted by the experiment stations at the present time, is what the several ingredients can be purchased for in the markets. While these figures were never intended to represent the relative agricultural values of the ingredients of a fertilizer, they do to a very large degree reflect the relative esteem in which soluble and reverted phosphoric acid are held both by scientific and practical men, for agricultural purposes. The stations value reverted phosphoric acid at the present time within a fraction ot a cent as high per pound as soluble phosphoric acid. There is really no good reason why the market value of reverted phosphoric acid should be as high as soluble phosphoric acid except that it produces nearly as good results agriculturally considered, for there is no doubt but that it could be produced much cheaper if there were sufficient demand for it on the part of the farmers to warrant its production in large quantities. The leveling up of the market values of soluble and insoluble phosphoric acid has resulted it is believed from two causes. First it has been shown that soluble phosphoric acid rapidly becomes insoluble in water when applied to the soil. In ordinary soils little remains in a soluble condition after a few days, while in calcarious soils a few hours suffices for a complete reversion.

All that can be urged in favor of water soluble phosphoric acid is that on the majority of soils possibly a more even distribution is obtained through the diffusion of the acid through the soil before it reverts, while reverted phosphoric acid remains where it falls until acted on either by the roots of plants or is distributed through the solvent action of the soil water.

On calcarious soils soluble phosphoric acid is rendered insoluble in water almost instantaneously and on such soils is in no way superior to phosphoric acid which is in the reverted condition before its application. On humus soils it is doubtful if reverted phosphoric acid is not superior to the water soluble because the latter has the tendency to increase the acidity of such soils.

The second reason why reverted phosphoric acid has come to be looked upon with more favor than formerly is outside of any theoretical considerations.

The practical experiments which have been undertaken to determine the relative agricultural value of these two forms of phosphoric acid both in this country and in Europe are too numerous and have been too long before the public to warrant me in giving a detailed account of them. But it may be said that the results obtained have shown reverted phosphoric acid superior to water soluble quite as often as the reverse. The experiments at the Pennsylvania Experiment Station are notable in that through five years work reverted phosphoric acid has uniformly produced larger gains in the crops than water soluble.

With these facts before us we are warranted in drawing the conclusion that in general reverted phosphoric acid possesses an agricultural value equal to water soluble.

While we may regard the opinions of the majority of agricultural chemists as changed to conform to the facts as above set forth in regard to the comparative agricultural value of soluble and reverted phosphoric acid, experimental research is rapidly forcing a modification of the views that have heretofore been held as to the agricultural value of insoluble phosphoric acid as compared with soluble and reverted.

It has long been known that there are agencies at work in the soil tending to make insoluble phosphates soluble. This process has been regarded and probably is a slow one, but nevertheless is worthy of being taken into account in considering this question.

Twenty years or so ago Sachs showed that the roots of plants exerted a solvent action on polished plates of insoluble phosphate of lime to such an extent that root markings could be distinctly traced by the naked eye where they came in contact with the plates.

In 1879 Professor Jordan commenced experiments at the Maine State College on the comparative agricultural value of the three forms of phosphoric acid which have been continued to the present time, by the college first and subsequently by the Experiment Station. Shortly after these experiments were instituted at the Maine State College, Professor Jordan removed to Pennsylvania State College where similar experiments were undertaken, which have been continued under the direction of the Pennsylvania Experiment Station.

In 1886, the Connecticut Experiment Station at New Haven took up the work. The investigations carried on at these three institutions have been more extensive and more decisive in their results than any others that have come to the notice of the writer.

The experiments under the direction of the Maine Experiment Station are of two classes. (1st) Field Experiments. (2d) Box and Pot Experiments.

Of the field experiments one set has been run continuously for five years in triplicate plots of one-twentieth acre each. In this set a given quantity of insoluble phosphoric acid in raw finely ground South Carolina rock is compared with about an equal quantity of soluble phosphoric acid in dissolved bone-black. In this experiment soluble phosphoric acid has uniformly given higher yields, though in some cases the gains due the use of phosphoric acid have cost less with the insoluble phosphates. In an experiment in which a given quantity ot soluble phosphoric acid in South Carolina rock was compared with three times that quantity of insoluble acid in finely ground, raw, South Carolina rock, the gains produced by the latter were equal to those of the former with a barley crop, and larger with a pea crop. Under the direction of the Experiment Station a number of trials have been made by farmers in various parts of the State, in which four times as much phosphoric acid was used in the insoluble form for the comparison as was used of soluble phosphoric acid. In all of the trials by farmers, the results showed that the crops were decidedly benefited by the insoluble phosphoric acid but in no case was the gain so great from this source as that derived from soluble phosphoric acid.

The fertilizer experiments in boxes have given similar results to the field experiments.

At the Pennsylvania Experiment Station with the application of equal quantities of phosphoric acid in soluble and insoluble forms the average production for five years was greater from the insoluble phosphoric acid.

The experiments carried out under the direction of the Connecticut Station were arranged so that equal money values of various raw phosphates and dissolved bone-black were compared.

In nearly every case where soils were deficient in assimilable phosphoric acid, the raw phosphates caused a gain in the crop. In one case on a sandy loam, Thomas Slag produced a higher yield of potatoes than dissolved bone-black. In another experiment extending through three years in which the phosphates were applied the first year only, the dissolved bone-black was nearly expended the first year while the percentage gains produced by the raw phosphates over the plots to which no phosphoric acid was applied were highest on the third year, showing that the raw phosphates become more available as time goes on.

The results of the Connecticut experiments indicate that for the soils on which this work was carried out, South Carolina rock is one of the least effective of the raw phosphates and that Thomas Slag and Grand Caymans phosphate are the most effective.

It appears from the results of the experiments to determine the relative agricultural value of phosphoric acid in raw and acid phosphates that on some soil they are equally effective, and that the lime and sandy soils seem to furnish conditions especially favorable to the action of the raw phosphates. It also appears that most soils that are deficient in assimilable phosphoric acid respond well to a manuring with raw phosphates.

Phosphoric acid in the finely ground raw phosphates can be purchased from two to three cents per pound in the large markets while reverted and soluble phosphoric acid in acid phosphates cost from six to eight cents per pound. Three to four times as much phosphoric acid can therefore be obtained for the same expenditure of money in raw phosphates as in acid phosphates and while its immediate effect on the crop may not be as great there is a much larger quantity left in the soil for the use of subsequent crops.

There is no doubt that many of our farmers will find it advantageous to use raw phosphates in part at least in the place of the more expensive soluble phosphoric acid in superphosphates.

A word of caution in this connection may not be out of place, however. It is well known that soluble phosphoric acid causes early maturity and with all crops in which early maturity is an object superphosphates should not be superseded by raw phosphates.

In growing sweet corn in this State for canning purposes, it will probably be desirable to use some soluble phosphoric acid in the hill or drill regardless of the quantity of raw phosphate that may be worked into the land, so as to reduce the chances of the crops failing to mature sufficiently for canning before the early frosts.

In urging farmers, who have land that responds to phosphatic manures, to experiment with raw ground phosphates, it may be well to add that on the College Farm at Orono the use of raw phosphates has gone beyond the experimental stage. Two years ago eight acres were seeded down on which raw phosphates were used as fertilizers, with a small amount of muriate of potash. From this field a good crop of grain was taken the first year which was followed last year by a good crop of hay, and the indications are that the crop of hay for 1891 will be larger than that for the preceding year.

This season (1891) eleven acres of oats have been manured with a raw phosphate and seeded to clover, with the expectation that a fair crop of both oats and clover will be produced.

It is not expected however that the crop of grain or clover will be as large as would be the case had twenty loads of stable manure been applied to the acre.

The raw phosphate used was a Caribbean Sea guano purchased of the Cumberland Bone Company, under the name of concentrated phosphate, and cost four cents per pound for the citrate soluble phosphoric acid it contained. This phosphate was selected because on every occasion when we have used it, a good stand of red clover has been obtained when we have seeded with clover, which has not followed the use of South Carolina rock.

This is quite an important point in farming with commercial manures, as the clover not only acts as a collector of nitrogen for subsequent crops but in part at least brings about that physical condition of the soil which stable manure is well known to effect.

Raw South Carolina rock would probably do as well if one or two hundred pounds of acid rock be added per acre. A fine ground bone would also be a phosphate that would favor the growth of clover. Thomas Slag is another phosphate that could be recommended for the same purpose. A good quality of ground bone can be obtained of the Sagadahoc Fertilizer Company and Thomas Slag is sold by Paul Weidinger, No. 76 Pine St., N. Y. Raw fine ground South Carolina rock and acid South Carolina rock can be obtained of most manufacturers of commercial fertilizers.

BUSINESS FARMING !

By B. W. McKEEN, Fryeburg, President of the Board.

The word "agriculture" is from the Latin "ager" a field, and "colo," I till. It is the art of rearing those plants and animals that are suited to supply the wants of man. The spontaneous growth of either, unaided by the skill and care of man can supply but a small number of people with necessary food or clothing. It is only in the most rude and uncultivated state that man exists upon the natural growth of the soil.

The chase soon exhausts the supply of animal food, and man, from stern necessity, sought, even in remote ages, to learn the art of agriculture, and sought by selection, care, and feeding animals and plants, to obtain food necessary to sustain life and the material for clothing. We see the wisdom of the Creator in this provision of nature, for it is only by the necessity to labor, that man ever reaches the highest state of intelligence or of culture. Truly God cursed the land for our sake. The labor necessary to obtain food and clothing brings a desire to procure objects beyond the simple necessities, and an ability for more and better labor. Thus the greatest results have come from labor, to bless the people, and advance their enlightenment and culture.

In this way civilization in its highest and best condition has become possible. Without the necessity to labor, the results of the noble efforts of those who by self denial and self sacrifices have sought to upbuild their fellow man had never sprung into existence, and the world would have been, to-day, without a single lighting ray of civilization or of christianity. As we look over the history of the past we shall find that farming has always been the foundation of all business, and the sheet anchor of the welfare of the people. As agriculture has prospered nations have flourished, as it has declined, nations have dwindled and gone down into oblivion.

The farms are, to-day, and always have been producing, not only the food that feeds the world and the raiment with which it is clothed, but the men who sit in high places in every land, and who by their wisdom, zeal and far-sightedness have controlled the destinies of nations, and have wrested from nature and from time some of the greatest laurels. When any crisis comes, the farmers respond and the gap is filled that saves many a home and keeps moving the wheels of business and of enterprise.

There is no profession in the land but owes its place in the world's history to the active recruiting that is ever going on from our farms. There are no places of honor or of trust but are being filled by men whose lessons of push, honesty and business enterprise, came from their early training upon the farm.

History is all the time writing the great achievements of some man who sprung from some of our farm homes and whose life has been moulded by their influences. These self-evident truths must of necessity force themselves upon the minds of every thinking man, must ever stand as an embodyment of historical law that cannot be gainsaid.

Now how about this business that feeds and clothes all the people? The business that from its very nature and the character of its cares and responsibilities, is forging, day by day, the characters that mould the thought of the world. Is it properly conducted? Are its responsibilities and possibilities fully realized by those whose lot in life is cast upon the farm? Are the needs and requirements understood and complied with by those who have the affairs of the people in charge? Is there a proper balance between the men who toil upon our farms and those for whom they labor? We fear all these questions must be answered in the negative.

That the business is not properly conducted, the deserted farm houses and depreciating soils of our hillsides and valleys show only too plainly. The very wasteful system of culture followed on too many of our farms, the total lack of system on others, and the prevailing opinion that in order to thrive upon a farm, we must get something from nothing, and that the land owes us a living, lead to these results.

In order to change these things and start the business upon a proper basis, it will be necessary to adopt new methods, and to modify our practices so as to hit upon the processes that will correspond to the spirit of the times, the push and enterprise that characterize all business in other directions. When a business is properly conducted, its resources will fully correspond to the efforts put into it. The profit will constantly increase as the business is extended, while the original capital will never be allowed to become less by failure to replace, what necessarily goes into the profits. That this is true, we have only to look carefully into the workings of any successful business enterprise to prove. In too many cases the net profits from our farms have gone, not into the business itself, but to swell a bank account, or into some far off Western security.

Any business has a right to demand of its followers, the return of a certain per cent of its surplus earnings for the purpose of maintaining its efficiency. Small returns must necessarily come from small ventures.

One of the most frequent causes of dissatisfaction with farming as a business, comes from the fact that many of us fail to realize that the capital is small and that the family has a home and a living from the farm, in many cases far superior to those occupied by people engaged in other industrial pursuits, and all as a part of the business. A farmer may be engaged in dairying or stock raising, or gardening on a small scale, and, when he counts his profits at the end of the year, if he fails to give proper credit to his business for his home, with its associations and privileges, the result is a dissatisfaction and a discouragement that injures the business and lessens the love and regard necessary in the followers of any calling, if success is to be gained. The associations and the sacred privileges of our farm homes are seldom fully realized until they are broken up and their occupants gone to other and distant fields. Then the mind reverts to the home of our youth and the heart yearns for the old and familiar associations, ours no longer, and as the years roll on and the frosts of age silver the locks and dim the eye, these longings for the old home grow stronger, and the desire to tread again the old familiar fields increases and, if fortune has smiled upon us and there is enough of the necessary money to warrant, the tired wanderer returns to his native place and seeks to end his days near the old homestead, if not within its sacred walls and upon its time worn hearth-stone.

I believe there is a misconception in the minds of many in regard to the object of business. It is not, as some suppose, to amass a fortune, to win a great name or achieve great honors, but to build up a *home*, to surround ourselves with the necessities and comforts that the name implies, to see growing up around us the family, and to minister to its wants, to carve a place in the world's history, that shall be honorable for its good intentions and the moral effects that always follow a life spent in honest efforts.

"One naturally would like to leave his children in a better world than he found, but how many go to work to improve the world instead of making money?" "There is more honor in being a good citizen than in simply being rich."

Let the cold, calculating, conscienceless millionaires of to-day roll in their wealth, let them gloat over their piles of gold, which in far too many cases have been wrung from the very hearts of the poor. As they grow narrow and sordid and selfish, listening to the clink of their silver, I will thank God that my lot is cast in different places. I will listen to the innocent prattle of my children and try to grow better by their influence, and as their arms twine around my neck in childish love, may I ever grow broader in my ideas, better in every way, praying that strength and skill may be spared me to build up for them a home which shall always prove pleasant, and to which their thoughts may turn with joy in after years, when time and circumstances may have placed them beyond its walls, but not beyond its softening and elevating influences. If this can be vouchsafed to me I will look with scorn upon the narrowing greed that builds up large fortunes or wins great names.

"We live in *deeds* not years,
In heart-throbs, not in measures on a dial.
He lives longest who thinks most,
Who tunes his life to the harmonies of nature and of love."

If our State Board of Agriculture can by its efforts add to the appreciation of our farm homes, can help the farmers of our grand old State to see and realize their privileges and their advantages, can prevail upon them to value them at their true worth and place them upon the credit side of the farm balance sheet, it shall have done a good work. As these homes are better appreciated the business of farming will be extended, and we shall see larger farm enterprises, larger business ventures, and increased returns that will add much to the valuation of the business of farming. In manufacturing and in all other industries which afford ample profits, we find intensive work and a generous amount of concentrated capital. If the little gains of the first small ventures had been withdrawn and placed in other channels, possibly to help swell the tide of some distant rival enterprise, as has been too often the case with money accumulated on our Maine farms, the business would still have been small in extent and profits. That my premises are correct, and that it is true that capital, skill and energy will return profits from our farms, and that extended operations will pay, I may be allowed to cite you to many successful farmers and stock raisers in our own State to prove. That modern methods and appliances are necessary a glance at their products will convince any.

Let none of us be discouraged because we possess but few of the articles necessary, or because our stock is not up to what we deem requisite. There need be no radical change that will call for a large outlay of money. Simply, let us do the best we can with what we have, put our best thought and effort into our labors and seek to improve as opportunity offers.

Put intelligence and forethought into our efforts, and if we find that a change is necessary to enable us to put our products upon the market in condition to command attention and attract sales at a profit, then let us change, being careful not to make any unnecessary sacrifices and thus become possessed of more available implements and becoming masters of the situation. In the matter of changing our animals we have the advantage of the mechanic, manufacturer or merchant. In their cases if any change of stock is required, they must make an entire change beginning at the bottom, but it is different with our animals. By skill and care and liberal feeding, the most indifferent herd in our State to-day may be changed into fine, profitable animals. There seems to be hardly any limit to the range of usefulness in animals that may not be reached by careful breeding and feeding for a purpose. And while it may be true that but few can ever reach the top, we can all so improve our herds that we shall be surprised at the results. Only a small outlay is necessary at first, and when once begun aright the improvement will be constant and sure. Farmers are too prone to look upon new methods with distrust, and to cling to the old with a pertinacity that is surprising. They too often forget that the world moves, and that we must move with it, or be left stranded upon the beach of inaction. We are apt to dwell on the beauties of the good old times that are gone, without a due appreciation of the needs, duties and privileges of the hour. By this constant clinging to the moss grown relics of the past, we are losing the golden opportunity that comes but once, and that will not stay, but vanishes never to return. That the responsibilities and possibilities of our calling are not fully realized by those who till the soil needs no repetition from me. Would that each and every man who is making a business of farming could be made to appreciate the responsibilities with which he is clothed, the great duties that devolve upon him, and that call for constant efforts on his part. We, as farmers, have been far too apt to belittle our vocation, forgetting its grandeur and its nobleness, and that it affords means for thought and study and research unknown to any other business. Forgetting that God in his infinite wisdom has placed the husbandman in closest possible communion with nature, has laid open at his feet the great book of creation whose lessons are ever varied and always valuable, whose pages teem with information and intelligence to all those who study them. All being in direct line with our business and the greatest aids possible to the tiller of the soil.

Oh! the grandeur of our calling as husbandmen! Let the hills speak it in their silent eloquence, let the rills and brooks echo it as they leap down the mountain sides, turning the wheels of industry and spreading fertility upon our valleys. Let our magnificent rivers as they course to the ocean, bearing on their bosoms the products of our fertile fields, repeat the strain, and let the glorious sun, giver of light and life, the gentle showers and rattling tempests of summer and frosts and snows of winter take it up, until the humblest farmer may fully understand it and be assisted in his daily labor by the thought of the possibilities within his reach, around and beneath him, and with the knowledge that they are only waiting for the thinking mind, the sympathetic heart and the skillful eye and hand to draw them out. Some may say that this is a "work a day" world, that those who labor in it for a purpose have no time for a consideration of the grand or the beautiful. To all such I would say, it is only by an earnest appreciation of the higher principles of nature that we are enabled to grasp the lesser ones, and to get such hold upon the details as shall give us the ability to carry on the business successfully. This truth holds good in all industries.

The laborer who never looks beyond the point of contact of his tools never advances. The mechanic whose horizon is bounded by the low, close-fitting mantle of the humdrum of his labor lives and dies a simple mechanic, working ever by the day. The professional man who never reaches beyond the routine business of his labors and never sees anything above them, is never at the top of the professional ladder, but plods along ever bewailing his lot.

It is the same with the farmer who can see nothing but dirt in the fields and orchards that surround him, nothing but beef or pork or labor in the animals under his charge, nothing but the lowest materialist properties of his surroundings. He goes to the field in spring and cannot see in imagination the result of his labors in springing vine, in flowering corn or waving grain, and never reaches the highest pinnacle of success. The reasons are obvious, no attention will be given to details, no care or thought will be given the future, all the labor performed will be "day work" and will lack the zest necessary to accomplish good results.

Attention to details! I wish I might be allowed a whole hour for the consideration of its necessity. Book-keeping on our farms is nearly a lost art. And why is it so? Not because of the inability of farmers to keep accounts, but because too many of us have the idea that our business will run itself or is not worthy of any special effort in that direction, and because in too many cases we are not willing to dignify it to its proper position from a lack of appreciation of its grandeur and its possibilities. I hope that many of the farmers in this place keep a debt and credit account with their animals and their crops. I trust they can tell at a glance just the cost of each and every article raised by them, but from my experience and observation elsewhere I am led to think that such may not be the case. Do we find men engaged in any other business thus ignorant of the knowledge of their gains or losses? Certainly not. Then why should we neglect for one season to adopt rules that shall enable us to know at a glance the general outcome of our business? Shall we say it is because we have not the ability? No. Shall we say it is because we have not the time? No. Shall we say it is because we have not the means? No. Shall we say our business does not need it? Certainly not.

Let me urge upon you, farmers of our grand old State, at this time, that you take hold of it at once and by a careful but simple system of book-keeping be able to tell at a single glance just what you are doing. Do not hesitate to do this for fear of the result. If our balance is on the wrong side we want to know it. If our system is bringing us a loss each year we of course wish to correct it. And how else can we do it than by a simple study of addition and subtraction in our farm accounts.

Don't hesitate to do this because of the labor, for there is no need of any extended accounts. Simply put down the amount of debts and credits and these, at the end of the term, added and their difference obtained is just what we are after.

What would be thought of the merchant who should fill his shelves with goods from all countries and of all varieties, without keeping an accurate account of their cost? What manufacturer would expect to succeed who did all of his business by guess, who knew not, nor cared what his stock cost him or how much margin he could get on it? If you have ever known of any such ventures you will remember that they were failures. But farmers seldom think of such things. Although we have, in our fields, our orchards, our flocks and our herds, more variety, more opportunity for moulding our work to our liking than any other class, we too often plod blindly along, leaving the result to other hands than ours, and as time rolls on and the profits do not come in to our liking we blame our business instead of ourselves.

"Eternal vigilance is the price of a dividend" on the farm, as everywhere else, and that too many of us do not reach success is due to the fact that we neglect the very first principles of business, the keeping of simple accounts. I am looking forward when we shall all be keeping farm accounts with a great deal of pleasant anticipation, as then I shall expect to find a real appreciation of the true worth of our calling, a real knowledge of requirements and its necessities, which will cause us to bring to our aid all the equipments necessary to enable us to do first-class work, and only first-class work pays anywhere in any business. Then will come a thorough knowledge of the extent and thought of investigation and research that is laid at our feet by the many and varied resources with which we deal.

As we follow up this course we shall begin to study more closely into cause and effect from a business standpoint. If we wish to select crops for rotation or for a cash revenue, we shall try to look beyond the fact of returns, and ascertain if possible how much a given amount of each one will take from our soil. Merchants grade their prices according to the condition of the trade in the article priced, being careful in every instance to squeeze on all the trade will admit of. So should we as farmers develop into business men by adopting business methods. In dealing with others, learn to put upon every article sold a price sufficient to repay cost of production and legitimate profits. To cost of production must, of course be added the value of the plant food removed from the soil which is our stock in trade. Acres enough for an earldom would be of no use to any man except they be stocked with that which goes to feed our plants. There is no rainbow in the East for the farmer who exhausts the fertility of his soil. It is a part of our business to compute this, and we can as readily do it as the merchant can calculate the cost of his goods at his store with the addition of the freight and other expenses. I believe in exalting one's business, in placing the whole being in it and working for all we are worth to accomplish our object. I have often been led to deplore the lack of appreciation on the part of many farmers of the responsibilities that should rest upon them. Instead of understanding and living up to the great purposes that should be theirs, they will constantly talk of the smallness of their vocation, and sadly bewail the lot that placed them upon a farm.

That such do not succeed is no wonder. That they manage to live speaks volumes for the business. No other business would do it. Unless we can place our whole being in our work and understand its great responsibilities we need not look for success because we shall not deserve it. The fact must be apparent to all that no business in which man labors clothes him with the responsibilities that does farming. Its purposes are so elevating, its implements for progress so many and the springs from which it draws its life so near the source from which rises all nature's gifts, that from the natural fitness of things its followers must be clothed with responsibilities that rest upon no other class. Let us then, as farmers, drop the idea that we have no duties to ourselves and our farms.

Let us get rid of the feeling of littleness that too often characterizes us, and broaden our ideas in conformity to our responsibilities and act nobly up to the standard of our calling. By so doing many of the hardships that now stand in our way would fall unheeded at our feet, and the march onward to prosperity be begun in such good earnest that it will not cease until the last mile-stone that stands between us and our object is passed, the goal of success gained and the end crowned with honor and satisfaction.

Neither are the possibilities of the business fully realized by its followers. It is seldom that the fullest meed of success is gained in any department of agriculture. The extent to which all branches of farming may be carried, is never fully understood, because so few people ever lay out to get all there is to be had from their land or animals. The fullest extent of growth that can be gained day by day is the cheapest, the requisite amount to maintain life and keep the animal without loss of flesh or form is an absolute necessity.

It corresponds to the force necessary to overcome gravitation and friction in mechanics. Every mechanic knows that this force is indispensable and figures to carry as large an amount of force over and above this as he possibly can, because he knows that just here comes in the profit. I have often known farmers of my acquaintance to boast of the small amount of feed given certain animals, and have seen them look with contempt upon the better fed and more valuable animals of their neighbors, saying they ought to look better than theirs as they had been fed better. The fact that their animals consume as much food for their own actual needs and to sustain life as do the more valuable ones of their neighbor, that while they have been feeding to just keep the machine going without doing any work, he is getting a net profit in growth or flesh or milk each day, does not occur to them.

These two men are carrying on their business in just comparison with two manufacturers, one of whom puts all the power available onto his machinery, running it up to its full capacity for work, and turning out each day some article which the market demands and which brings a fair price; and another, who has become discouraged and does not believe in push, but runs his factory with just enough power turned on to overcome the resistance of friction and nothing more. At the end of the year the former will have earned a dividend, while the latter will have grown poorer just the amount he has put into his machinery. Just here I wish to urge upon all, the necessity of farming for a profit. To calculate their affairs, so that they shall have something to draw from regularly, the oftener the better, is the true course for every farmer. To adapt ourselves and our farms to the production of that article which our market demands is the corner stone of our safety. Then to learn how to produce that article at a profit is the next.

After having got this part arranged satisfactorily, then push the chosen business to the fullest possible extent, putting on every ounce of steam that we can and keep within the bounds of profitable production. I firmly believe that many a farm fails to produce an income, not from any lack of industry on the part of its owner, or from lack of frugality, but because there is no one leading object of production in his list, and consequently all production is eaten up by the actual needs of the family. The farmer who realizes the possibilities of his business and who feeds his animals liberally, but judiciously, will be constantly adding to his capital, while he who feeds just enough to keep alive, will constantly grow poorer. The same comparisons might be made in relation to feeding our crops. The thought, the study, and the time necessary to enable us to fully understand our soil is seldom or never given.

As we look upon the brown soil of our fields do we see the future growth that will be there? Do we understand the properties in it necessary to produce our crops? Do we know by actual study or comparison the needs of our growing plants and the cheapest and best way to supply them? Does our vision encompass the fact, that from this humble source will come, by touch of Divine command, in the sunshine and showers, all that is useful and beautiful, all that is grand and ennobling? As we stand under the celestial arch and look over the broad expanse of hill and vale do we know that we are in nature's workshop, and that all that is necessary for us to do is to attune our hearts and minds in unison with this grand chorus of nature's harmonies to fully consummate the purposes of our lives? Yet such is the case. I believe an All-wise Providence has so shaped all the elements of nature about us that we have only to take, with an intelligent purpose, to accomplish all that is for our good. The lands which we till are ours only for our use through life, and we are in duty bound to turn them over to our successors in as good condition as they were when we took them. This I believe is a sacred trust, and any system of farming that overlooks it is not agriculture but brigandage. The possibilities of a well developed, well cared for farm are almost beyond computation, for the reason that with each succeeding year there comes a better knowledge of its resources and capabilities.

When we get down to the bed rock of sensible practice, and understand the extent of the natural advantages that lay at our feet, and learn to live up to our responsibilities, and possess a complete knowledge of the possibilities that are before us, our farms shall be made to pay a good honest profit, our homes shall be more cheerful and happy, our lives shall have woven into them, more of the god-like principles of humanity, charity and brotherly love. I am looking for something of a change in the general conditions of Maine farmers before very long.

They are beginning to turn their thoughts more within and to strive to work their own resources more. The age for great Western speculation is past. The time has now come if never before when industry, skill and capital will give better returns right at home among the associations of our childhood and the privileges of an advanced civilization than can possibly come from any Western investment with its uncertainties and necessary privations. The attention of capitalists is being turned in our direction for profitable investment and in a very short time I believe the Pine Tree State shall become as it deserves to be one of the leading states of our glorious Union in thrift and enterprise. Our fertile valleys shall rival the far-famed prairies of the West in their productiveness, our mountains with their magnificent scenery and our coast line with its health-giving influences shall resound as never before with the sounds of industry and of thrift.

Our schools have done far too much to draw the minds of our young men away from the farm. Instead of educating toward the farm they have educated from it. Our text-books are filled with the idea that nothing is ever gained in this life worthy of any young man outside of the professions, until it has become a question in the minds of many thinking men whether education pays. All that is necessary is to place agriculture in its true light before the minds of our young men and it will take its just place in their estimation. By an active, earnest effort in the interests of education on our part these conditions will be gained. It lays with the farmers to correct this evil tendency, and one of the most encouraging signs of the times is that they are waking up to their duty in the matter. That the needs of our agricultural interests are not fully understood by those who have our public affairs in charge is so well known that it goes without saying. If there could be an adjustment of public burdens that would equalize the duties and responsibilities it would place the business of farming upon a firm foundation and enable the active tiller of the soil to obtain his share of the profits. He has spent his time on his farm wresting from it a living, and sometimes laying by a little for a rainy day, entirely regardless of the outside world. It has mattered little to him what laws were passed, or what men filled places of trust in the land, as long as the sun shone and the earth gave forth her increase. He has cared but little about the welfare of the public, but has gone on working within himself, and withdrawing more and more from outside influences, until the very thought of duties outside of his farm home has passed away.

But the tendency of the times is toward justice for all and a desire to render unto every man his due, and every good and worthy object will in time receive proper attention if its friends will only stand behind it in concerted action, living boldly up to their convictions of right. The trouble with far too many men in this world is they have not the courage of their convictions, and allow themselves to be twisted about by the silver tongue of policy, regardless of what is true or right. There is not a cause that has required an honest endeavor from its followers but has suffered at the hands of these uncertain characters, who seek to win the applause of the present regardless of consequences, while many a true man, with singleness of purpose, intent solely and only on the accomplishment of some honorable object, has lived unappreciated and unhonored, and not till after the victory is won have his merits been known.

Let us recapitulate the questions which I have endeavored to bring to your attention.

First, we must study all the conditions of our farm and endeavor to appreciate our responsibilities and school ourselves to our duties. As these are plainly brought out the possibilities will be made plain, and we shall have opened up before us in all its grandeur the great position that farmers should occupy in the land.

By carefully solving all the details and paying strict attention to each and every help that presents itself we shall be able to act up to our convictions and place our demands to our legislators in a way that they shall be heeded. As these problems are worked out, agriculture as a business shall take its true place among the industries of the world. The farm home shall present attractions as never before for those whose young life was spent there. Our young people will again turn their attention to tilling the soil, our hills and valleys shall be made to blossom as the rose, prattling children shall echo the music of the rills and brooks, the old homesteads shall again smile upon us, awaking a new prosperity for all who have the fortune to be located within our borders.

STATE DAIRYMEN'S CONFERENCE

AT WINTHROP, JANUARY 15-16, 1891.

H. O. Nickerson, Member of the Board for Kennebec county, called the meeting to order.

Ladies and Gentlemen: I call this goodly meeting together. It is not necessary that I should say to you that it is a great pleasure to call so goodly a number of the citizens of our State to order at this time for the purpose of holding such a meeting as is now proposed.

It is highly suitable that this meeting should be gathered in this town of Winthrop, here where the first incorporated agricultural society breathed life in the State of Maine. Then in addition to this, the great dairying interests which centre here make this an unusually favorable place in which to hold this meeting. Ordinarily, it might devolve upon me to preside at this meeting but fortunately for you the President of our Board is present and will preside during this meeting.

I now present to you our President, Mr. Daggett of Foxcroft.

Pres. DAGGETT.

Ladies and Gentlemen: The object of this meeting is too well known to need explanation from me, and I will proceed at once with the business of the day.

The first in order is the address of welcome by L. K. Litchfield, whom I now introduce to you.

ADDRESS OF WELCOME.

Mr. Chairman and Gentlemen of the Maine Board of Agriculture:

It is my pleasant duty, in behalf of the dairymen and farmers of this historic town, which is now nearing the close of the first quarter of its second century as an incorporated organization, to welcome you here, to extend to you a cheerful greeting. The hearts of the sturdy sons and grandsons, descendants of those noble men who first broke the stillness and the solitude of the grand old forests that stood where now stands our beautiful village and our goodly town, are open to bid you welcome. They are here upon the paternal heritages, handed down from generation to generation, to invite you to their homes and their firesides; their latch strings hanging outside silently bid you welcome.

The descendants of that grand old stock of pioneers which felled the trees, cleared the ground, and cultivated the first farms of the town, remain to promote the welfare, encourage the progress and advance the interests of that art which is the life and support of the teeming millions of the earth. Gladly would they have shown you the wonderful improvements which have been made during the one hundred and twenty years which have passed and gone since the sires and grandsires struck sturdy blows for that future which is now ours, if, perchance, your meeting with us had come in a less inclement season. Improvement is written all over and about the grand old mountains and beautiful lakes upon which our ancestry first looked with satisfaction. Gladly would we point out to you the improved condition of all the industrial pursuits of our people, comparing the present with the past; not only so, but in what pertains to intellectual development and culture, through the excellent educational facilities provided, our young people stand in the front lines of progress. But, gentlemen, more closely connected with the purposes of your meeting with us at this time is the agricultural advancement of this community.

Early in the history of this town, so early indeed as 1818, a society was formed "with a view to improve the art of husbandry, and to elevate the calling of the husbandman," and an act of incorporation was obtained from the legislature of Massachusetts. This was the first incorporated society of its kind in the State. It has held exhibitions each year since its organization, and in 1832 was merged in the Kennebec County Agricultural Society, which continued for many years to have its headquarters and hold its fairs here. Following closely the formation of the county society, and perhaps an outgrowth of the same, the town was honored by being the birthplace of that sterling agricultural paper, the Maine Farmer. Our people point with just pride to this honorable record, and to the distinguished names connected therewith. But, gentlemen, records of past events perpetuate simple facts, and monuments of stone perpetuate the memory of men. The former may become obliterated, the latter may crumble, while that monument reared in the hearts of a people by an unselfish devotion to the common good will stand the test of time, and perpetuate the memory and the everlasting honor of its builders. Such a monument builder was he who for years labored unceasingly to advance the interests of the farmers of this town and of this State, our late townsman, Dr. Ezekiel Holmes. In the formation of agricultural societies, and the promotion of their interests, in the creation of your honorable Board, and the directing of its future usefulness, and in the building up of the Maine Farmer, he labored for "Our home, our country and our brother man." But, gentlemen, if he had left no other monument or act to perpetuate his memory, if to his name we could attach no other deed that might claim the never ceasing gratitude of our hearts, the fact that he first brought to our notice and introduced into our town the Jersey breed of cattle, is sufficient to place his name high up on the roll of public benefactors.

The pure Jersey animals, Butter Boy and Pansy, probably the third and forth of the kind brought into the State, and the first into this town, were brought here by Dr. Holmes about thirty-six years ago, and these formed the foundation stock from which very many fine dairy animals, now owned in this town and county, have descended. Indeed, to such an extent has this breed been adopted and bred here, the town is called the home of the Jersey cow, and not inaptly so called, for, notwithstanding the bitter prejudice which antagonized them at first, and in a measure still continues, they have won their way on their merits until about eighty per cent of the live stock kept by our farmers have a portion of Jersey blood. From this town has gone out many fine representatives of this stock into all the counties and a large proportion of the towns of the State. Large prices have been received by our breeders, and large herds have added to the valuation of the farm property in town. But this is not all. Large shipments of Maine State Jerseys have been made to neighboring states and to the far West, Iowa, Colorado and Nebraska.

Dairying has been the leading interest of our farmers for many years, and many of our dairymen have become somewhat noted for the excellence of their dairy products, which has largely found market at good prices beyond the limits of the State. Our dairymen have, as a rule, reached out for light and knowledge by which to perfect their business; have investigated the new and untried theories which from time to time have been put forward, adopting whatever appears to have real merit, and rejecting all else. They have experimented with all the new appliances brought to their notice, readily accepting all that proved in practice beneficial, discarding all others. They have discussed modern methods, modern practices, modern demands, and have applied to the business that which gave promise of profit to the producer and guaranteed entire satisfaction to the consumer. They are constantly looking out to gather information that they may keep abreast the times in which they live, and we do not doubt the occasion of this convention will be of lasting benefit to them.

It is the good fortune of this town to be honored by having this meeting located here by your honorable Board. It is also our good fortune to have so many distinguished visitors from abroad, and we trust our townspeople, one and all, do appreciate to the fullest extent the high distinction conferred upon us.

The beauty as well as the truth of the democratic belief that men are brothers, and that differences in station, and in morals, too, are differences of circumstances and conditions is impressing itself upon greater numbers of people all the while, and is carrying with it its inevitable lesson of personal responsibility. If it be true, the profit as well as the duty of mutual helpfulness is plain, and men are best employed in their own interest and in the common interest of their race when they are contributing to the welfare of others. Trusting this meeting will be of mutual benefit to all present, I again extend to you, gentlemen of the Board, and to all visitors, a cordial welcome.

RESPONSE BY SECRETARY GILBERT.

Mr. President, Ladies and Gentlemen:

It seems to be a proper thing, and certainly it is my pleasure at this time, in behalf of the Board of Agriculture, to acknowledge the compliment of the welcome so heartily given by your representative for the holding of these deliberations with you on this occasion.

This great interest which we represent here to-day is one full of importance to the farmers of the State of Maine; and one that cannot be too earnestly or too heartily endorsed, and should be enforced upon the attention of stock growers among us. It is, therefore, because that we are laboring in this line of work that we are welcomed here in the midst of this dairy industry in this the first home of dairying in the State of Maine. This meeting speaks of the progress which has been made in the line of the better work that is being carried on among us.

It is not my purpose to multiply words on this occasion, but the address of welcome recalled some matters of early recollections which I can hardly pass by without further reference.

We are assembled here in the former home of a phalanx of able and willing workers in the line in which we are trying to follow. It is the home of a Thurston, a Wood, a Holmes:—names as familiar as household words to us who were scholars in the earlier days of the progess of agriculture in this vicinity. It is also the home of the "Maine Farmer." Well do I remember that familiar sheet, and how I ran to the post office after the paper on mail day, and how eagerly, by the fire-light, I studied its contents night after night and week after week, until I almost learned its columns by heart. Ladies and gentlemen, little did I think or dream of the relation to that paper that I now stand in. There are many reminiscences of this kind that come up on this occasion. Those men have passed away but their work remains, and we are here to-day as a measure of the results of that work. Let us all resolve that we will do our work to-day as well as that earlier work was done by those who preceded us.

Our dairy business in this State needs stimulation from two distinct directions. First of all, it needs *courage*. It is one of the puzzling problems to me when I consider what the dairy is capable of doing, and what it is now doing for the prosperity of those engaged in it, that our farmers have not more courage than they have and that they do not go into it and pursue it with the greatest efforts in their power. I feel that it should be the business of this meeting to encourage to the utmost extent work in this direction. We need this encouragement and we have those with us who are able to extend to the people of this State further encouragement in the business.

Further than that, it needs knowledge. It is the best work of our day. It is paying the best. But it is the indifferent work that pays nothing of profit to the operator. Knowledge of this dairying business is wanted. After all our studies, all our investigations, all our efforts, we have but just commenced the investigation of the business. The way is open and invites us to efforts that shall secure more of success, more of money, as we apply knowledge to it, and we are here to-day to enlist the attention of you who have come together. We invite you to use your efforts to draw out such suggestions and such information as can be done in the time allowed for the meeting.

It is not designed to load this meeting with formalities but rather to give it the character expressed in the name, a *conference*, a conferring together of men and women interested in this business, and desirous of gaining a knowledge of its best methods. The meeting will endeavor to give tone and direction to this work so far as you desire it to do, and will make an effort to draw out such matters as you will be particularly interested in. We are here as servants and not masters of the occasion. We have arranged to have time unoccupied for the purpose of introducing questions and answers by those who may be present, and I trust you will all, or as many as see fit, avail yourselves of this opportunity.

With these preliminary remarks I wish again to thank the gentleman for the courtesy so cordially extended to us and for the hospitality so freely tendered by your people. By it we are made to feel that we are among friends, and are glad to be thus assured.

DAIRYING A GOOD BUSINESS FOR THE MAINE FARMER.

By Hon. R. W. Ellis, Embden.

Mr. Chairman, Ladies and Gentlemen:

I expect if there was but one cow handed down from the ark, she was brought to the town of Winthrop. If there were two, probably the other was carried into the town of Turner; so you see what was the commencement of the dairy business in this town and vicinity. To you who have been carrying on this business so long, it would be utterly futile for me to attempt to tell you anything new upon the subject. I was not sent here for any such purpose. I started in to open this ball for a mark at which you can fire.

I attended an Institute where a Professor in Agriculture made the remark—he was speaking of the question of soil—that it was impossible for the farmers of Maine and in general to keep up the fertility of the farms without either buying food from the West and feeding it out to their farm stock, or buying special fertilizers. It struck me as curious and I asked if he didn't think it was possible, with proper management, to keep up the fertility of the farm. He said we could not possibly, without something from the outside, keep up the farm.

Now, gentlemen, if this is a sound theory, there need not be any trouble about the the destruction of this earth by fire or flood; it is only a question of time when it shall be entirely exhausted and animate creation will cease to exist. The earth may reach the sun before that time, as we are slowly progressing that way, but one or the other must come. But I do not believe in this theory at all; I utterly repudiate it. I believe the earth is capable of sustaining itself and more with proper attention paid to the principles of agriculture, and blossom as the rose and keep its own fertility and yield abundant sustenance for the support of man; and the State of Maine can carry five times its present population.

When we look into the profits of the dairy business, we look too much for the dollars and cents we get every day. We don't put stress enough upon the fact that the corner stone of our prosperity is in building up and increasing the fertility of our farms. There is no other branch of business where we carry away so little as we do from the butter. There is no other branch of business that so spreads out and increases constantly in every direction. Not only is it a fact that we send away nothing of fertility, nothing of value as fertilizing elements to the farm, but we are enabled to keep stock from the product of the dairy that is of the richest possible kind for the farm. And I want to impress upon your minds that we do not do as much as we ought in this direction. We are looking too much for the product in butter, and are not making proper use of the fertilizing elements that may be obtained from this business. You cannot use the skim milk in any form but you get rich results therefrom. I contend that this by-product of skim milk is worth half a cent a quart to feed swine. I have experimented with swine and have made the statement that they can be made to pay half a cent a quart, or two cents a gallon for the skim milk fed to them.

I made the experiment with three swine and at the present price of pork. I gave them skimmed milk, charging half a cent, keeping the account of what they ate from the time they were bought until they were sold. The pork sold for five and a half cents and they paid for the milk and gave me something besides. I didn't expect them to pay me much besides, for they will yield me a rich amount of dressing. It is a good investment and I can afford to take care of them.

Ques. What do you consider the manure worth per head, for six months, with skim milk as a basis.

Ans. For a rough estimate of that I should say it was worth, at least, $2.00, and perhaps more. I should say that they would make half a cord if kept largely on milk.

Ques. Did you feed milk, wholly?

Ans. I did for two and a half months after they were taken from the mother, then commenced to feed corn meal in addition.

Ques. You would not consider the milk a perfect food?

Ans. I should for a time.

So gentlemen, I think we can manage much better than we do, and it is the duty of farmers to take more thought to increase the fertility of the soil. We can add cow after cow to our herd and we can raise our own feed and not depend upon the West. As we take advantage of this point in butter making, we can increase so as to be independent of the Western farmers. I want to emphasize this:— You understand about making and selling butter, but perhaps you do not make what you ought out of the by-products of the dairy.

We can increase the fertility of our farms until we can carry double the amount of cows we do now. I know we can raise grain cheaper than we can buy, and I believe it is the duty of every dairyman to husband his resources in this direction and I know also from experiment there is a profit. We should increase our business and *spread out.* The profit in dairying is not what it was when we sold butter for forty and fifty cents. Perhaps some sell for that now, but the majority do no not get this price. It calls for different methods of action. We have got to figure closer if butter gets down to fifteen, eighteen or twenty cents. We must figure closer and understand more of the science of the business; experiment more in feed and in the care of stock, cut down the cost of production; and that *can be done* to a great extent. I think the farmers have experimented more in this line than any other, but I believe there is still a chance for improvement.

There has been a great waste in feeding stock, and though I presume you have brought that down to a fine point, but there are many cases where money is lost by injudicious feeding to-day, and dairymen should study this closer. Scientific men will give you rations for cows and if they are correct you must follow them. I have reduced the cost of making butter by my experiments. It don't cost me as much as it did thirty years ago. I have changed my methods. You are beyond where I am to-day, but the particular point I want to enforce is, that we should take more care to increase our business. If we look for the dollars and cents they will increase as we improve our farms.

In doing this, we are gaining in different directions; we are making business for our children to keep them at home. If you increase your business you will increase the demand for help. It pays in dollars and cents and enables us to hold our children on the farm. It is the farmer's duty to lay out every dollar that he can and *make it pay*. We hear men say, "Farming is poor business; I must cut down my work so I can do it myself; I cannot hire." This is not the right policy; we want to carry out a different one; hire all the help we can, employ our children and the children of our neighbors. We want energy; we want to put the whole man into this business and increase it. You don't want to be satisfied to hand down your farm to your posterity no better than you took it from your father. What does it profit a man if he gains the whole world and hands down a farm to the children that they flee from. We should labor to build up and make farms that the boys will stay upon and stay with us.

Ques. To what extent have you reduced the cost of production?

Ans. I keep a better grade of animals than I did; I take better care of them. I find it is necessary, in order to get the most out of a cow, to keep her as quiet and happy as I can, to take care of her regularly. Give the cows all the comfort you can; keep them warm and feed them regularly; give them the most nutritious food and so get the greatest amount from the least outlay. I feel delicate about talking of these things which you all know just as well as I. You know if cows are uneasy you see a falling off in the milk. If a cow comes into a strange herd she is restless and her milk falls off; there is no rest or contentment. If there is anything that makes your cow uneasy she is not doing her best. I have learned that I must feed my cows at regular intervals. If you feed them regularly they know what is coming as well as we do, and it keeps them in a state of rest so they can do their best; they can digest and assimilate their food. If they are suffering from cold it takes a great deal more food to keep up the animal heat and you don't get what you might. You must keep the body up to about 100 degrees, and you can do this better where it is fifty above than where it is thirty below zero.

Then there is another matter in the feeding of cows. The stomach is able to do a certain amount of work, and cannot get beyond that. Hay is a perfect ration for a cow; all the elements are in it, but it is too bulky and you cannot afford to feed that ration for beef or butter. You must have more concentrated food. It is hard to know just how to divide this; it requires a good deal of careful study; but I am satisfied that too much coarse food and too little fine is fed by farmers. Cows want a certain amount of coarse and a certain amount of fine feed and it is a nice point to find the proportions. I have got the lowest cost of butter when I fed the greatest amount of grain feed and the least of hay.

Ques. What amount of hay and grain do you feed?

Ans. I feed according to the size of the animal,—twelve or fifteen pounds of coarse feed, and from seven to eight pounds of fine. When I buy provender,—two quarts of shorts, two quarts cotton seed meal and two quarts corn meal is fed. This is a fair ration with ten or twelve pounds of hay. When I feed corn, I grind the cob with it and feed four quarts twice a day. If you raise oats and peas you would give them three quarts of oat and pea meal and four quarts of corn and cob meal. I feed barley meal and like it fairly well, though I don't think it is as profitable as oat and pea meal, but it is a very good feed.

Ques. Will oat and pea meal take the place of cotton seed?

Ans. It is abuut the same thing. There is another grain we can raise that takes the place in nutritive elements and albuminoid material. It is pea meal. Barley is good.

Ques. Is barley meal as good as corn and cob meal?

Ans. Yes, I think so, pound for pound. I feed corn fodder every winter, all that I can grow—sometimes four, five or six acres—yellow corn mainly. I have two places. On the place at Belfast we don't raise sweet corn, but in Somerset county where there is a corn factory, I prefer it.

Ques. Isn't one ton of sweet corn fodder worth two of the other kind?

Ans. I raise sweet corn and it is a very rich feed. I feed my cows on it when they first come to the barn and they do well on it. I raised a variety last year of large growth, most of the ears were big; it was very nice sweet corn and is much better and more profitable, I think, to raise.

Ques. Do you raise your calves on the cows?

Ans. I raise them on skim milk. They are just as good for dairy purposes as if grown on whole milk. I feed them on skim milk alone until they are old enough to eat something else; then I give them a little cotton seed meal. I can raise as good calves as I want to on skim milk. I never had any experience with oil meal, I am satisfied with cotton seed meal. I used to think the cow was the best judge of what she wanted and fed on that principal, but I have learned that that is a wrong theory. I know a person will eat too much, and if a person will do that with a better judgment than an animal, we cannot expect a cow to be a judge. I feed but little more than half as much as I did. A cow weighing 1000 pounds would eat twenty-five pounds of hay a day. I have heard men say that they had weighed it; but I know from experience that it is not profitable to feed such rations. I have recommended this course to others and they have cut down from twenty-five pounds down to fifteen with good results. Animals with a sharp appetite will eat more than they can make use of; it is not assimilated and what goes through without contributing to the pail is lost.

Ques. How much cotton seed do you feed, clear, with nothing else?

Ans. I wouldn't feed more than two quarts. I never have fed much over two quarts of cotton seed meal a day to animals I keep right along. I don't think it is profitable to feed all of one kind of feed, it is better to mix. We always give two feeds, morning and night, of both hay and grain; I adopted that practice three or four years ago and am satisfied it is a little better, though I don't know as it makes much difference whether it is twice or three times, but I prefer twice.

Ques. Do you turn the cows out to water?

Ans. Yes. We do that immediately after they are fed. I have never experienced any difficulty by keeping cows close. I think perhaps you could make a tie-up tight enough so there would be trouble, but when the mercury is below zero it would have to be very tight. They cannot be kept too quiet if they have proper ventilation. A certain amount of exercise is necessary, but they can get a good deal of exercise when they go out to drink. I know of cows that are tied up in the fall and are not again turned out till spring, and without experiencing any particular trouble. There is more difficulty from too much ventilation than from lack of it. I would have plenty of ventilation, an open space for the air to circulate, but when the mercury is below zero there isn't much trouble. I intend that my cows shall have water as it comes out of the earth, about forty-five degrees.

Ques. What time do you feed grain?

Ans. After the coarse feed, just before watering. I don't water at night. If I had water in the barn, I should water twice a day. I don't think it makes much difference whether you feed provender or hay first. They want a certain amount of water, and I think it is as well for them to drink after eating, that it may go through the mass of food and moisten it up. I feed provender dry. I used to think it quite necessary to feed it wet. I once recommended scalding it to a gentleman in this town, but I am satisfied now that I was in error. I think it is as good fed dry as wet.

I feed my grain alone. I don't think it would make any material difference, where you have poor fodder if you should mix it. Cows properly fed will eat anything as poor as they ought to eat. There is no trouble in making cows eat any coarse feed, if properly fed.

Ques. Do you feed meadow hay to the cows?

Ans. I feed a little straw every day to my cows until it is gone, and they will eat it with as good a relish as they will hay. I believe in mixing it in right along. Formerly we commenced on the poorest fodder there was, so did my father, but it was wrong—we want to mix it in from day to day. I calculate to make the ration amount to about fifteen pounds of good hay. If you have poor, you must feed a little more of it.

Ques. Do you feed roots?

Ans. Yes, I have fed roots and apples. I consider there is a little value in apples, enough to pay to pick them up and feed them to cows.

Ques. About beets?

Ans. They are pretty good food, a few a day, but you cannot afford to raise them. You can take care of the health of the animal without them.

Ques. In the spring when the cows go to pasture, do you find any injury from feeding cotton seed meal?

Ans. I have never fed to that extent that there was any injury. I have fed cotton seed meal as late as anything. It is about the first thing I feed in the fall.

Ques. Would you recommend the small variety of sweet corn rather than large?

Ans. I do. I don't believe in Southern corn. I believe that growing sweet corn with a fair ear is the most profitable. I think the Southern corn sowed broadcast without much of an ear, is poor stuff to raise; I don't get as much good from it as from a smaller growth of corn.

THURSDAY AFTERNOON.

QUALITY IN BUTTER.

By PROF. JAMES CHEESEMAN, Superintendent Deerfoot Farm, Southboro,' Mass.

Ladies and Gentlemen: Before I say anything upon the subject assigned to me, I want to make a report of samples of butter which have been submitted to me on the side tables here. We have twenty-one samples of fall made butters and prizes are awarded as follows: First prize to Mrs. Robbins, Winthrop, second prize to Mrs. C. E. Moore, East Winthrop; third prize to Mr. Otis Meader, Albion.

Mr. Meader's butter is of excellent flavor but excessively salted. I shouldn't attach much importance to the matter of salt because that depends on the market for which it is manufactured; but the method calls for some attention. In this butter, the salt is not of the best kind; it wasn't well incorporated into the butter; wasn't dissolved; otherwise it would have received the second prize. The second premium butter, Mrs. C. E. Moore's, is of delicate quality, fresh and very nicely salted. The first premium butter, Mrs. Robbins, is butter of uniformly good body, excellent grain and high flavor, worked very carefully, the dryest butter, with its grain intact throughout. This disposes of the report of the fall butters.

I now come to that from the creameries. These lots submitted by creameries are disappointing to me, though they show immense improvement in the general character over those of two years ago from Dexter and Skowhegan. The Fayette sample, granulated butter, is very uniform. The butter of the Monmouth Dairy Association was good and took the first premium. The second premium went to the Fayette butter and the third premium is to the sample of the New Gloucester Creamery. This lacks flavor and is more or less wet. This question of moisture is a serious one for the dairy farmers, the makers of dairy farm butter. Generally, dairy butter is dryer than creamery butter.

I want to say a word about the exhibits of cheese. Premiums were awarded as follows: First to A. C. Carr for Winthrop factory; second to Monmouth factory; third to North Livermore. That which took the first premium, is not the best on exhibition, but it is the best sample exhibited by the manufacturer. There is one other sample which I would call attention to, that exhibited by the veterinary surgeon of Bangor, coming from Canada. I should say that cheese was made of milk rather lower than the average quality, and from milk partly skimmed by the separator. That cheese is a good exhibit of the cheese makers' art; it shows that the milk was well manipulated at all stages of the process. The curing is a fine study; its flavor is good.

The first prize cheese, by Mr. Carr of this town, is a well cured cheese, produced from milk richer than this cheese made in Canada but not as well manipulated. The second premium cheese is a very creditable product. There is plenty of room for improvement of the raw material. It seems to me that making cheese from the product of Jersey cows calls for some special instruction in cheese making. This difference in the percentage of fat in the milk, is liable to present considerable difficulty to cheese makers.

This closes my report and before I proceed, you may ask such questions as you desire.

Ques. Will you give your method of incorporating the salt in butter?

Ans. The amount of salt will necessarily depend upon the quantity your market calls for. If three-fourths or seven-eighths of an ounce, the matter is simple if the manufacturer will take time enough for the salt to dissolve while in the granular condition, before the final working or before working at all. Makers of the best butters are satisfied with one working after the salt is dissolved thoroughly in the butter.

Ques. How long should the butter stand after the salt is put in—the best quality of salt?

Ans. The time varies from two and a half hours to six and eight according to the quantity used, from three-eighths to five-eighths of an ounce we have used.

Ques. What is the cause of salt working out of butter after standing a while?

Ans. If it is impure salt it will ooze out faster,—that is, if it contains chlorides or magnesia.

Our butter goes with light salting. In salting butter great allowance must be made for the buyer's taste, the particular kind of butter which he has been used to. I take this separator butter; that is my ideal, for it is exceedingly fresh and delicate.

Ques. Should butter be worked as soon as salted? Would it be injured by standing over night?

Ans. Not at all.

Ques. In working butter, some work it before salting and take up the moisture?

Ans. We use a high quality of sponge to take up the water.

Ques. What is the method of making cheese from rich Jersey milk?

Ans. I have never made cheese from Jersey milk on the factory method; I have made cheese that sold for fifty cents a pound, a limited quantity, on the Chedder system. In making cheese in factories, the milk is heated to a temperature from eighty-two to eighty-six degrees and the rennet added. The quantity is found by practice, some standard manufacturer being employed. After the curd is set and arrives at a proper condition the whey is allowed to drain off thoroughly and the temperature is raised to ninety-four or ninety-six degrees for twenty or thirty minutes and even a longer period. After this cooking of the curd is done, then put in the press. If you are making soft cheese you wouldn't submit your curd to the ordinary method of pressing applied to factory made cheese. When you have your cheese sufficiently dry you can submit it to the curing process from three weeks up to three months as is preferred.

Ques. If a larger amount than three-fourths of an ounce of salt is incorporated with the butter, how would you do it?

Ans. Whatever quantity is employed, I would prefer the wooden rake or worker, then turn it into your large tub and set it away to dissolve. When ready for the final working I should drain off the brine from the bottom before working. I practice salting my butter before working at all.

Ques. Do you prefer sweet cream for butter?

Ans. That is a matter of taste. It is the primary consideration to make what your market calls for. Some one said to me this morning, "Would this or that kind of butter making do for the Boston market?" The city of Boston calls for a great many more qualities of butter than Portland. There is a very wide range of character demanded in the butter by large cities. Speaking of the bias of the individual consumer,—about a year ago when we had our Annual Press Club dinner, friend W., sat beside me and Mr. S., sat next to him. He didn't know that this butter was the best or among the best in Boston. It was butter from the Deerfoot farm. I said, "Mr. S., what do you think of this butter?" He turned the butter over and tasted it, and tasted again. I said, "What have you to say about this butter?" He said, "What is it, Oleo?" Some of the makers of butter in this room can supply the quality required in the high flavor obtained by the ripening of the cream.

Ques. Whether cheese is not sometimes pressed too hard at first?

Ans. That depends upon the treatment in the vat. If the whey has not been thoroughly drained, the cheese maker is very apt to overpress the mass and make a dry, firm cheese, particularly if it is made from Jersey milk.

Ques. Is dryness and firmness due to pressing?

Ans. Partly.

Ques. After butter is salted, do you cover it with brine?

Ans. It would be very nearly covered with brine. It would not be enveloped in brine if you were salting for a market that called for a very little salt. I should prefer that it should be set in a solution of brine.

Ques. Your ideal butter must be made from perfectly sweet cream?

Ans. Yes, that is my preference, but this is a butter for which there is only a small demand.

Ques. Is anything gained in quantity?

Ans. No, there is apt to be a slight loss. We separate the night and morning's milk one day and churn, and the butter is on the table next day. We churn at a temperature of sixty-six degrees at this season.

Ques. Is the flavor of butter changed by washing it?

Ans. Undoubtedly. Under any conditions, if the butter is allowed to lump in the churn you cannot get out the buttermilk. You will see clots of cream among the prints and the butter will grow rancid. There is danger of washing too much, especially if too cold water is employed.

Ques. How do you wash your butter?

Ans. We wash our butter twice, in weak brine at first and turned into the barrel, afterwards in very strong brine. We use half an ounce of salt—some of it is worked out.

Ques. How long do you let it stand in the churn?

Ans. That depends on the time of the man who makes the butter. The ideal plan would be a dozen hours if you had the time.

Ques. Would that be after the butter comes in granulated form?

Ans. Yes, after salting. White specks in butter is sometimes caused by thick, crusty cream. The way of incorporating salt has something to do with it.

Ques. What is your method of warming cream for churning?

Ans. We warm it in a cream vat, in a water bath.

Ques. You speak of butter in granulated form; please explain what you mean?

Ans. You will examine these samples of granulation. I consider that as near the ideal granulation as I have examined.

Ques. How high a temperature can cream be raised to without injury to the butter?

Ans. That is a broad question. It is advisable to raise the temperature to about 60° or 68°. It is usually from 60° to 62°; it is better below 68°.

Ques. What temperature gives the best results?

Ans. Well, I suppose Mrs. Robbins gets about the best results in the State of Maine. I could name four or five who get the best results from my standpoint. I should say at this season of the year, if I had a warm room, I should not want to raise the temperature of the cream above 64°; should prefer from 62° to 63°. We rarely raise it above 61°.

I try to avoid the question of dairying with apparatus, because a skillful maker who has the right kind of milk, can make good butter by any method. Take the first premium butter here; I suppose it is made by the shallow pan process. This is not one which I would recommend to any one starting out new; but at the same time, a plan which I would not recommend Mrs. Robbins to abandon because she has a small dairy. It is a process that she can manipulate with the least amount of labor. I want to speak now of the feed and care of animals. We had a good common sense talk from a feeder this morning, learned in the best of all schools, that of experience. He told you what improvements he had been able to bring about in the quantity and quality and not the *least* important, in the *cost* of goods, in thirty years.

When the professors of colleges want a lesson, they always go out into the fields. From the habits of animals themselves the best lessons we can get may be obtained, by watching them when they are feeding on nature's best products in the State of Maine. Nature provides mixed herbage, as we see if we observe the feed in our pastures when at their best. The best feeds are well-grown clover, hay and corn ; these with a few roots will give an ideal feed for stock.

In winter when succulent feed, either roots or ensilage, is not used we are apt to find inequality of products. It arises almost invariably in the improper mixture of the grain feed. Cotton seed meal, though a most valuable thing in itself, is notwithstanding, a dangerous feed unless fed with proper care with cob meal or whatever else you may feed. Undue proportions of cotton seed meal has a very deleterious effect on the quality of butter; so much so that makers have been obliged to prohibit its use. Such may be the result from an undue feed of the linseed meal.

Ques. What do you consider an undue amount of cotton seed meal?

Ans. That would depend upon circumstances; the way you feed it. Intermixed with ensilage or fodder we feed with twenty per cent of linseed meal, thirty per cent of cob meal and an equal quantity of bran. These are thoroughly mixed and fed twice a day to our grade cattle. The product from this farm, the night's milk is used for butter and the morning milk is taken for our city milk trade. We feed both ensilage and roots. Ensilage is without doubt much the cheaper food. The dry ensilage runs as high as twenty-three or twenty-six per cent. I usually figure it at twenty-five per cent and roots at fifteen per cent. We grow twenty-five tons of ensilage to the acre, on land which has an inclination to the north.

Ques. How does ensilage affect the flavor of butter?

Ans. I have never found any but good results from feeding ensilage to highly bred cows. The herd that furnishes butter to the hotels are ensilage fed cows. We have fed ensilage for two winters and no one has been able to discover any difference between the milk of ensilage cows and those that fed roots. Our Jerseys have no ensilage, but grades get both ensilage and roots. The Jerseys get roots twice a day. Some of the best butters are made from cows fed on ensilage. I refer to sweet ensilage.

Ques. Will you define sweet ensilage?

Ans. Absolutely sweet—no, that is a relative term—I never met with absolutely sweet ensilage.

Ques. What kind of ensilage corn do you consider best?

Ans. We prefer Stowells evergreen. We like the Mammoth Ensilage; that is the heaviest cropper. In some parts of the field we crop thirty tons to the acre. Wherever there are canning factories, I think it is best to grow for that.

I am told that your State Board of Agriculture is still working on the same appropriation as it was two years ago. I am amazed. I have said in other parts of the State, and I want to say now, that I want you to assist in making a special effort to get more funds to do the work in this State. I have said that the amount of work done by your secretary with the limited appropriation made to him is truly amazing. How he does it I have never been able to find out; it is truly marvelous. Judging from this beautiful exhibition of dairy products, showing a high degree of improvement, I think you can well go before the legislature with your claim for an increased appropriation to strengthen his hands.

This is purely an agricultural State, and next to Vermont is perhaps as great a dairy State as any in New England; certainly it will compare favorably with New Hampshire in the amount and quality of dairy products, considering the time you have been engaged in it.

Judging from the attendance here to-day, I think the board will find a strong rally to present the claims for an increased appropriation to continue this part of your work. The dairy work I think forms one-third of its entire labor. This is getting more exacting every year; a greater number of your people are enlisting in its interests. You will soon have to employ a permanent instructor. This is an innovation as far as the New England States are concerned; they do it in New York. You will do well to have an instructor in butter making; but I think you will gain more by having an instructor in cheese making, because in summer you have the right to compete with any of the cheese making states. You will find cheese making a better outlay for your milk than crowding into the butter market too rapidly. Two days ago, I didn't know as I could come to this meeting. I like to come because you get a large attendance, certainly larger than we get in Massachusetts. It is purely an agricultural State. I am sorry I cannot stay and visit some of your cattle. I want to see a herd I have heard about which I hope to, at some other time.

THURSDAY EVENING.

FINE POINTS IN BUTTER MAKING.

By G. M. GOWELL, Bowdoin.

Fifteen or twenty years ago, when we were first commencing to give much thought to butter dairying as a feature of our farming, the questions deemed of greatest importance and most discussed were: Is our location favorable for the industry? Does the soil produce suitable grasses? Is the drainage thorough? Is the water supply of sufficient purity and abundance? The agricultural writers of the times told at length of the operations of a few dairymen near Philadelphia, who had gained notoriety as makers of fancy print butter. Philadelphia butter—as their product was called—was marketed in New York, Philadelphia and Baltimore and was standard at a dollar a pound. We were told that these farms were located in a mild climate, that the fields were beautiful undulations, and the pastures moist swells and hillsides, the soil of which was made of materials that yield grasses of such composition and sweetness, that the like was found nowhere else. The copious springs breaking out from the limestone hills, were of such purity as could be found in no other section. Deep. cool dairy rooms or spring houses were dug into the hillsides, and located so that the water of large springs flowed through them and constantly surrounded the small shallow pans of milk setting upon slabs in the cellar bottoms.

Aside from the detailed process of manufacture, this was the substance of the literature of the time relating to the making of nice butter. From it the would-be dairyman in New England received the impression that unless his farm corresponded closely in all these requirements, his chance as a producer of fine butter was not encouraging. Not that butter could not be made in quantity, as in past generations, stored in tubs and marketed and consumed anywhere within the twelve months following, and still be regarded as good butter by a consuming public whose taste had not become corrupted by the delicate flavored, aromatic wax of modern discovery.

In examining our own State as to its adaptability to this industry, the conclusion was generally accepted that while some of the lands in the more elevated counties might be used successfully, the clay soils of the central and coast counties were entirely unfit for the purpose. In the favored sections the difficulty of securing springs so located as to supply the spring house with water, presented barriers not easily overcome. Notwithstanding these supposed obstacles, venturesome parties cautiously engaged in the line of work, and their success was such, that as time passed their numbers increased; and even before the discovery and introduction of the Swedish deep-can system of creaming milk, our dairymen had demonstrated the fitness of our State and their own ability to produce perfect butter, not only by selling their goods in the markets of New York and Boston at the best of prices, but by meeting in competition the dairy products of the other states at the International Dairy Exposition at Chicago, and bringing away much more than their proportional number of medals and first prizes. More than this, it has been fully proven, and we believe to-day, that there is not a farm in Maine, from the Province to the sea, upon which butter of high quality can not be made, when the work is done by the use of implements and methods now available.

Our superior natural advantages are proven and accepted. It remains for us to keep ourselves in constant training in every department of the business—from the breeding of the calf and its development to cowhood, and the growing of grass and forage crops, and their economic combinations with grain and by-products in the feeding process—to the treatment and handling of the milk, cream and butter—and the final marketing of the finished product.

Never before has so much thought been directed to the business as within the past year. The great West—the agricultural region of the country that has been devoted to meat growing has turned its attention to this industry, and the leading subject at almost every Farmers' Institute from New York to Minnesota, last winter and this is butter making. What effect the putting of the product of these great states upon the market will have, is a question of the future. This, however, is certain, the grading will be more thorough—and only the best will be called for.

With many people the idea prevails that but very few can master the art of butter making. In this, as in other lines of work where skill is required, the person with fair natural powers of discrimination who harnesses himself to the work, body and mind, becomes an expert. Every advance step that has been made in the science has been met with severe criticism. The idea still largely prevails that butter, obtained from cream secured by cold setting, lacks in keeping qualities. The same charge is made against the butter from the centrifugal separator. These butters are obtained by entirely different processes. In the former, the low temperature was the condemning feature; in the latter, it is not employed. Is the charge, in either case, truth or fallacy?

Our apples are harvested in autumn and placed in storage until their season for use arrives, which is when time and temperature have had their effect upon the structure and the rigid cells have weakened and are readily broken down, easily yielding their syrups and juices. Dry, hard and repellant in October, in January they have become crisp, succulent and delicious.

So with cream, as regards its availability for perfect butter. Secure it by whatever process we may, from the shallow pans at sixty degrees, the refrigerator cans at forty-five degrees, or by the centrifugal separator, a space of time must elapse, coupled with suitable temperature, so that the butter may become readily separable while at a moderate temperature, and without severe mechanical agitation. The ripening of cream, when once started, goes on rapidly, and it is but a step from ripeness to putrification. Bitter cream, from too long standing at a low temperature, over-acidity and too much warmth, even if in but slight excess, leave their stamp upon the butter so indelibly that erasure is impossible.

The idea has gained foothold that the butter of large yielding cows is of inferior quality; indeed, such has seemed to be the case in very many instances. If the coloring and texture of the butter are the results of the peculiar construction of certain organs of the individual in a greater measure than of the food employed, we must surely acknowledge the cow as the prime factor upon which quality depends, and relinquish the idea that butter is entirely the result of food. A dozen cows living in the same stable, subjected to the same treatment, ventilation, water supply and food, with the milk treated, and butter made by uniform methods, will furnish as many samples of butter, each differing from the other in certain essentials. Doubtless some of these samples would be so nearly alike in all respects as to baffle the skill of an expert in discriminating; but in all probability there would be extremes in quality which even the unskilled novice would not fail to criticise. Studying closely every detail of the industry, from first to last, I believe the finest points, and those upon which the success of our work depends in a greater degree than all others, are to be found in the qualities of the cow herself. Skill in managing and feeding the animals, and expertness in handling milk, cream and butter, are the results of training, and readily obtained; but the breeding of a herd of butter cows, every one of which is capable of yielding high quality and quantity, *is not* the work of a year or two. If we are to hold our own in the competition which we are sure to meet in the immediate future, we must devote our energies more to breeding for quality than ever before. Every requisite for doing so is in our possession.

We have many typical herds where the butter yield is of the highest quality, texture, flavor, aroma, and standard color, furnished by the cow herself without recourse to the annatto preparation of commerce. Our State drew largely from the early importations of Channel Island cattle, and, thanks to the wisdom and forethought of her people, that stock was fostered, and to-day we have the grandest foundation upon which to build and extend our dairy herds. But the handling which these cattle have received in the past has been more with the view to their preservation than development. We have too nearly been satisfied with registering every calf which was admissible to the herd book, many of which despite their purity of blood were defective when quality and volume of work were demanded of them. Many dairymen, when selecting males for use in their herds, have taken animals bred from stock celebrated for its large yields, fostering this qualification and too frequently neglecting to provide for quality as well. A cow to be profitable to a butter dairyman should produce a sufficient amount of milk and rich enough to make at least three hundred pounds of butter per year. A certain amount of food is required to maintain an animal in thrift and health. All the dairy cow can spare to compensate her owner is just what she is able to produce from the food she consumes above this maintenance ration. It has been said, I think with truth, that one-quarter of our cows do not yield butter enough to pay for their food; one-quarter more give only enough to pay but little above the actual cost of keeping. So that whatever of profit we have comes from about one-half of the dairy. We can ascertain for ourselves which of our cows are profitable, either by some of the processes for determining the percentage of butter fat in the milk or by actual tests with the churn. When we have satisfied ourselves which cows are profitable, let the matter be settled irrevocably, once for all, that those cows and those only are to remain upon the farm.

Now, I do not claim to know it all, or that my way is the only way or the best way of producing milk and butter. I know simply this: For quite a number of years I kept a little herd of from ten to fifteen cows and heifers, mostly of my own breeding; that their average yearly butter yield was always above three hundred pounds per animal; that among them were several whose yields were from 400 to 470 pounds each, while on the other hand were individuals whose yields were constantly below the average, and from which we got 250 to 300 pounds each per year. I was not able to eliminate all of the light workers and go on with a herd of large yielders, from the fact that not all of the heifers bred were typical butter cows, and the testing of promising animals was frequently disappointing. This, however, I believe to be the fact: No herd need be long continued whose butter yield is less than 300 pounds. A few years of careful breeding and selection will give animals of this capacity, which can but be regarded as quite moderate when we consider how many herds there are in our State where it is exceeded.

Recognizing the fact that the successful future of our dairying rests more upon the strength and quality of our cows than upon all other conditions combined, I query if we can do the industry a greater service than by seeking the revival of our old State Dairymen's Association, or the organization of a new one, and placing in its hands the work of establishing and maintaining a book of butter cows, to contain the records of thoroughbred cows, of any breed, which have actually produced 400 pounds of butter in one year, and been breeding eight months of that time, the butter showing itself to be of high quality in the winter season. No animal should be entered here because of the breeding or performance of its father or mother, or any relative, but only by its own individulal strength and quality as a producer. If its mother, and sisters, and cousins, and aunts are in the registry, so much the better. Objectors will doubt the practicability of the scheme because of the difficulty of obtaining reliable data upon which to base the registering. But the difficulty is not insurmountable. Delegate the testing to a committee appointed for the purpose, or take the sworn statement of the owner of the cow. Base it upon actual tests at different seasons of the year, and submit the samples to experts to decide its quality. With this registry established and patronized we should have a source from which to procure our males for breeding, with the assurance that the selection was intelligently made. By this arrangement we should be able to draw desirable blood from near the fountain head. I believe we have some of the best blood that the dairy world affords, and that we have only to trace it out, establish it and use it. I believe we have been fooling too much in breeding from animals with small percentage of noted ancestors. We have expected too much from the ten, twenty or thirty per cent of blood of St. Lamberts, Stoke Pogis, Rietor, Victor Hugo or Coomassie, and too little from the remaining seventy, eighty or ninety per cent of almost unknown blood which fashionable bulls have introduced into our herds.

CANADIAN CHEESE MAKING.

By ALBERT LETIECQ, V. S., Bangor.

It is not my intention to-night to give you a long description of the construction of the buildings used in Canada in the manufacture of cheese, but pass directly to the business itself, taking the milk after milking and following it through the several stages until it is transformed into cheese. First of all, great care is observed in the cleanliness of the cattle. Impurities getting into the milk at milking time will remain to injure the quality of the product. A common practice is for the farmer to take his big cans used for transporting the milk to the factory to the fields where the cows are milked during the summer months. The first care after milking and properly straining into the cans is to aerate the milk. This is done with a dipper, the milk being stirred and dipped for ten or fifteen minutes. This has the effect to prevent the development of the germ of fermentation and eliminate by evaporation any and all volatile elements which may be in it, because it has been found impossible to make first-class Chedder cheese from milk that has not been aereated. The milk is cooled by putting the cans into a bucket half filled with ice water, or into a spring or well as cold as possible. Here the milk is stirred with the dipper ten or fifteen minutes, and the milk finally cooled to sixty or seventy degrees. At that temperature, by reason of the stirring, the cream will not come to the surface during the night. This is a very fine point with those desirous of making a first-class cheese. There is never any too much cream in the milk for a first-class article but it wants to be kept in and not allowed to come to the surface. The cans are placed out of doors during the night, covered with a piece of cloth which will allow the free passage of fresh air. Usually several farmers unite and divide in carrying the milk for a neighborhood. Arriving at the factory it is carefully inspected with different instruments. Being acceptable, it is weighed and passed into the vat through a strainer. Here the milk is stirred every five minutes in order to aerate and also prevent the cream coming to the surface. When all has been received the process of heating begins, and here the color is added if any is used. Stirring is continued constantly until the temperature of eighty-four is reached, (spring and fall the temperature should be two degrees higher) when the rennet is added. This should be previously mixed with a pailful of water to each vat of milk, and must be of sufficient quantity to coagulate the milk in from twelve to fifteen minutes.

In thirty to thirty-five minutes it is ready to cut. This is done with a knife, adapted to the purpose, and three cuttings are made, one after the other, without interruption, when the curd is left for five to eight minutes until the first whey comes to the surface. Then they commence to detach the curd from the vat with their hands, stirring continually for five minutes, but exercising great caution not to crush it. At that time the temperature is slowly raised. This stirring is done with a curd or milk stirrer, the invention of Dr. A. McPherson, which merits high consideration. The curd is heated to ninety-eight degrees, then the steam is shut off. The stirring is continued every five minutes, care being taken to maintain the temperature at the given point, that is from ninety-four to ninety-eight, until the acid is developed sufficiently so that when applied to the hot iron it will give threads from one-twelfth to one-sixteenth of an inch long. It is then time to draw the whey, which must be done as quickly as possible. During this part of the operation the curd is stirred constantly, in order to further aerate and also to eliminate all volatile elements which may remain. It is then piled on each side of the vat to facilitate the drawing off of the whey. The vat is built in such a way as to balance in the centre, allowing one end to be lowered. The vat is covered with a thick cloth, to which are attached sticks from twelve to fifteen inches apart. To keep the temperature, pails of hot water are placed in lower end of the vat, or by introducing a steam pipe under the cloth. The temperature must be kept at from ninety-two to ninety-six during this part of the process of manufacturing. The curd is cut into blocks, four or five inches wide by twelve to fifteen inches long, and turned every half hour. When applied on the hot iron the curd now makes threads about one-quarter to one-half inches long, and it is time to pass into the curd mill. That operation must be done as quickly as possible in order not to allow it to cool too much, and the curd must be stirred actively about five minutes and piled up again on the sides of the vat and covered with the cloth. They then wait until with an application of the hot iron threads will make three-quarters of an inch long. This work will take from three to four hours. It is then passed into the mill for the last time, and again stirred actively during ten or fifteen minutes. As soon as the curd is uniform and firm they proceed to the salting. The temperature must still be maintained at from eighty-eight to eighty-nine degrees, and the quantity of salt is generally two and one-half pounds in the summer, two and one-quarter in the spring and two and three-quarters in the fall. After salting, the vat is covered again and left still for half an hour, when, if the curd is firm and the temperature at eighty-three to eighty-six, according to the season, it goes to the press.

Here the work must proceed slowly, and time must be given for the curd to take its place under the gradual pressure. It is left in the press forty-eight hours, and then taken to the curing room. Here the temperature must be from seventy to seventy-five degrees, and the cheese should be turned every day for one week, and once every two or three days for the following weeks. The cheese is generally sold at the factory every week or two, and exported to the old country, bearing its peculiar mark.

Let me give you, in closing, a few figures as to the proportion of the business in Canada. Last year, 91,000,000 pounds were exported, a gain of 86,888,518 pounds in twenty-two years. I saw a few days ago that Mr. D. A. McPherson of Montreal has exported the past season 233,444 boxes. For one man that is quite a business. It is a positive fact that the dairy interests have grown to large proportions during the past twenty years, and especially during the last ten. The average price realized on the exportation of 1888 was nine and one-fourth cents, and in 1889, nine and one-half cents. The industry is prosperous and very promising for the future. If this be true, ladies and gentlemen, as I know that it is, the fact is due to the influence of the dairy associations, their inspection of cheese made in the Province, and their influence upon those interested in the advance of agriculture. In view of these facts, I do not see any reason why the State of Maine, with its fertile soil, good pastures and intelligent inhabitants, should not be able to make and export a cheese as good, if not superior, to their neighbors across the border. You have great advantages over the Canadian farmers, and should be encouraged to persevere in every effort which will insure a first-class article, and that of itself will win its way to the best markets of the world.

In answer to a question the doctor stated that regular inspection is made at different times during the season, correcting what may be wrong. At the close the makers report to the Dairy Association the output, and all facts necessary to complete the records so fully kept. The government supports in part, and the Dairy Association pays the remainder of the expense. The dairy industry in the Province of Quebec has materially increased during the past few years. From nine and three-fourths to ten pounds of milk are necessary to make a pound of cheese, as it is cured ready for exportation. Cream having come to the surface you cannot hold it in the cheese. If the milk is properly aerated, and creaming prevented, a large per cent of the fats will be retained in the cheese. The factories usually run about five months and a half, and the farmers pay the factories one cent and a half to two cents per pound for manufacturing.

Ques. How is the work of cheese making carried on?

Ans. At the present time, they have not what may be called a dairy school, though we have some cheese and cream factories which are first class, and young men who want some knowledge in cheese and butter making go there and spend a week or two.

They have an inspector who inspects the factory once or twice in summer. These inspectors are experts of course, and if the factory needs improvement they give them advice, or if there is any new discovery they explain it. Every cheese maker makes a report to the dairy association. It contains the number of pounds of milk received at the factory and how much is paid per pound; the pounds of cheese and price obtained for the same.

Ques. How is this inspector paid for his services?

Ans. There are three inspectors; one is paid by the dairy association and two others supported by the government. They get a salary of about $800 a year.

The proprietor of the factory when they go to inspect, generally pays them three dollars for expenses. The inspector will visit the factory at any time if there is any trouble with the patrons.

The cheese I exhibit to-day is cheese made for exportation. A good many make by the old process, making the cheese a little softer. This is pressed hard, made to stand the trip from here to the old country. So far as I know, the dairy industry in Quebec has grown greatly in the last three or four years.

Ques. Has this system of inspection been effectual in building up the quality of the make in that section?

Ans. Yes. Those inspectors know well how to make cheese and as they go on with the process, if they notice anything not right they tell the maker right on the spot.

Ques. How much milk is required to make a pound of such cheese as is exhibited on the table.

Ans. In Canada most of the cattle are Ayrshire. It takes from nine and three-quarters to ten pounds of milk to make a pound of Chedder cheese. It takes more than by the old system. This is the average for the season. I mean cured cheese, ready for the market.

Ques. At what age is this Chedder cheese cured and ready for the market?

Ans. Generally cheese is sold every two weeks. In some large factories they ship cheese every week. That cheese is ready to be opened in thirty or thirty-five days after it is pressed. Just give it time to come to Montreal, then to the old country and it is ready to be opened.

Ques. Would you recommend us to manufacture cheese in this way, instead of the old process?

Ans. As you want to make cheese for the local market, I don't suppose it would be best to change; it takes a little more milk to make a pound of cheese. Still if you want to make cheese to hold five or six months, I think that process will stand better because it takes longer for the germ of the acetic acid to work than in cheese by the old process.

Ques. What was the percentage of fat in the milk that this cheese was made of?

Ans. Not more than four per cent. I noticed this morning that Mr. Cheeseman said the cheese was made of partially skimmed milk. I don't think it is so; but the difference is that cheese made with Ayrshire cows is not so rich.

Ques. What percentage of fat in milk, sound and all right, can you hold and carry into cheese?

Ans. I cannot tell you to-night exactly; but I should think you could hold four to six per cent, if you take good care of the milk.

Ques. If your cream rises, can you carry it into the curd?

Ans. I do not think you can, because as soon as the grains set in the cream they come up to the surface.

Ques. What does the word *Chedder* mean?

Ans. Fifteen or twenty years ago there was a place in England where they made cheese they called Chedder cheese. We call it Canadian Chedder or Manchester Chedder, because made by the same process as that in the old country.

Ques. Do the Canadian factories buy their milk?

Ans. No, they make it for one and a half or two cents a pound.

Ques. How long do these factories run?

Ans. About five and a half months; that is the general average; some of them a little longer.

Ques. Do the Canadians manufacture any fancy brands of cheese?

Ans. No, not a great deal; they tried a few years ago to make some Holland cheese, but it requires quite a different kind of milk. Of course the Holland cheese have a high appreciation on the market because they have a good name.

THE MARKET OUTLOOK FOR DAIRY PRODUCTS.

By I. O. Winslow, St. Albans.

Ladies and Gentlemen: I feel that the subject set down opposite my name on the programme is one of the most difficult I ever attempted to speak upon. I am not a prophet or a soothsayer, otherwise the case might be different. It might be comparatively easy to look back and cast reflections upon the past conditions of the dairy and its mistakes; tell of what has been done, make comments on the present and tell what *is*, but it is quite another matter to look into the future and say what *will* be.

With regard to other products, like beans, grain and corn, we may claim to have some reliable knowledge of the markets in the future, because they are not perishable and may be held over for the market to be better; but butter and cheese, together with certain other products are perishable, in the sense that they must be consumed within a certain time or they are worthless. Dairy products are subject to variations from slight causes. If you have just enough to supply the wants of the country, to feed the people, the market goes on smoothly, there is no rise, no fall; but if there is just a little too much butter and cheese made to feed the people this year, what is the effect? The people who own that little surplus are very anxious to sell, and offer it at a low price and the price goes down.

On the other hand, if there is not quite *enough* to supply the want, if the demand is greater than the supply, the tendency is upward. It takes but a slight increase or decrease in quantity of articles on the market to change the prices. A little too much sends them down; not quite enough sends them up; so it is difficult to make predictions.

In years past, some of us who have been friendly to the dairy interests, and have looked upon the bright side, have made predictions that have failed to come true. Six or seven years ago we made the prediction that the market had reached bottom; that the prices would be higher; but we have since been forced to learn the lesson that the bottom was a great deal lower down than we knew. Now, the reason why the markets for dairy products have been so depressed? There are several. In the first place, go back ten or fifteen years, and the market price of dairy products was too high, and as a natural consequence must go down. When butter would bring forty cents, and cheese fifteen or twenty, I don't see why the farmers did not get rich. The fact was they didn't understand how to conduct the business economically, and therefore failed to accumulate property rapidly. As time went on farmers learned that there was money in dairying, and there was given to the dairy interest a general impetus throughout the country; everybody went into the dairy business. The development of dairy farming must necessarily be slow. When a country is first settled, the people are not in a condition to go into this intensive work. The land must be ploughed, barns built and a home provided. The dairy business calls for the permanent farmer, the man who is established in the home.

As time went on, there came a period when these fertile sections of country became filled with dairy farms; when there was a general boom in dairy matters, and the business has been a little overdone. It has gone a little ahead of the demand for dairy products. This was a matter which we didn't foresee at the time. Then, there

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came in this matter of oleomargarine, thus bringing together the most unfortunate combinations of circumstances that could come. It came just at the wrong time, and the oleomargarine and butterine manufactured and sold for what it was not did a great injury. To cap the climax we have had during the past three years a most remarkable combination of circumstances in the seasons. They have given abundant crops of grass and hay; and insured a surplus of butter and cheese. The same number of cows have produced quite a percentage more than they would under other conditions. We have had rainy seasons and great crops of grass through the summer and fall. We have had mild falls and mild winters. When there is a mild winter, the people eat less and the cows produce more. Farmers said "This is a remarkable winter, we shall not have it again." But we have had three such in succession,—a wonderful combination to increase the products of the cows. All these circumstances have combined to depress the product by increasing the supply. The wonder is that the bottom has not fallen out and the dairymen given up the whole business. It has gone through a most remarkable ordeal.

There are certain contingencies in favor of the market for dairy products. I will mention first the fact that the people of this country and of the old like butter and cheese; they enjoy the taste of it; and furthermore this enjoyment is perfectly legitimate because butter and cheese are good articles of food and are wholesome. They are not strictly economical because a pound compared with a pound of beef is only worth about ten or twelve cents, whereas the market price is twenty-five to thirty. However, there is no reason why we shouldn't eat butter. If civilization gives us any right, it is the right to indulge our appetites in wholesome food, if it does cost more than pork and beans.

That liking is increasing all the time, and statistics show that the people of this country are large consumers of butter. Of cheese perhaps the same cannot be said; the English eat more cheese than we do, but we have increased a little in the consumption of that product; and I think the increase would be more rapid if less like that exhibited here were exported. People have learned to like butter and cheese, and once having learned they will not give them up. If you like butter you don't want to do without it, so there will always be a demand, and as I have said there is at present an increased call for these articles.

The question is often asked, whether, if there is any money in dairying, the capitalists are not liable to crowd the small farmers out? Whether the big ranches in the West will not all go into it and not leave the poor New England farmer any chance?

That is not possible. Dairying cannot in the nature of the case be conducted on a large scale. We have large dairy farmers in the West who keep a hundred cows and some several hundred; but it is not practically possible for many men in the country to keep their thousands of cows, as they do steers, because unfortunately cows have to be milked twice a day and it would be quite difficult to employ suitable men to take care of that large number. There is a very definite limit in this business. You cannot go into the dairying business on a very large scale without overstocking the market. Then there is another point, to which allusion has been made by Mr. Ellis, and that is, that farmers in general fail to appreciate the profits of dairying because they are not all visible. There is a profit lying underneath which is not noticed at first. A large proportion of our farmers in considering the question of profit must see the dollar coming into their hands at the end of the week or month, and fail to see the profit which is coming next year or in five or ten years from now.

It is my observation and experience, that those of my neighbors who have been engaged in the dairy business the longest time are the best off, have the best farms and are the most wealthy farmers. Those men never could figure out that they were receiving a large number of dollars from the cows every month or year in by-products, and that the cows kept on the farm bring a steady flow of profits in other directions, and make the business profitable when it does not appear to be so.

With regard to the *immediate* future, as I have said, we have had three very favorable years for the production of butter and cheese, and the markets and people have been obliged to accustom themselves to the conditions. We have been able to take care of the butter and cheese we have made and the tendency is to go right on and make about the same quantity next year as this. Supposing we have a drought next year, supposing the winter is cold and everything should be late and conditions not as favorable; then we dairymen will have the upper hands in the matter. It seems to me there is a grain of hope here. People have been accustomed to the machinery of the markets, to favorable conditions of producing large quantities of butter and cheese and have learned to take care of these.

If we don't get as much there will be a shortage. The only reason why more butter and cheese have been consumed, is because they have been cheap. When butter is thirty cents a pound a good many cannot afford it; when it is twenty cents, they will, and having learned at twenty, they will not do without it, if it goes up to twenty-five or thirty. People have learned to eat more and will demand it in the future. So there are grains of hope here for the future of dairying. While the matter looks hopeful in these ways, I wish distinctly to be understood, that I would confine this hopeful outlook to *good* butter and *good* cheese. The time has gone by when it is of any use to make poor dairy goods. To be sure poor goods are sold, but market men and grocers at the stores are complaining more and more that they cannot do anything with the butter that is brought in and swapped for goods; that it is a drug on their hands. Butter has been so low that people have bought nice butter and they don't like to go back to poor butter, neither will they do so, if the better product is available.

Our fathers and mothers used to eat butter salted heavily, but as it was *butter*, it was all right; but by eating a better article, people have learned to enjoy it and are no longer satisfied with the poor. Country grocers have depended upon larger villages for a market; they have sent butter to Waterville, Saco, Bath or Lewiston, and sold it at quite a reasonable price, but I have noticed two facts. One is, the grocers say they cannot sell butter in that way and these dealers are all the time sending out applications for creamery butter. They are using a different article. What I want to emphasize is, that the time has gone by for anything but good butter and cheese. You must either patronize the creamery or employ modern methods. These private dairies can do as well as the creameries.

The question of private dairying or patronizing creameries is a business matter. It is, whether you can make as good an article at home as in any other way. You must get on the modern track and make a better article or give it up. To sum up the whole matter, I firmly believe, that dairymen have passed through the valley; that we have finally reached bottom and that the country will not be developed as fast in the future. Dairy farms have been established more rapidly in the past than they will be in the future. There is no prospect that the dairy business will increase any faster than the demand. I believe that the tendency will be upward; so, gentlemen, while there is no hope for those making poor butter, there is ample opportunity for skill and ability to reap a fair reward.

Ques. You said that the price of butter is nearly or quite double that of other food supplies?

Ans. Of *some* of the food supplies.

Ques. Staple articles, like meat and grain?

Mr. WINSLOW. I will appeal to Prof. Jordan to say if that is correct. Is butter worth twelve cents a pound from an economical stand point?

Prof. JORDAN. It is not worth that, as compared with beef; with wheat it is about ten cents.

Ques. How long can it be forced up to that under the present prospect when the supply of butter is increasing so largely every year?

Ans. I don't know why it shouldn't pay. Let me ask you what the value of a pound of tea is compared with a pound of wheat? How can the price of tea be kept up,—it is a luxury.

Ques. The production of butter is increasing largely every year; it will come nearer the standard of other supplies of food. It is one of the best articles of food for intelligent, thinking beings; it is largely productive of food for the brain; but it seems to me it must take its place as grain in the increase of supply or production that the country can afford. I think the price will fall off. I think there was never such a supply of butter upon the Boston market as during the past season.

Ans. With the increase of population, there must be an increase of supply to meet that.

Ques. The increase of production and population is not equal. If we go on making more butter than we want, what is to become of this that is not consumed, or that which is not actually necessary to answer the butter supply?

Ans. The brother looks upon the dark side and I on the bright, and if he goes out of the business by reason of imaginary ills, it will give me all the more chance.

Ques. Can you state how many packages have been received in the Boston market for any stated length of time, and how would it compare with the total amount exported from the State of Maine?

Ans. Very much larger. Besides, dealers will tell you that they pay no attention to New England at all. Its product don't amount to anything. It is the great West they look to.

Ques. In relation to Maine butter, on which side is the balance in favor, of exporting or importing? Does it import more than it exports?

Ans. I think it favors the exports a little, take the year through.

Ques. What is your opinion with regard to the price of cream; what can the farmer afford to produce cream for, to make a profit, compared with beef at five cents and hogs at the same price?

Ans. To answer the question with regard to butter; I believe that with the average price of twenty cents a pound during the year, I can make cows pay a net profit of $25 each, fair grade Jersey cows—properly managed and under proper methods.

Ques. In that particular, what is your idea of the cost price of a pound of butter and a pound of beef?

Ans. I have not figured it; I should say, supposing cows to make two hundred and fifty pounds of butter each year;—some one said it ought to be three hundred pounds at the least—that would be $50. We will say it cost $25 to keep the cow a year leaving $25 profit. It is a fact that we can produce butter at a lower figure than the papers will show, in connection with general farming. You cannot buy cows and put upon the farm and go into business in a large way; but working it all in, raising as much as possible of the food products aud keeping a strict account,—$25 a cow on twenty cows is a fair profit. I should say that butter might be produced at twelve cents a pound.

Ques. What prospect is there of competition from oleomargarine?

Ans. The days of oleomargarine are numbered. The time is come when it must be sold for what it is. If you have observed the tendency of legislation, you will come to the conclusion that we have nothing to fear from oleomargarine in this country.

Ques. You have spoken of the development of the dairy interest and your remarks have tended to encourage it. Is not the State of Maine going to develop more than can be reached in this dairy business? The local consumption is going to increase faster than the dairy?

Ans. I think so now. The local consumption is likely to increase as fast at least as the production of butter and cheese.

Ques. Isn't butter higher than all other articles necessary to life, at this time?

Ans. Perhaps some might say it is not necessary. Perhaps that is true. Taken from that standpoint, there are many articles which from a nutritious standpoint, like tea and coffee, we use because we like to, and we have a right to if we can buy them. It is a luxury we use for the taste.

Ques. On what do you feed your cows?

Ans. On fodder, grass, clover, hay, ensilage, cotton seed meal, etc.

Ques. Can you do that for twenty-five dollars a year?

Ans. I think so. I raise ensilage quite cheaply and feed cows on it in winter. I don't find feed that I can get profit from butter at twelve cents a pound. During the year I kept these figures, I didn't feed heavily in that line; and then I have taken into the account the by-products which have been deducted from the first cost. I do not mean that the food the cows have eaten does not cost more than $25; I have deducted the value of the pork, etc., which makes the net expense of keeping the cow $25. We do not appreciate the value of the skimmed milk, and hence fail to realize all the sources of profit.

Secretary GILBERT. I am somewhat surprised that any clouds should be thrown over this business, or any attempt made to manufacture clouds to darken our horizon in this matter. We are quite apt to take the dark side of all these questions without any labored efforts in that direction. I have been making butter and cheese for thirty-three years and during that long period of time there has not been a year but I have met pessimistic dairymen who could just see the world on the verge of a production which would prostrate the business to a condition of unprofitableness.

But gentlemen, we have never got there and I am free to say I fully believe that facts will bear me out in the statement that any product that is so necessary to every individual, wherever found, cannot be driven down for any length of time to a value that shall make it unprofitable. A parallel cannot be found in human history, consequently we are safe in the conclusion that the business will continue profitable among us. Besides, it will show us where the dividing line is between profit and loss; what figure is the measure of profitable dairying. Our country as a market beats the world, and as time goes on, it can grow no less. The food material that will make a pound of dressed beef will make a pound of fine butter; and we are making as fine beef as ever was slaughtered and which has been sold this week in Boston,—carried from the county of Kennebec,—for seven and one-fourth cents a pound. As long as people eat beef, beef will be made; as long as man eats bread he will want butter. As long as these conditions exist butter will be called for, the business will be profitable, and the intelligent man who takes hold of it is going to make money providing it sells for more than a pound of beef. That is the view that I feel authorized to take of the matter at the present time.

Mr. E. R. FRENCH, Chesterville. Mr. President, I suppose that the pessimism is aimed at me. I am not a pessimist. I am inclined to look at the bright side, but I want also to look things in the face. Prof. Winslow has said that at twenty cents a pound butter is more profitable than other farming. He says further that twelve cents a pound would be equal to beef and pork at a certain price. Mr. Gilbert has just said that we can produce a pound of butter with the food that will produce a pound of beef. Are you going to force people to buy butter at four times the price? I tell you the law of supply and demand will settle this question, and we may as well look at it face to face. Now, that law runs through all business, leveling the whole production of the country, grain foods and fruit foods; it is just as true of one as it is of the other. We can make butter for twenty cents and make a profit, twice the profit that we can raising meat at six cents, and farmers will find it out in the State of Maine and they will double the number of cows. When you have doubled the butter product it must be sold, and when you sell cheap enough the common people will eat it; they will have a chance to eat it then. I don't believe that figure will be reached directly, but it seems to me that this same law that governs all our business operations will reach even the butter trade.

Mr. GILBERT being called on answered the following questions:

Ques. Whether the amount of associated dairy butter is increasing any faster than the amount of private, in the State of Maine?

Ans. You may not be aware that while we are talking so much about butter making, there are not over three towns in the State where dairying has increased to any considerable extent. Furthermore look and see whether we are approaching that period when the price of dairy products will drop to any extremely low figure. How was it years ago, in the earlier days? Butter never exceeded twenty cents and we felt satisfied with that; selling in summer for twelve cents. Farmers in the town of Livermore got rich making butter at twelve cents a pound and cheese at seven, and carting it down to the Kennebec river for sale. What are those products worth to-day in the market? The last quotations were twenty-five cents per pound at wholesale in the Boston market for first quality product of northern creamery butter—June make, not the fresh article, -and the first-class fresh article not found in the market at the present time. The first quality of product is quoted at twenty-nine cents.

It is not a fact that comparing the population with the products in general, that dairy products of any description have increased above other staple products in this country. In fact, the evidence is the other way. It is this: That the prices are higher to-day than they used to be which is evidence that the supply is not as great, and that the demand is fully up to it. It is true that at certain seasons of the year in the State of Maine, we make a little more butter than we consume; but we are now just about on the balance. Two years ago I consulted wholesale dealers in butter products in Portland as to where they got their supply. They said to me, "We get every pound of it outside of the State of Maine." As long as these things exist, we needn't indulge in any shadowy conclusions in regard to this business.

There is room for intelligent work; and when we manufacture a first-class article and keep the inferior article out of the way, the product is so satisfactory that consumption goes on in an increased ratio. As we put a better product before the public, give them what they want, educate them up to the idea that nothing else will satisfy, there will be a steadily increasing demand, and prices will be well maintained.

FRIDAY MORNING.

WORK OF THE SEPARATOR.

BY THE SECRETARY.

It seems proper, ladies and gentlemen, to make some little explanation of the work of the separator and what the design was in introducing it here. While it is a practice little known in our State, this method of creaming milk is in practice over a large portion of New England, and to a still larger extent in the dairy states of the West. Comparatively few of these small hand machines are yet in operation; the machine usually introduced being run by steam and used for creaming milk on a large scale in co-operative enterprises. We have several of these steam separators at work in our State, largely perhaps to separate cream, for sale in that form rather than butter; but the cream is equally suited to making butter.

The object of separating the cream from the milk with this machine for the purpose of selling as cream is that the density of the cream is at the command of the operator. It is sold for household use to a considerable extent and as people become acquainted with its merits the use in that way is largely on the increase. For certain purposes people want heavy cream. In ordinary setting cream is light or liquid; but this machine can be so adjusted and handled that the cream will be thrown from it in almost as solid condition as ordinary butter. This variation is secured by changing the speed of the bowl in which the milk is held. Here is a strong steel bowl into which the milk when in operation is allowed to flow. In ordinary creaming that bowl makes 7,000 revolutions a minute. You see the necessity of having very strong material for if not, in so rapid a motion as that, the centrifugal force would overcome the strength of the bowl, and it would blow up like a steam engine.

The hand machine is designed for small dairies, and larger ones for co-operative work. In practice the usual course is to have the factory for the manufacture of butter at some convenient point for the work, then establish separators in surrounding towns as near as possible to the places where the milk is produced, and carry the cream to the factory. In private work the smaller separator answers the purpose. Steam separators would be applicable only to large dairies. This little machine has separated this morning 175 pounds of milk in forty minutes. You will see that that is not a very slow process, and the machine does not require very great power to propel it after the speed is once up. The advantage of the process is this, that while the machine costs quite heavily, yet the apparatus required in the work of butter making by the old methods is not called for when the separator is used; consequently what you put into the separator you do not have to invest in the ordinary dairy appointments.

Then in the separation of cream by deep setting, you must use ice in summer. No ice is needed with these machines, because the milk is separated immediately after coming from the cow. Yesterday morning the morning's milk was brought in here from the cows. At fifteen minutes past ten the separator was stopped and that cream was taken to the room below and before twelve o'clock we had butter ready to place upon the table. This was done to illustrate what *can* be done, rather than what *ought* to be done. As the result of that is sweet cream butter, probably you wouldn't like it, and wouldn't want your supply made in that way, not being accustomed to the taste. That sweet cream after being removed from here was changed to the proper temperature, and churned in thirty minutes' time. It wasn't well churned, because the work was hurried in order to have the butter for dinner; it was churned at too high a temperature. In churning cream just separated from milk, the temperature should be reduced quite low. It takes longer to churn, and on these occasions, without conveniences to carry on the work, we don't expect to do expert work, but this illustrates what can be done, and if it is worth anything to you the Board is very glad of the opportunity to show the workings of the machine.

Where is this machine applicable? The board of agriculture has made no particular effort to introduce this method of work into our State for the reason that places where it might be made profitable are not very numerous. You see it calls for the delivery of the whole milk to the separator at a central point, just as in associated cheese making. In order to carry it on and make it profitable, it is necessary to find a large amount in a limited territory; because we have learned in the cheese factory business that farmers will not carry a small amount of milk a long distance. The same obtains with regard to the separator. Wherever you can find a large quantity of milk that can be cheaply and easily delivered to a separator, there is the place for the machine. But unfortunately for us, and for a reason I know not and cannot comprehend, our farmers are not disposed to do a large business. Their wisdom, or lack of wisdom, inclines them to do a little of everything and one of these *littles* is dairying. Instead of putting all their energies into this work and doing a large business, they do a little of every kind.

When our farmers are ready to buckle together and offer you an apology if they haven't fifty cows on the farm, you will find the place where they cannot do without a separator. These places are limited in our State, but by illustrations of this kind attention is being called to this method of work.

Ques. Explain what advantage the separator has to the dairyman over the deep setting process of raising cream? The dairyman wants to get cream in the cheapest way?

Ans. It is a question which is the cheapest way; I don't know as that is established. There is one point that is well settled; that this machine creams milk more completely than any method we have. There are some conditions to offset that slight advantage and one is, where you set milk and raise cream by the gravity method the cream separates itself. Where you run it through the machine you have to apply power; you have got to turn that crank or generate steam. It costs something to turn the crank; consequently the separation of cream costs something, whereas it raises itself by the other method.

Ques. How long will a machine last?

Ans. I don't know; perhaps some one can tell; but I never heard of one being worn out; but they have been in use in this country only a few years. I think they are durable machines.

Ques. What about the quality, compared with the gravity method?

Ans. That is an open question; it is always a difficult matter to talk about when you talk about the quality of butter. You heard that pretty well explained yesterday. Butter is good or bad just as people like it. It is an open question which is the better butter. Sometimes at our fairs the separator butter will take the prize and sometimes the deep setting. Both make good butter and it is as well to leave that there. There is no wide distinction between them any way.

Ques. What is the cost of that machine?

Ans. One hundred twenty-five dollars at the present time. There is another about the same size that is sold for one hundred dollars.

The price will probably come down in time, as it has on sewing machines and mowing machines.

Ques. Do you advise dairymen to invest in separators at the present time?

Ans. I am not here for the purpose of advising people what to do; we are here for the purpose of laying facts before them and they must do as they please.

Ques. How old should milk be when separated?

Ans. It is desirable to do the work as soon as possible after milking. But in many of the separators the separation is made only once a day, taking the morning's and night's milk at the same time. They warm the milk up to a certain temperature.

Ques. Can you obtain about the same results as if taken warm from the cows?

Ans. There is no marked difference; it takes the cream very cleanly. It is the centrifugal force and it operates on those particles, whether old or new. Of course, if the milk puts on an acid condition it wouldn't separate it, because the globules are tangled up with the curd of the milk.

Ques. Which has the greater value, cream raised by deep setting or by the separator?

Ans. That would depend upon the density of the cream in separating. It can be made of light density; it can be made more valuable. Dense cream is worth more than liquid cream.

I find a few questions in the box which we will take up at the present time.

1st Ques. "To what limit can corn and cotton seed meal be fed with profit to dairy cows while out to grass, without injury to the animal?"

Answered by Mr. Ellis. I told them yesterday that I never have had experience in feeding cows with grain feed when out to grass until fall, so really I am not competent to answer that question. Those who have had experience in feeding cows through the summer can tell.

Mr. Gilbert. It can be used to the same limit in summer that it can any other time, there is no essential difference. The question of profit must be for your own consideration. I will make no attempt to answer further than this, that in my practice I have found invariably that the heaviest grain feeds are the most profitable, up to the point of safety.

2d Ques. Are the pure bred cows any better than grades for dairy purposes?

Mr. ELLIS. I will say that the two best cows I have ever owned, each making over 500 pounds, were high grades. My experience has been that for butter making, I have never got any particular advantage from the thoroughbreds. I would as soon have a grade for butter purposes, a *high* grade. I never used any low grade, but high grade I think can be used profitably in the dairy business. But for breeding you are not quite as sure.

Ques. Why would you take high grade rather than low grade, if the grade is best?

Ans. I don't know as I said I would take them in preference. I didn't give the opinion that they were better; only the two best cows I ever owned were high grade. That may have been accidental. I don't wish to be understood that I prefer grades.

Ques. Why are the thoroughbreds better than grades for business purposes?

Mr. C. E. WHEELER. My idea is that for centuries the Jersey cow and the Guernsey have been bred particularly for the making of butter, and if we can use these cattle here as many of them do, I think we can increase the product of our herds materially; and if a high grade is better than a low grade, I don't see why a full blood is not better than a high grade. You have a stronger element of registered blood in the high grade and that is why they are better, I think.

Mr. GILBERT. We don't care about argument. I heard a most noted breeder on the platform last winter advise a meeting of farmers that for business purposes he would recommend grade stock rather than pure bred. That is no argument against pure breeds, but here is a fact found among all breeders of stock; that the *cross* produces a more vigorous, powerful animal than pure bred blood alone. This holds good in practice with all kinds of animals. The difference between high grade and low grade is this; in the high grade you have got a little out blood to strengthen and tone up and give constitution to the pure bred animal, but not enough to destroy the characteristics.

Ques. If high grade is better, why not make thoroughbred crosses instead?

Ans. We have animals that people have been breeding up for 150 years; I don't know of any one who wants to take more time to better it; life isn't long enough.

Ques. What breed would you have, if you have grades?

Ans. That depends upon what you want to do with the animal. Our breeds have varying characteristics. If you are doing one thing you want an animal that can do that kind of work; and so on.

Ques. By what sign to the eye or taste may we know when cream is properly ripened?

Mr. W. H. KEITH. In securing ripeness in my cream I give it a certain time to obtain that condition, using the thermometer occasionally to ascertain when it is at a proper temperature. After it has a proper time to ripen and before it obtains much acid, it is in a right condition to churn. You must allow it to put on the first stages of acidity in order to ripen the cream.

Governor W. D. HOARD of Wisconsin.

Mr. President, Ladies and Gentlemen: It doesn't make much difference where a man comes from. I remember thirty-three years ago in Wisconsin a man from some college came out West to preach; and he commenced by saying,—"My dear friends: I am just from college, and I hope you will bear with me if my language is not suited to your comprehension." An old man sitting on the front bench said with a yawn of weariness,—"Wall, wall, drive on; we're all from *somewhere*." I cannot see any difference in the looks of your faces from the looks of the earnest, thinking men and women in Wisconsin. I went to war along side of Maine troops and waded the swamps of Louisiana, and the only difference that I could see was that the Maine men sometimes had a little advantage in deep wading.

The problem that appeals to you here in Maine, isn't a whit different from that which appeals to us in Wisconsin. It is the everlasting problem of Knowledge *versus* Ignorance,—not in some *other* man, but in *me*; and as far as the disposition of our fortunes, administering upon our own estates, I had rather do that by a good deal than to leave it to somebody else. Steering by the very best light possible we have some difficulties to contend with. We have, many of us been a long time earnest students looking down this avenue, studying the cow, and the darkest spot I ever found on earth is the inside of a cow. She, like every other mother, is a mystery of mysteries; for life is a mystery itself, and out of that cometh that which God has given us to support life,—the highest combination of *all* mystery, *milk*.

I have been greatly interested in hearing *Prof. Jordan, and I want to compliment him by saying that his is one of the most practical talks I have heard for a long time and is worth coming to Maine to hear, and I want to congratulate myself and you on being fortunate enough to hear it. Some of these problems have been racking the heads of men with more or less success, for years; and we have come now just where we can see out of the woods; light begins to dawn. But we must not forget those patient workers who toiled by faith alone so many years in quest of truth as it finally is made clear.

I want to turn my attention to a very practical piece of work. The Professor said to you, that it costs more to maintain a 1200 pound cow than a 900 pound cow. If we could get the average farmer of the United States to clearly see that statement in all its bearings it would do more than anything else to reinforce his pocket. It is the food of support, and that places other important functions with the outcome we try to get from the food of production. There are men who don't see where they are and throw away the entire results of a year's labor.

I have two creameries, with one hundred and twenty-four patrons in one and eighty in another. These men have been a most interesting study to me for years. We wanted to convince our patrons of the value of skim milk. We found them wasting themselves in every direction; wasting their results. Why, you know some men will take hold of a result and you never will see a trace of it; you might as well try to fatten an animal by running oats through a fan mill as to make some men yield results.

We know certain things; one is, if you would get just results from skim milk you must feed it wisely. That wisdom was what we wanted to make popular. We wanted to determine at what period of a pig's growth he reached the highest stage of assimilation of food. We found it didn't have reference to age but to weight; and our experiments tentatively ran from ten, twenty, thirty, forty and fifty, up to three hundred pounds; and we found that the pig reached the maximum of growth, in proportion to the food consumed, between forty and fifty pounds. That at fifty pounds he commenced to go down hill; the weight commenced to cost more and more, so that it cost ten per cent more to make one pound of meat on a hundred pound pig than it did at fifty, and still more on a hundred and fifty pound pig, and so on, varying of course with individual characteristics. It cost from thirty-four to forty-eight per cent more to make

*Referring to his lecture on breeds affecting milk. See Experiment Station Report.

a pound of meat at three hundred pounds weight than at fifty. This taught us this wonderfully clear and crystalized lesson,—that if we wished to get just returns from skim milk, we must feed to young pigs and get growth while they are in the growing period. What is the philosophy of that,—and it is always your duty and mine to hunt for the reason, because when you have the reason of a thing then you can adjust it as you can a switch, down this track or that. It is necessary to understand the principle.

There is a reason for this variation in the growth of a pig or animal. Food is taken by every animal, and handled in two directions. First, for daily support, the maintenance of weight. Second, for production. The trotting horse trots ; that is his productive energy and he eats his food and expends so much. The cow produces milk, but the daily support of the carcass in each case is in proportion to its weight. A great many farmers say that when you get a hog going, keep him going—forgetting that just as you add to weight you are adding to the demand for support of that weight. You have got to pay for it every day.

Cost of Production, then, is a constant factor, and if the farmer would only think he is not a producer but a manufacturer, and would look at his business from the standpoint of manufacturing and of mechanics, at once a flood of light would be turned upon the problem. He would begin to see where cost of production plays so important a part.

What is the food of support as near as we can get at it? The Germans have gone farther to determine rations than any one else. They say it is about two per cent of the animal's live weight each day. Now two per cent of a 300-pound hog is six pounds of food as an average ration every day to hold the weight you have got. Don't you see that you have expended more than you think for in supporting weight acquired, in order to get a little more? This shows us the value of turning our weights at a less expensive standard. We see that the best pig feeders are learning to turn the pig at 175 or 200 pounds, never holding them older than eight months. Many a man has put a hog away when that pork has cost him six or eight cents a pound ; and then he says "Confound the tariff," and he joins some society that is going to *down* things ; when if he could turn his thoughts inward he would see that *he* is the administrator of his own estate.

Mr. W. H. KEITH, Winthrop.

It is a well established fact that these Institute meetings have been profitable gatherings for the farmers of the State and I believe that the more work that is put into them, the more farmers will appreciate them and the better the results that will be obtained. I think the present meeting indicates to us the necessity of continuing them on a larger scale and I wish to present these resolutions:

WHEREAS, The farmers of Maine in session at the Dairymen's Conference at Winthrop, believe that the time has come when the State should require the entire services of the Secretary of the Board of Agriculture, and that the appropriation for the State Board should be sufficient to permit of more extended service. Therefore, be it

Resolved, That we, voters and tax payers, gathered from all portions of the State, ask and insist upon the members of the State legislature now in session, that a sum be appropriated for Institute work proportionate to the demands of agriculture in its present condition. And that the appropriation for salary for the Secretary of the Board be made equal to that of other heads of State departments, in order that his entire time may be given to advancing the agricultural interests of the State.

This was seconded by E. E. Light of Appleton, and A. C. Carr of Winthrop, when the resolutions were given a hearty passage.

THE DAIRY SCHOOL AT THE STATE COLLEGE.

Prof. BALENTINE, Orono.

Ladies and Gentlemen: Last fall at the Maine State College it was decided to establish a Course in Dairying, and I have been requested to speak on that subject to-day.

The object of this school will be to turn out practical dairymen, men to take charge of the manufacture of butter and cheese wherever their services may be needed. How well we shall succeed in this work remains to be seen, but if the citizens of this State will send their sons and daughters to the State College we will make earnest efforts to bring about the best possible results. One of the objects of my tour through Canada and some of the western states has been to get information as to what a dairy school ought to be. There is not a model school in existence at the present time in the United States and there is only one dairy school on the American Continent that I know of. That was started at the Wisconsin University a year ago. They had a dozen pupils a year ago, and now they commenced a term on the 5th of January with forty students. The course is short, only two years course of twelve weeks each. In the school they give practical instruction in the converting of milk into butter and cheese by every known process. They are cramped for room and cannot do the full work they desire to do. One of the particular works that they undertake to do is the testing of milk and cream for the amount of fat it contains. They give instruction in several different processes, one like that you have seen to-day. They also give instruction in the gravimetric system. This is a long process ; only a few samples of milk can be tested in a day. There were several other short processes, some less expensive than the one shown to-day, but none more accurate though better fitted for small dairies. That is a point however that experience will have to settle. Besides that they are giving instruction in the manufacture of cheese, and the man in charge of that work has had a great experience in this country and Canada and is said to be the best man in that work in the country. They have the highest authority in Illinois there for the winter for expert work in butter making.

There will be a term at our college to carry out just such work or similar work to that now being carried out at Wisconsin. I will say that the manufacture of cheese and butter is only a part of the dairy business. You must commence back of that if you will produce butter and cheese with the least expense. The whole two years' course is laid out by the Trustees of our college and while not absolutely indispensable to the practical dairyman, yet it will be found helpful, and a young man after he has had a few years' experience will be a master of the business.

As I said in starting, we cannot turn out agricultural men unless they are sent there, unless we have students in that course. Parents must look to the matter of keeping the boys on the farm before they complain very much more about the Maine State College not turning out farmers. The majority of the students who come there don't come with the object of taking a course in agriculture. Their parents have taught them that the business is not inviting, and no amount of talk of ours will make them think it is when parents want them to take some other course. I know that the Maine State College has not been a model agricultural school. I think the authorities have made it so as far as they were able. Mistakes have been made in the course of instruction perhaps ; and I think the course has been too high toned ; but we propose to take a new departure.

We are trying to give you a course that in two years' time students will acquire the practical and theoretical knowledge of the business which shall be of great service to them in after life. We don't propose that the four years' course at the college shall be discontinued, for we believe that those who want to become farmers should have the opportunity for as good a technical education as is furnished in any college.

AFTERNOON.

The afternoon exercises were attended by the Governor of the State, members of the executive council, and a large number of senators and representatives of the legislature. Governor Burleigh presided.

ADDRESS OF HIS EXCELLENCY, GOV. E. C. BURLEIGH.

Mr. Chairman, Ladies and Gentlemen: I will not undertake to inflict upon you a speech. I will say, however, that I am glad to be with you here, and that this and all other movements for the advancement of the important agricultural interests of the State have my most cordial sympathy. The interchange of views which is brought about by gatherings of this character must, necessarily, be helpful to all concerned. But there is another feature of these occasions which seems to me of equal advantage, and that is the social one. I think the value of this has often times been under-estimated. Good-fellowship is always broadening, and through its kindly offices we are largely led to a proper conception of the character and scope of our common needs. Especially is it of benefit to those of us whose ordinary vocations tend in a greater or less degree to keep us from contact with our fellowmen. Our own little world must always be a narrow one, and it will do us good to look at life and its various problems now and then through other eyes than our own.

I am convinced that gatherings of this character have accomplished a vast work of good in the past, and that everything possible should be done to enlarge their number and scope in the future.

I entertain the earnest hope that the next decade may see a vast improvement in the material prosperity of our agricultural interests. To this end we should all work with intelligent zeal. Despite the increasing number and variety of other industries, Maine has been, is, and will doubtless continue to be for many years to come, a distinctively agricultural State. Whatever, therefore, will be of advantage to this great interest is deserving of cordial support. To my mind there are five things which will work in the next decade to the practical advantage of our farming interests. These are: First, the increased production that is coming, and will continue to come, through the adoption of more advanced and scientific methods of cultivation; second, the great advance which is sure to be made in our dairying interests; third, the enlarged market that will come with the growth of manufacturing communities; fourth, the relief from the inequalities of taxation which have operated in the past to the disadvantage of our agricultural interests; fifth, increased facilities for transporting products to profitable markets.

Other agencies may, and doubtless will, operate to the advantage of Maine farmers, but to those which I have mentioned it seems to me we must look for the more immediate aad far reaching benefits.

The object of this meeting is to give a needed impulse to the dairying interests of the State. It is a subject in every way worthy of our attention. Maine is admirably adapted to be a leading and successful dairy State. There is a vast field for further advance, with, I believe, profitable returns in this department of industry. Where we have twenty-five creameries to-day, we should in a few years have a hundred.

In the same way, our cheese factories should multiply. Our farmers should be able to secure profitable returns from successful co-operation in these lines. I believe that within the next few years our herds will be largely increased, and much of the energy now employed in other pursuits will be devoted, with greater corresponding returns, to the advancement of our dairying interests.

It is our good fortune to have with us here the editor of the leading dairy paper of the country, and a gentleman who is himself an expert and scientific dairyman. No man is better qualified to instruct us on this important subject. We may listen to him with both pleasure and profit. His fellow citizens have given most practical evidence of the esteem in which they hold him. It gives me great pleasure to introduce to you Ex-Governor Hoard of Wisconsin.

DAIRY TEMPERAMENT OF COWS.

By Gov. W. D. Hoard, Wisconsin.

Governor Burleigh, Ladies and Gentlemen: The topic I am to address you upon to-day is entitled, "The Dairy Temperament in Cows." It is not a question which has been popularly discussed except within the last few years. I first brought it out I think, in 1885. It was the product of thirty years of hard study to determine certain facts connected with the functions and operations of the cow in the dairy line. I will preface by saying I was raised and trained a dairyman. Fortunately, my father was a man of wonderful insight in this line, and he left to his son at an early age, a great deal of enthusiasm in its study. I found he had very original notions and left me some investigations that he could not prosecute himself. I wanted to know the best established, underlying foundation,—physiological foundation for judgment in the great problem of breeding, feeding and handling the dairy cow. I early saw that there must be a distinction in the *dairy* cow, as against the one that is *not* a dairy cow; the same as between the running horse and the draft horse; the same as between dogs of different breed. I early saw that breeding establishes function; and my mind was led to that study first from the breeding of dogs. Being a great lover of dogs I was led to observe the lines that nature establishes herself upon, and it is along these I want you to follow me to-day.

It will not be an amusing lecture; it will require steady, close thinking; but you have hard heads in Maine and I know you don't tire when once you are put upon the quest of knowledge. The dairy temperament in cows is based, first, upon the function of maternity. Now to understand that, here stand to-day, two representative mothers of two representative temperaments in cattle. (Referring to cuts of three different breeds of cows placed before the audience. Jerseys, Herefords and Holsteins.) The center figure represents the Hereford cow, belonging to the beef temperament. You see how distinctively different she is in her build! You see how like a square block set upon four pegs, is her form; you see the protruding bosom, the strong brisket, thick, heavy neck, round shoulders, heavy chine, straight back, wide rib, broad barrel, deep, wide breast, heavy, thick, low flank, heavy protruding ham; everything denoting a wonderful difference in temperament and purpose. First, we must have an intelligent understanding of the physiological reason *why* things are different; and, second, what are the deductions that are valuable to you and me as dairymen when we have understood that difference. These animals, Jersey and Holstein, show a totally different formation. You see the bright, clean, alert, active, nervous look of the face of either; the thin neck, sharp shoulder, retreating brisket, the angle of the shoulder, the sloping spring of the rib, the high, strong back bone, high hips, light chine or loin, high pelvic arch, thin ham and large mammary glands;—this is what she is made for. This cow represents motherhood; represents the beneficence of her character. She is a dairy benefactor, taking large quantities of food and turning them by virtue of her cow instincts,—because she is built that way,—into the daily production of milk.

This cow, the Hereford, is a miser; storing up in her body the result of each day's work; never giving it all until she is finally, reluctantly laid upon the block. You see the law of it all, *maternity*. Starting with me, we will on the one side, discuss the mother and on the other, the bullock of feminine gender. Here you have the philosophy that will run through your mind and mine and from it we can deduce some understanding of her treatment, breeding, handling and her feeding. Dairy cattle should be distinctly considered from these three points: breeding specially for the dairy, handling specially for the dairy, and feeding specially for the dairy; and when a dairyman is wise enough to have a store of knowledge on these three points, he then administers upon his own estate successfully. You will readily discover that I am not an advocate of the general purpose cow. I will tell you why: life is short, though it has been severely crowded in my case; yet it will never be long enough for me to make what money I desire out of the general purpose animal. I don't see how I am to eat my cake, sell my cake and give away my cake. So it is with the general purpose cow; she has ceased to be the most profitable for the nineteenth century. The dairyman is confronted with sharp competition. He must go into dairy expenses at the start and he finds it costs as much to keep a cow that produces 150 pounds a year, as to keep one that produces 300 pounds: consequently he cannot hope for success if he maintains 500 pounds of meat six or seven years and swaps the maintenance of this meat for a hundred pounds of butter, keeping that beef on hand and supporting it for the purpose of selling it in six or eight years for old cow beef. It wont pay; it never has paid; and thousands of men can date their lack of success to the vitiating character of that notion that cuts the sand from under their feet. Had they turned their attention to the production and handling of the special purpose cow; put the same expense in housing and feeding; the same expense in handling; the same expense in hiring help; he would have had a profit from the partnership.

Therefore I want to discuss the cow to-day from the distinct standpoint of the specially bred mother for dairy purposes. I place great stress upon the word *mother*, to start with, and I don't put too much on it; for what I am as a man, if I have been enabled in any sense whatever to understand my duty in this life, it is largely because I had a mother who helped me do it; and mother has been an element with me, both as mother and in that of a wife. The element of motherhood has stood about me and has given me an understanding of my duty, and an encouragement and insight in all these things. Therefore, my *mother* makes me understand this bovine mother. No wonder the Hindoo people should worship the cow; so in various things which authors who have been among them describe, you will see this expression:

"Oh Mother of the race! Oh thou that givest life and existence!"

They understood that thoroughly.

The foundation of the dairy temperament is builded in what is known as the nervous temperament. What do we mean by the word *temperament?* You see your speaker standing before you, a man of nervous, bilious temperament; another of nervous, sanguine temperament; another of phlegmatic temperament; another of the sanguine temperament. Men are classed according to temperament. Study men, and your observations of temperament establishes function. Men seek their employments in this world largely because of this. For instance, you never saw a man with thick, fat fingers, with short, thick neck, with a decided phlegmatic temperament, become a success as a violinist. It don't appear on record; it is impossible for him to be a violinist. A man must have a peculiar development of the nervous temperament; he must have strong fingers and deftness of hand, with a peculiar sympathy between motion and thought. You never saw a skillful embroideress, a quick seamstress who had the phlegmatic temperament. Men choose their professions according to temperament. You see that in the make-up of John L. Sullivan. Men seek nervous professions who are of the nervous temperament and build. These are truths in physiology. Temperament establishes function and function establishes form. Take the form of the race horse or trotting horse. He is invariably of nervous temperament; the fineness of the bone characterizes his breed. His alertness and quickness of motion show that. The trotting horse and race horse have shoulders sloping back. Why is it? It is that function has established form. The shoulder slopes back in the trotting horse in order that the forward feet may be thrown forward easily. Just forward of the hips in the trotting horse, you notice the backbone rises a little; that has a wonderful influence upon the pace of the horse. If the backbone hollowed it would pitch the hind feet backward; if it rises, they are thrown forward. Take for instance, hunting dogs. My friends, have you ever studied the peculiar shape of the greyhound? Do you ask why they are not built like the bull dog? I have known hundreds of men who have gone on through life in partnership with greyhounds and not raised the question.

The greyhound is the product of distinct functions. Now we say we wish to perpetuate them by breeding or heredity. That is the question we are coming to now. We base breeding upon heredity; upon the power of carrying on the stream and enlarging it a little every additional life we create. I want to tell you of the wonderful power to which man has arrived in conveying heredity. The fox hound has a sharp nose as any animal, yet additional powers of scent are conveyed by wise breeding with the setter dog. Both have keen scent. The fox hound crosses a thousand bird tracks and never knows it, but the moment he strikes a fox track, up goes his nose and in *his* language he exclaims "Eureka! I have found it!" Found *what*, Mr. hound? "Found that for which I was bred to find, the foot prints of a fox."

Take the setter dog and go into the field and he goes to his work and crosses a thousand fox tracks and never knows it; but the moment he touches the track of a chicken or a woodcock he is instantly arrested in his speed and he says, "I have found it!" Found what? "That for which I was bred to find."

There isn't a boy in Maine who would go out to hunt foxes with a bird dog, or to hunt birds with a fox hound or bull dog, but his daddy perhaps will hunt for butter with a beef hound.

We see men standing out in community spasmodically; they are a success, they amass wealth, they achieve success; but the great mass of community trend along oblivious to the possibilities that lie before them.

What is the secret of it? The insight that hard study and intelligence gives. They take this animal and proceed, first, to understand the laws of her being; second, to breed her according to those laws; third, to handle and feed her according to those laws, and she returns to them the reward of their intelligence.

I tell you, my friends, no man can be a dairyman on a cheap order of intelligence. Christ said, "Except ye become as little children ye cannot enter the kingdom of heaven;" and I have discovered that except we become teachable we shall in no wise attain the kingdom of the cow. To every man who will not study her, she shuts the door; for those who will, she kindly opens abundant motherhood. God said, by the sweat of your brow shall you earn your bread; he didn't say, by the sweat of your *hand* or *back*; he didn't put "sweat" anywhere else except where you do your *thinking*. And if you read between the lines, it says, "If you don't *think*, you shall not have much bread." And it is in this case probable that if you don't think, you wont get much *butter* to put on your bread.

This is the reason why the subject as a rule, has not been popular because it compels men to think. One old man said "Oh, consarn your dairying, I want business that I can stick in the ground and go down town and play pitch. I am not going to be tied to the tail of a cow."

Let me turn once more to the study of this animal specifically. First, supposing you are to buy a cow. You wish to judge that animal for the money she will bring into your pocket and the measure of your judgment is the measure of your success.

Commencing at the head of the cow, you notice in the first place that she is long from the eye to the pole, a full length from the pole to the eye. You will see a wonderful agreement in the outlines between the Holstein and the Jersey. They agree in the general outlines and temperament. They are both of the dairy breed. There should be full length between the pole and the eye, because the basis of action of the dairy temperament is in the nervous machinery that is in the brain. The mammary organs, the maternal organs and the brain are wonderfully tied together. I wish that every man on earth that raises a hand against this gentle mother could see as clearly as he ought to see how the brain and the maternal organs are connected together, so it is impossible to separate one from the other.

This is the action of maternity; this is all maternal in character; therefore you must have clear judgment based upon a knowledge of the action of the machinery of maternity. The brain must be strong and full. Remember a cow making a pound of butter a day draws more upon her nervous machinery than a horse pulling a plow to plough two acres. It is a wonderful draft; yet men turn her out when it is below zero in order that she may have exercise. Why, gentlemen, you never saw a cow in your life turned out, that sought the cold side of the barn; but you have seen fat steers lie on a snow drift, because they were full of carbon. The cow always seeks the sunny side, because motherhood instinctively seeks warmth.

A cow should show a thin, feminine neck. Why? Because this is evidence that she does not swing towards the beef temperament. There are good cows with thick necks, but it is a dangerous quality if you wish to perpetuate the animal, because the cow breeds from her blood and from her functions and not upon her performance. The backbone is a most important consideration in the judgment of a cow. You want to see that it comes up strong and true to the head. If there is weakness there, it indicates a low degree of power or force on the part of the animal, therefore it should be strong the full length of the backbone.

The old Hollanders had a notion that the end of the bone formation of the tail should come below the hock. It was because the formation of the tail demonstrated the strength and formation of the backbone. This is the channel that feeds those mammary organs with nervous power and force. See that the processes of the backbone are large, full and strong. Prof. Robertson wrote me from Denmark "I have struck a wonderful confirmation of what you say, through the skeletons of the most famous cows in Denmark. I never saw such processes as these cows exhibit." I have followed this through many thousand cases, and I have been trying to arrive at a judgment of this animal for thirty years. Here is the pelvic arch. "I want a cow straight upon the back," some men say. Do they know what they are talking about? They have been corrupted by the old short-horn standard of dairy cow. Here is one of the most important considerations claiming our attention. These are where the processes of maternity are carried on. The object of this animal is repeated motherhood. She must have this machinery in full and strong development. Here in the pelvic arch is the indication of large maternity in the cow. I want to elucidate this; to show you that this function is based upon the nervous machinery. Take the action of a cow in milk fever, the same as in other mother's is called puerperal fever. Where does it first start? It commences in the uterus in three or four days after parturition. Suppose we look at this wonderful mammary gland; dissect it, put it under the microscope. You have the most wonderful machinery that man ever directed attention to, and this is surrounded by the sympathetic plexus.

Where do they go to? Straight to the uterus. Where then? Straight to the lumbar region of the spine and from there direct to the brain. Milk fever sets in; there are premonitions of coming destruction upon this mother. These nerves telegraph to the others; "stop secreting milk;" and instantly the command is obeyed. Then commences the slow process that you and I have seen so often. I never had but one case, and that was when I lost my old Guernsey cow, "Bonny Belle," and I stood aud looked at the poor old creature till my eyes moistened, for she was one of the kindest and best; so sweetly and beautifully a mother. I had great pride in her. What is the progress of this disease? It follows the nervous channel, involves the uterus; then along the same net work of nerves it strikes the spine. The cow droops, paralysis ensues; the cow shows strange premonitions of death, her eyes are glassy;—take her calf before her and she cannot see it. This nervous action upon the brain shortens the line of vision, then it involves the spine and convulsion follows convulsion, and by and by the mother throws her head oneside and dies, the victim of her maternity and our stupidity. There is scarcely any cure for this disease, but common sense may be used in prevention.

Last spring I had a new man to care for my cattle, one of those men who never learns anything or forgets anything. It had been my custom when a cow come to her trial to shut her away so no one could disturb her; to see that she had no cold water. I tried to carry her by these few days safely. But this man said it was all humbug, and I left him in care of this animal,—Bonny Belle, under the direction of my son. I got a telegram from him that Bonny Belle had a beautiful heifer calf and I dropped the affairs of State and hurried home. It was worth $500 to me. I said to my son, "Where is Bonny Belle? He said: "In the pasture." My heart dropped. In the pasture? I said: "Why you know better than that?" This was in June. He said: "You have so many notions." Yes, I said, but they haven't cost me any cows. I went and found her with a beautiful calf by her side. I went to the old cow and she got up and looked at me, and I said: "She is gone." That man had allowed her to go through this trial on the damp ground, forgetting that this highly organized mother, this thoroughbred animal was different from the Texan cow on the plains.

The dairy cow should have, not only a strong development of the back, but I have given you the reasons why she should also have a short shoulder. It is excellent to see the back bone rise above the point of the shoulder. It is a strange indication of nervous power. Let me show you the effect of temperament. Take these cows,—this first one made over nine hundred pounds of butter in one year. She would take twenty-four pounds of heavy feed and consume it and turn it into butter. If she had been of the beef temperament would she have turned it into butter? Do you not see the value of a distinct understanding of the temperament of cows? If you have a cow of decided dairy temperament, she will not misappropiate your feed, but turn it into butter. The dairy cow should have wide spread rib; the beef cow a narrow rib; the dairy cow should have a deep barrel, a large capacity to eat and drink, in order to swap your feed for twenty-five cent butter. A cow should have a strong constitution. You hear farmers say, "I want a hardy cow." Let me differ with you; you don't want a hardy cow; not in the sense that you mean, because your idea of a hardy cow, is a cow that will sustain exposure. To my mind a good cow never does that. A poor cow can always do it. A good cow is very sensitive to cold, to exposure; she always shows that sensitiveness because she *is* a good cow. Now you want a cow to have a strong constitution. This cow that made 900 lbs. of butter a year, had a strong constitution. What does that word mean? It means ability to endure within the scope of your strength; within the purpose of your being. John L. Sullivan has a good constitution; he could knock a dozen men like me out in the prize ring; but I could kill John L. Sullivan sitting down at a desk. Put him in the place of a book-keeper and he would find himself out of the ring. So the meaning of constitution is the ability to endure; within the scope of your *ability*, and not beyond it. The best sign of constitution in men, horses, dogs or cattle that I ever saw is the development of the umbilical cord.

I will explain this. I first saw this from an English surgeon who examined men for the army. They were obliged to strip and show their proportions. I was detailed as private to assist in the work. I saw the doctor reject broad shouldered, strong men; and I said: "Why do you do that?" He says, "The man has no constitution." Why he looks as if he were chock full of it. "No," he says, "he has no constitution." Constitution is vitality, endurance, power to sustain long continued action within the range of your strength. You have seen plenty of small men in the army walk right along side of big men; you have seen the small men outwalk them, outmarch them and outwork them; and you wondered probably; but constitution is never indicated by strength. It is something you cannot feed into men; something you cannot train into men; it is something that must be *born* in them; it is that which his mother gives him. It is the power to endure which she gives to him; it largely proceeds from the mother. This is the answer right *here*. If the channel of strength be full in the mother she gives to the child a full answer down the channel.

If the channel be weak and flaccid, then the answer to the child is weakness. Every physician in this country will tell you instantly, that at the birth of children, that is seen with remarkable truth. The infant is fortunate to whom his mother has given a strong enduring vitality.

I said, "doctor, do you carry it any farther?"

"Yes," he says, "I never saw a variation." Then he explained to me the difference in the development in horses and I found I had to study every animal. I carried it to the fox hound and found that dog to be best that had a strong umbilical development. So it became my theory in judging the cow, to see if this development be strong and full. It does not indicate dairy capacity, but it indicates endurance in the exercise of dairy qualities. *That* is constitution; and when you go home, go into your herds and look over the cows carefully. You know every one that is always ready for her feed and can endure like a good soldier, careful mothers right along, and see if you don't find these bearing me out in this judgment.

We want a long sole upon the bottom of the udder. You know how vicious it is to have all four teats come out close together. If you wish to have well spread teats like these, select in the sire the same indication in the rudimentary; and it is almost certain that he will impart to his own daughters the same quality of breadth, but if they are close together you will find the same trait in his daughters. There is a science here; and I want to make a practical application.

One of the finest dairymen in Wisconsin, a man of lovely character; to look into his face was an inspiration, I never knew a man I thought so much of; was remarkably successful in dairying. He was full of chivalry towards the mother. The question was asked, "How should we treat the cow?" He says, "I always speak to a cow as I would to a lady." Too many reverse it and speak to a lady as they would to a cow.

My friends, I have tried to lead you out into an understanding of these delicate relations. I cannot speak as plainly as I would, because people might think me indelicate; but I don't see how it could be considered so. The most indelicate thing on earth is ignorance. This has to do with my sympathies, with my humanity and as I enlarge in my judgment of God's mysteries so ought I to enlarge in my understanding of my duty to my fellows, and it seems to me that the broadest humanity, the broadest philosophy is the understanding that this animal is a *mother*, as your mother and my mother were mothers, and that God has made these laws which we should study for our benefit and promotion in the acquirement of knowledge in the handling of this cow as a mother, remembering that motherhood requires warmth and kindness.

My own wife, a noble *mother* she is, too, taught me more concerning these things than any one else. She was a mother, I could question her concerning this other mother which I could not question. Remember that warmth is the instinctive requirement of maternity; therefore give the cow a cleanly and warm place; and above everything else, promote her comfort. Let me say that I have been hunting for years to find some system of stabling my cows so they might be clean and wholesome and comfortable. I have found it in the past three years and now I can put up my cows so they come out in the spring as daintily clean as if they had lain upon a June pasture. There is no dirt or filth in the milk, and both the cow and myself are so much more content at the results. Winter milk is full of stable taint. You will find many cows completely disfigured with the filth of the stable. Many cows have this winter passed through the pain of parturition standing in their stanchion. If I was guilty of that thing I should doubt whether it was of any use to ask a blessing tomorrow morning. At least I should know it was not a very good way to cheat an All-seeing God. You must feed a cow so as to conduce to maternity. Milk is first created by nervous energy from nerve supporting food, and in turn becomes nerve-supporting food. If you make butter or milk in good quantity you must have strong albuminoid rations; that which contains proteine, carbohydrates and starchy foods that create heat. You have to feed nerve-supporting food regularly; avoid giving cold water; avoid forcing this mother into the cold or to drink from a frozen stream; avoid turning her out in cold days to range the fields; you cannot warm your fields in that way with profit. The more you expose a cow, the more it will cost you. This is a question of economy. If you feed this mother from the standpoint of maternity, and treat her with warmth, kindness and gentleness she will yield you a rich return.

A man who would speak cross to one of my cows, or would strike her, or in any sense whatever misuse her, I would discharge instantly. I would a thousand times rather he would strike me.

Ladies and Gentlemen: I regret that this lecture could not be more clearly elucidated; I regret that it could not be more interesting to you, but such as I have, give I unto thee.

Ques What is the effect of breeding from an immature sire?

Gov. H. A total failure as a rule. I tell you, you cannot be too careful in the selection of sires in all the lines. I wish there was some power that would have the same result upon the human race; but poor humanity has got to do the best it can.

Ques. Is the habit of laying on flesh under high feed objectionable in dairy cows?

Gov. H. Yes, it indicates a low degree of dairy temperament.

Ques. At what age should a heifer be bred?

Ans. I think it wise to have a heifer come fresh when two years old because it begins to establish the habit of maternity. If she passes to three or four, very often she becomes a second or third rate cow, when she would have been first rate if she had come fresh when two years old.

Ques. What are the advantages of feeding silage, oats or corn in summer?

Ans. I think they are very decided. Our pastures are very apt to get dry in July and August, and if the cows shrink then they are bound to remain so; you cannot work them back; and as a consequence you lose in the fall or early winter, when milk is high, what you might have had, if you had kept them up through this dry period. It is practiced to-day by our best dairymen. Mr. Smith, who kept 200 cows in Wisconsin, carried his herd through in this way and said his butter cost him less per pound.

Ques. What salary are you satisfied to receive from your cows, for your services?

Ans. All I can get. I cannot keep a cow that does not give me 250 pounds of butter a year, because it would cost 150 pounds of butter a year, at twenty-five cents, to keep an ordinary cow.

Ques. Has food any influence upon the cow's butter product?

Ans. Yes, up to a certain point. There has been a constant wrangle going on between scientists, as to whether fat increases butter fat in the milk. I have determined this to my satisfaction, and I will give it you; but I don't want you to accept it unless you choose;—I have discovered that every cow is born with an individual limit. She can be fed so that she is for years below her natural limit of percentage. You handle her nicely and she goes up to her limit, but she never passes it. It requires a long time for you to get a cow to enlarge the percentage of any one of these constituents. This is the reason why some cows have so wide a limit in butter fat. My cow, Bonny Belle, made fourteen pounds of butter a week. Her percentage of butter fat was very high, I mean her natural percentage. I have seen her drop below, but I never saw her pass it. I tried often and she came up to, but never passed it; therefore feed does have an effect upon butter fat up to the butter born limit of the cow.

Ques. Will all give the same results on the same food?

Ans. No. In a herd of trotting horses, they fail to produce the same result on the same feed. Jay Eye See will trot a mile in 2.10 on six quarts of oats; and I have known horses that couldn't trot a mile in ten minutes on ten tons. Now there is a capital good point,—the difference of individuality in cows. That ought to teach dairymen what a cow is worth. If you were to get a Babcock tester,—it wouldn't cost you much—and go to work and study your cows; test every cow you have; why, my friends, you would be so sick and disgusted that you wouldn't come out to a dairy convention in ten years. There are cows boarding on you that test your final fitness for heaven by virtue of your very forbearance.

Ques. Does it pay to feed grain when cows are in pasture?

Ans. I think it does pay to give cows supplementary food; we give them red corn ensilage; we allow five tons to every cow; that would feed two hundred days. We try to put up seven or eight tons to a cow, so as to give some to the cow in summer as supplementary food. On the best pasture bossy will come up and pitch into the ensilage as if she never had seen it before. It is a very strong sustainer.

PRODUCTS OF THE DAIRY AND HOW TO SECURE THEM.

[Discussion at a Farmers' Institute held at Limerick, March, 1891.]

Opened by Z. A. Gilbert, Secretary of the Board.

Mr. President, Ladies and Gentlemen: I am glad to be here in the town of Limerick, and certainly I am glad to know that the Board of Agriculture and its representatives have not been forgotten here, and that their former efforts, limited as they were, have resulted in something of advantage to the farmers of the town. Rest assured that words of welcome as expressed by you at this time have no unmeaning sound to the members of the Board. We go from time to time into different sections of the State, and possibly where there is a measure of the missionary effort attached to the work, and we hardly know what the reception may be among those we may meet. So I assure you that any expression on your part of an appreciation of our work is an encouragement to those engaged in it. We come here this morning with somewhat of a special object in view. We realize something of the situation of this town of Limerick. Lines of railroads have gone around your town and have left you outside of their advantages. There is a tendency at the present time towards the centralization of industries in the localities of easy reach and quick transportation. These influences draw away industries from towns that are left out in the country. We have seen large villages with their enterprises completely drained out in consequence. It is a condition that must come and will come, and it is of no use to butt against it.

We have only to shape conditions that remain in accordance with that which prevails. It is the drift of trade and of business that will shape itself and it is of no use for us to try to have it otherwise for it cannot be done. You have the land, you have your farms, and farming may be made successful though located at a distance from railroad connection. But its work must be shaped in accord with the surrounding conditions. We have many towns ten miles away from transportation, and we will have them for many years to come. And now, what are we to do? In no sense are we to conclude that we will die out. There is no need of it. We must go on and devise methods and ways of securing a reasonable measure of prosperity. This is left to us if we will shape our work right.

We have been asked to come here to give special attention to the matter of dairying as applicable to this town, and we are most glad to do this. We believe in selecting some special matter toward which attention shall be chiefly centered for the day.

Co-operative dairying is especially well adapted if introduced as a specialty, to a town situated as this is. It is necessary in such cases largely to do business of a character that will concentrate the products into a small compass on account of transportation. It costs very much less to transport concentrated products of high value—a less percentage of their value,—to market than it does to transport the raw product. For instance, it takes but a few pounds of butter to measure the value of a ton of hay. It costs much less to transport that few pounds of butter to market than it does that bulky and less valuable product. Here comes in the argument in favor of condensing articles into a small compass. Dairy business—especially butter business,—I speak particularly of that at this time, is especially well adapted to be taken up as a specialty in this town. We have examples in our State where they have worked out a complete success in this direction. I am one of those who believe that if one town can do successful work of this kind, another town like situated can do the same thing. It is a matter of fact that the men of one town are as capable as in any other town, and probably you are not willing to admit that the other town can excel you. You rightly think the farmers of Limerick are just as capable as those in the town of Wales where they have made the dairy business a marked success. All there is to that is that you have to go to work and put in your efforts in like manner as they have been doing. The business is all right.

I will refer to something of what has been done in other directions. We have thirty-five creameries in operation in the State at the present time; nearly all of them having run the year round. It has taken some courage and a good deal of push on the part of individuals to sustain and carry forward these enterprises, but they have grown into popular favor and have so far established their advantages among farmers that they are now well patronized and farmers are reaping a reward for their enterprise. I will here say that while you may have had the idea, possibly, that if you could sell your hay for a good market price you could make a grand success of the farm. If you will put your intelligence and your energy into the business of co-operative butter making in this town you can use every pound of hay and grain you get on your farms, and in addition to that go outside and buy still more grain and put with it, and get it into the form of receipts for butter and make more money than that hay would sell for in the markets. We have any amount of examples in our State, where it has been done by whole neighborhoods of individuals.

Co-operative butter making is like any other business; it does not allow of leaks or extravagant expenses. It is necessary for those interested in a factory to do a good deal of thinking that they don't get their pay for. Somebody must do work they are not paid for in dollars and cents; but they do get their pay for it in the privilege of being able to contribute to the factory. It pays well too. People must be willing to put some attention into co-operative work, if they have it, and pull together. The cost of collecting cream must be figured out fine and carefully.

Ques. How much has been paid out by the Turner factory in the year to the farmers for cream?

Ans. $62,860.65 the past year.

Ques. How many patrons did they have?

Ans. I cannot tell you. There is this much, and it is quite a compliment to the industry, and an encouragement to others, that in all this amount of business from the first starting of the enterprise up to the present day, I don't know of but a single man who has left the patronage of the factory.

There are to-day many farms carrying twice the number of cows that it was possible for them to carry when the business first started some eight years ago. This is increasing the production of the soil in consequence of the introduction of this system of work; feeding out the crops on the farm; making manure to enrich the soil and in turn to produce more crops.

Ques. Are there many farms for sale there?

Ans. There are not. Ten years ago the farmers were discouraged; but now they brag that the town of Turner is the best in the

State of Maine. There is nothing that will encourage men like money, on a farm. The comforts of farm life have increased but it needs money to go with them. Nothing encourages farm life as much as to realize that there is some money coming in. There is no limit to what farmers can do in this direction. The limit is simply what they *want* to do. So I close with this, that if you want to do something that will make your farms a success here is the opportunity. It is for you to conclude whether you want to do it or not. If you want to, all you have to do is to go to work and do it. There is no excuse for hesitating or stopping to question over the matter. It is all within reach of those who go to work and *do* it.

Hon. R. W. ELLIS of Embden.

Mr. President, Ladies and Gentlemen: This subject has been pretty thoroughly gone over, but it is a subject, like many others, upon which a great deal may be said.

The first point that I wish to direct your attention to in this matter is the advantage that the dairy business gives the husbandman to enlarge his farm and increase its carrying capacity. No other branch of business so thoroughly provides a man with means of enlarging and increasing the fertility as dairying. I don't think there is any other point in dairy business so much neglected by the husbandman as this. He is too likely to overlook it in his operations on the farm. There are a great many auxiliaries that can be brought into the dairy business;—the raising of any kind of young stock, pigs, colts and calves. Milk is the best of material for the growth of young animals. There is not enough account made of this by-product when we reckon the profits of the dairy. In towns where farmers are engaged in butter making it is important that every man connected with the factory should take hold and produce all he possibly can.

I think you should all understand this making all you can out of the by-products of the dairy in order to increase the fertility of your farms. When you increase the carrying capacity of your farms, you increase the profits at the same time. It costs no more to carry a whole load of cream than to carry half a load. Every cow you add not only increases by what that cow gives, but increases the profit of the rest of the herd. In this, as in every other business, it is practicable, if you take hold of it, to increase it almost indefinitely.

I believe that farmers in the dairy business if they have decent farms ought to do more cultivation of their farms. I have increased my farm by increasing cultivated crops. I don't think it is the best way for the farmers of Maine to import so much of the feed they give their animals. You may think you can buy cheaper than you can raise it, but with a fair kind of soil that isn't so. I have tried it and I know that on an average, when I have kept debt and credit with my crops, I can raise grain and corn cheaper than I have bought it from the West. Every time we raise an acre of corn we increase the productiveness of the soil. Nature has a large store of plant food locked in the soil, and the more we expose it to the rain and sunshine the more we are bringing out that locked-up food. The longer you let the land lay in grass the less you get. Not only do we get more and better crops by cultivation, but we get more and more from Nature's storehouse to produce that crop.

Ques. What is skim milk worth per quart to feed swine or stock, and what is the relative value of buttermilk?

Ans. Skimmed milk is worth a little more than buttermilk. I think there is not much difference however. I kept two pigs and measured the milk, kept account of everything and killed them at six months old and sold them at five and a half cents a pound. They paid two cents a gallon for the skim milk, and paid a little bonus. It is safe to reckon two cents a gallon for skim milk.

Ques. Is it worth as much to feed to young calves?

Ans. That depends upon circumstances. You may sell a calf for $5, $10 or $20. It is impossible to tell just the value of milk, fed to calves, but I think it is worth two cents a gallon to feed to any kind of young animals if properly fed.

Before I speak of the feed and care of stock, I want to speak of the kind of stock we should keep, not particularly the *breed* but I presume dairying here is not different from other places. A great many cows are kept that don't pay for their feed. There has been the trouble always with dairymen who go into the business and haven't tried these things. No man should feed a cow a single week without testing to find out the quantity of butter she makes. Then breed from your best cows, and *breed up*. There is more necessity for quality than quantity. Look out for the *quality* first; then after that *quantity*. You can more easily get quantity than quality.

There is a great deal depending upon the care we give cows, as much as in the feed. We want to reduce the amount of food it takes to support nature to the very lowest limit. You know the temperature of a cow's body is from ninety-eight to 100 degrees. If she is in a stable at thirty degrees it takes more feed than if the temperature is at sixty. You cannot afford to waste feed in keeping an animal in this way. Common prudence demands that animals should be kept warm and comfortable. A large amount of exercise shows on the food you give them. Profit is what you are after and you want to reduce cost. Nothing so draws upon the system of a cow as excitement. Anything that excites a cow detracts from her capacity for filling the pail. You know if you take a cow from one locality to another it makes her uneasy and you get less milk. The more quiet animals are kept, the better they pay; you cannot afford to be careless or keep them in a state of unrest. It is a part of the stock in trade to take good care of the animals.

It is very essential in feeding stock to feed them regularly. It is a necessity with everything that pertains to the dairy, that it should be carried on with the utmost regularity. If you feed an animal every time you go into the barn, you keep them in a state of unrest. An animal wants to eat and lie down contentedly and have ample time to chew the cud and digest and assimilate the food. You may think these are small matters, but when the profits are reduced to a low figure as now we cannot afford to neglect anything. Every man wants the best results.

Some people run of an idea that the higher they can force a cow the more profit it is, but it is not so always. Don't think I am advancing the idea that most people do that. A great many people don't feed as much as they ought to, but it is not always profitable to feed to the highest capacity. You want to feed for the highest amount of profit. So there is a continual study for you. If you weigh the hay to the cows you can experiment week after week and month after month. You can feed a certain amount of hay and a certain amount of grain for a week or a month and note the result, then change the feed for a certain length of time. That is one of the things farmers can do. You must experiment and get as nearly to perfection as you can. You want to know just what you are doing. Every man wants to know for himself.

Some one spoke of the probability of butter going below the cost price. You will be astonished if you keep debt and credit with your cows to see how small a figure you can produce butter for. I have produced butter in winter time for eleven and a fourth cents a pound. I have produced it when it cost as high as fourteen and three-fourths, but the cost of butter ought not to go above thirteen cents a pound. Now I don't feel much danger of butter going below that. That pays for the hay and every article you raise and feed on the farm. If you can get as a profit what you get above thirteen cents a pound, after paying for everything you have raised, isn't that a safe business for you to go into and put all the farm and the men into it? Isn't it perfectly safe? I don't say that every cow or every herd will do it; but with a proper selection of cows, you can make butter for thirteen cents a pound.

Ques. How much hay do you give a cow a day?

Ans. About seven or eight pounds to a feed twice a day. Sometimes I have not fed but ten pounds a day, and one quart each of shorts, cotton seed meal and corn meal twice a day. I don't see much difference between sixteen and ten pounds of hay. My cows are light weight.

Ques. The same amount of grain?

Ans. Yes, the same amount of grain fed in each case. If you will go into this business and patronize the factory you have until you get to the full capacity of your farms, your prosperity will increase.

Charles E. Wheeler, member from Franklin county. I want to say a word about this matter; I went to a grange meeting in our town and met Dr. Twitchell. I wasn't a granger—the rest were. He asked "what does it cost you a pound for your butter?" I couldn't tell him anything about it. I went home, thinking I wouldn't be caught that way again. I fixed up an arrangement for weighing hay and went at it. In the first place I took the fodder I fed the cows and weighed it and found we were feeding some of them at the rate of twenty-six pounds of hay a day. We squared right off to five pounds of common hay in the morning, five pounds of straw, oat straw, at noon and five pounds of good hay at night. They were uneasy the first few days, as you would expect, but the same amount of grain feed was kept up as before. That was in the month of December. During that month we fed them ten pounds of hay and five of oat straw, three pounds of oat and pea meal, two parts oat and one of pea meal, three pounds gluten meal. In two weeks three pounds of cotton seed were substituted for the gluten, still using three pounds of oats and peas. This was followed the rest of the month. The decrease of the cream was only thirteen inches from the month of November and we had saved more than a ton of hay. We saved $5 worth of hay a week with a decrease of only $1.30 worth of cream. The loss came in the first two weeks, because they were uneasy. I know you will find the matter of feed as Mr. Ellis has told you because I have tried it myself.

Secretary GILBERT. I am glad that some of these facts are brought out here because representations that are not backed by experience have but little weight with farmers. Any claims that may be put forth that cannot be borne out by experience of course are not reliable. I have a question in my hand.

Ques. "Is the barnyard or other filthy places, the proper place to set milk for the purpose of setting cream?"

I don't know as such a question really needs an answer, yet it is a fact that all the milk is not cared for as it ought to be. The best course to pursue in setting milk, in a co-operative way, is to set it by a uniform method, that is having uniform cans and the milk set at a practically uniform temperature. Every one is interested to do it right. There is a law connected with this matter which should be observed everywhere: *That all the surroundings where milk is set should be clean and sweet.* Most butter is made by the ripened cream process. This applies to all dairying the same. That is, the cream shall so far change as to begin to put on the acid condition. At that time we get the nearest to the highest quality as rated by the market. We have sweet cream butter, but the markets generally do not call for sweet cream butter. The temperature of the cream should be kept so that the change shall be taken on as quickly as possible, without raising it up to an extremely high temperature. In summer care must be taken that the temperature does not get too high, and in the winter not let it get too low. It will range all the way from fifty to seventy degrees Sometimes the cream has to be warmed in summer at our factory; nearly the entire summer, last summer, there was but a few days but the steam pipe was let upon the cream and the cream hastened in ripening in that way so it could be churned. We want the cream collected to-day, put into the tanks and churned to-morrow.

Ques. Whether you would raise the temperature of the cream higher than it would be necessary for the churning?

Ans. It is necessary many times to do this in order to hasten the process. It does no harm, but it must be brought to the proper temperature when churned.

Ques. Cannot you get it too warm?

Ans. Certainly; if you get up to a hundred there is danger of melting the particles of butter fat. It should range from 50 to 70 degrees.

Ques. What should be the temperature of cream for churning?

Ans. It varies with the season and with the cows. There is where the matter of judgment is called for. It should range from 55 to 65 degrees. The difference comes from this; in the winter season in churning generally speaking the cream will grow cold in manipulation, and in summer it grows warm. Then there is a tendency in cold weather for the cream not to have put on the same condition of ripeness as in the hot weather of summer. If the temperature is too low it takes longer to churn, and if too long it injures the grain of the butter and it is greasy instead of granulated. These conditions apply at the factory just the same as in the family making of butter. If you have a bad lot of cream somebody is to blame for it, somebody has transgressed these rules in furnishing the milk or handling the cream or in making the butter at the factory; it was *somewhere.* Be sure you never send an inferior product of butter to market where you have a reputation. People will not endure poor butter; it will be better for you and all concerned —well, to take it home and eat it.

Now, to cap all this, in the co-operative methods of work the butter must not cost too much in the making. That calls for business management. That is where many factories fail. Not because the officers of the factory don't know enough to manage the business, but simply because they don't *do* it. Expenses must be figured to the smallest fraction and kept there.

Ques. Does an inch of cream from a Jersey cow, give more butter than the same amount from a Hereford?

Ans. An inch of cream made from any cow is practically worth, —very closely, at least—the same as an inch made from any other. There is no special advantage from the Jersey cow in that direction. There is a variation in cream from time to time, but they are accounted for from causes outside of herds. A cow's cream is worth most per inch when she is fresh in milk. Its value gradually goes down until she comes to the dry period, and if the cow continues in milk close to the time of dropping a calf, the later weeks of that time the milk should never be saved. It is unfit for use.

S. A. Hickox, South Williamstown, Mass. If you are going to make a success of butter making it is necessary that you should make and sell good goods. We eat two million pounds of oleomargerine and sell two million pounds of pure butter for soap grease. How is that? Can you conceive of any point where that two million pounds sold for soap grease is any advantage to the farmer?

If you are thinking of making butter here I can tell you before you start, that if you do not make good goods it is a failure; you lose your money. If you do make good goods you receive the benefit. It will all depend upon the business principles you bring to bear upon the industry, and upon the quality of butter you make. If it is good, it will be in demand.

HOW TO BRING UP A NEW ENGLAND FARM.

By S. A. Hickox, South Williamstown, Mass.

Mr. President, Ladies and Gentlemen:—We are going to talk about keeping up New England farms. In the first place if a man is going to engage in an industry, he wants to make up his mind whether he is going to be ashamed of the industry he thinks of engaging in. I wish to bring this fact before you. I believe that in order for a man to be successful in any industry, he must feel an interest in that industry. He wants to make it a business question and needs to take the subject into deep consideration, and if he finds that he is able and willing to give himself and all that is in him to it, it is safe to engage in that industry.

I stand before you as one who cultivates the soil. I have tried farming at home, aud I am thankful that I engaged in the industry because it is the most noble work that God has given to man. You can say that, because it is the industry that feeds the world and feeds every other industry. It is the great shaft that runs the other machinery and that every industry has to come to for motive power. I appeal to your good judgment to say if this is not a noble industry.

It is acknowledged by all New England that the agricultural industry is under a cloud. Speakers that go before audiences tell you this, and that the farmers neglect their duty, and they tell you the truth. But I want to say to you that as bad as agriculture is neglected I believe there is such a thing as a political agricultural industry; and I wish to say to you to-night that if you have neglected your agricultural industry you have neglected your political agriculture ten times where you have the other once. At a meeting the other day we were talking about this and I appealed to the audience. I said to the president that I would like to know how many of that audience had attended the caucus. I feared for the audience and wouldn't ask him to put the question. A gentlemen of the law in the hall said, "Mr. President. I make the motion that all who attended the caucus last year shall rise." With an audience larger than this there were only seven got upon their feet. This is not the way to take care of the farm. If you don't take care of one you need not try to take care of the other. The thorough farmer attends to his farm, but he is going at his chores an hour earlier that night because it is his duty to go to the caucus and put in the names of men whom he is going to try to elect, and who if elected will go to the law making house and take care of his business. Now that I have called your attention to this, I want you to think it over and I think you will get into the right place. Do not neglect this.

I find all along the line of discouragement a light in the eastern horizon for the agricultural industry. We begin to see that we must go to the poles and vote one way. And why shouldn't we, when our interests are all so nearly or quite alike. We want the same things; but are we going to have our industry protected if you go down a republican and I a democrat, and some other one a mugwump?

We are scattered so we do not amount to anything and we cannot get anything, while the other fellow gets what he wants in his caucus. We want more agricultural men in the State House and we will get them there if we concentrate our power. I appeal to you to see to it that you put judicious men into the State House.

With these facts we start out here, advising these young men and women to come forward and go out upon the hills and locate and manage these New England farms, with "the rocks and the rills and the vales and the hills." We heard a great deal last spring about the abandoned farms of Vermont and Massachusetts. I was in an editor's office last fall and this question came up and I told the editor I didn't believe in his system of populating our abandoned farms. I said, "I think you could give such protection to the agricultural industry that your sons and daughters would make their homes on them and raise their children, and make these farms bud and blossom like the rose." We wonder why our sons and daughters don't locate on these farms. *It is because we don't do our duty.*

I would advise young men to-night never to undertake to improve an acre that isn't worth it. If it is hard and rough leave it to the rabbits and go where there is a better promise; but wherever you pitch your tent make your land better. If you cannot make money in that way you cannot at all; for successful agriculture is to improve your soil while you raise crops, and if you can't do that you wont make money.

Starting out in life, it took me three years to decide what I wanted to do. That is the first decision to make. I saw the different industries of my town. I compared farming with other industries. I would have to work more hours. When the mechanic got through his work I would have to take a pail and milk and work two hours in the morning before he started at all. That looked hard. I looked over these industries and saw there was a good side to all and a poor side to all, and I thought after all I could live as happily and be as comfortable on a farm as anywhere. I looked among the mechanics I knew in the town and saw what per cent owned their homes. I looked them over and said, "Isn't that man a good mechanic? he has good qualities. Is it the industry or is it the man?" You have got to make up your mind to that yourself. I thought I would cast my lot in the agricultural world, and when I cast it there I cast it there to stay for better or for worse. I felt that if I did not succeed in agriculture that I never would look over the fence and tell myself how much better I should have done on that side. I took this for all that is in it, determined to push it with all that was in me, and I never saw a day when I considered my work on the farm a drudgery.

You never can make money in work that you feel is drudgery. No matter how dirty it is, if it is in the line of your business pick it up with a smile, because you will live longer if you smile than if you frown. Say, "This is in the line of my business and I am going to pick it up and go on."

I got on a farm that was able to keep twenty cows. My father had farmed there forty years; my mother had made butter and cheese in the house for more than thirty years. There was a mortgage, and with buildings forty years old. Every particle of manure lay exposed to the air and rain; everything to hire done that I and my good wife could not do and with a debt of $6,000. I ask some of these young men how they would feel if they had that burden on them, and with an agricultural industry that they had got to learn before they could manage it. Such was the condition, and I thought it was rather a blue time, but I thought I had the ghost of chance. I recollected a story I heard a contractor tell. He took a job and another contractor blamed him for taking it so cheap. He says, "You know no man can do that job for that money." "I know it," he replied, "but it is worth something to be boss." I felt that way. I never liked to work for somebody else. I always wanted to furnish my own work. I went there with my good wife and when I didn't carry the flag she did. She was at my side and we worked together, and we were not lazy. But when I got through the first year I could not pay my hired man all up!

How did I feel with regard to this matter? I have frequently heard farmers down in the blacksmith shop cursing the industry that I was engaged in. I dare say you have heard men do the same, and say they were going to sell out and get money enough to get out of town.

I felt just as I did when I was a boy and went to school. We used to wrestle down to the school-house, and they would take me down. I felt always when they took me down that I wanted to try it again. I felt just like that when I failed to pay my hired man I had not lost a particle of courage. I wanted to try it again and I did.

I took my paper and pencil and sat down and began to put things together that I had heard older farmers say about this, that and the other. I remembered that they had said time after time that the farms in my section of the country raised the best crops of grass and that it was the best crop the farmers grew. I did not know whether it was so or not, but I took what I had heard and began to think and put those things together. I began to wonder why I did not have money enough to pay my hired man. I did not know of any place where I had been extravagant. I thought I had made a dollar go as far as any man could. When I came to sift the matter down I concluded the reason was because I had not enough to sell. I had not enough product to sell to get the money with. What I pay my bills with must come out of the soil.

I took the matter into consideration and I figured out farming the best I knew how with pencil and paper. I said to myself "In the first place I am not raising enough, yet how can I raise more?" Men before that had been raising milk and beef on that farm. "What does milk and beef extract from the soil?" "That's what ails it," I said. How was I to get that which the milk and the beef had taken away? I could not buy it. I said I could go to work and make and save a great deal more than I was then doing, and I turned my attention to that. I never worked on the road; I never looked over the fence after a job. I thought if I could earn four dollars on the road I could earn eight dollars at home. I put these things together as seemed best to me and turned my attention toward making manure. I got compost and went to work, and I had more manure the first day of December than I ever saw upon those premises. I used this manure. My father used to raise five or six acres of corn, two or three of potatoes and buckwheat,—he was a good farmer, he did his work well. I remembered that I had heard men say that the manure raised a crop of corn, then oats, and then grass. The hay crop was the third crop. They put in not half manure enough in the first place to grow the first crop.

Now this is good business. I will take enough land to receive my manure and turn it over. I will plow in the fall and put on the manure and plow every inch of it in. In the spring I will pulverize it and sow it to oats and when the oats get headed I will strike in and mow them and see if I cannot get more fodder. In order to meet my expenses I must raise more. I am going to raise more fodder. I continued this course. I thought if I could only manage to carry twenty-five cows I should be one of the largest dairymen in the place. Pretty soon I had the product of twenty-five cows, and had built a barn to make hay room. I then said I would keep thirty cows, and when I got thirty I started for fifty, and before many years I doubled my stock on that farm. In that way I raise oats, barley, clover and timothy. All the corn I raise is sweet corn for fodder in August and September.

I heard a man talk about ensilage. His words fell like idle tales at the time, but after I went home these things kept ringing in my ears, and I thought if that man was correct it would prove a god-send to me. I began to feel that it was too good to be true. I could not get that off my brain, so I went thirty miles to see the gentleman. I asked him all the questions I could think of and in thirty minutes he had me converted; and, too, after I had promised myself before I went there, that I would not be converted by anybody. That man answered every question I asked him. I could see the animals, and why shouldn't I be converted? If you find you are wrong get right as quickly as you can. I got right, and when I went home I studied up how and where I would fix my silo and went right to work, and when I told my men you ought to have seen the expression of their faces. They ridiculed me but I did my work and people would drive for miles to interview me. Certainly, I knew nothing about it, but I did not wish to tell them that. I listened to what they had to say. When they turned to go they would say, "Well sir, I hope you will succeed."

I used my silo and continued to increase my earnings. I have been at work on these principles, and if you will go home with me you may find standing there one hundred and ten head of cattle and horses, and with pits made to receive the manure. I have built three houses, the debt is paid; I own the houses. I will leave this fact with you. It is not the acres you have, but it is what the acre produces. I have sixty-five acres of meadow. On that sixty-five acres is the place where I get my fodder for a hundred and ten head of cattle—oats, ensilage and grass.

Turn these things over. I wish you to farm on your political farm as well and help all the brother farmers of America to take care of our interests.

THE PROFITS OF ORCHARDING.

By PROF. ELIJAH COOK, Manchester.

[Given at Limerick, York County.]

Mr. President, Ladies and Gentlemen: I have great faith in the advantages of these institutes. I had the pleasure of attending one in Kennebec county a short time ago and listening to a remark I heard made there, which I wish to repeat to-night. It was that the advantage to the farmers of that one institute was more than all the cost of the Board of Agriculture in the State of Maine during the past year. That statement was not wild; it was not placing the value of that institute too high. It is a fact that farmers need to meet more; they want to converse more with each other; want to gain more information with regard to their calling. A gentleman attending a similar meeting in Bangor a short time ago, told me the advantage of being at that meeting that he could count in dollars and cents was up to $200; and so it goes all over the State. The farmers of Maine are willing and glad to impart information to help one another. There is enough of the milk of human kindness in the human race if we are prepared to receive it.

I tell you, friends, there is much for us to learn in regard to agriculture. We know that the business has been talked now for a long time as being depressed. Yet this depression extends not only from ocean to ocean, but across the ocean and all over the old world. Examine it as you will and you will find the most favored spot on the globe for us is here in this northeastern corner of our country. We hear gentlemen speak often of the competition of the West; that we are unable to cope with it. Yet we have in the State of Maine, one product which the West can never compete with us in. This is the production of apples. You know that Maine Baldwins, Maine apples, bring more in the markets of the world to-day than the apples of any other part of the Union. You know yourselves that adding what Maine fruits will bring a barrel to the cost of transportation across the continent, from one to two thousand miles, add that to the bare cost of production in the West and you have got a profit here. So you have nothing to fear from that section of the country for the product of apples. Fruit, you know, is God's best gift to man. Hardly any of us begin to consume enough for health and enjoyment.

The question comes home to the farmer 'What can we do to keep our sons upon the farm?' There is a way to overcome to a great extent this floating away from the farm to the city. One thing, and the first, is to beautify your homes, set out your shade trees, your shrubbery; make everything beautiful and attractive around your homes. Another thing is to supply your table bountifully all the year round with fruit in its season, and this cannot fail to attract your sons and daughters. You know what advantages there are in the country over the city. You know that every field and flower, forest or valley is a picture. You know that the pure air, the grand scenery around your country homes are an inspiration to your sons, begetting something in them that is noble and grand, something that raises them higher and higher and makes them nearer like their Creator.

What different influences surround the city boy! What different influences surround the city man! How many times as I have been riding in the city of Chicago through the lower part of that city, and seeing those dismal, dirty homes and those poor children consigned to such homes, and the poor men going home to such surroundings; and after a few hours I wake in the broad fields of the West in the country where everything is pure and free, and see what a difference there is surrounding the community there, how my thoughts go up to God in praise that there is such a place as the country. Farmers do not half appreciate the grand privileges they have of rearing a family in the country instead of the city.

But our boys too often have a desire to throw off the overalls and rubber boots, and flee to the city and carry a cane and puff a cigarette. And why? Twenty years ago while sitting at a desk in the Provinces a boy came and asked permission to go into the city. "What for?" There was a vacancy in a dry goods store and he wanted to get it. I said, "You have a good business at home." He said, "Yes, it pays well, but *there isn't any style to it.*" See what absurdity had crept into that boy's mind.

It is often the case that such conditions of mind are due to the surroundings and instruction and talk that the boy has heard at home. The farmer is too often discouraged when he ought to be hopeful, when he ought to be throwing out grander thoughts of his occupation than any other man on the face of the globe. Washington said that "agriculture is the healthiest and the noblest employment of man." And why should it not be? From my boyhood up I have always looked at the occupation of agriculture as the "noblest employment of man." Said Mr. Barker of Forest Hill, Boston, to me a short time ago, "I love to see the plant unfold as the seed begins to grow and burst and puts forth leaves and branches; I never saw it without being grateful that my attention was called to such subjects. It brings a person nearer to his Creator when he is examining these wonderful miracles going on about us."

We have been told to-day that there is nothing like a balance on the right side of the ledger to make farmers attend to this truth. We cannot live to be sure on grand scenery; we must have something to supply the wants of life. And that is what I want to call your attention to to-night. I have heard it remarked to-day that you know all about fruit and orcharding in this section. I do not question but many of you know more than I do about it; but there is one thing that I am positive of, and that is that there is evidence that if you *do* know, you do not at all times do as well as you know. It is too often the case with us all that we do not put in practice what we know. Those poor trees by the roadside all the way up and down your streets are starving to death for a little care, calling loudly for attention when they would be so glad to pay ten or a hundred fold if they could receive it. You have a grand orchard country, some of the best in the State, and that means some of the best in the world, but you do not improve your opportunities. We have been considering all day the possibilities of dairying, and which have not been half reached; the half that might be said has not been presented. It is a paying industry; it is a grand industry; but orcharding here in Maine will beat it two to one every time.

Neither one wants to be alone, but the two should be combined. I want to show you a little that I have gathered on this subject within a few days of what is being done in Maine, not somebody's theory, but what is actually being done here in the State of Maine.

Joseph Smiley, living in Vassalboro, Kennebec county, is a small farmer, has a small farm and a small orchard of three acres. He has his trees too thick for under planting, and I call your attention to what he has received from those three acres of trees. In the poorest years his net receipts have been more than $100 per acre. There are about 250 trees on three acres. They are set too thick, but they have been well tilled or well dressed, consequently have produced not as much as trees under more favorable circumstances, but very satisfactory results. They have netted him on the whole, about $500 a year. The orchard has produced $1,100 in one year on those three acres, gross proceeds. Thus far he has received from the three acres set about fifty years ago, $15,000. He is a man who has kept a most careful account and knows what he states. One of his orchards consists of thirty-two greening trees. This is separate from the others planted twenty years ago, and has been profitably bearing some twelve or fifteen years. Last year it produced 125 barrels of apples on half an acre, which sold for $2 35 a barrel, number ones and twos together.

This half acre was worth about five dollars before the trees were set, and Mr. Smiley has refused $500 for it, or more than $1,000 per acre. The ground has not been tilled but mulched and dressed.

Silas Bragg of Sidney set an orchard of three hundred trees nine years ago. He had them grafted but the work not being successful he had it done again. This set them back a year. When those trees were eight years from setting he received eighty bushels of Baldwins from them, worth $65. He says when the trees are ten years old they will cost him nothing. They were set in grass land, mulched and dressed lightly. Notice how quickly these trees began to give results! They did this simply from what we call *ordinary* care, not remarkable care.

It is only a question of care as to how much trees will do. Nine-tenths of the trees all over the State, are doing but little it is true; but it is because they are sadly neglected. If they could be tilled, properly dressed, properly pruned, simply taken anything like decent care of they would return to the owner greater profits than he could get from any other source on his farm.

Ques. Do you approve of plowing orchards?

Ans. No, not to cut the roots very much. Trees do well plowed when it can be done with a shallow furrow; but it is better in most cases to keep the trees well dressed and mulched without further work.

I have here a statement made at a Dairyman's Association in Pennsylvania which I wish to compare with orchards in Maine. At this association one gentleman made a statement of what he had done the past year, and the facts that he stated, show that he understood his business exactly. He had over a hundred cows which were worth more than $100 apiece. They averaged him three hundred and forty pounds of butter per head. I venture the statement that not one dairyman in ten gets 240 pounds of butter a head, from forty cows. That shows that he was an expert in the business and understood it from the root up. He had over a hundred acres. Notice in the first place how much money he has invested there. A hundred acre farm in a favorable location in Pennsylvania, producing as he shows his farm did, could not be bought a few years ago for less than $100 an acre; probably it it worth $50 now, not less than $50 at this time. So you see he has from $7,000 to $10,000 invested in that plant. He tells us that the gross income of his cows was $110 per head. He sold the butter for twenty-seven cents, so the net income is $45 a head. He states further that he made during the year besides his household living, $1,300. Now I should set his dairy down as standing at the head of the list of any agricultural business except fruit growing. You will always have to except that when you look into the matter as you should.

Now, there are men in the State of Maine who are making a larger amount of money than that from orcharding, with a great deal less invested. During the past year a young orchard was sold for $3,000. Many thought the price too high. Without a dollar's expense to the purchaser the crop of 1890 sold for $1,500, and this off the farm purchased for $3,000, with considerable to it beside the orchard, delightfully situated, a pleasant home. There are such opportunities in the State left.

Mr. Phinneas Whittier, the Apple King of the State, began on a poor piece of land, purchased for $400, with $75 paid down,—and turned his attention to orcharding. For the past ten years his net income from that orchard has been nearly $2,000 a year for ten years in succession. For the past three years his receipts were $2,400, $4,200 and $3,000 respectively, from his orchard alone, and his trees are not yet half in bearing and some of these are bearing but little. The grand possibilities of his farm are something to astonish any of us when we consider from how little it grew. I will not take your time with these particulars; they may be found in various parts of the State where men have given attention to the matter of cultivating their trees as they ought. One gentleman in Gardiner, with a small orchard, has received $3,000 in apples; but his trees had been dressed, properly tilled.

I want you to consider what the possibilities are in this kind of land in the State of Maine, which can be bought, the very best of orchard land for about $10 an acre in various parts of the State. Take that acre for $10 and expend $10 more in trees,—forty trees of the best quality, buy nothing but the best; set in the best manner possible, pay six per cent for the investment; dress and mulch in the best way until they are about eight years old, when they begin to make returns. Your whole expense, interest, work and everything will not exceed $100 per acre, and an acre will be worth more than $500 any time, every time and all the time.

Supposing I had come to you from the West and told you and given you reason for believing my statement that there was a *mine* out there in which you could invest your money and get six per cent on the investment for eight years, then sell out for five hundred per cent. You wouldn't be lacking to find men to invest in that grand enterprise. But right here in the State of Maine is a mine of wealth in orcharding greater than the silver mines of Nevada if people only understood it. There is not a young man in this hall but has just as good opportunities as were ever given to man with his own industry, his own intelligence, perseverance, pluck and determination, to make himself well off here in the State of Maine in twenty years, worth a handsome property, independent of everybody and everything, and be his own master all the time.

I set twenty-five apple trees twenty-five years ago. They have had only ordinary care; the ground has not been tilled; they have been dressed some but not properly mulched. They have had what you might call average or ordinary care. Those twenty-five trees have produced more than a hundred per cent on all they cost time and again since they were set, paid for themselves, paid for the land many times over. Nine other trees set before that in a favored position which have been dressed well or what we might perhaps call *heavily*, have produced for more than fifteen years, every year but one, a good crop of apples. Last year one of the prettiest sights I ever saw was those nine trees hanging full of red apples. What prettier sight did God ever make. He might have made something more beautiful than the apple tree loaded with beautiful fruit but He never did. And it was not all beauty. They brought in a splendid income. If the farmers of York county would look about them and see how they might improve the trees they have, make them bear four or five times as much, see how they might enlarge their orchards from year to year, and how they might increase the wealth of the county and reap rich results to themselves, I am sure they would not be indifferent to such opportunities.

There is now being talked up a company for the purpose of conducting orcharding on a large scale here in Maine. Everything may be done better and more economically on a large than a small scale. No man ever need ask for a better opportunity in raising apples than in the State of Maine. The plan is a stock company and it proposes to raise a sufficient sum of money to plant a thousand acres or so of orcharding, to be controlled by a Board of Managers, the stock to pay six per cent on the investment from the time of investment. The stock to be salable in the market, the same as bank, railroad, or any other stock, so any one can realize at any time from it if he wishes. This company conducting this business under the direction of men who thoroughly understand all the ins and outs to it, who have had large experience and who have gained much knowledge from the experience of others, who know how to select the best land and know what the most profitable kinds are and how to harvest and market to the best advantage, combining their knowledge in this way;—think of the grand possibilities before them! The investor in this stock can receive six per cent dividend upon his stock every year until his trees are eight years old when they cannot be worth on any human calculation, less than five times the investment, five hundred per cent.

When the gimlet screw was first patented and commenced to be manufactured, the stock began to run up to two, three and five hundred per cent on the investment, and how those stockholders rejoiced in what they had secured! But right here without any patent, without any let or hindrance from any source, such a company has the prospect upon as good a foundation as any business of making five hundred per cent in ten years upon their investment.

I know gentlemen you have been sitting here a long time and I will not weary you much longer; but I wish to make one earnest appeal to you to consider carefully your grand possibilities; and the grand possibilities that confront the Maine farmers in the direction of apple raising, in addition to the dairy and other business. See if you cannot double your income, double your assets in the course of a few years by careful attention to your orchards. Investigate this matter.

Mr. Whittier has his orchard enlarged to such dimensions that he can conduct it upon a scale and in a manner that the small producers cannot. He evaporates a large portion and by that means culls all the poor apples out and makes the others of nice quality of fruit. It is the nicest quality that commands the highest price. His number two Baldwins sold a little while ago for $4.50 a barrel. The number *ones* sold for $6.00 a barrel. He commands the top of the market all the time, because he produces a grand, good article. Then the poorer qualities are evaporated and he gets a grand income from his fruit. It pays him admirably.

One thing more with regard to that. It is considerable cost to evaporate these apples. He is from sixty to ninety days employed with help in this work; but what everybody throws away pays for the work. The peelings and cores of the apples pay for every particle of the work performed. It is the little things that add so much to the success of any business, and I appeal to you to look into the matter of orcharding, and see how much you can improve your homes, farms and bank account from this grand and noble enterprise. I want to appeal to you in one other respect, and that is that you should join the State Pomological Society. It costs a dollar a year, or what is better, $10 for a life membership. Every report they issue, going to every member, will pay for that many times over in the suggestions it gives you with regard to fruit raising; and if you take the trouble of securing to yourselves the pleasure of attending their meetings you get your pay a great many times more. There are matters that come in their reports, their papers and the discussions of these men who are alive in the work of fruit culture that are valuable beyond anything we can state in dollars and cents. There is no reason to be given why you should not join the society.

If by any effort of mine I could induce any considerable portion of this audience to pay more attention to fruit culture, to do more to beautify their homes, to supply them better with fruit, to make them "wear that pleasant countenance" that one of the gentlemen mentioned here to-day it would be a blessing to the community.

Any improvement of this kind is contagious. One man cannot improve his home, cannot improve his orchard and add to his income from these efforts of fruit raising without his neighbors catching the inspiration from him and going into it also. If this should happen this county of York would receive such a boom as it never knew before. I appeal to you to consider carefully if you have not some grand opportunities in this line that have been long neglected.

EXPERIMENTS WITH SHEEP AND LAMBS.

By W. A. HENRY, Director, Wisconsin Experiment Station.

[From the Seventh Annual Report of the Wisconsin Experiment Station for the Year Ending June, 1890.]

SUMMARY OF THE EXPERIMENTS.

The purpose of these experiments was to determine the food required to produce 100 pounds of gain, and to ascertain whether the sheep can utilize its food as well as cattle or hogs. We started at this point because facts of this kind are essential to a full understanding of sheep husbandry. The sheep used were those most common in southeastern Wisconsin, very high grade, wrinkled Merino ewes. The lambs were from these ewes by an imported Shropshire ram.

I. FOOD FOR 100 POUNDS GAIN WITH LAMBS: DOES IT COST MORE TO GROW LAMBS THAN PIGS?

In this experiment milk was fed to lambs for the reason that we have often fed it to pigs, and know its worth with them. It is the only feed that we could get suitable to both. Four lambs were taken from their mothers when about ten days old, and fed full milk from a bottle, four times daily for twenty-one days. During this time they consumed 226 pounds of full milk, gaining thirty-nine pounds, or nearly half a pound each, daily. At this rate it would require 579 pounds of full milk for 100 pounds of gain. Full milk has sold as low as thirty cents per hundred this summer at Western creameries, but valuing it at sixty cents, a fair summer price, the cost of 100 pounds of gain would be $3.47.

The lambs were next put on sweet skim milk, and fed oats with green clover and green fodder corn. For the first period of twenty-eight days they drank 424 pounds of sweet skim milk, and ate fourteen pounds of oats and thirty-two pounds of green clover, gaining fifty-three pounds, or nearly half a pound each, daily. At this rate 800 pounds of sweet skim milk with twenty-six pounds of oats and sixty pounds of green feed would make 100 pounds of gain. Valuing skim milk at twenty-five cents per hundred, oats at eighty cents per hundred or about twenty-six cents per bushel, green corn and clover at $2.00 per ton, the feed would cost $2.30 for 100 pounds of gain. In subsequent periods the cost increased gradually as more grain was consumed. In September the cost ran up to $4.50 per hundred pounds gain. During the last period in September and October, after the milk was withdrawn, the cost was $4.06 per 100 pounds gain. During this period some hay was fed, which was charged at the rate of $6.00 per ton.

Comparing the lambs with pigs before and after weaning, we have:

Food Required for 100 Pounds of Gain with Lambs.

1. Eight hundred pounds sweet skim milk; 26 pounds oats; 60 pounds green feed.

2. Nine hundred and thirteen pounds sweet skim milk; 64 pounds oats; 131 pounds green feed.

Food Required for 100 Pounds of Gain with Pigs. (From Trials at this Station.)

1. Six hundred and fifty-four pounds sweet milk; 198 pounds corn meal and shorts.

Food Required for 100 Pounds of Gain with Shotes.

2. Nine hundred and sixty-four pounds sweet milk; 92 pounds corn meal.

It is generally supposed that the pig makes the best use of its food but our figures lead us to doubt that conclusion. If lambs can be taught to drink as we teach calves, why can they not be used to consume milk on dairy farms with satisfaction and profit. Whether they can be easily taught to drink from pail or trough we have not yet ascertained. It will often pay to force lambs ahead just as rapidly as possible. Cannot skim milk be used for this purpose?

II. SOILING EWES AND LAMBS TO ASCERTAIN HOW MUCH FOOD THEY CONSUME.

Ten ewes and ten lambs were kept in barnyard and barn during the whole summer, and all the feed they consumed weighed out to them. The experiment was conducted with much difficulty, as sheep do not like grass or clover which has grown long enough to be cut with a scythe, nor do they like green feed which has been handled. With much patience the trial was carried through successfully. The lambs were about a month old at the beginning of the trial, June 3d. In fifty-seven days the ewes gained fifty-five pounds and the lambs 192 pounds, or one-tenth of a pound a day for ewes and one-third of a pound daily for the lambs. For 100 pounds of increase the ewes and lambs together consumed 2,822 pounds of green clover, 478 pounds of green corn and forty-five pounds of oats. At the same prices as before given for feed, the increase was made at a cost of $3.66 per hundred weight. During the next period somewhat less food was consumed, with a total cost of $3 22 per hundred pounds of gain. The lambs were then weaned and placed on dry feed. Charging $6.00 per ton for hay and the same prices as before for the other food articles consumed, the gain with lambs was made at the cost of $5.10 per hundred pounds, a satisfactory price, we think, for gain made at weaning time when just changing from green to dry food.

As green clover will easily yield 24,000 pounds to the acre, and green fodder corn 36,000 pounds, these feeds would bring $24 and $36 per acre respectively; good returns from land, even where cutting and hauling are included.

III. FATTENING WETHER LAMBS.

Three lots of wether lambs with three in each lot were placed in separate pens January 2d. To the first lot was fed shelled corn, corn silage and corn fodder; to the second, corn and oats, equal parts, clover silage and clover hay; to the third, oil meal and oats, clover silage and clover hay. The trial continued eighty-six days, during which time Lot I gained ninety-eight pounds, Lot II, ninety-six pounds, and Lot III, ninety-two pounds. Taking the same values for feed as before, the ninety-eight pounds gain made by Lot I cost $3.28; ninety-six pounds gain with Lot II cost $4.06; while Lot III gained ninety-two pounds at a cost of $5.31 for feed. The ration in which corn silage and fodder were fed not only cost the least, but produced the best results, though the difference in gain is small. The ration where oil meal was fed produced the least gain at the greatest expense. In these experiments silage proved a very satisfactory feed keeping the bowels in fine condition and enabling the animals to make a very satisfactory gain for food consumed. In order to compare the cost of producing beef and mutton, we select the following trials which are the cheapest that have come to our knowledge:

Food required for 100 *lbs. of gain with wether lambs at the Wisconsin Station. (Lot I of the experiments just reported)*	384 lbs. corn. 296 lbs. corn silage. 158 lbs. corn fodder. 22 lbs. potatoes.
Food required for 100 *lbs. gain with fattening steers at the Wisconsin Station.* .... *(Best of all trials by us.)*	394 lbs. corn. 181 lbs. bran. 654 lbs. corn silage.
Food required for 100 *lbs. gain with fattening steers at the Canada Agricultural College.*	396 lbs. corn. 227 lbs. bran. 874 lbs. roots. 393 lbs. hay.

It will be seen that our wether lambs made a more economical gain than did the steers in either case. These results should go far toward inducing our farmers to become liberal feeders of mutton sheep. The results with corn silage are very satisfactory. Those flockmasters who will not grow roots should have silage. For growing animals and breeding stock, clover hay with corn silage will be found very valuable and satisfactory.

REPORT OF SHEEP-FEEDING TRIALS.

In the experiment here described the ewes were high grade wrinkled Merinos, not over four years old and in fair flesh. The lambs were sired by pure bred, imported Shropshire ram. All of the lambs showed Shropshire blood, having brown faces and legs;

some still had wrinkles, and carried a very profitable fleece of long, lustrous wool showing that the Merino had by no means been obliterated with the first cross. They were a good lot of lambs of the class.

In charging for feed consumed, average Wisconsin prices have been taken:

Corn seventy cents per hundred pounds (about forty cents per bushel).

Oats eighty cents per hundred pounds (about twenty-six cents per bushel).

Oil meal one dollar and twenty cents per hundred pounds (twenty-four dollars per ton).

Hay thirty cents per hundred pounds (six dollars per ton).

Dried corn fodder twenty cents per hundred pounds (four dollars per ton).

Full milk sixty cents per hundred pounds.

Skim milk twenty-five cents per hundred pounds.

Green fodder corn and green clover ten cents per hundred, or two dollars per ton.

Corn and clover silage ten cents per hundred, or two dollars per ton.

These are fair prices for Wisconsin. Each reader can change values to suit his own conditions. No charge is made for labor. Our experiments are not directly practical—none can be where every feed is weighed each meal, to a few animals. With the farmer the manure pays liberally all cost for labor.

I. LAMBS FED ON MILK AND GRAIN.

The purpose of this experiment was to determine the amount of feed required to produce 100 pounds of growth with lambs. By using milk as the food we have a substance which also serves as a food for calves and pigs; this enables us to institute comparisons as to the cost of feed for a given gain between these different kinds of animals. The lambs were about ten days old at the beginning of the experiment, May 10. Four lambs were fed until August 5, when a fifth lamb weighing forty pounds was added. They were taken from their mothers, placed in a shaded paddock and given fresh cow's milk for twenty-one days, after which they were fed sweet skim milk from the Cooley setting, with ground oats, green clover, green fodder corn and hay. In all cases the milk was warmed to blood heat and fed from a bottle, and weighed for each lamb at each feeding, the lambs being fed four times daily. The large number of figures resulting from this work is reduced to concise form in the following tables, the first of which shows the weight of the lambs and the amount of feed consumed for the different periods, while the second gives the feed required with the cost of the same for 100 pounds of grain.

Table showing results of Feeding Lambs Milk, Grain and Grass.

Four lambs to August 5th; after that five lambs

Date.	Length of period.	Weight of lambs.	Gain.	Feed Eaten.				
				Full milk.	Sweet skim milk.	Oats.	Green clover.	Hay.
May 10..	-	47 lbs.	-	-	-	-	-	-
May 31..	21 days.	86 " ..	39 lbs...	226 lbs.	-	-	-	-
June 28.	28 "	139 " ..	53 " ...	-	424 lbs..	14 lbs.	32 lbs..	-
July 26..	28 "	184 " ..	45 " ...	-	411 " .	29 "	59 " ..	-
Aug. 23..	28 "	296 " ..	72 " ...	-	557 " ..	88 "	167 " ..	-
Sept. 23 .	31 "	363 " ..	67 " ...	-	577 " ..	151 "	365 " ..	-
Oct. 14 .	21 "	397 " ..	34 " ...	-	-	99	407 "	60 lbs.

Table showing Feed required for 100 lbs. of Gain with Lambs.

Feed Consumed.					Cost of 100 pounds of gain.
Full milk.	Sweet skim milk.	Ground oats.	Green feed.	Hay.	
579 pounds..	-	-	-	-	$3.47
-	800 lbs....	26 lbs....	60 lbs....	-	2.30
-	913 "	64 "	131 "	-	2.92
-	801 "	121 "	218 "	-	3.18
-	861 "	225 "	545 "	-	4.50
-	-	291 "	1,197 "	176 lbs	4.06

When we remember that full milk the past season has in some instances netted the farmers but thirty cents per hundred pounds at creameries, it will be seen that sixty cents per hundred pounds for full milk and twenty-five cents for skim milk are relatively high prices for these articles. The solids contained in the feed must have been exceedingly well digested and assimilated to have produced the gains here recorded. Toward the latter part of the trial the cost increases considerably, but for the period immediately after weaning the gain is certainly very satisfactory, when we remember that the lambs were being weaned from milk and placed on dry feed.

For the purposes of comparison a few figures are here introduced from successful pig feeding trials at this station to show the feed required by pigs in comparison with the above:

Food Required to Produce 100 Pounds Gain: With Young Pigs.

1. Six hundred and fifty-four pounds sweet skim milk; 198 pounds corn meal and shorts.

2. Five hundred eighty-seven pounds sweet skim milk; 251 pounds corn meal and shorts.

With Shotes.

3. Nine hundred and sixty-four pounds sweet skim milk; 92 pounds corn meal.

4. Six hundred and eighty-three pounds sweet skim milk; 130 pounds corn meal.

It will be seen that the lambs show up exceedingly well in this comparison.

It seems strange to think of feeding skim milk to lambs, but why not? It took the world a long time to find that calves could be successfully weaned from their mothers and fed from a pail, and still longer to learn that fine animals could be reared on skim milk. May we not find that lambs can be given milk with profit? Under some systems, the lamb should be forced ahead at the most rapid rate possible and milk seems adapted to this purpose. It certainly seems possible that sheep might be employed to utilize waste products on dairy farms instead of hogs. But the purpose of this experiment was primarily to see if lambs could make as good use of their food as pigs. Certainly these lambs did as well as any pigs we have ever fed. If we can come to fully realize that sheep can utilize their food as well as any animals on the farm we may be more willing to wait upon them.

II. SOILING EWES AND LAMBS.

On June 3d, when the lambs were a trifle over one month old, ten ewes and ten lambs were placed in the barnyard and barn, away from all grass, for a soiling test. The purpose of the experiment was to ascertain how much feed is required to produce a given gain.

The soiling experiment was kept up with much trouble, as sheep do not like fodder which has grown long enough to be cut to advantage with the scythe or mower, nor do they like green feed which has been handled. As previously mentioned, we started with ten ewes and ten lambs, but on July 27th, we threw out two ewes and two lambs which are not accounted for after that date. All of the green clover and green corn was cut daily, as required by the sheep, carefully weighed and fed in racks to prevent waste. The oats were ground. After weaning, in October mixed hay was fed.

Table showing Weight of Ewes and Lambs and Feed Consumed in Soiling Experiment.

Date	Length of period, days.	Number of ewes.	Weight of ewes, pounds	Gain of ewes, pounds.	Number of lambs.	Weight of lambs, pounds.	Gain of lambs, pounds.	Total gain, pounds.	Feed Consumed.			
									Green clover, lbs.	Green corn, lbs	Hay, lbs.	Oats, lbs.
Before weaning.												
June 3	-	10	655	-	10	178	-	-	-	-	-	-
July 27	57	10	710	55	10	370	192	247	6,971	1,181	-	110
Sept. 16	49	8	652	52	8	436	138	190	1,054	4,560	-	87
After weaning.												
Oct. 14	28	8	-	-	8	483	47	47	-	430	137	194

It will be seen that our ewes made a fair gain during both periods. For the first period the lambs made a gain of 192 pounds, and for the second, 138 pounds. During the third period, including weaning time and when going over to dry feed, the lambs made a gain of forty-seven pounds in twenty-eight days. The last columns show the total green clover, green corn, hay and oats consumed. Such a table as this, however, is confusing; from it the second is deduced, which presents the facts in a condensed, available form. In this is shown the amount of feed required for 100 pounds of gain, and the cost of the same.

Table showing Food required for 100 pounds of Gain with Ewes and Lambs on Soiling Experiment.

	Feed for 100 Pounds Gain.				Cost of 100 lbs. gain.
	Green clover.	Green corn fodder.	Hay.	Oats.	
Before weaning.......	2,882 lbs....	478 lbs....	-	45 lbs....	$3.66
Before weaning.......	555 "	2,400 "	-	45 "	3.22
After weaning	-	915 "	292 lbs....	413 "	5.10

At the prices stated in the beginning of this article, for the first period it cost $3.66 to produce 100 pounds of gain with ewes and lambs. During the second period the cost was $3.22; while for the third, during which the lambs were being weaned and placed on dry feed, the cost was $5.10. These are certainly satisfactory results, considering the many difficulties of such an experiment.

III. FATTENING WETHER LAMBS.

In the following experiment there were three wether lambs in each lot. They were eight months old at the beginning of the trial, January 2, 1890.

Lot I received shelled corn, corn silage and fodder corn.

Lot II received corn and oats equal parts by weight, clover silage and clover hay.

Lot III received oil meal, oats, clover silage and clover hay.

It will be observed that the ration for Lot I was highly carbonaceous, and of the cheapest feeding materials at command of Western farmers. The second lot was fed a somewhat more expensive ration, containing more nitrogen. The third lot received a highly nitrogenous ration of still more expensive character. In the first table are given the weights of the lambs for the different periods from January 2 to March 28, together with the total gain of each, for the time.

Table showing Weight of each Wether Lamb for the Several Periods.

Date.	Lot I.			Lot II.			Lot III.		
	No. 1. Lbs.	No. 2. Lbs.	No. 3. Lbs.	No. 1. Lbs.	No. 2. Lbs.	No. 3. Lbs.	No. 1. Lbs.	No. 2. Lbs.	No. 3. Lbs.
Jan. 2....	93	90	78	93	74	88	102	85	91
Jan. 31...	105	108	85	98	81	90	117	84	100
Feb. 28..	111	118	94	116	101	99	130	97	111
Mar. 28..	119	132	108	127	113	111	141	108	121
Gain...	26	42	30	34	39	23	39	23	30

Tables showing Food Consumed by each lot, Cost of same and the Gain by periods.

LOT I.

Length of period.	Food Consumed.				Value of food.	Gain.
	Corn.	Corn silage.	Corn fodder.	Potatoes.		
29 days....	120 lbs.....	142 lbs.....	36 lbs.....	-	$1.05	37 lbs.
28 "	132 "	79 "	49 "	-	1.10	25 "
29 "	125 "	69 "	70 "	22 lbs......	1.13	36 "
86 days....	377 lbs.....	290 lbs.....	155 lbs.....	22 lbs......	$3.28	98 lbs.

LOT II.

Length of period.	Food Consumed. Corn and oats.	Clover silage.	Clover hay.	Potatoes.	Value of food.	Gain.
29 days....	114 lbs.....	227 lbs.....	-	-	$1.08	14 lbs.
28 "	142 "	178 "	-	-	1.25	47 "
29 "	149 "	106 " ...	86 lbs......	22 lbs......	1.53	35 "
86 days....	405 lbs.....	511 lbs....	86 lbs......	22 lbs......	$3.86	96 lbs.

LOT III.

Length of period.	Food Consumed. Oil meal.	Oats	Clover silage.	Clover hay.	Potatoes.	Value of food.	Gain.
29 days....	24 lbs....	96 lbs...	150 lbs...	76 lbs...	-	$1.44	23 lbs.
28 " ..	28 " ...	114 " .	153 " ..	77 "	-	1.63	37 "
29 "	30 " ..	130 " ..	80 " ..	125 " ..	22 lbs. ...	1.89	32 "
86 days....	82 lbs....	340 lbs...	383 lbs...	278 lbs...	22 lbs	$4.96	92 lbs.

From the tables it will be seen that the three lambs of Lot I consumed 377 pounds of shelled corn, 290 pounds of corn silage, 155 pounds of corn fodder and twenty-two pounds of sliced potatoes, worth $3.28, and gained from this food ninety-eight pounds.

Lot II gained ninety-six pounds at a cost of $3.86 for feed. Lot III gained ninety-two pounds at a cost of $4.96.

The lambs were shorn and slaughtered, and a careful examination made to ascertain the effects of the feed upon the carcass. No difference in the proportion of fat to lean meat was observed, the carcasses of Lot I showing as large a proportion of red meat to fat as did any of the others. This is interesting and important. Lot I made the best gain for the feed consumed. We believe this favorable and important result was due largely to the use of silage, as that food kept the lambs thriving and prevented costiveness which is very apt to follow with sheep fed on dry, heating food. With this variety of feed and the age attained, the animals suffered no loss from the small proportion of nitrogenous matter present. From the results with the other two lots we see how cost of production may be increased without equivalent returns. From the way the animals fed and from the appearance of the carcasses when the meat was cut up, the ration for Lot I was certainly very satisfactory. Had corn silage been withheld, I believe we could not have obtained anything like such favorable results.

In the table in the appendix are given the results obtained at shearing and at slaughtering time.

FOOD REQUIRED TO PRODUCE 100 POUNDS OF GAIN WITH WETHER LAMBS.

In the following we have calculated the food required to produce 100 pounds of gain, deduced from the tables last given, in order to compare our work more readily with itself, with that done elsewhere and with fattening steers:

Food required for 100 pounds of gain with these lambs.

Lot I. Three hundred and eighty-four pounds corn; 296 pounds corn silage; 158 pounds corn fodder; 22 pounds potatoes.

Lot II. Four hundred and twenty-two pounds corn and oats; 532 pounds clover silage; 90 pounds clover hay; 23 pounds potatoes.

Lot III. Eighty-nine pounds oil meal; 369 pounds oats; 302 pounds clover hay; 416 pounds clover silage; 27 pounds potatoes.

At the Ontario Agricultural College Professor Brown crossed pure Cotswold, Leicester, Oxford, Shropshire and Southdown rams with native Canadian ewes. With lambs resulting from this cross weighing from ninety-five to 120 pounds at beginning, Professor Brown found the food* required for 100 pounds of gain to be as follows:

Canada, Professor Brown. Two hundred and ten pounds oil cake; 139 pounds oats; 290 pounds peas; 87 pounds bran; 1,028 pounds roots; 410 pounds hay.

It will be seen that our gains were made with considerable less feed than Professor Brown's.

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*Report of Ontario Agricultural College, 1885, p. 154.

COST OF PRODUCING MUTTON AND BEEF COMPARED.

Can we put gain on sheep as cheaply as on steers? The following figures are given in the hope of throwing some light on this important topic. At this station we have fed steers with good success, at times. From our best results, I select three trials, and give in addition one with twenty-one half-blood Shorthorns reported by Professor Brown.*

Food required to produce 100 pounds of gain with fattening steers.

Wisconsin. Three hundred and ninety-four pounds corn; 181 pounds bran; 654 pounds corn silage.

Wisconsin. Five hundred and thirty-three pounds corn; 267 pounds bran; 402 pounds mixed hay.

Wisconsin. Three sixty-eight pounds corn; 183 pounds bran; 633 pounds mixed hay.

Canada, Professor Brown. Three ninety-eight pounds corn; 227 pounds bran; 878 pounds roots; 393 pounds hay.

It will be seen that our wether lambs made 100 pounds of gain from less feed than did the steers, in these trials. I know of no experiments where better gains for the feed consumed have been made by steers than those here quoted.

I cannot close this article without recurring to the fact that the best gain was made with the food that cost the least, and is easiest grown and handled in a large part of this state. Corn silage appears to have a high value in making mutton, and we commend it to the careful consideration of flockmasters. For younger animals and breeding stock clover silage will prove satisfactory, although if clover hay is at hand I should prefer corn silage to go with it, rather than clover silage. Where the farmer cannot or will not grow roots, he should have silage which seems a most valuable and economical substitute.

*Report of the Ontario Agricultural College, 1884, p. 166.

EXPERIMENTS WITH FODDER CORN AND ENSILAGE.

By F. G. SHORT, Assistant Chemist to the Wisconsin Experiment Station.

[From the Sixth Annual Report of the Wisconsin Experiment Station.]

The work on the silo at this station has been for the most part a series of endeavors to find the best and most economical method of handling, storing and preserving corn ensilage. That these endeavors have been in some degree successful, is shown by the steady improvement in the quality of the ensilage made, and a decrease in the loss of dry matter by mould and putrefactive changes. Although there is still a loss of about 15 per cent of dry matter in the silo, this seems not so much greater than that undergone by fodder corn during the process of curing, as to prevent making a comparison of the relative economy of the two methods of preserving fodder. The work of the past year has been under the following heads:

a. Yield and composition of different silo corns.

b. A comparison of the economy of curing and siloing the same variety of corn.

c. Ensilage vs. fodder corn for milk production.

d. Losses in corn-stalks due to weathering.

e. Composition of different parts of the corn plant.

YIELD AND COMPOSITION OF DIFFERENT SILO CORNS.

VARIETIES OF CORN FOR ENSILAGE.

The question as to which is the best variety of corn for the silo is an important one at the present time. The exceptional weather for the past three summers has permitted the maturity of varieties of corn which in general do not ripen so far north as Wisconsin. The Southern corns, characterized by an immense yield of fodder per acre, have played an important part in supplying forage during the repeated severe drouths of the past few years, and have given fine crops of fodder under conditions where, in many cases dent and flint corns have been partial failures. In view of the fact that the large varieties will usually not ripen in Wisconsin, it seems advisable to endeavor to find a corn which will combine a fairly large yield with early ripening. For the purpose of obtaining information on this subject there were planted at the station nine varieties of corn, comprising flint, dent, sweet and the so-called ensilage corns. The varieties were as follows: King Philip (flint); Smedley Dent; Evergreen Sweet; Normandy White Giant; B. & W.; Sibley's Sheep Tooth; Southern Ensilage; Southern Horse Tooth; Fargo Bros.' Ensilage. The last four varieties were Southern corns. The Normandy White Giant was from seed received from the Department of Agriculture at Washington.

These corns are well-known typical varieties of their classes. The corns were planted in plots, May 24, 1888, on well prepared rich land. September 6th, samples were taken by cutting the corn from an area of 120 square feet, and from this large sample sub-samples were taken for analysis.

The result of the analyses will be found in the following table:

Table Showing the Weight of Green Fodder, Dry Matter, Sugar and Protein per Acre.

	Date.	Weight green corn per acre—pounds.	Total dry matter—pounds	Total sugar—pounds.	Total protein—pounds
King Philip (flint)	Sept. 5	26,200	8,352	982.4	572.0
Smedley (large yellow dent)	Sept. 5	33,570	10,160	1,393.0	632.3
Evergreen Sweet	Sept. 5	22,690	5,526	858.6	352.0
B. & W	Sept 5	39,800	9,028	1,329.0	474.5
Sibley's Sheep Tooth	Sept. 5	31,490	7,785	1,182.0	437.1
Southern Ensilage	Sept. 5	43,700	11,060	1,877.0	697.7
Normandy White Giant	Sept. 5	37,390	9,906	1,237.0	625.0
Southern Horse Tooth	Sept. 5	42,060	14,070	2,419.0	984.7
Fargo Brothers' Ensilage	Sept 5	38,890	10,150	1,310.0	634.3

It is seen from the table that at the date of cutting, September 5th, the value of the corns according to the yield of dry matter would be in the following order, beginning with the highest:

1. Southern Horse Tooth.
2. Southern Ensilage.
3. Smedley Dent.

4. Normandy White Giant.
5. Fargo Bros.' Ensilage.
6. B. &. W. Ensilage.
7. Sibley's Sheep Tooth.
8. King Philip.
9. Evergreen Sweet.

Although the Southern Ensilage is slightly ahead of the Smedley Dent in actual pounds of dry matter produced, yet the greater maturity of the Smedley would probably place it second in the list, if ranked according to feeding value. While the above figures would indicate that the sweet and flint corns were of rather low value for the silo, yet we must take into account the fact that the summer of 1888 was exceptionally favorable to the growth of the Southern and adverse to Northern varieties. Another season may reverse these figures, especially if it is a cold, rainy one. It is evident from the table that marked differences in composition, as well as yield, exist between the Northern and Southern corns. Also that the weight ot green fodder per acre is no indication of the true value of the corn. The large, rank-growing corns, B. & W. and Fargo Bros.' Ensilage, while giving in one case 5,000 and in the other 6,000 pounds more green fodder to the acre, yet gave no more nutritive matter than the Smedley, a yellow dent variety of the Pride of the North type, suitable for northern Illinois, but a little too large and late for a general field crop in this vicinity. We must, therefore, in judging of the value of a corn take into account the time necessary for its maturity. It is necessary that the corn be far advanced toward ripening and that it be sufficiently matured to have obtained its maximum growth without having lost its succulence; this condition is obtained when the kernel of the ear is glazed so as not to be easily dented with the nail. Besides having a greater feeding value, corn that has been allowed to mature to the point of glazing has nearly twice as much nutritive matter to the ton as that cut when the ears are just beginning to show the tassel.

METHODS OF PLANTING VARIETIES.

Formerly farmers thought that for fodder purposes corn should be sown broadcast; experience soon taught them that it was better to plant it in drills where it could get more sunlight and be less crowded. With the first silos came quite thick planting in the row, as much as a bushel of seed per acre being used. Such thick planting gave no ears and but watery stalks. Now the tendency is toward planting so thin that a fair crop of grain can be secured. For the large varieties of corn, with the rows four feet apart, the kernels should be dropped singly about every eight inches in the row. With smaller varieties the rows can be three and one-half feet apart with the grains six inches apart. A corn field is easier kept clean and the corn fodder easier gathered, when cut by hand if the stalks grow in hills. Flint corn planted three grains to the hill, with the hills two feet apart, in rows three and one-half feet apart, will give a large crop of fodder and grain.

At this station several years since, we obtained 33,000 pounds of fodder per acre from flint corn planted two grains to the hill, with the hills two feet apart each way. The corn was easily cultivated and soon shaded the ground so that cultivation was no longer necessary. Nearly every stalk carried a good sized ear.

From what has been said it is every evident that the station is in favor of smaller varieties of corn than has usually been planted for ensilage purposes. After urging that no variety be used that will not mature in ample time to be gathered into the silo before there is danger of frost, another precaution is that the corn be planted so thin that considerable grain will mature. The ordinary varieties of field corn, either dent or flint will prove satisfactory for ensilage.

TIME OF CUTTING.

Repeated experiments have shown that to obtain the maximum amount of nutritive matter the corn must be allowed to reach a certain degree of maturity. The proper condition is apparently obtained when the corn has just passed the glazing stage, in the flint, and is well dented, in the dent corns. Experience and analysis indicate that corn cut at this stage is in the best possible condition for the silo.

COMPARISON OF SILOING AND SHOCKING FODDER CORN.

The preservation of green fodder by siloing is always accompanied by a certain degree of heat and fermentation of the mass. This fermentation and heating goes on at the expense of the nutritive matter of the fodder corn, the amount destroyed depending upon the length of time during which fermentation is allowed to proceed, and the degree of heat attained in the silo. The great objection to the silo has been that this loss of nutritive matter was much larger than by other methods of curing fodder. This was certainly so in some of the earlier silos, losses of fifty per cent having been reported. Improvements in building and filling the silo have reduced this loss, but experiments still show a loss of from ten to twenty-five per cent. This is certainly too large a loss to be ignored, but if other methods of saving fodder corn are accompanied by equal losses, the advantages possessed by the silo will over-balance the loss of nutritive matter, which improved methods may further largely reduce.

The experiments here reported are a continuation of those given in the Fifth Annual Report of this station, and were conducted in nearly the same manner. Four silos, each with a capacity of about ten tons, were filled with well matured corn of different varieties, each silo being filled as rapidly as possible, left for a day or two to settle, then filled to the top with fresh fodder corn. A layer of tarred paper was then put on, and the whole covered with a foot of sawdust. During filling, samples of fodder were taken for analysis. Every other load of fodder was carried back to the field and carefully shocked.

It was the intention to leave a part of the fodder corn in this experiment, shocked in the field and exposed to the snow and rain, till it was wanted for feeding, with the view of finding the effect of snow and rain on the fodder. In this we were disappointed, as but very little snow or rain fell till after the fodder was wanted for feeding trials. The fodder corresponding to silos No. 3 and 5, was left in the field for one month, and then stored in the loft of the barn; that corresponding to silos No. 1 and 2, was left out in the field till used on the experiments.

The weight of the fodder put into the silo, as well as the amount shocked, was carefully taken. The following table gives the amount of dry matter in the siloed and shocked corn:

Table Showing Losses in Siloing and Shocking Fodder Corn.

	Siloed Fodder.				Shocked Fodder.			
	Put in silo—lbs	Taken out—lbs.	Loss—lbs.	Per cent —loss.	Fresh—lbs.	Cured—lbs.	Loss—lbs.	Per cent.—loss.
Silo No. 1—*Yellow Flint Corn:*								
Weight of fodder......	14,766 0	-	-	-	11,401 0	3,847 0	7,554.0	
Weight of dry matter ..	3,306.1	-	-	-	2,552.7	2,256.0	296.7	11.57
Weight of protein......	206.6	-	-	-	159.0	138.0	21.0	13.40
Silo No. 2—*Sheep's Tooth Corn:*								
Weight of fodder.......	14,002 0	12,225.0	1,777.0	-	14,972.0	5,142.5	9,829.5	
Weight of dry matter...	3,431.5	2,800.7	630.8	18.36	4,689.6	3,669.0	1,020.6	21.77
Weight of protein......	235.8	182.9	42.9	22.43	322.1	308.9	13.2	4.05
Silo No 3—*Smedley Yellow Dent Corn:*								
Weight of fodder......	15,288.0	12,151 0	3,137,0	-	15,464.0	5,076.0	10,388.0	
Weight of dry matter...	4,150.3	3,373.5	776.8	16.72	3,997.9	3,483.0	514 9	12 87
Weight of protein......	303.3	231.7	71.6	23.62	292 2	277 0	15.2	5.20
Silo No. 5—*Yellow Flint Corn:*								
Weight of fodder.......	17,218 0	14,540 0	2,677.0	-	14,890.0	4,358.5	10,531.5	
Weight of dry matter ..	3,844.0	3,355.0	489.0	12.74	4,197.0	3,357.0	840.0	20 02
Weight of protein......	314 4	258.3	56.1	17.84	343 4	282 0	61.4	17.87

The great source of error in work of this kind is the difficulty of obtaining a sample which shall accurately represent the large mass of fodder used in the experiment. A single experiment may lead to erroneous results, owing to an error in taking the sample, but if we take the average of several experiments, the errors of sampling and analysis are greatly reduced, while the figures thus obtained are nearer the truth than those from any one experiment. Taking, therefore, the average of the figures given in the preceding table we have the following:

Table Showing the Average Losses in Siloing and Shocking Fodder.

	From three silos.	From four lots shocked corn.
Dry matter....	15.94 per cent.	16.54 per cent.
Crude protein	21.26 per cent.	10.13 per cent.

The above table shows two things: first, that with improved methods of building and filling the silos, the loss of nutritive matter is being gradually reduced. That with a tight silo and fodder at the right stage of maturity, corn can be preserved in the silo with a loss of sixteen per cent of nutritive matter. This is certainly a great gain over the destruction of thirty to forty and even fifty per cent of nutritive matter which was reported in the first experiments on the silo, but even this is too great for economy.

Returning to the shocked corn, we find that the results confirm these obtained last year at this station by Mr. F. W. Woll.*

Under the exceptionally favorable conditions previously reported, the fodder corn lost 16.54 per cent dry matter, slightly more than was destroyed by fermentation in the silo. If, under the most favorable circumstances, fodder corn can lose sixteen per cent of nutritive matter, the loss during wet years, when the corn is subject to fermentation and mold in the shock, must equal, if not considerably exceed, the loss in the silo. A loss of thirty-six per cent is reported† in one case when the fodder corn began to heat and mould, and consequently had to be reshocked.

ENSILAGE vs. FODDER CORN FOR MILK AND BUTTER PRODUCTION.

The following experiment was conducted for the purpose of ascertaining the relative value of fodder corn and ensilage for milk production.

PLAN OF THE EXPERIMENTS.

The experiment was divided into two periods of two weeks each, each period being preceded by a week of preliminary feeding. Four cows were used in each trial. Two cows were fed ensilage, and two others fodder corn. At the end of the first period the animals

*Fifth Annual Report Wisconsin Agricultural Station, p. 67-74.

†Fifth Annual Report Wisconsin Agricultural Experiment Station, p 71.

were changed over; those receiving ensilage were now given fodder corn, while the animals formerly fed fodder corn now received ensilage. This method of changing the animals so that each lot was on both sides of the experiment eliminates almost entirely the errors due to period of lactation and sudden changes in the weather, etc. The week of preliminary feeding which preceded each period, was necessary to accustom the animals to a change of feed, and to be sure that the new feed would have its full effect on the flow of milk and the weight of the animal, before the actual experimental period commenced.

The animals were weighed daily during the experiment. During which they were also given water heated to about 70° F.; the amount of water drank each day was also weighed.

FIRST TRIAL WITH ENSILAGE VS. FODDER CORN.

The animals used in the first experiment were as follows:

Cows Used in the Experiment.

	Breeding.	Age.	Time from calving.	Weight.
Queen	Grade Jersey	5 years	15 days	775
Rose	Grade Jersey	7 years	48 days	921
Dollie	Grade Jersey	5 years	17 days	735
Bessie	Native	7 years	52 days	879

It had been noticed in previous feeding experiments that when the endeavor was made to get the fullest effect of the ensilage or fodder corn by making up the ration with but a small amount of grain feed, such as bran, oats, etc., the animals almost invariably suffered in condition and appetite. This change in the condition of the animal would necessarily have a bad effect on the milk and butter yield, and consequently would introduce an error of greater or less degree into the experiment. To obviate this error, the animals in the experiment were given what might be called a "foundation ration" of bran, oats and hay, in the following proportion:

Hay	2 pounds.
Bran	4 pounds.
Oats	1 pound.

The above ration was fed daily in two feeds; with it was given as much ensilage or fodder corn as the animals would eat up clean. Under the above ration the animals remained in good condition, showing no loss either in weight or flow of milk.

The ensilage used was from silo No. 5, which contained a mixture of Yellow Dent corn and Early Yellow Flint. The dry fodder is the same mixture, cured in the shock and stored in the barn after it had stood in the field forty days. As the fall of 1888 was unusually dry and clear, the fodder cured perfectly and was in fine condition when put in the barn. About two hundred pounds at a time were run through an ensilage cutter, stored in a dry bin, and samples taken for analysis. The ensilage was bright and sweet, free from mold, and was eagerly eaten by the cows. As the silo was emptied by feeding, numerous samples were taken, analyzed, and the average of the several samples taken for the composition of the ensilage fed.

The following table shows the results of the trial. First period November 23–December 16, 1888; second period December 23–January 16, 1889:

Table Showing the Weight of Dry Matter and Protein Eaten in Periods I and II.

	Ensilage.		Bran.		Oats.		Hay.	
	Dry matter.	Protein.	Dry matter.	Protein.	Dry matter.	Protein	Dry matter.	Protein.
Ensilage.								
Period I—21 days								
Rose and Queen..	675.7	52.02	144.1	23.94	36.01	4.32	69.93	4.89
Period II—								
Dollie and Jessie.	715.8	50.10	143.7	23.90	35.08	4.21	70.44	4.93
Total	1,391.5	102.12	287.8	47.84	71.09	8.53	140.33	9.82
Fodder Corn.								
Period I—								
Dollie and Jessie.	648.31	51.09	144.1	23.94	36.01	4.32	69.93	4.89
Period II—								
Rose and Queen .	683.33	56.82	143.7	23.90	35.08	4.21	70.44	4.93
Total	1,331.64	102.12	287.8	47.84	71.09	8.53	140.37	9.82

Table Showing the Yield of Milk and Butter Fat, Periods I and II.

	Total milk—pounds.	Total fat—pounds.	Butter—pounds.	Butter, fat—pounds.	Per cent. fat churned out.
ENSILAGE.					
Period I—Rose and Queen ...	1,096.5	47.05	50.62	32.22	
Period II—Dollie and Jessie,	728.6	38.23	33.88	25.79	
	1,825.1	85.28	83.50	58.01	69.48
FODDER CORN.					
Period I—Dollie and Jessie. .	768.4	36.04	33.63	26.25	
Period II—Rose and Queen. .	975.9	51.12	44.12	32.46	
	1,744.3	87.16	77.75	58.71	75.51

Number of pounds of Milk to One Pound of Butter.

Ensilage .... 21.83 pounds
Fodder corn .... 22.43 pounds

SECOND TRIAL WITH ENSILAGE VS. FODDER CORN.

In the second trial the conditions of the experiment were the same as in the first trial. The ensilage was from silo No. 2, which contained Sheep's Tooth fodder corn. The fodder corn was of the same variety. The ration of bran, oats and hay, was the same as in the first experiment.

The animals used were as follows:

Cows Used in the Experiment.

Name.	Breeding.	Number days from calving
Palmer	Grade Shorthorn	35
Mattie	Grade Holstein	36
Bunn	Cross-bred Jersey and Holstein.......	30
Bessie	Grade Jersey	24

The following table shows the amount of dry matter and protein eaten during the trial:

Table Showing the Amount of Dry Matter and Protein Eaten in Periods I and II.

	Ensilage.		Bran.		Oats.		Hay.	
	Dry matter—lbs.	Protein—lbs.	Dry matter—lbs.	Protein—lbs.	Dry matter—lbs.	Protein—lbs.	Dry matter—lbs.	Protein—lbs.
Ensilage.								
Period I—Bunn and Bessie	616.0	40.16	145.48	24.18	35.70	4.28	71.88	5.02
Period II—Palmer and Mattie ...	563.0	36.22	145.90	24.26	36.06	4.32	72.04	5.04
Total..................	1,189.0	76.38	291.38	48.44	71.76	8.60	144.92	10.08
Fodder Corn.								
Period I—Palmer and Mattie.....	658.9	43.11	145.48	24.18	35.70	4.28	71.88	5.02
Period II—Bunn and Bessie.....	607.2	34.19	145.90	24.26	36.06	4.32	72.04	5.04
Total..................	1,266.1	77.30	291.38	48.44	71.76	8.60	144.92	10.08

Table Showing the Amount of Milk, Butter and Butter Fat given in Periods I and II.

	Total milk.	Total fat in milk.	Total butter.	Total fat in butter.	Per cent fat churned out.
Ensilage.					
Period I—					
Palmer and Mattie.....	1,088.6 lbs	42.71 lbs.	46.65 lbs.	37.09 lbs.	-
Period II—					
Bessie and Bunn	1,117.9 "	45.90 "	40.22 lbs.	38.31 "	-
Total	2,206.5 lbs	92.61 lbs.	86.87 lbs.	75.40 lbs	81.43
Fodder Corn.					
Period I—					
Bessie and Bunn	968.7 lbs.	41.66 lbs.	41.79 lbs.	32.76 lbs.	-
Period II—					
Palmer and Mattie	1,168.2 "	49.38 "	46.61 "	37.03 "	-
Total	2,136.9 lbs	91.04 lbs.	88.40 lbs.	69.79 lbs.	76.67

THIRD TRIAL OF ENSILAGE VS. FODDER CORN.

The conditions of the experiment in the third trial were the same as in the two previous ones, with the following exceptions: Owing to a scarcity of ensilage, the periods were reduced to fourteen days, and the amount of hay fed was increased to four pounds per cow daily. The animals used were as follows:

Cows Used in the Experiment.

Name.	Breed.	Number of days from calving.
Doubtful	Grade Jersey	33
Mattie	Grade Holstein	88
Beauty	Native	39
Sylvia's heifer	Grade Jersey	15

The following table shows the amount of dry matter and protein eaten during the trial:

Table Showing the Amount of Dry Matter and Protein Eaten in Trial No. III.

	Ensilage.		Bran.		Oats.		Hay.	
	Dry matter, lbs.	Protein, lbs.	Dry matter, lbs.	Protein, lbs.	Dry matter, lbs.	Protein, lbs.	Dry matter, lbs.	Protein, lbs.
Ensilage.								
Period I—								
Beauty and Sylvia	423.6	32.20	99.91	16.4	24.56	2.94	74.57	5.88
Period II—								
Doubtful and Mattie	477.6	36.23	98.19	16.3	24.33	2.92	74.59	5.88
Total	901.2	68.43	197.10	32.7	48.89	5.86	149.16	11.76
Fodder Corn.								
Period II—								
Doubtful and Mattie	554.7	56.1	99.91	16.4	24.56	2.94	74.57	5.88
Period II—								
Beauty and Sylvia	405.0	30.79	98.19	16.3	24.33	2.92	74.59	5.88
Total	959.7	86.80	197.10	32.7	48.89	5.86	149.16	11.76

Table Showing the Amount of Milk and Butter Fat Given in Trial III, Periods I and II.

	Total milk—lbs.	Total butter fat—lbs.
ENSILAGE.		
Period I—Beauty and Sylvia	721.9	32.28
Period II—Doubtful and Mattie	644.4	28.72
	1,366.3	61.00
FODDER CORN.		
Period I—Doubtful and Mattie	721.3	29.96
Period II—Beauty and Sylvia	597.9	24.55
	1,319.2	54.51

DISCUSSION OF THE PRECEDING TRIALS.

In discussing the relative value of ensilage and fodder corn as shown in the three trials here given, there are several points to be considered besides the actual weight of milk and butter produced by equal weights of the dry matter of ensilage and fodder corn. The palatability of the feed, its influence on the milk flow, and condition of the animal should be considered. While perhaps the most important point of all is: How much dry matter, of corn standing in the field, is required to produce 100 pounds of milk, when the fodder is siloed; and how much when it is field cured? Comparing the results of the first trial and remembering that 499.3 pounds of dry matter in the form of bran, oats and hay were fed with the ensilage and fodder corn, we find that

1,391.5 pounds of dry matter in ensilage produced 1,825.1 pounds of milk.

1,331.6 pounds of dry matter in fodder corn produced 1,744 pounds of milk,

or making the calculation so that we can get a direct comparison, we find that 1,000 pounds of milk required 762.1 pounds of dry matter in the form of ensilage, and 763.5 pounds of dry matter in the form of fodder corn, or a difference of only 1.4 pounds of dry matter per 1,000 pounds of milk in favor of ensilage.

On comparing the amount of fat produced, we find that

1,391.5 pounds of dry matter in ensilage made 85.28 pounds fat in milk.

1,331.6 pounds of dry matter in fodder corn made 87.16 pounds fat in milk,

or calculating as above, we find that to make 100 pounds of milk fat would require of

Dry matter in ensilage	1,632 pounds
Dry matter in fodder corn	1,524 pounds

a difference in favor of fodder corn of 108 pounds of dry matter in producing 100 pounds of fat in milk.

In the second trial, under the same conditions as the first, but with different animals, we find that

1,189 pounds of ensilage dry matter produced 2,206 pounds of milk.

1,266 pounds of fodder corn dry matter produced 2,136 pounds of milk,

or that 1,000 pounds of milk required of

Ensilage dry matter	539.2 pounds.
Fodder corn dry matter	602.8 pounds.

We find also that

1,189 pounds of ensilage dry matter produced 92.6 pounds of milk fat.

1,266 pounds fodder corn dry matter produced 91.04 pounds of milk fat.

Calculating the above to equal amounts of fat for comparison, we find that to make 100 pounds of milk fat would require of

Ensilage dry matter	1,284 pounds
Fodder corn dry matter	1,391 pounds

a difference in favor of ensilage of 107 pounds of dry matter in making 100 pounds of milk fat.

In the third trial the conditions were slightly changed. The amount of dry fodder fed was slightly increased by feeding four pounds of hay instead of two pounds in the other two trials; with this exception the conditions were the same.

The table shows that

901.2 pounds of ensilage dry matter produced 1,366 pounds of milk.

959.7 pounds of fodder corn dry matter produced 1,319 pounds of milk.

Consequently, each 1,000 pounds of milk required of
Ensilage dry matter .... 659.8 pounds
Fodder corn dry matter................................ 729.3 pounds
a difference in favor of ensilage of 69.5 pounds of dry matter in producing 1,000 pounds of milk.

We also find from the tables that

901.2 pounds of ensilage dry matter produced 61 pounds milk fat.

959.7 pounds of fodder corn dry matter produced 54.51 pounds of fat in milk.

In the same proportion, 100 pounds of milk fat would require
Of ensilage dry matter. .... 1,477.4 pounds.
Of fodder corn dry matter .... 1,760.6 pounds.
a difference in favor of ensilage of 283.2 pounds of dry matter in producing 100 pounds of fat in the milk. Taking these results and arranging them in a tabular form we have the following table:

SUMMARY OF PRECEDING TRIALS.

Table Showing the Amount of Dry Matter Eaten, together with the Weight of Milk and Fat in Milk, Produced in Three Trials of Ensilage vs. *Fodder Corn.*

	Dry matter eaten—lbs.	Milk produced —lbs.	Fat in milk produced —lbs.
Ensilage	3,481.7	5,397.0	238.88
Fodder corn	3,557.3	5,199.0	232.71
Difference	+75.6	—198.0	—6.16

The table shows that the ensilage is slightly ahead in all three points, that a greater amount of both milk and milk fat was produced with a smaller ration of dry matter in ensilage than in the case of fodder corn. The circumstances under which the above trials were carried on were peculiarly satisfactory.

As before stated, the ensilage was perhaps the best ever produced on the Station Farm; owing to the long, dry fall the fodder corn was in almost perfect condition, and far superior to that ordinarily produced.

The above, however, does not represent the actual relative value of ensilage and fodder corn. To find this, we must go further back and find how much dry matter, ot corn standing in the field, the amount of dry matter, fed in the experiment actually represents. This we can do by taking into account the loss of dry matter in the silo and the shock, respectively.

Turning to page 213 we find that the average loss of dry matter in the silo was 15.94 per cent, and in the shocks, 16.54 per cent. Taking this loss into account we find that the 3,481.7 pounds of dry matter fed in the ensilage experiment represented 4,142 pounds of dry matter as standing in the field, and that the 3,557.3 pounds of dry matter fed in the fodder corn represent 4,262 pounds of dry matter as standing in the field, showing that the animals fed on ensilage required 122 pounds less dry matter from the field than when being fed fodder corn; at the same time producing an excess of 198 pounds of milk and 6.16 pounds of butter fat.

CONCLUSIONS.

From our investigations we observe:

First. Notwithstanding the fact that the fall of 1888 was exceptionally dry, and well suited to the curing of fodder corn, nevertheless, the fodder shocked in the field lost a little more dry matter than that preserved in the silo. Consequently, as far as the loss of dry matter is concerned, there is little difference in the results between the method of storing fodder in small silos, as managed in this case, and that of curing in shocks during an exceptionally dry fall.

Second. There is but little difference in the feeding value of the ensilage and fodder corn when preserved under the conditions indicated above. In both cases the small differences are in favor of the ensilage.

LOSSES IN CORN STALKS DUE TO WEATHERING.

It is the custom in many parts of the country, after snapping the corn, to turn the cattle into the stalk fields, to pick up what food they may, from the bleaching and washed-out corn stalks. There is no doubt that, by this method of feeding, an immense quantity of food material is wasted, partly by the large quantity of stalks which remain uneaten, and partly by the destruction of nutritive matter through rain and frost. To gain some information on this subject the following experiment was tried.

Two plots of fodder corn, twenty feet square, were set apart at the time of cutting the corn. Two rows as nearly even as possible were sampled. One row of twenty feet was cut when the corn was ripe, the ears were removed, and the fodder weighed and sampled for analysis. The second row was allowed to stand exposed to the rain and frost for two months, then cut, the ears removed, and the fodder sampled for analysis. The following table shows the weight and composition of the samples:

Table Showing the Composition and Loss of Weathered Corn Stalks.

		Fresh.	Weathered.	Loss.	Loss.
Sample I	Weight	27.00 lbs.	11.25 lbs	18.75 lbs.	-
	Dry matter	7.84 "	6.84 "	1.00 "	12.76 per cent.
	Protein	.663 "	.22 "	.343 "	59.56 "
	Date	Sept. 21 ..	Nov. 14		
Sample II	Weight	28.50 lbs.	10.25 lbs.	18.25 lbs.	-
	Dry matter	8.45 "	6.52 "	1.93 "	22.83 per cent.
	Protein	.485 "	.138 "	.347 "	71.55 "
	Date	Sept. 21 ..	Nov. 14.		

This loss falls on the most valuable part of the plant, viz.: the leaves; the amount of nutritive matter left in the stalks and rendered worthless because of lack of palatability is also great. There remained, in the two cases given in the above table, over six pounds of matter which would have had a higher food value, if that part which gives palatability had not been washed out. The stalk of the corn plant, besides being the largest part of it, contains also a considerable percentage of nutritive matter. The following experiment was undertaken for the purpose of obtaining data in regard to this point.

WEIGHT AND COMPOSITION OF THE DIFFERENT PARTS OF THE CORN PLANT.

The following table shows the distribution of nutritive matter in different parts of the plant:

Table Showing the Weights of Different Parts of the Corn Plant.

Station number.	Variety.	Weight of stalks —lbs.	Number of stalks	Weight of green leaves—grams.	Weight of dry leaves—grams	Total weight of stalks free from leaves—grams	Weight of lower third of stalk —grams.	Weight of middle third of stalk—grams.	Weight of upper third of stalk—grams.	Weight of tops —grams.	Ears—grams.
465	White Flint,	24.0	-	3,898.0	-	4,261.0	2,072.0	1,181.0	1,008.0	97.0	2,913.0
466	B & W. ensilage,	34.5	20	3,916.0	499.0	9,408.0	5,078.0	2,577.0	1,653.0	94.0	775.0
467	Normandy White Giant	22.5	11	2,828.0	185.0	5,163.0	2,290.0	1,687.0	1,159.0	97.0	1,221.0
468	Sibley's White Flint,	29.75	25	2,779.0	762.0	7,071.0	4,153.0	1,905.0	1,013.0	118.0	
469	Yellow Dent	37.25	22	5,037.0	503.0	8,348.0	4,641.0	2,257.0	1,450.0	178.0	2,374.0

Table Showing Percentage Composition of Different Parts of the Corn Plant.

Number.		Green leaves.	Dry leaves.	Butts.	Middle.	Top of stalk.	Tops.	Ears.
465	Dry matter....	21.98	-	18.76	17.99	24.50	50.23	32.13
	Protein.....................	7.31	-	4.18	5.75	5.12	6.06	10.75
466	Dry matter................	22.46	68.01	20.6	24.85	27.30	50.23	10.93
	Protein.	8.66	2.62	1.43	2.00	3.56	6.06	10.40
467	Dry matter....	30.13	73.81	21.45	24.52	26.96	61.58	14.83
	Protein.....................	10.43	4.90	2.18	2.81	4.18	7.90	10 76
469	Dry matter................	30.71	61.95	19.33	25.34	25.97	71.47	37.14
	Protein	8.56	5.12	3.56	3.60	3.50	5.74	10.13
468	Dry matter................	28.67	66.39	15.98	14.95	33.11	86.26	
	Protein.....................	6.68	5.12	4.18	4.28	4.56	5.12	

The tables show two things: First, that as before stated, the stalks form a large part of the weight of the plant, and second, that difference in composition is made up by the greater weight of the stalk in comparison with the rest of the plant. This is shown in the following table:

Table Showing the Total Weight and Percentage of Dry Matter Found in the Stalks Compared with the Rest of the Plant.

Number.	Total weight of stalk—grams.	Total weight of rest of plant—grams.	Total dry matter in stalk—grams.	Total protein in stalks—grams.	Total weight dry matter in rest of plant—grams.	Total protein in rest of plant—grams.	Per cent of total dry matter of plant in stalk.	Per cent of protein of plant in stalk.
465	4,261.0	3,995.0	848.1	41.11	1,470.2	99.8	30.73	36.59
466	9,408.0	4,509.0	2,162.0	44.42	850.7	87.92	69.47	33.57
467	5,163.0	3,100.0	1,117.3	35.39	1,048.2	99.87	48.50	26.18
468	7,071.0	3,659.0	1,182.5	50.61	1,406.2	84.41	45.67	37.50
469	8,348.0	5,718.0	1,845.9	67.71	1,985.9	155.6	47.08	29.69
Average,	-	-	-	-	-	-	48.33	32.70

Taking the average of the five samples given in the table, we see that nearly 50 per cent of the dry matter, and over 30 per cent of the protein in fodder corn, is present in the much neglected stalk. No farmer can afford to allow so large a proportion of his crop to be wasted, as it is in the present methods of feeding in the field. The best way to prevent such losses will depend to a large extent on climate and location. In Wisconsin there is but little doubt that the silo, even with the loss of 25 per cent of nutritive matter, is more economical than attempting to cure and shock corn fodder in the field. It is not so much the fact that there is large waste in shocking fodder, as it is that what is lost is the most valuable part of the fodder. Every day's exposure to wind, rain and snow tends to decrease the value of corn fodder by destroying the sugar and other soluble parts, which give to the plant its flavor and palatability. The completeness with which sweet, well cured fodder is eaten up, compared with the large amount left uneaten where badly cured, weather-beaten fodder is fed, is enough to show the value of a well flavored, well cured, palatable fodder.

CLOVER ENSILAGE.

Much of the foregoing applies with equal force to clover. There are few plants so liable to lose value during the process of curing as the clover, and even when in the barn, its liability to mustiness and mould renders its feeding qualities still more uncertain. The results obtained last winter from a silo filled with clover would seem to indicate that by siloing clover, we are able to preserve one of our most valuable crops with comparative little labor and a reasonable certainty of preserving it in the most valuable condition for feeding.

The silo was filled and covered with a layer of tarred paper and sawdust, July 19. It remained sealed till October 13, 1889, when it was opened. Some six inches of the top were found to be dry and mouldy, but below that, the clover was found to be bright and well preserved with only slight traces of mould in the corners.

The following table shows the amounts of dry matter and protein put in and taken out of the silo.

Table Showing the Amount of Dry Matter and Protein in Clover.

Clover put in silo, lbs.	Ensilage taken out, lbs.	Dry matter put in, lbs.	Protein put in, lbs.	Dry matter taken out, lbs.	Protein taken out, lbs.	Loss dry matter, per cent.	Loss protein, per cent.
12,279	9,283	4,458.6	563.1	3,772.1	490.9	15.41	12.66

The table shows a loss of 15.41 per cent of dry matter and 12.66 per cent of protein, much less than has been found in previous investigations. If further experiments confirm this result, this method of preserving clover will be found to be of great value.

ABSTRACT

OF

Cattle Commissioners Report, 1890.

F. O. BEAL, President. W. W. HARRIS, Treasurer.

GEO. H. BAILEY, Veterinarian.

To His Excellency, the Governor of Maine:

In presenting our biennial report for 1889, we take this occasion to congratulate the stock owners and farmers of Maine, upon the remarkable freedom from disease among all our native bred cattle and horses within the year just closed.

A summary of the whole number of cases reported to the Commission in 1890 is found to be seventy-nine. Forty-eight herds of cattle were inspected, and thirty-one stables. Twelve head of cattle were condemned and destroyed, at an appraisal of $593, and eighteen horses were also condemned and destroyed at an appraisal of $1,215. The number of horses destroyed has increased from last season, over double in number, and but a single one of them was found to have been bred in Maine. It would seem from this fact that we have no contagious disease among our home bred horses.

The expenditures of the year will overrun the appropriation by about fifty dollars, and although the work has been carried on for three years previous without exceeding this amount, we believe the work of the Commission could be broadened and made more effective by a larger appropriation, as is well known that should any serious outbreak occur in many of the private herds of Maine, it would absorb the entire amount of money to adjust the appraisal.

There has been quite a number of cases reported this season of "hog cholera" or swine plague, which the owners have thought it was our duty to attend, relying upon certain sections of the law of 1887, as in section one (for extirpating all insidious, infectious and contagious diseases, now or that may be, among cattle *and other live stock.*)

Section 2 also provides (that it shall be the duties of 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 disease.*)

There are other sections that have been quoted and relied upon in the making of applications for attendance upon such cases, and we believe the law should be made more explicit as to just what classes of animals are to be entitled to inspection and appraisal, as according to the understanding of our board, "sheep and swine," are excluded from the list of contagious diseases, by the action of the legislature of 1887, under the amended law of that year, chapter 138 of Public Laws of Maine.

The first notice and inspection of the year just closed was on January 1st at Limerick, where a horse owned by J. F. Littlefield, stage proprietor, was found badly affected with glanders, and was condemned and destroyed. Appraised $100.

January 2d. An inspection was ordered upon the farm of Chauncy Bangs, West Farmington, in a herd of dairy cattle, but no contagious disease was found to exist.

January 13th. The cattle of J. S. Knight of Windham Center were inspected and a cow found affected with emphysema. No case.

January 17. Inspected the cattle belonging to E. W. Allen of Canton, but found no contagious disease.

January 28th. Inspected the herd of L. F. Jones of Andover, but no contagious disease was found to exist, the whole herd being in fine condition.

February 4th. Inspected the cattle of Orville Knights, at Waterboro' Center, but no disease was discovered.

February 5th. Inspected the herd of Sumner and Adna Foss at Mechanic Falls, but found no case.

February 7th. Inspected the herd of Mr. Hinckley at Livermore Falls, and found no case.

February 12th. Inspected the herd of James Eastman at Hill Side, but found only a case of emphysema.

February 14th. Inspected the herd of Alfred B. Nichols of Abbot village, but found no trouble.

February 15th. Inspected the cattle of T. C. Woodbury of Lincoln Center, and found a cow affected with tuberculosis. Appraisal $30.

February 18th. Inspected a reported case of glanders in a horse belonging to Joseph Marcott of Lewiston, but found no case.

March 2d. Inspected a horse belonging to Abner French of Glenburn, reported to have glanders, but found no case.

March 11th. Inspected the herd of cattle belonging to James Pinkham of Lincoln, and found two cows and a calf affected with tuberculosis. They were condemned and destroyed. Appraisal $60.

March 12th. Inspected the herd of N. N. Knights of Winthrop, and found a single case of emphysema.

March 15th. Inspected the herd of George E. Libbey of North Warren, but found no case.

March 18th. The cattle of W. L. Seymore of Livermore Falls were inspected, but no disease was discovered.

March 20th. Inspected a case of glanders at Glenburn, belonging to Abner T. French. The horse was condemned and appraised at $50.

March 31st. Inspected the cattle of James Plummer of South Dover, but found no case.

April 3d. Inspected the cattle owned by Benjamin Day of Sanford, and found an old cow affected with tuberculosis. She was condemned and appraised at $18.

April 5th Inspected the cattle of C. H. Records of East Auburn, and found a case of emphysema.

April 11th. Inspected the cattle of Lewis B. Davis of West Auburn, but found no case.

April 14th and 15th. Inspected the cattle of Elmer Carter, and the horse of Frank Brown of Etna, but found no contagious disease upon either premises.

April 17th. Inspected the herd of Hereford cattle, belonging to Gilbert Underwood of Fayette, but discovered no contagious disease.

May 2d. Inspected a case of suspected glanders, belonging to Joseph La Chapel of Lewiston, but found no case.

May 3d. Inspected a horse belonging to James A. Brooks of West Paris, and found a bad case of glanders and farcy. The horse was condemned and appraised at $100.

May 10th. Inspected the cattle of A. Higgins and M. Blanchard at Scarboro', but found no disease on either farm.

May 14th. Inspected the cattle of Jason Rackley of Leeds, but found no case.

May 16th. Inspected the cattle of Alphonzo Blanchard of Kingfield, but found no case.

May 19th. Inspected the cattle of William H. Keene of Waterford, and found a case of tuberculosis in a grade Jersey cow. She was condemned and appraised at $30.

May 26th. A case of suspected glanders was reported by the selectmen of Norway, but the horse was found to be suffering from catarrh.

May 30th. Inspected the herd of Joseph H. Lovell of Yarmouth, but found only an ox affected with emphysema.

May 31st. Inspected the cattle of Amaziah W. Davis, of Dayton, but found no case.

June 7th. Inspected the cattle belonging to A. C. Libby of Locke's Mills, but no disease was discovered.

June 14th. Inspected a case of suspected glanders, belonging to Mr. McKenney of Lewiston, but found only a case of catarrh.

June 17th. Inspected a horse, reported by the selectmen to have glanders, and belonging to Mrs. Lura Hamilton of North Yarmouth, but no case was found to exist.

June 27th. Inspected a horse belonging to Mr. Savage of Lagrange, suspected to be a case of glanders, but none was found.

June 28th. Inspected the cattle of William E. Irish of Turner but found no disease.

July 1st. Inspected the cattle of T. L. Spaulding of Lewiston, but found no disease.

July 7th. Inspected the horses belonging to Charles C. Davis of Oxford, and found two work horses (Canadians) badly affected with glanders and farcy. Both horses were condemned and destroyed. Appraisal $200.

July 7th. Same day as above, inspected a horse belonging to Abe Lincoln Chaplin of Welchville, and found a case of glanders. The horse was destroyed and appraised at $80.

July 8th. Inspected a two-year-old colt at Kent's Hill, belonging to B. W. Harriman. Colt found badly affected with farcy, and was destroyed. Appraisal $50.

July 10th. Inspected the cattle of C. G. Sawyer of Wilton, but found no case.

July 19th. Inspected the cattle of Swett Bros. of Buxton Center, but found no case.

July 21st. Inspected the cattle of James Blazo at Parsonsfield, but found no case.

August 2d. Inspected the team horses of Dudley Gilman of Bath, and found two horses affected with glanders in an advanced condition. Both horses were condemned and appraised at $150.

August 9th. Inspected a horse belonging to a Mr. Pearson of East Corinth, but it proved to be a case of chronic catarrh.

August 15th. Inspected the herd of Jersey cattle belonging to Wallace K. Oaks, M. D., of Auburn, but found them all right.

August 16th. Inspected a case of suspected glanders in a Canadian horse belonging to W. A. Crocker of Topsham. A bad case of glanders was found to exist and the horse condemned, but as he had been brought into the State within a year, no appraisal was held.

August 27th. Inspected a reported case of glanders at Springfield, belonging to M. L. Scribner, and found a bad case of glanders. The horse was condemned and appraised at $100.

September 1st. Inspected the herd of George H. McKechnie of Alton, but no cattle were condemned.

September 7th. Inspected the herd of cattle belonging to B. R. Blackstone of East Perham, (Aroostook county), but no contagion was identified in the herd.

September 7th. Same day Messrs. Harris and Bailey of the Commission inspected the bull found in the possession of Edward M. Bennett of Limestone, and was destroyed having been appraised at $40.

September 16th. Inspection was ordered on the premises of R. B. Hassard of Bangor, in a herd of milch cows, but no disease was discovered.

September 22d. Inspection was ordered on the premises of Albert E. Jennings of Farmington, but no cattle were found diseased.

September 27th. Inspected the cattle of Mrs. Mary Pollard of Skowhegan, and a four-year-old heifer found afflicted with tuberculosis. Condemned and appraised at $20.

October 10th. Inspected the cattle of Nathaniel Ladd at Abbot, but found no case.

October 13th. A case of suspected glanders was reported at Edes Falls, in the possession of C. M. Barton, but no case was found.

October 14th. Inspected the herd of cattle belong to M. H. Hubbard of Fayette Corner, and a cow was condemned and appraised at $25.

October 22d. A case of glanders was reported by the selectmen of Turner, at the stable of Peter Gouther. The horse was found diseased and condemned. Appraisal $50.

October 25th. Inspected a horse suspected of glanders, and owned by A. C. Dow of Chase's Mills. No case was found.

November 11th. Inspected the herd of cattle at the "State College Farm," and discovered an advanced case of tuberculosis in a cow. The cow was condemned and destroyed. Appraisal $200.

November 12th. Inspected a suspected case of glanders in the stable of Orlando Hall at Newcastle, which proved to be catarrh.

November 15. Went to Forest Station to inspect a case of glanders reported by the Board of Health as belonging to Abram A. Cox. No case was found.

November 20th. Inspected a reported case of glanders belonging to G. W. Baden of Bangor. Horse condemned and appraised at $35.

November 24th. Notice was given by the State Board of Health at Augusta, of a supposed case of glanders at Egypt, near Bar Harbor in the possession of E. G. Burnham. The horse was found badly affected with the disease and destroyed, but as he had been brought from Massachusetts into this State within a year, no appraisal was held. Full particulars of this case will be found in this report.

November 29th. Inspected a herd of cattle at East Baldwin, and found a cow affected with tuberculosis. The cow was destroyed and appraised at $150.

December 2d. Inspected a reported case of glanders at the stables of John J. Sturgis of New Gloucester, but found a case of chronic catarrh.

December 4th. Inspected at Portland an old cow belonging to Catherine McCarthy, and condemned and destroyed her. Appraisal $20.

December 6th. Inspected a reported case of glanders at Orono, at the stables of Mr. Oliver, which proved to be chronic catarrh.

December 10th. Inspected a reported case of glanders at Kingman, belonging to James C. Tracy of Springfield. No disease was found to exist.

December 15th. Inspected the stables of Dudley Gilman of Bath, and found a case of glanders in a Canada horse, and had him destroyed and appraised at $100. These are the same premises in which two other horses were found affected with the same disease last August and destroyed.

December 15th. Same day as above, inspected a horse in the stables of Fred Burgess at Bath, and found him affected with glanders and farcy. The horse was destroyed and appraised at $100.

December 17th. Inspected the cattle belonging to Thomas Simmons of Brewer, but found no contagious disease.

December 19th. Inspected the horses belonging to W. H. Bacon at Sebago lake, and found a bad case of glanders and farcy in a Canadian horse. He was condemned and appraised at $100.

December 22d. Inspected the cattle of E. C. Morrill of Glenburn, but found no contagious disease.

December 26th. Inspected a reported case of tuberculosis at Pittsfield, owned by B. S. Barton. The cow had emphysema.

December 27th. Examined a reported case of glanders in the possession of H. W. Smith of Lewiston, but found no case.

ANNUAL REPORT

OF THE

Maine State College

Agricultural Experiment Station.

1890.

MAINE STATE COLLEGE.

AGRICULTURAL EXPERIMENT STATION.

STATION COUNCIL.

*Deceased.

REPORT.

NOTE—Part I of the Station Report, devoted exclusively to the inspection of fertilizers and a report of analyses made, is omitted in this connection.

Z. A. GILBERT,
Secretary Board of Agriculture.

TESTS OF DAIRY COWS.

The Report of this Experiment Station for 1889 gives on page 106 to 134 the results of the first year's test of three breeds of dairy cows. When this work was undertaken it was the intention to continue it for two years. The second year's test has been completed and the results reached, combined with those of the first year, can be found on the following pages. The general conditions under which these trials have been conducted, the methods adopted and the objects sought to be reached are fully stated in the Report of 1889, and as that Report has been sent to all those who are likely to receive this one, or can be had upon application, a restatement of these facts is not considered necessary. There were omitted from the description of the six animals used in the test the records of the Holstein cow, Agnes Smit.

In order to make these descriptions complete her record is inserted at this point.

Agnes Smit, Holstein, No. 4,479 H. F. H. B , sire, "Barsingerhoen" (a district bull), dam "Diekje," weight 1,175 pounds. Bought of William A. Russell, North Andover, Mass., May 22d, 1889. Her first calf after coming to the Station was born on February 1, 1890.

FOOD OF THE COWS.

The food of the cows for the second year has been the same as that of the first, with the exception that Agnes Smit has been fed a certain amount of middlings in addition to the regular grain ration. A statement of the rations fed and the general methods of feeding can be found in the 1889 Report on page 109. During the summer of 1890 the cows were at pasture after May 30th and until October 10th, although with the exception of about two months they ate considerable hay in the barn. The grain ration was continued unchanged throughout the season. The following tables show the amounts of the different kinds of food eaten by the several animals during the years 1888-89 and 1889-90, and also the average daily ration for each animal during the time that the trials have been carried on.

Food Eaten by Cows in 1888-89.

	Jansje (Holstein), June 13, 1888, to June 13, 1889.	Nancy Avondale (Ayrshire), June 17, 1888, to June 17, 1889.	Queen Linda (Ayrshire), Oct 20, 1888, to Oct. 20, 1889.	Agnes (Jersey), Sept. 13, 1888, to Sept. 13, 1889.	Ida (Jersey), Sept. 1, 1888, to Sept. 1, 1889.
Total hay eaten—lbs	6740	6375	5800	5600	5500
Total ensilage eaten—lbs	2670	1648	2540	2540	2540
Total cotton-seed meal eaten—lbs	524	250	486	459	427
Total corn meal eaten—lbs	1442	827	982	976	913
Total wheat bran eaten—lbs	724	778	748	616	605
Total food eaten in barn—lbs	12100	9878	10556	10191	9985
Days of pasturage	102	102	122	104	104
Hay eaten daily for 365 days—lbs	18.5	17.4	16.0	15.4	15.1
Ensilage eaten daily for 365 days—lbs	7.3	4.5	7.0	7.0	7.0
Grain eaten daily for 365 days—lbs	7.4	5.1	6.1	5.6	5.3
Pasturage daily for 365 days—hours	2.2	2.2	2.7	2.3	2.3

Food Eaten by Cows in 1889-90.

	Jansje (Holstein), June 13, 1889, to June 13, 1890.	Agnes Smit (Holstein), June 2, 1889, to June 2, 1890.	Nancy Avondale (Ayrshire), June 17, 1889, to June 17, 1890	Queen Linda (Ayrshire), Oct. 20, 1889, to Oct. 20, 1890.	Agnes (Jersey), Sept. 18, 1889, to Sept. 18, 1890.	Ida (Jersey), Sept. 1, 1889, to Sept. 1, 1890.
Hay—lbs.	6643	6275	6150	6150	6000	5800
Cotton-seed meal—lbs.	606	221	509	521	513	526
Corn meal—lbs.	1230	1342	1123	1077	1035	1053
Wheat bran—lbs.	836	1342	755	670	531	568
Middlings—lbs.	-	170				
Total grain—lbs	2672	3075	2387	2268	2079	2147
Total food—lbs.	9315	9350	8537	8418	8079	7947
Hay eaten daily, 365 days—lbs.,	18.2	17.2	16.9	16.9	16.4	15.9
Grain eaten daily, 365 days—lbs.	7.3	8.4	6.5	6.2	5.7	5.9
Days out in pasture	132	132	132	132	132	132

Rations for Two Years.

	Jansje.	Agnes Smit (one year only)	Nancy Avondale.	Queen Linda.	Agnes.	Ida.
Total hay eaten—lbs	13383	6275	12525	11950	11600	11300
Hay eaten daily (730 days)—lbs.	18.3	17.2	17.3	16.4	15.9	15.5
Total ensilage eaten (in 1889)—lbs.	2670	-	1648	2540	2540	2540
Ensilage eaten daily (730 days)—lbs	3.6	-	2.2	3.5	3.5	3.5
Total grain eaten—lbs.	5362	3075	4442	4464	4130	4093
Grain eaten daily (730 days)—lbs.	7.3	8.4	6.1	6.1	5.7	5.6

NOTE—The cows were in the pasture part or all of about 1[illegible]0 days each year, but they probably had the equivalent of not over 90 full days of pasturage each season. In fact, there were not over two months each year when hay was not fed in the barn.

COST OF THE FOOD.

The cost of the food is reckoned at what are assumed to be average market values. The reasons for taking such values rather than those ruling at the time work is being carried on are given in the Report for 1889. It is again remarked in this report that the figures thus reached simply show the relative expense of feeding each animal and not the actual expense for any one year, or any one period of time, or for any particular farmer. These figures may be more or less, according to the circumstances of the farmer or the ruling market prices, but whatever may be the changes in these figures, they will relatively stand the same. The table below shows the expense of each animal for each of the two years, as well as the average expense.

Cost of the Food.

	Jansje.	Agnes Smit.	Nancy Avondale.	Queen Linda.	Agnes.	Ida.
Cost of hay, 2d year.........	$33 21	$31 37	$30 75	$30 75	$30 00	$29 00
Cost of cotton-seed meal, 2d year,	8 42	3 09	7 12	7 29	7 18	7 36
Cost of corn meal, 2d year...	12 30	13 42	11 23	10 77	10 35	10 53
Cost of wheat bran, 2d year..	8 36	13 42	7 55	6 70	5 31	5 68
Cost of middlings, 2d year...	-	2 12				
	62 29	63 42	56 65	55 51	52 84	52 57
Cost of pasturage..........	7 00	7 00	7 00	7 00	7 00	7 00
Total cost................	69 29	70 42	63 65	62 51	59 84	59 57
Cost of 1st year...........	73 20	-	59 89	63 90	59 64	57 95
Average cost for 2 years,	$71 24	$70 42	$61 77	$63 21	$59 74	$58 76

It is to be noticed that the expense of feeding a Holstein animal averaging 1,200 pounds in weight is only $11 per year more than the cost of feeding a Jersey animal, averaging in weight only about 900 pounds; or, in other words, the expense of feeding the heavier animals has been only about eighteen per cent more than that of maintaining the lighter animals, whereas the Holsteins exceed the Jerseys in weight about thirty-three per cent. This is equivalent to saying that the quantity of food has not been in proportion to the weight of the animals, and it may be suggested by some one that this fact places the larger cows at a disadvantage as compared with the smaller. It should be remarked, however, that the Holsteins have eaten on the average a third more grain than the Jerseys, and hay has been fed to them according to their appetites. It is a well recognized fact that the food of an animal does not increase in proportion to the increase in weight, or, in other words, a small cow requires a larger maintenance ration in proportion to her weight than a large cow, consequently the food required for a given production would be relatively less in the case of the heavier animal. It is perfectly reasonable that this should be so. The large cow gives off less heat for each pound of live weight than the small cow, for the reason that two cows weighing six hundred pounds each would have much more surface exposed to the air than one cow weighing twelve hundred pounds. The loss of heat will be somewhat in proportion to the exposed surface, and so the two small cows would require more food as fuel than the one large one. A study of the figures of the two previous tables shows that only moderate rations have been fed, and it is believed that these rations have been fairly proportioned to the needs of the several animals. While the grain rations may seem to some to be small, it should be remembered that the mixture of foods has been such as to give the maximum results from the amount eaten.

THE YIFLD OF MILK, MILK SOLIDS, FAT, CREAM AND BUTTER.

The nature of the record kept of the production of these cows is given in the Report for 1889 on page 112, to which place reference is made for those desiring information. The figures of the table which follows represents the main results of the two years' test. It is to be noticed that something more than the yield of milk and butter is given. If a cow's butter capacity is to be tested, then the total amount of fat in her milk is in general the standard by which she should be judged. If on the other hand, we wish to ascertain her capacity as a producer of human food, then it becomes a question of the total amount of milk solids which she is able to manufacture. Having kept a record with these animals, not only of the yield of milk but also of its composition in the several cases, we are able to calculate the weights of milk solids and fat which the several cows have produced. This is all shown in the following table:

Table Showing the Production of the Cows.

	Jansje (Holstein).	Agnes Smit (Holstein).	Nancy Avondale (Ayrshire).	Queen Linda (Ayrshire).	Agnes (Jersey).	Ida (Jersey).
Number of days milked first year.........	365	-	281	287	340	322
Number of days milked second year.......	308	293	294	296	357	351
Average......	336	293	287	291	348	336
Yield of milk first year—lbs	9991	-	5948	6983	6876	4107
Yield of milk second year—lbs	8362	7562	6293	7227	6204	4655
Average	9176	7562	6120	7105	6540	4381
Av. daily yield of milk for 365 days—lbs..	27.	20.7	16.8	19.5	17.9	12.
Yield of milk solids first year—lbs.	1228	-	751	894	1015	638
Yield of milk solids second year—lbs.	1042	893	811	919	960	696
Average..........................	1135	893	781	906	987	667
Yield of fat first year—lbs...............	340	-	209	246	352	238
Yield of fat second year—lbs	298	251	219	261	337	263
Average	319	251	214	253	344	250
Weight of cream, fresh, first year—lbs.....	1819	-	1008	1008	1586	951
Weight of cream, fresh, second year—lbs. .	1377	973	1068	908	1537	1066
Average	1598	973	1038	958	1561	1008
Average number of inches cream..........	799	486	519	479	780	504
Weight of butter first year—lbs.	349	-	197	188	379	238
Weight of butter second year—lbs....	285	224	202	207	369	273
Average.........................	317	224	199	197	374	255

NOTE—The quarts of milk can be calculated by dividing the pounds by 2 1-7.

Table Showing Average Production of Breeds.

	Holstein.	Ayrshire.	Jersey.
Average yield of milk—lbs	8369	6612	5460
Average yield of milk solids—lbs	1014	848	827
Average yield of butter fat—lbs.	285	233	297
Average yield of cream—inches	642	499	642
Average yield of butter—lbs.	270	199	314

The figures given above should be carefully examined. They show that the Holsteins have produced milk solids considerably in excess of the other two breeds and that the Ayrshires and Jerseys have differed very little in this respect This means that the Holsteins have produced considerably the larger amount of human food. When, however, we come to the consideration of the yield of fat, we find that the Jerseys excel and that the Ayrshires stand lowest in the scale. We see then, that when it becomes a question of a particular kind of production from a cow, the total solids in the milk cannot be taken as a standard any more than can the total fat. There is no question but that these two Holsteins would produce much larger weight of cheese in a year than either the Ayrshires or Jerseys, and that the Ayrshires would in this matter excel the Jerseys On the other hand, the Jerseys plainly excel in butter production. It would be, therefore, decidedly unfair to measure the relative butter production of these animals by the solids in the milk, or the relative cheese production by the fats. This is true, because one breed of animals produces more fat in proportion to the total solids than does another breed. It is no injustice to any other breed, and is but an impartial statement of a fact, to say that the Jersey is eminently a fat producing cow.

THE RELATION IN QUANTITY OF MILK, MILK SOLIDS, FAT, CREAM AND BUTTER.

The quality and value of the milk from these several animals is very clearly seen by showing its relation in quantity to the cream and butter produced. Another point that is of importance to Maine creameries, and which it seems proper to bring out in this connection, is the relative butter value of the cream. These relations are expressed in the table which follows:

	Jansje.	Agnes Smit.	Nancy Avondale.	Queen Linda.	Agnes.	Ida.
Milk for each lb. milk solids 1st year—lbs.	8.13	-	7.92	7.82	6 77	6.43
Milk for each lb. milk solids 2d year—lbs.,	8.02	8.47	7.76	7.86	6 46	6.69
Average	8.07	8.47	7.84	7.84	6.62	6.56
Milk for each lb. butter fat 1st year—lbs.,	29.35	-	28.49	28.40	19.52	17.27
Milk for each lb. butter fat 2d year—lbs..	28.06	30.13	28.73	27.70	18.41	17.70
Average	28.70	30.13	28.61	28.05	18.96	17.48
Milk for each inch cream, average—lbs....	11.4	15.5	11.8	14.8	8.4	8.7
Milk for each lb of butter 1st year—lbs...	28.59	-	30.19	37.13	18.12	17.26
Milk for each lb. of butter 2d year—lbs. ..	29.34	33.79	31.14	34.91	16.81	17.05
Average	28.96	33.79	30.67	36.02	17.46	17.30
Cream for each lb of butter 1st year—lbs..	5.20	-	5 12	5.36	4.18	4.00
Cream for each lb. of butter 2d year—lbs..	4.83	4.34	5.28	4.38	4.17	3.90
Average	5.01	4.34	5.20	4.87	4.18	3.95
Inches of cream for 1 lb. of butter	2.52	2.17	2.61	2.43	2.06	1.98

The facts set forth in the above table forcibly illustrate the great differences that may occur in the value of certain dairy products, whether we regard them from the food standpoint or as factors in business operations. This is a matter in which the consumers of milk in our villages and cities have an interest. Milk is an important source, when healthful, of the very best quality of human food, and is so regarded especially by those who have to do with the physical welfare of children. It is evidently unfair, however, to pay the same price per quart for all kinds of milk. The food value of a quart of Jersey milk, such as that produced by the Station animals, is worth twenty-five per cent more for purposes of nutrition, than is the Holstein milk. While it may not be possible to grade the retail price of milk according to its quality, it would be entirely just for the milk man who is selling the product of a Jersey herd to receive a larger price than that which is paid for Holstein or Ayrshire milk.

This matter of the varying value of milk according to its source is a very important one in the case of those butter factories that are purchasing milk instead of cream. When the managements of such factories pay the same price for milk containing five and one-half pounds of fat to the hundred, that they do for milk containing three and one-half pounds of fat to the hundred, they are either defrauding themselves or doing great injustice to the producers of the richer milk. Nothing can be more unbusiness-like than to purchase milk for butter making purposes at a uniform price without regard to quality. Somewhat the same considerations pertain to cream-gathering butter factories. The above table makes it very clear that cream is not of uniform value and that the individuality of animals has a very marked influence upon the cream that is produced. Taking the average of a two years' record we see that the amount of cream required for a pound of butter has varied from 5.2 pounds, in the case of the Ayrshire, Nancy Avondale, to 3.95 pounds, in the case of the Jersey, Ida. The custom so far in Maine has been to pay the same price for equal volumes of cream, without regard to its source. This may be rank injustice, as the facts show, and is excusable only on the ground that no rapid and accurate method exists for testing cream. It is true that until a comparatively recent date no such method has existed, but now we have several methods that are fairly efficient and their absence can no longer serve as an excuse for underpaying one cream producer and overpaying another.

The time has clearly come when the butter factories of Maine should deal justly with their patrons and take steps towards paying for cream according to its butter value. Apart from other considerations the two facts that the milk and cream from different breeds of animals is so greatly unlike, and that the animals now found upon a farm are very likely to be either thoroughbreds or grades of a single breed, make it imperative that we shall no longer proceed upon the old assumption that milk is milk and cream is cream. In response to a request from a gentleman in this State interested in dairy matters, the cream produced by the several Station animals has been measured in inches as well as in pounds. This was done from March 2d to September 21st, of the present year.

The quantity of cream in pounds, also in inches and the amount of butter produced during that time are given below.

Variation of Inches of Cream Required for One Pound of Butter with Different Cows.

	Jansje.	Agnes Smit.	Nancy Avondale.	Queen Linda.	Agnes.	Ida.
Pounds of cream	454	347	185	492	748	506
Inches of cream	226¾	176⅛	93	256⅛	378½	265½
Pounds of butter..............	95½	83¼	37¾	107⅔	184½	132¼
Weight of an inch of cream—lbs	2.	1.97	2.	1.92	1.98	1.91
Pounds of cream for each pound of butter..................	4.75	4.17	4.90	4.58	4.06	3.90
Inches of cream for each pound of butter..................	2.36	2.12	2.46	2.38	2.05	2.01

We see that the same varying ratios exist between the inches of cream and the pounds of butter as between the pounds of cream and the pounds of butter, the inches of cream required in the several cases to make one pound of butter varying from 2.46 inches to 2.01 inches. This demonstrates in terms that are familiar to dairymen how unjust may be the present system of paying for cream.

COST OF MILK, MILK SOLIDS, FAT, CREAM AND BUTTER.

The method of calculating the cost of the products from the several animals are explained in the Report for 1889 on page 115. In order that the figures may not be misunderstood, the statements referred to are repeated here.

"In computing the cost of the production of these cows, the food is alone considered. Moreover, the cost given for the butter fat and butter, represents the whole value of the food, no allowance being made for the other solids which are retained in the waste products from butter making, and which are certainly worth something. If there was a recognized market price for skimmed milk and butter milk, or if the skimmed milk of these animals was alike in value, in short, if an allowance made for the skimmed and butter milk could be anything but a purely arbitrary estimate, relatively unfair in any case unless based upon the percentage of solids, it would be possible to calculate the case of butter on a different basis. As it is, each farmer must make his own estimate of the worth to him of the waste products of the dairy.

The following table of costs is calculated from the figures given in the two preceding tables:"

Cost of Production.

	Jansj	Agnes Smit.	Nancy Avondale.	Queen Linda.	Agnes.	Ida.
Cost of milk per pound first year	.7326	-	1.007	.9151	.8674	1.411
Cost of milk per pound second year ...	.8287	.9312	1.011	.8649	.9648	1.279
Average	.780	.931	1.009	.890	.916	1.345
Cost of milk per quart first year	1.56	-	2.16	1.96	1.86	3.02
Cost of milk per quart second year	1.77	2.00	2.17	1.85	2.06	2.74
Average	1.67	2.00	2.16	1.90	1.96	2.88
Cost of milk solids per pound first year,	5.96	-	7.97	7.15	5.87	9.08
Cost of milk solids per pound second y'r,	6.64	7.88	7.85	6.80	6.23	8 56
Average	6.30	7 88	7.91	6.98	6.05	2.82
Cost of butter fat per pound first year,	21.50	-	28.68	25.58	16.96	24.39
Cost of butter fat per pound second y'r,	23.26	28.06	29.07	23.96	17.76	22.65
Average	22.39	28.06	28.87	24.77	17.35	23.52
Cost of cream per inch first year......	8.05	-	11.88	12.68	7.52	12.19
Cost of cream per inch second year ...	10.06	14.49	11.92	13.77	7.79	11.17
Average	9.05	14.49	11.90	13.22	7.65	11.68
Cost of butter per pound first year ...	20.94	-	30.40	33.99	15.72	24.35
Cost of butter per pound second year..	24.32	31.44	31.50	30.14	16.22	21.82
Average	22.63	31.44	30.95	32.06	15.96	23.08

Average Food Cost of Production with Breeds.

	Holstein	Ayrshire.	Jersey.
Average cost of milk per pound—cents....	855	.949	1.13
Average cost of milk per quart—cents ..	1.83	2.03	2.42
Average cost of milk solids per lb.—cents,	7.09	7.45	7.44
Average cost of butter fat per lb —cents ..	25.22	26.82	20.43
Average cost of cream per inch—cents	11.75	12.56	9.66
Average cost of butter per pound—cents..	27.03	31.50	19.52

The above results show that the Holstein milk has cost least and the Jersey milk the most, when quantity alone is considered. When we come to consider the cost of the solid matter in the milk, then the case is somewhat different. The Holsteins still show a somewhat more economical production than the others, but there is really only a small difference in the cost of a pound of milk solids as produced by each of the three breeds. As was remarked in the Report of 1889, the cost of a quart of milk depends not so much upon the volume produced, as upon the amount of solid matter that it contains. Of course the greater volume of milk a cow produces the less its quart cost, other things being equal, but it seems to be true that we do not find in general the production of a large volume of milk which has a high percentage of solids. If, for instance, by a process of selection, the Holsteins are bred to the production of richer milk, a decrease in the yield will undoubtedly occur

The cost of a pound of solid matter in milk is really the true test to follow, especially if we regard the milk simply as human food. It seems that in the case of these cows a pound of Jersey milk has cost nearly a third more than a pound of Holstein milk, whereas, a pound of Jersey milk solids has cost only about one-twentieth more, or five per cent. The figures that represent the cost of the fat, cream and butter, show some very marked differences in favor of the Jersey animals. The butter fat in the milk of the Ayrshire and Holstein animals has cost from twenty to thirty per cent more than in the case of the Jerseys, with about the same differences for the cream. The cost of a pound of butter in each of the three cases varies still more, the Ayrshire butter costing sixty per cent more than the Jersey butter. In order to make these relations still plainer, the table below is arranged. The cost of the various products, milk, milk solids, fat, cream and butter is taken as 100 for the Holsteins.

Relation of Food Cost.

	Holstein.	Ayrshire.	Jersey.
Cost of milk	100	111	132
Cost of milk solids	100	105	105
Cost of butter fat......................	100	106	81
Cost of cream per inch	100	107	81
Cost of butter......	100	115	72

It may not be out of place to again emphasize in this connection the great difference between the cost of a pound of edible material in milk and in beef The Station cows have produced annually during the past two years an average of 895 pounds of milk solids, all of which is edible. This has been done at an average food cost of 7¼ cents per pound. It is safe to say that farmers of Maine would consider the production of a 1,400 pound steer in three years a fairly creditable performance. Such an animal, if fat, would furnish for the purpose of human food, not far from 375 pounds of edible dry matter.

No one can find fault with the assumption that it would cost as much to feed this steer for three years as it would to feed a cow giving milk for half that time, or, for a year and a half. Estimating the expense of the food on the same basis that we have for the cows, the food cost in the case of the steer three years old would be $96, making the food expense of producing a pound of edible dry matter in the butcher's meat 25.6 cents. According to these figures, the food cost of producing human food by means of the dairy cow as compared with beef production would be as 100 :353.

COMPOSITION OF THE MILK.

The milk of the several animals has been analyzed during the two years' test to as full an extent as it was possible. On the average, samples of milk have been taken of the night's and morning's milk for about forty-five days in each year, the intention having been to take samples for five consecutive days in each month during the time the cows were giving milk. During the time from June 1888 to April 1889 the night's milk and morning's milk were analyzed separately, but since that time equal quantities of the two have been mixed and this mixture has been analyzed.

In calculating the composition of the first year's milk, the ash was assumed to be seventy-five per cent. Analyses made during the second year have shown that seventy-five per cent for the Jersey's and sixty-five per cent for the Holstein and Ayrshire milk would more accurately represent the amount of ash, and in the calculations of the composition of the second year's milk these figures have been used, the averages for the first year being corrected to correspond.

The following tables show the averages of each cow's milk for each period of five days, and also the average for each cow for the whole year:

Tables Showing Composition of Milk of Each Cow—Jansje.

	Solids.	Ash.	Casein	Sugar.	Fats.
July 15-19	14.96	.65	4.90	4.71	4.70
Sept. 30 Oct. 4	12.03	.65	2.95	5.51	2.94
Nov. 11-15	11.91	.65	2.94	5.16	3.16
Jan. 7 11	12.32	.65	2.91	5.16	3.59
Feb. 17-21	12.23	.65	3.06	5.06	3.46
March 19-23	12.35	.65	3.08	5.26	3.33
April 22 26	12.23	.65	3.04	5.01	3.52
June 10-14	12.92	.65	3.28	5.22	3.76
Average	12.62	.65	3.27	5.13	3.56

Agnes Smit.

	Solids.	Ash.	Casein	Sugar.	Fats.
July 15-19	11.39	.65	2.88	4.80	3.06
Sept. 30 Oct. 4	12.50	.65	3.26	5.03	3.56
Nov. 11-15	13.21	.65	3.48	4.80	4.27
Feb. 17-21	12.68	.65	3.05	5.06	3.93
March 19 23	11.60	.65	2.79	5.20	2.96
April 22 26	11.38	.65	2.59	4.93	3.21
June 10-14	11.60	.65	2.89	4.99	3.06
Average	12.05	.65	2.99	4.97	3.44

Nancy Avondale.

	Solids.	Ash.	Casein	Sugar.	Fats.
July 15-19	12.42	.65	3.36	5.20	3.20
Sept. 30 Oct. 4	12.60	.65	3.37	5.21	3.37
Nov. 11-15	12.73	.65	3.54	5.06	3.48
Jan. 7-11	14.44	.65	4.19	5.49	4.11
Feb. 17 21	14.39	.65	4.52	4.98	4.25
June 10-14	12.61	.65	3.17	5.45	3.34
Average	13.19	.65	3.69	5.23	3.63

Queen Linda.

	Solids.	Ash.	Casein.	Sugar.	Fat.
Jan. 7-11	12.55	.65	2.80	5.60	3.50
Feb. 17 21	12.54	.65	2.99	5.36	3.54
March 19-23	12.55	.65	3.02	5.48	3.40
April 22-26	12.25	.65	3.04	5.04	3.52
June 10-14	13.21	.65	3.25	5.41	3.90
July 7-11	13.04	.65	3.22	5.44	3.73
August 11-15	13.74	.65	3.63	4.91	4.55
Average	12.84	.65	3.14	5.32	3.73

Agnes.

	Solids.	Ash.	Casein.	Sugar.	Fat.
Sept. 30-Oct. 4	15.08	.75	4.32	5.06	4.95
Nov. 11-15	15.81	.75	4.65	4.77	5.64
Jan. 7-11	15.52	.75	4.23	5.10	5.45
Feb. 17 21	15.36	.75	4.38	5.06	5.17
March 19-23	15.29	.75	4.23	5.17	5.14
April 15 26	15.24	.75	4.28	4.76	5.45
June 10-14	15.55	.75	4.27	5.04	5.49
July 7-11	15.53	.75	4.12	4.95	5.71
August 11-15	16.15	.75	4.52	4.52	6.35
Average	15.50	.75	4.33	4.93	5.48

Ida.

	Solids.	Ash.	Casein.	Sugar.	Fat.
Sept. 30-Oct. 4	13.92	.75	3.34	5.13	4.70
Nov. 11-15	14.00	.75	3.61	4.71	4.93
Jan. 7-11	15.00	.75	3.98	4.67	5.60
Feb 17-21	15.12	.75	4.08	4.63	5.66
March 19-23	15.55	.75	3.95	4.99	5.86
April 22-26	15.15	.75	3.90	4.74	5.76
June 10-14	15.76	.75	3.86	4.93	6.21
July 7-11	15.76	.75	3.90	4.86	6.25
August 11 15	15.05	.75	4.02	4.51	5.76
Average	15.04	.75	3.85	4.80	5.63

Average Composition of Milk of Each Breed for Two Years.

	Total solids.	Ash.	Casein and albumen.	Sugar.	Fat.
Average of Holstein milk ..	12.22	.65	3.10	5.00	3.47
Average of Ayrshire milk ..	12.98	.65	3.39	5.27	3.67
Average of Jersey milk	15.24	.75	4.09	4.90	5.50

The above analyses, representing as they do several animals, and extending over a period of two years, furnish information on several points that are worthy of consideration.

(1) *The effect of breed upon the composition of milk.*

The quality of the milk as based upon the percentage of solid matter in it, is best with the Jerseys and poorest with the Holsteins. If the milk solids of the Holstein milk are represented by 100 we have as follows:

Holstein, 100; Ayrshire, 106; Jersey, 125.

It is to be observed that the relation in quantity of the various constituents of the milk solids is not the same with all the breeds. For instance, there is very nearly the same quantity of sugar in a hundred pounds of each of the three kinds ot milk. The larger quantity of solids in the Jersey milk is due to the presence of more casein, albumen and fat. Moreover, the relation existing between the nitrogenous constituents (casein and albumen) and the fat is not the same in the several cases.

Relation of Casein and Albumen to Butter Fat—Casein and Albumen=100.

	Jansje.	Agnes Smit.	Nancy Avondale.	Queen Linda.	Agnes.	Ida.
1888—June	100 :103	-	100 : 98			
July	100 :107	-	100 : 94			
August	100 :103	-	100 :105			
September	100 :107	-	100 :104	-	100 :110	100 :139
October	100 :111	-	100 :101	100 :127	100 :128	100 :151
November	100 :115	-	100 :100	100 :115	100 :130	100 :145
December	100 :117	-	100 : 99	100 :118	100 :128	100 :140
1889—January	100 :114	-	-	100 :120	100 :131	100 :142
February	100 :105	-	-	100 :103	100 :121	100 :139
April	100 :107	-	100 :151	100 :109	100 :120	100 :142
May	100 : 93	-	100 :104	100 :102	100 :119	100 :139
June	100 : 98	-	100 :100	100 : 99	100 :120	100 :145
July	100 : 96	100 :106	100 : 96	100 :106	100 :126	100 :116
September	100 :100	100 :109	100 :100	-	100 :115	100 :141
November	100 :107	100 :120	100 : 98	-	100 :121	100 :137
1890—January	100 :123	-	100 : 98	100 :124	100 :129	100 :147
February	100 :113	100 :129	100 : 94	100 :119	100 :118	100 :137
March	100 :108	100 :106	-	100 :112	100 :121	100 :149
April	100 :116	100 :124	-	100 :112	100 :127	100 :148
June	100 :115	100 :106	100 :105	100 :120	100 :128	100 :161
July	-	-	-	100 :116	100 :138	100 :160
August	-	-	-	100 :125	100 :140	100 :143
Average	100 :108	100 :114	100 :103	100 :113	100 :125	100 :143

NOTE—The heavy lines indicate the times when the cows were dry.

Taking the average composition of milk for two years we have with the Holsteins the casein and albumen standing in relation to the fat as 100:111, with the Ayrshire as 100:108, and with the Jerseys, as 100:134. This is a matter of considerable importance because of its bearing upon the proposal to measure the cheese value of milk by an estimation of the percentage of fat. It is very evident that a pound of fat in Jersey milk does not carry with it so large an amount of the other solids that go into the cheese as does a pound of fat in the Ayrshire milk. In other words, the cheese value of Ayrshire milk is larger in proportion to its percentage of fat than is the case with the Jersey milk, and the difference is sufficiently large to be worthy of practical consideration. The analyses of the milk of several breeds of animals at the New Jersey Experiment Station, furnish similar testimony in regard to this matter.

Relation of Casein and Albumen to Butter Fat—Results at New Jersey Experiment Station.

Holstein	Casein	and	Albumen:	Fat—	100:116
Ayrshire	"	"	"	"	100:108
Jersey	"	"	"	"	100:125
Guernsey	"	"	"	"	100:123

(2) *Effect of certain conditions upon the relative proportion of milk solids.*

A great deal of discussion is going on at the present time in regard to the effect of certain conditions upon the composition of the milk solids. The question is, Can we increase the casein and diminish the fat, or increase the fat and diminish the casein, in a cow's milk, by changes in her food, or does the relation in quantity of the various milk solids depend upon the constitutional characteristics of the animal? Again, does the composition of the milk solids vary with the season or with the duration of the period of lactation? One of the tables just given shows the relation in quantity of the casein and albumen to the butter fat in the case of six cows for the period of two years, this relation being determined by the analysis of the milk during five days in nearly every month of the year. It is plainly seen that the composition of the milk solids is somewhat variable, that is, that the fat is sometimes more, and sometimes less, in proportion to the casein and albumen. But a very careful study of the figures fails to reveal any fixed relation between these changes and the food of the animals, the season, or the period of lactation. The change from cold weather to warm, from dry food to grass, or from a full yield of milk to the diminished yield of approaching parturition, seems to have no well defined effect upon the proportions in which the various ingredients exist in the milk solids.

Whatever changes occur seem to be due to functional causes that are hidden from ordinary observation. Whether or not radical changes in the food have the effect to increase or decrease the amount of a single ingredient of the milk without affecting other ingredients to a like degree, is still a question in dispute, although all the scientific experience of the past indicates that such is not the case. This station is about to enter into an investigation, with a view to studying this point.

(3) *The effect of an advance in the period of lactation.*

The general effect of an advance in the period of lactation seems to be to increase the solid matter in the milk. It is especially true that during the last few weeks a cow produces milk previous to the time of parturition, the percentage of solids in the milk is greatly increased. It is a question whether the somewhat uniform increase that is seen to occur in the quantity of solids, is not due to the corresponding decrease in the yield of milk. It would not be strange if extended observations finally show that any cause tending to largely augment the amount of milk produced within a given time has in general the effect of diminishing the percentage of milk solids, whether that cause be breed, food, season or any other. For this reason it is not safe to measure the value of a ration for either butter or cheese production by the increase or decrease which such ration may cause in the yield of milk.

A part of the animals have shown an increase in the relative amount of fat in the milk solids as the period of lactation has advanced, but this has not been generally true and seems therefore to be an individual matter.

(4) *The daily variation of the composition of milk.*

There is a daily variation in the composition of milk which seems to be independent of breed, individuality, food, or any other known cause. While the milk of any given animal may have essentially the same composition during six days out of seven, there occasionally comes a day when there is suddenly an unexplainable change and which is sufficiently great to render it entirely unsafe to judge of the effect of food by the composition of a single day's milk.

When, however, we take the averages of periods of four or five days each, we find that these averages compare very closely. If, for instance, the milk of a single animal were to be analyzed for every day in a month, and these analyses were to be averaged in six periods of five days each, it would be found that the six averages would give practically the same figures. Whatever permanent changes take place in the character of the milk of the individual animal are periodical in their nature and seem to be due largely to conditions over which we have no control. We must after all regard any particular cow as a machine set to a certain gauge, which is capable of producing a certain kind of product, and while we may make changes in food and surroundings which increase or decrease the amount of product we can do but little in the way of changing its character.

COMPOSITION OF SKIMMED MILK, CREAM AND BUTTERMILK.

On the days that the whole milk has been analyzed samples of the skimmed milk have also been taken, as well as samples of the cream and buttermilk coming from the milk during these periods. The samples were taken as follows: The skimmed milk was drawn off to within an inch or so of the cream, then stirred, and a portion taken for analysis, after which the skimming was completed. In this way the accidental presence of fat from the cream was avoided. The cream was thoroughly stirred before churning and then sampled. The samples of buttermilk were taken before it was mixed with the washings from the butter. The analyses have not been complete, only the total solids and fat having been determined.

The analytical results appear below:

Tables Showing Composition of Skimmed Milk, Cream, and Buttermilk of Each Cow—Jansje.

	Skimmed Milk.		Cream.		Buttermilk.	
	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.
July 15-19	11.58	1.03	22.76	13.77	10.58	.22
September 30, October 4	9.35	.16	24.54	17.05	9.74	.92
November 11-15	9.49	.55	22.99	15.69	9.05	.23
January 7-11	9.79	.75	24.94	17.59	9.24	.35
February 17-21	9.52	.46	24.20	16.69	9.27	.16
March 19-23	9.52	.37	23.45	15.91	9.32	.10
April 22-26	9.31	.35	30.61	21.02	8.97	.13
June 10-14	9.81	.36	26.05	18.36	9.85	.17
Average	9.79	.50	24.94	17.01	9.50	.26

Agnes Smit.

July 15 19	9.15	.56	26.18	19.46	9.45	.71
September 30, October 4	9.85	.88	26.40	19.27	12.64	.43
November 11 15	10.63	1.35	25.26	17.62	9.59	.29
February 17-21	9.58	.42	28.01	21.82	9.70	.37
March 19-23	9.03	.44	26.34	19.36	9.15	
April 22 26	8.86	.48	30.48	22.89	9.05	1.10
June 10-14	9.10	.46	27.84	20.48	9.22	.39
Average	9.45	.65	27.22	20.13	9.83	.54

Nancy Avondale.

July 15-19	9.69	.31	24.51	16.32	9.50	.35
September 30, October 4	9.88	.40	23.88	16.15	11.02	2.07
November 11-15	10.10	.57	23.56	15.49	9.65	.22
January 7-11	11.59	.89	24.55	16.08	12.03	1.96
February 17-21	11.28	.89	25.22	16.49	11.49	.76
March 19-23						
April 22-26						
June 10-14	9.51	.22	25.05	17.56	9.49	.36
Average	10.34	.54	24.46	16.34	10.53	.62

Queen Linda.

January 7-11	10.11	1.05	27.03	19.70	9.51	.38
February 17-21	10.39	1.12	25.71	17.77	9.79	.33
March 19-23	10.35	1.00	26.38	18.82	9.55	.19
April 22-26	10.12	1.02	26.23	18.90	9.31	.16
June 10-14	10.55	1.02	27.70	20.26	9.61	.31
July 7-11	10.43	1.08	27.27	19.80	7.96	.69
August 11-15	11.18	1.80	24.26	16.05	9.99	.27
Average	10.45	1.15	26.37	18.75	9.39	.33

Agnes.

	Skimmed Milk.		Cream		Buttermilk.	
	Solids.	Fat.	Solids	Fat.	Solids.	Fat.
September 30, October 4....	10.42	.08	27.75	19.49	10.15	.10
November 11-15...........	10.56	.18	27.01	18.64	10.52	.12
January 7-11...............	10.83	.26	27.85	19.58	10.83	.09
February 17-21............	10.69	.18	27.28	18.69	10.96	.35
March 19-23...............	10.70	.11	27.03	18.59	10.52	.09
April 22-26................	10.26	.09	27.81	19.75	10.29	.08
June 10-14.................	10.59	.20	29.97	21.78	10.63	.18
July 7-11..................	10.46	.22	28.68	20.58	10.54	.28
August 11 15...............	10.36	.37	27.65	19.15	10.62	.25
Average..............	10.54	.19	27.89	19.58	10.56	.17

Ida.

	Skimmed Milk.		Cream		Buttermilk.	
	Solids.	Fat.	Solids	Fat.	Solids.	Fat.
September 30, October 4....	9.55	.10	27.80	20.21	9.38	.38
November 11-15...........	9.58	.17	27.34	19.81	9.45	.07
January 7-11...............	10.34	.47	26.73	19.31	10.23	.40
February 17-21............	10.20	.29	28.02	19.83	10.24	.17
March 19-23...............	10.28	.15	27.93	19.96	10.10	.08
April 22-26................	9.98	.09	29.02	21.18	10.01	.08
June 10-14.................	10.49	.60	31.33	24.01	8.90	.22
July 7 11..................	10.69	.81	31.47	23.70	10.38	.31
August 11 15...............	10 53	1.08	28.85	20.74	10.22	.23
Average..............	10.18	.40	28.72	20.97	9.88	.22

Average Composition of Skimmed Milk, Cream and Buttermilk of the Different Breeds for Two Years.

	Skimmed Milk.		Cream.		Buttermilk.	
	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.
Holstein..................	9.50	.52	25.80	18.30	9.70	.45
Ayrshire..................	10.40	.85	25.00	17.00	10.00	.44
Jersey....................	10.50	.37	27.90	19.80	10.30	.19

Several facts are shown in regard to the skimmed milk, cream and buttermilk which are worthy of attention, partly because they stand in opposition to certain notions that are entertained by many. First of all, it does not appear to be true that the cows producing the most and the richest cream are those that furnish the poorest skimmed milk. The proportion of cream from the Jersey milk has been much larger than from either of the other two breeds, and at the same time the Jersey skimmed milk proves to be the richest of all.

The question is often asked, How do skimmed milk and buttermilk compare in composition? It appears from these analyses that they are not greatly different so far as the percentage of solid matter is concerned. It is true with regard to both skimmed milk and buttermilk that they follow the order of richness of the whole milk from which they come, or in other words, the poorer the whole milk, the poorer are the waste products of the dairy. In regard to the waste of fat, it appears that the Jerseys have had the advantage with both the skimmed milk and buttermilk. The Ayrshire skimmed milk has contained the most fat, but with the buttermilk there has been but very little difference between the Holstein and Ayrshire.

Another interesting matter is that of the composition of the cream. It is a fact that the Jerseys have uniformly produced the richest cream, while the average is lowest for the Ayrshires. In these cases, the analyses made in the laboratory are in entire accordance with the results obtained with the churn. This is equivalent to saying that all kinds of cream are not the same. The results of these analyses suggest an explanation of the fact that has been observed by creamery men, namely: That cream gathered in autumn appears to have a lower butter value than that of spring or summer. The poor feed of the pastures and other conditions have been brought forward as an explanation of this fact, but in the light of the results here shown, it seems more reasonable to suppose that this lower butter value of cream, is due to the advanced period of lactation. The practice of dairy men now is such that in the autumn the herd generally contains fewer animals fresh in milk than at any other season of the year. A careful study of the figures given in the above tables shows that while the cream from a cow that has been milked several months is as rich in solid matter as when she was "fresh," there is a marked difference in the relative amount of the different solids. It seems that without exception the cream-solids from a "fresh" cow contain a larger proportion of butter fat than is the case during the latter stages of the milking period. This fact is made evident by the figures in the succeeding table, where the relation of the fat to the other solids of the cream is numerically stated.

Relation of Other Solids in Cream to the Fat.

	Total solids.	Solids not fat.	Ratio of other solids to fat.	Total solids.	Solids not fat.	Ratio of other solids to fat.
		Jansje.			Agnes Smit.	
Cream from "fresh" cow	24.54	7.49	1: 2.3	28.01	6.19	1: 3.5
Cream just previous to "drying off"	22.76	8.99	1: 1.5	25.26	7.65	1: 2.3
		Nancy Avondale.			Queen Linda.	
Cream from "fresh" cow	25.05	7.49	1: 2.3	27.03	7.33	1: 2.7
Cream just previous to "drying off"	25.22	8.73	1: 1.9	24.26	8.21	1: 1.9
		Agnes			Ida.	
Cream from "fresh" cow	27.75	8.26	1: 2.3	27.80	7.60	1: 2.7
Cream just previous to "drying off"	27.65	8.50	1: 2.2	28.85	8.11	1: 2.6

As above stated, the inches of cream have not been measured during the entire two years, but only from March 2, 1880, to the following September. In order to furnish additional testimony for the correctness of the figures in the above table, the relation of butter to the inches of cream both in March, 1890 and in September of the same year is given. It appears that without exception more inches of cream were necessary for a pound of butter in September than in March, and it is also true that at the latter time the three animals mentioned were near the time of "drying off."

	Queen Linda.	Agnes.	Ida.
Inches of cream for 1 lb. of butter Mar. 2-9,	2.2	2.1	1.9
Inches of cream for 1 lb. of butter Aug. 24-31	3.2	2.4	2.4

THE FOOD VALUE OF THE WASTE PRODUCTS OF THE DAIRY.

The food value of the skimmed milk and buttermilk, which are the waste products from butter making, is not sufficiently considered in estimating the profits of dairying. The methods adopted in testing these dairy animals have made it possible to secure some very definite and reliable figures in regard to this matter. The table below shows these figures.

Table Showing the Food Material Retained in the Waste Products of the Dairy.

	Jansje.	Agnes Smit.	Nancy Avondale.	Queen Linda.	Agnes.	Ida.
Total milk solids, 1st year	1228.	-	751.	893.	1015.	638.
Total milk solids, 2d year	1042.	893.	811.	919.	960.	696.
Average	1135.	893.	781.	906.	987.	667.
Cream solids, 1st year	415.	-	238.8	230.	415.7	253.2
Cream solids, 2d year	335.	251.5	246.	232.2	422.4	293.5
Average	375.	251.5	242.4	231.1	419.	273.3
Cream solids, per cent. of total milk solids, 1st yr,	33.8	-	31.8	25.7	40.9	39.7
Cream solids, per cent of total milk solids, 2d yr.,	32.2	28.2	30.3	25.3	44.0	42.2
Average	33.	28.2	31.0	25.5	42.4	40.9
Skim milk solids, 1st year	768.5	-	491.9	632.1	557.2	340.9
Skim milk solids, 2d year	673.9	610.8	526.	650.7	492.4	366.4
Average	721.2	610.8	508.5	641.4	524.8	353.6
Skim milk solids, p'r ct. of total milk solids, 1st yr.	62.6	-	65.5	70.6	54.9	53.4
Skim milk solids, p'r ct. of total milk solids, 2d yr	64.6	68.4	64.9	70.8	51.3	52.6
Average	63.6	68.4	65.2	70.7	53.1	53.
Buttermilk solids, 1st year	124.2	-	68.	64.1	104.7	59.
Buttermilk solids, 2d year	91.4	60.8	79.	57.7	106.8	65.
Average	107.8	60.8	73.5	60.9	105.7	62.
Butt'rmilk solids, pr ct. in tot'l milk solids, 1st yr	10.1	-	9.0	7.2	10.2	9.2
Butt'rmilk solids, pr. ct. in tot'l milk solids, 2d yr	8.8	6.8	9.7	6.3	11.1	9.3
Average	9.5	6.8	9.3	6.7	10.6	9.2

We see that the total amount of solid matter contained in a year's milk of the various animals ranged from 667 pounds up to 1,135 pounds, or an average of 895 pounds per year. There was retained in the skimmed milk and buttermilk from 416 up to 829 pounds of dry matter, or an average of 638 pounds of dry matter. This is seventy-one per cent of the total yearly production, or, stated in another way, in making butter there is sent away from the farm only twenty-nine per cent of the dry matter which the cows produce. It is worthy of note that seven-eighths of this is contained in the skimmed milk, which is equivalent to saying that the food value of the skimmed milk is seven times that of the buttermilk. Now, what is the total food value of the waste products of the dairy, reckoned in dollars and cents?

At the present prices of grain it is safe to estimate the solids in the buttermilk and skimmed milk at two cents per pound, which would give an average value per cow of $12.76 yearly. It should be remembered that this material is wholly edible and wholly digestible, whereas in the case of grain from fifteen to twenty-five per cent of the dry matter is indigestible and of no use to the animal.

LOSS OF FAT IN THE WASTE PRODUCTS OF THE DAIRY.

In testing the behavior of the milk of these several animals in the manufacture of butter, the various lots of milk have been treated exactly alike, that is, they have been set in the same cabinet, with water at the same temperature and for the same length of time.

In the table below can be seen the amounts of fat which the cold setting process has failed to remove from the skimmed milk, as well as the amounts of fat in the buttermilk.

	Jansje.	Agnes Smit.	Nancy Avondale.	Queen Linda.	Agnes.	Ida.
Total fat in milk, 1st year—lbs	340.4	-	208.8	245.9	352.	237.8
Total fat in milk, 2d year—lbs	286.5	251.6	219.5	269.6	337.5	263.1
Average	313.4	251.6	214.1	257.7	344.7	250.4
Fat left in skimmed milk, 1st year—lbs	22.9	-	248.	64.	13.1	19.3
Fat left in skimmed milk, 2d year—lbs	32.6	38.	23.6	68.3	8.5	14.2
Average	27.7	38.	24.2	66.1	10.8	16.7
Fat left in buttermilk, 1st year—lbs	6.1	-	3.3	2.1	1.4	1.
Fat left in buttermilk, 2d year—lbs	2.7	3.2	7.1	2.0	1.7	1.4
Average	4.4	3.2	5.2	2.0	1.5	1.2
Total waste of fat—average	32.1	41.2	29.4	68.1	12.3	17.9
Per cent total fat in skimmed milk 1st yr.	6.7	-	11.9	26.0	3.7	8.1
Per cent total fat in skimmed milk 2d yr.	11.38	15.1	10.75	25.3	2.5	5.4
Average	9.0	15.1	11.3	25.6	3.1	6.7
Per cent total fat in buttermilk, 1st yr	1.8	-	1.6	0.8	0.4	0.4
Per cent total fat in buttermilk, 2d yr	.9	1.27	3.2	0.7	0.5	0.5
Average	1.3	1.3	2.4	.75	.45	.45
Total per cent waste of fat—average	10.3	16.4	13.7	26.3	3.5	7.10

Several facts are very plainly set forth by the above figures. The most noticeable fact is that the behavior of the milk from the various animals is greatly different. For instance, in the skimmed milk from the cow Agnes only 12.3 pounds of fat were left during the entire year, whereas the amount in the case of the cow Queen Linda is seen to be 68.1 pounds. It cannot be said that poor manipulation of the milk is the cause of the large waste in the case of the latter animal, because the milk was treated exactly alike in the two cases.

It is claimed by certain parties that where a can is only partially filled the creaming is not as perfect as with full cans, but granting that this is true, the effect of this condition should be seen to as great an extent with the two Jerseys as with the animals of the other breeds. On the contrary, we see that the creaming of the Jersey milk has been very satisfactory, notwithstanding the cans have for part of the time only contained a small amount of milk. The fact simply is that the cold setting process is able to do for one kind of milk what it cannot do for another. Where the manipulation of the milk has been entirely the same in all cases, we must look to the constitution of the milk for an explanation of this difference in behavior. A reference to the work done by Mr. Merrill in studying the milk globules of these various animals, which appears later on, seems to offer a satisfactory partial explanation of the great difference in the readiness in which the fat globules come to the surface in the two cases cited.

The loss of fat in the skimmed milk has varied from 10 8 pounds yearly to 66.1 pounds, or an average for the six cows of 30.6 pounds. By the use of a centrifuge it would be possible to remove all but about seven pounds of this fat, which would be equivalent to a gain of thirty pounds of butter per cow. This would amount to an increased income per animal of about six dollars. It remains for the farmer to determine whether with his herd of ten to twenty cows such an income would warrant either the use of a centrifuge at home, or the shipping of his milk to a factory where the cream is separated by the centrifugal process. It is fair to remark, that with a herd of Jerseys or grade Jerseys the gain made by discarding the cold setting process would undoubtedly not be as great. Another fact prominently brought to view by these figures is that the great waste of butter fat is in the skimmed milk, the waste in the buttermilk being of comparatively little importance.

It is to the process of separation of cream that we must look for an improvement in dairy methods if we wish to avoid the larger wastes of butter fat, rather than to the churning. The highest average loss in the buttermilk for any single cow during two years has been five pounds.

SUMMARY.

(1) The average amount of water-free food consumed daily by the cows tested was, for each animal: Holsteins, 27.4 pounds; Ayrshire, 24.7 pounds; Jersey, 23.2 pounds.

The weight of digestible dry matter consumed per cow, averaged daily: Holstein, 17.70 pounds; Ayrshire, 15.70 pounds; Jersey, 15 pounds. The daily use of digestible dry matter for each 1,000 pounds of live weight has been as follows: Holstein, 14.30 pounds; Ayrshire, 15.2 pounds; Jersey, 16.8 pounds.

(2) It has required approximately ten pounds of dry food material, or 6.6 pounds of digestible food material, to produce one pound of milk solids. The averages for the three breeds are nearly alike in this particular.

(3) The annual yield of milk solids has been: Holsteins, 1,014 pounds; Aryshire, 848 pounds; Jersey, 827 pounds; or in the ratio of 122, 102 and 100 respectively. The annual yield of butter fat has been: Holsteins, 285 pounds; Ayrshire, 233 pounds; Jersey, 297 pounds; or in the ratio of 122, 100 and 128 respectively.

(4) The milk required for a pound of milk solids has been as follows: Holstein, 8.3 pounds; Ayrshire, 7.8 pounds; Jersey, 6.6 pounds. For a pound of butter fat: Holstein, 29.4 pounds; Ayrshire, 28.3 pounds; Jersey, 18.2 pounds. The weight of cream corresponding to a pound of butter has been: Holstein, 4.7 pounds; Ayrshire, 5.0 pounds; Jersey, 4.1 pounds.

A measurement of the cream in inches for six months, showed the relation of cream to one pound butter to be as follows: Holstein, 2.24 inches; Ayrshire, 2.42 inches; Jersey, 2.03 inches.

(5) The food cost of a quart of milk, reckoning the cattle foods at market prices has been: Holstein, 1.83 cents; Ayrshire, 2.03 cents; Jersey, 2.42 cents, or in the ratio of 100:111:132. The food cost of a pound of milk solids has been: Holstein, 7.09 cents; Ayrshire, 7.45 cents; Jersey, 7.44 cents, or in the ratio of 100:105:105. The food cost of a pound of butter fat has been: Holstein, 25.22 cents; Ayrshire, 26.82 cents; Jersey, 20.43 cents, or in the ratio of 100:107:81.

A pound of milk solids has been produced by these six cows at an average food cost of 7.3 cents, which bears to the cost of a similar amount of edible material in a steer's carcass an estimated ratio of 100 : 350.

(6) The average composition of the milk for two years has been: Solids in 100 pounds, Holstein, 12.22 pounds; Ayrshire, 12.98 pounds; Jersey, 15.24 pounds, or in the ratio of 100 : 106 : 125. The pounds of fat in 100 pounds of milk have been: Holstein, 3.47 pounds; Ayrshire, 3.67 pounds; Jersey, 5.50 pounds, or in the ratio of 100 : 106 : 158. In general the milk has grown richer in solids (and fat) up to the time of "drying off."

(7) The ratio of the quantity of nitrogenous compounds (mostly casein) to the butter fat has been subject to considerable variation but does not seem to have been controlled by changes in the food or season, or to have been modified by an advance in the period of lactation. The proportion of milk solids is affected by breed, however. The casein (and albumen) being represented by 100, its ratio to the butter fat is seen to average: Holstein, 100 : 111, Ayrshire, 100 : 108; Jersey, 100 : 134.

(8) The average percentages of total solids and of fat in the skimmed milk for the two years give: Solids, Holsteins, 9.50 per cent; Ayrshire, 10.40 per cent; Jersey, 10.50 per cent. Fat, Holstein, .52 per cent; Ayrshire, .85 per cent and Jersey .37 per cent. In general the skimmed milk has grown richer in total solids and in fat as the time of parturition approached. The average composition of the buttermilk has been: Solids, Holstein, 9.70 per cent; Ayrshire, 10.00 per cent; Jersey, 10.30 per cent; fat, Holstein, .45 per cent; Ayrshire, .44 per cent; Jersey, .19 per cent. The composition of the skimmed milk and buttermilk has not been greatly different.

(9) The percentage of butter fat in the cream has averaged: Holstein, 18.30 per cent; Ayrshire, 17.00 per cent; Jersey, 19.80 per cent. As the time of parturition has approached the amount of fat has been less in proportion to the other solids in the cream, than while the cows were "fresh."

(10) The butter value of a given volume of cream has proved to be less in September than March, with such animals as were approaching the time of parturition.

(11) The skimmed milk has contained on the average 62 per cent of the solid matter of the milk, and the buttermilk, 9 per cent.

At the present prices of cattle foods, the 639 pounds of dry matter left in the dairy waste products from a single cow was worth for feeding purposes two cents per pound.

(12) The annual waste of butter fat in the skimmed milk has varied with the different cows from 10.8 pounds to 66.1 pounds or from 3.1 per cent to 25.6 per cent of the total fat. The waste in the butter milk has ranged from 1.5 pounds to 5.2 pounds or from .45 per cent to 2.4 per cent of the total fat. This waste has been least with the Jerseys and greatest with the Ayrshires.

MECHANICAL LOSS OF BUTTER FAT.

It is noted in the Station Report for 1889 on pages 131 and 132 that the total amount of solids in the whole milk is not accounted for by the amount of solids in the skimmed milk and sour cream. The loss seems to have fallen especially upon the butter fat. It was found that not far from ten per cent of the fat in the whole milk failed to appear in the skimmed milk and sour cream. A calculation based upon the second year's test shows a similar discrepancy. In a table below, which gives the results for both years, it appears that from twenty to forty-six pounds of butter fat are annually unaccounted for in the case of each of the cows.

Results for 1888-89 and for 1889-90.

	Jansje.	Agnes Smit.	Nancy Avondale.	Queen Linda.	Agnes.	Ida.
1888-89.						
Total solids in whole milk—lbs.	1222.77	-	751.1	893.6	1015.2	638.4
Solids in skimmed milk—lbs. } Solids in sour cream—lbs. }	1183.7	-	730.7	862.1	972.9	594.1
Deficiency of milk solids—lbs.	44.	-	20.4	31.5	42.3	44.3
Total fat in whole milk—lbs.	340.4	-	208.8	245.9	352.	237.8
Fat in skimmed milk—lbs.	22.9	-	24.8	64.	13.1	19.3
Fat in sour cream—lbs.	285.	-	163.5	154.	292.9	178.5
	307.9	-	188.3	218.	306.	197.8
Deficiency of fat—lbs.	32.5	-	20.5	27.9	46.	40.
1889-90.						
Total solids in whole milk—lbs.	1042.1	893.	811.	918.7	960.5	696.5
Solids in skimmed milk—lbs.	673.9	610.8	526.	650.7	492.4	366.4
Solids in sour cream—lbs.	335.1	251.5	246.1	232.2	422.4	293.5
Total	1009.0	862.3	972.1	882.9	914.8	659.9
Deficiency of milk solids—lbs.	33.1	30.7	38.9	35.8	45.7	36.6
Total fat in whole milk—lbs.	286.5	251.6	219.5	261.5	337.5	263.1
Fat in skimmed milk—lbs.	32.6	38.0	23.6	68.3	8.5	14.2
Fat in sour cream—lbs.	229.6	187.4	165.2	166.3	296.2	213.3
Total	262.2	225.4	188.8	234.6	304.7	227.5
Deficiency of fat—lbs.	24.3	26.2	30.7	26.9	32.8	35.6

One method of explaining this loss is to say that it is due to the milk and cream that have adhered to the dairy utensils. It is true, of course, that some loss does occur in this way, but it seems hardly possible that ten per cent of the total butter fat in the milk adheres to the milk pails and cans in which the milk is set. To be sure, the amount of waste in this way has been relatively much larger because the quantity of milk and cream handled at each time was small, and so the amount adhering to the dairy utensils was a much larger proportion of the total dry matter in the milk. The method of calculation used in securing these figures should be regarded with some suspicion, perhaps, for as has been stated, the product for each month, not only of milk, skimmed milk, but also of cream is assumed to have the same composition that is found for five days in the month, and all the calculations are made on this basis. In this way errors may have arisen, but it is hardly probable that they would all occur on one side and uniformly cause a discrepancy in the same direction. In order to test this matter more correctly and thoroughly, calculations have been made based upon the actual yield and composition of the milk and other products during the five days on which the cows were tested. A large part of the analyses made in 1888 were made of both the night's and morning's milk, and as the records show the weights of each mess of milk, of the skimmed milk and of the total amount of cream at the time when it was ready for the churn, it is possible to ascertain whether any loss of fat occurred. This has been done for four cows during the period of five days in June and a similar period in July. Besides these calculations, a special test has been made in which quite a large quantity of milk of known composition was taken. This latter trial was made in February, 1890. These additional results are shown below.

	Chloe.		Lois.		Jansje.		Nancy Avondale.	
	Solids.	Fat.	Solids	Fat.	Solids.	Fat.	Solids.	Fat.
JUNE, 1888.								
Total in whole milk—lbs.	17.30	4.68	14.92	4.24	22.97	6.32	16.50	4.36
Total in skimmed milk—lbs.	12.29	.73	10.36	.78	15.26	.81	11.10	.82
Total in sour cream—lbs.	4.75	3.62	4.33	3.27	6.94	5.14	4.67	3.28
	17.04	4.35	14.69	4.05	22.20	5.95	15.77	4.10
Deficiency	.26	.33	.23	.19	.77	.37	.73	.26
Per cent loss fat	-	7.00	-	4.5	-	5.8	-	6.00
JULY, 1888.								
Total in whole milk—lbs.	14.29	3.79	-	3.10	17.05	4.40	-	3.71
Total in skimmed milk—lbs.	9.67	.39	-	.44	10.80	.29	-	.51
Total in sour cream—lbs.	4.21	3.19	-	2.53	5.74	3.86	-	3.04
	13.88	3.58	-	2.97	16.54	4.15	-	3.55
Deficiency	.41	.21	-	.13	.51	.25	-	.19
Per cent loss fat	-	5.50	-	4.20	-	5.70	-	4.30

Special Test of Loss of Fat.

	Weight—lbs.
Milk taken morning	125
Milk taken night	83½
Sweet cream, total	38½
Skimmed milk, morning	103
Skimmed milk, night	66¾
Sour cream, total	37⅛

	Whole Milk.		Skim'd Milk.		Sweet Cream.	Sour Cream.
	Morn.	Night.	Morn.	Night.		
Solids in 100 pounds—lbs.	12.75	13.02	9.99	9.69	25.77	25.80
Fat in 100 pounds—lbs.	3.75	4.07	.685	.478	18.19	18.17

	Solids—lbs.	Fat—lbs.
Contained in whole milk	26.83	8.09
Contained in sour milk and sweet cream	26.68	8.02
Contained in sour milk and sour cream	26.34	7.77
Not accounted for in sour milk and sour cr'm (4 p'r ct of tot. fat)	-	.32

In no instance was the amount of fat in the skimmed milk and the sour cream equal to that of the whole milk, the discrepancy, or apparent loss, amounting in the several cows to from four to seven per cent of the total fat in the milk. It should be noted that in the special trial where a large quantity of milk is used, the fat of the sweet cream plus that of the skimmed milk accounts for practically that of the whole milk. The cream was allowed to stand a longer time than usual before churning and diminished in weight from evaporation or otherwise a pound and three-eights. The percentage of fat seems to have remaind unchanged, however, and the sour cream, although the weights were taken without pouring the cream from one can to another, thus avoiding any mechanical loss, contained by analysis a quarter of a pound less of fat than the sweet cream. This indicates a loss of fat not yet explained. These trials would have been repeated in a more exhaustive manner had not lack of time prevented, but this will be done, and further investigation may show that this loss has been wholly mechanical.

THE EFFECT OF A DELAY IN SETTING MILK.

It is often the case that milk is allowed to stand an hour or so after it is drawn before it is strained and set in cold water. Especially with a large herd, the milk of the first animals milked may sit some time before it is brought into contact with the cold water. Again, oftentimes the dairy-man is careless in allowing the milk to stand unnecessarily and so does not strain it into the cans nearly as soon as he might. The question arises, What is the effect of this delay in setting milk upon the amount of fat which is left in the skimmed milk? In order to secure information upon this point the matter was tested in the following manner: The milk of several animals (grades) was drawn as quickly as possible, thoroughly mixed in a large vessel, divided into two equal parts and one-half immediately submerged in water at a temperature of about forty degrees. The other half of the milk was allowed to stand from one-half hour to an hour, after that delay being submerged in the same cabinet with the other portion of the milk.

The following data were recorded:

The weight of milk set; the temperature of that portion of the milk which was placed in the cold water immediately; the temperature at the time of submerging of that portion of the milk which was allowed to stand some time before placing in the cold water; the composition of the milk which was used in the tests and the composition of the skimmed milk.

The first test was made from January 20th to January 24th, 1890, and the second test was made from February 3d to February 7th, 1890. In the case of the first test, that portion of the milk which was allowed to stand some time before setting in the cold water was strained into the cans at the same time that the other portion was set in the water, and when finally placed in the water it was not stirred. During the second test that portion of the milk which was not put into cold water until after a half hour or an hour, was thoroughly stirred at the time it was submerged. This latter method of treatment would correspond entirely to the way in which milk is manipulated when it is allowed to stand some time before straining. It should be stated that the milk which was not at once placed in the cold water was in the first test allowed to stand in the dairy-room, and in the second test, in a cold walk outside of the dairy-room. The results which are shown in the tables below were a surprise. Their testimony, however, is unmistakably in one direction.

Tables Showing the Effect of Delay in Setting Milk after it is Drawn.

	Weight of each lot of milk set.	Composition of milk set.	
		Total solids.	Fat.
January 20th, night	17¼ pounds	13.26 per cent	4.58 per cent.
" 21st, morning	25½ "	12.54 "	3.55 "
" 21st, night	18¾ "	12.86 "	3.21 "
" 22d, morning	26 "	12.44 "	3.30 "
" 22d, night	18¼ "	12.55 "	3.78 "
" 23d, morning	24¾ "	12 53 "	3.46 "
" 23d, night	18 "	13.37 "	4.57 "
" 24th, morning	24¾ "	12.75 "	3.48 "
" 24th, night	20¾ "	12.96 "	4.37 "
February 3d, night	27½ "	13.30 "	4.22 "
" 4th, night	28 "	12.80 "	4.10 "
" 5th, night	28 "	13.07 "	4.28 "
" 6th, night	27 "	13.25 "	4.05 "
" 7th, night	35 "	13.49 "	4.50 "

	Milk set at once after being drawn.			Milk allowed to stand before setting. Not stirred when set.				
	Temperature of milk when set—degrees.	Comp. of skm'd milk.		Time milk stood before setting.	Temperature of milk when set—degrees.	Degrees cooled by standing.	Comp. of skim'd milk.	
		Total solids, deg.	Fat, per ct.				Total solids, per ct	Fat, per ct.
January 20th, night	96	9.19	.27	½ hr.	90	6	9.21	.27
" 21st, morning	94	10.12	1.00	½ hr.	90	4	9.85	.66
" 21st, night	96	9.21	.20	½ hr.	92	4	9.27	.25
" 22d, morning	96	9.40	.25	½ hr.	90	6	9.84	.64
" 22d, night	96	9.07	.20	½ hr.	90	6	9.09	.24
" 23d, morning	96	9.59	.17	½ hr.	90	6	9.62	.22
" 23d, night	94	9.29	.17	1 hr.	86	8	9.35	.20
" 24th, morning	96	9.50	.20	1 hr.	86	10	9.51	.20
" 24th, night	94	9.41	.20	1 hr.	84	10	9.35	.24
Average			.29					.32
Average (ex. 21st morn.)			.21					.26
February 3d, night	96	9.41	.18	½ hr.	90	6	9.53	.21
" 4th, night	96	9.41	.14	½ hr.	91	5	9.51	.24
" 5th, night	95	9.46	.28	½ hr.	90	5	9.46	.29
" 6th, night	95	9.78	.32	1 hr.	84	11	9.79	.27
" 7th, night	95	9.49	.27	1 hr.	84	11	9.63	.27
Average			.24					.26

One of the important facts shown by the foregoing is the extent to which cooling took place by allowing the milk to stand from a half hour to an hour. A half hour's standing, both in the dairy-room and in the cooler walk outside, caused the temperature of the milk to lower from 4° to 6° or an average of 5.3°. An hour's standing lowered the temperature of the milk in about the same proportion for the length of time, or from 8° to 11°, the average being 10°. In no case did the temperature of the milk get below 84°, the temperature of the freshly drawn milk ranging from 94° to 96°. When we come to consider the effect of this extent of cooling upon the completeness of the separation of the fat from the skimmed milk, we find it to be slight, in fact, scarcely worth considering.

In the first test where the milk was immersed in cold water as quickly as practicable after it was drawn, the average per cent of fat in eight trials was .21 per cent, while the skimmed milk from the milk allowed to stand from a half hour to an hour before being placed in the cold water was found to contain on an average .26 per cent. In the first test, as has been stated, the cooled milk was not stirred at the time of placing it in the cabinet, and in the second, the cooled milk was stirred when submerged. In this latter case the milk that was placed in the ice water at once left only .24 per cent of fat in the skimmed milk, while that which was allowed to stand left .26 per cent. These differences are insignificant and show that with herds of ordinary size, it will not be profitable to submit to any great inconvenience in order to place the milk in ice water immediately after it is drawn. In a half hour to an hour, milk does not seem to cool sufficiently to materially effect the completeness with which the cream will rise.

THE PREPARATION OF THE RATION FOR MILCH COWS.

A great deal of time is spent in discussing not so much what the ration shall be as how it shall be fed. Matters which pertain to the minor details of cattle feeding, such as the method of preparing food, number of times of feeding, the mixture of the various parts of the ration and other things of similar nature, have been given, the writer believes, undue prominence in former discussions. It is especially the case that a prominent writer for one of our leading journals has strenuously advocated the chopping of the hay and coarse fodder fed, moistening the chopped material and thoroughly mixing the grain with it before feeding. This writer has claimed that the labor necessary to do this returns large profits.

The attention of the Director of the Station has been several times called to this matter and for that reason it was decided to make a test of the method advocated in order to illustrate either its value or lack of value. Consequently in the spring of 1890 the hay fed to the Station cows was for quite a period of time chopped quite fine, moistened and the grain thoroughly mixed with the chopped material. This mixture was allowed to stand several hours before feeding. Previous to beginning the feeding of the ration in this manner the animals were receiving hay and a mixture of two parts cotton seed meal, two parts corn meal and one part bran, by weight.

During the time that the chopped and moistened ration was fed the kind and quantity of food given remained unchanged, and at the end of the period of fifty-one days the animals were returned to the former ration, that is, unchopped hay, and grain fed dry. As the cows to which these rations were fed were those which were undergoing a two years' test, a careful record was kept of their yield and of the quality of the milk. This being done it became possible to ascertain whether chopping the hay and thoroughly mixing the grain with it after moistening, had any appreciable effect upon production. The figures which appear in the following tables form the basis of our conclusions:

The Rations Fed.

	Jansie, lbs	Agnes Smit, lbs.	Queen Linda, lbs.	Agnes, lbs.	Ida, lbs.
Dry ration, unmixed (February 2d to March 4th.)					
Hay fed daily (average)	24.4	22.5	22.7	21.6	20.7
Grain fed daily	8.0	8.0	7.0	6.0	6.0
Ration, chopped, wet and mixed (March 5th to April 24th.)					
Hay fed daily	25.0	23.0	23.0	22.0	20.0
Grain fed daily	8.0	*10.0	7.0	6.0	6.0
Dry ration, unmixed (April 25th to May 24th.)					
Hay fed daily	23.5	23.2	22.0	21.8	21.6
Grain fed daily	8.0	10.0	7.0	6.0	6.0

* The grain ration of Agnes Smit was increased on March 8th by two pounds of middlings.

Composition of the Milk during the Three Periods.

		Total solids, per cent.	Ash, per cent.	Casein, etc., per cent.	Sugar, per cent.	Fat, per cent.
Jansje.	February 17 21	12.23	.65	3.06	5.06	3.46
	March 19 23	12 35	.65	3.08	5.26	3.33
	April 22-26	12.23	.65	3.04	5.07	3.52
Agnes Smit.	February 17-21	12.68	.65	3.05	5.06	3.93
	March 19-23	11.60	.65	2.79	5.20	2 96
	April 22-26	11.38	.65	2.59	4.93	3 21
Queen Linda.	February 17-21	12.54	.65	2.99	5.36	3.54
	March 19-23	12.55	.65	3.02	5.48	3.40
	April 22-26	12.25	.65	3.04	5.04	3.52
Agnes.	February 17-21	15.36	.75	4.38	5.06	5.17
	March 19 23	15.29	.75	4.23	5.17	5.14
	April 22-26	15.24	.75	4.28	4.76	5.45
Ida	February 17-21	15.12	.75	4.08	4.63	5.66
	March 19 23	15.55	.75	3.95	4.99	5.86
	April 22 26	15.15	.75	3.90	4.74	5.76

Production of Milk and Butter during the Three Periods.

	Jansje, lbs.	Agnes Smit, lbs.	Queen Linda, lbs.	Agnes, lbs.	Ida, lbs.
Dry ration, unmixed (30 days).					
Total milk yield	896.	1108.	904.	601.	397.
Total butter yield.....	29.7	43.9	24.7	34.5	24.6
Average daily milk yield	29.9	36.9	30.1	20.	13.2
Average daily butter yield....	1.02	1.57	.82	1.15	.82
Ration, chopped wet and mixed (51 days).					
Total milk yield	1342.	1712.	1225.	884.	614.
Total butter yield..................	47.1	51.5	33.5	51.2	38.3
Average daily milk yield	26.3	33.6	24.	17.3	12.
Average daily buttor yield.	.83	1.00	.66	1.00	.75
Dry ration, unmixed (30 days).					
Total milk yield	720.	803.	644.	492.	357.
Total butter yield..................	25.	23.7	17.	27.5	21.
Average daily milk yield	24.	26.7	21.5	16.4	11.9
Average daily butter yield.........	.83	.79	.57	.92	.72

The records show that up to March 5th, the several cows were eating dry hay and grain, that from March 5th to April 24th, inclusive, the ration of hay and grain, without being changed in kind or quantity, was simply mixed by chopping the hay, moistening it and sprinkling the grain upon it. After April 24th, the animals were returned to the same ration that they had eaten previous to March 5th. Now how did these changes affect production? There is no evidence that they had any effect. The amount of food given, it is seen, remained practically unchanged and it does not appear that the method of preparation had any influence either upon the yield or composition of the milk. It is noticed that the yield is given for thirty days previous to March 5th, and for thirty days following April 24th. The time during which the chopped and moistened ration was fed between those dates was fifty-one days. During all this time there appears to have been very little change in the composition of the milk, as is shown by analyses made in February, March and April. There was a steady decrease in the daily yield of each animal, which seems to have been quite uniform throughout the entire time, from the first of February to the last of May. The daily weights of each mess of milk, although not recorded above, show that in changing from the dry food to the moistened or from the moistened to the dry, there was no deviation in the daily production, but that the animals behaved in every respect as though they were receiving the same amount of nutrition in the same form, which was really the case. The simple fact seems to be, that when animals are receiving palatable food that is adapted to their needs these minor differences in the method of treating the ration have very little influence. Of course it must be conceded that if steaming or chopping and wetting a coarse fodder renders palatable that which would otherwise be unpalatable and therefore useless as a cattle food, a saving is thereby made. It is, then, only a question as to whether the material thus utilized is of greater value than the cost of preparing it. But there is very little evidence that steaming, chopping, wetting or otherwise treating cattle foods that are palatable without any treatment, and of which the animals will eat a sufficient quantity in their natural condition, is good economy.

THE MINERAL INGREDIENTS OF MILK.

By L. H. MERRILL.

ANALYSIS OF THE ASH OF MILK.

The milk from which the ash was obtained for these analyses was not taken at random, but represents five consecutive milkings from each cow, 50 cubic centimeters being taken from each lot of milk at each milking. The skimmed milk represents the same lots as the whole milk.

For the benefit of those who are not familiar with chemical methods, it should be stated that the potassium, sodium, iron, etc., found in the ash were calculated as oxides. It is probable, however, that all the chlorine present is combined with these elements, and that the weight of the ash as calculated is too great by the amount of oxygen which would be replaced by the chlorine found. About 71 parts by weight of chlorine would replace 16 parts of oxygen. This correction is applied in all these tables.

Composition of Milk Ash—Holstein.

	One Hundred Parts of Ash Contained.					
	Jansje.		Agnes Smit.		Average.	
	Whole.	Skimmed.	Whole.	Skimmed.	Whole.	Skim'd.
Potash.........	26.49	26.67	27.23	27.12	26.86	26.89
Soda	8.88	7.35	9.37	9.19	9.12	8.27
Lime	21.94	22.70	19.65	19.93	20.79	21.31
Magnesia	3.25	2.71	2.47	2.39	2.86	2.55
Iron Oxide	.44	.52	.42	.25	.43	.39
Phosphoric acid..	26.11	26.49	29.63	29.47	27.87	27.98
Sulphuric acid ...	2.43	2.50	1.41	1.79	1.92	2.14
Chlorine	13.49	14.27	12.68	12.72	13.09	13.50
	103.03	103.21	102.86	102.86	102.94	103.03
Oxygen equiv'lent to chlorine	3.03	3.21	2.86	2.86	2.94	3.03
	100.00	100.00	100.00	100.00	100.00	100.00

Composition of Milk Ash—Ayrshire.

	One Hundred Parts of Ash Contained.					
	Nancy Avondale.		Queen Linda.		Average.	
	Whole.	Skimmed.	Whole.	Skimmed	Whole	Skim'd.
Potash..........	18.80	19.08	25.97	25.79	22.38	22.43
Soda............	11.72	9.90	7.62	7.72	9.67	8.81
Lime...........	26.85	27.13	24.05	23.98	25.45	25.55
Magnesia.......	3.10	2.77	2.34	2.53	2.72	2.65
Iron Oxide......	.39	.59	.19	31	.29	.45
Phosphoric acid..	25.52	26.53	30.31	29.40	27.92	27.97
Sulphuric acid...	3.21	3.26	1.38	1.76	2.29	2.51
Chlorine........	13.44	13.86	10.51	10.99	11.98	12.43
	103.03	103.12	102.37	102.48	102.70	102.80
Oxygen equiv'lent to chlorine....	3.03	3.12	2.37	2.48	2.70	2.80
	100.00	100.00	100.00	100.00	100.00	100.00

Composition of Milk Ash—Jersey.

	One Hundred Parts of Ash Contained.					
	Agnes.		Ida.		Average.	
	Whole.	Skimmed.	Whole.	Skimmed.	Whole.	Skim'd.
Potash..........	21.65	21.30	23.94	22.91	22.79	22.10
Soda............	7.79	7.65	8.94	8.50	8.37	8.08
Lime..........	25.58	25.45	22.13	22.93	23.85	24.19
Magnesia.......	2.50	2.68	2.59	2.49	2.55	2.57
Iron Oxide......	.46	.49	.20	.19	.33	.34
Phosphoric acid..	31.41	31.75	32.97	32.46	32.19	32.11
Sulphuric acid...	2.70	2.40	.93	1.92	1.81	2.16
Chlorine.......	10.21	10.70	10.71	11.10	10.46	10.91
	102.30	102.42	102.41	102.50	102.35	102.46
Oxygen equiv'lent to chlorine.....	2.30	2.42	2.41	2.50	2.35	2.46
	100.00	100.00	100.00	100.00	100.00	100.00

This work was undertaken in part to show the differences in composition which might be attributed to differences in breed. It is evident, however, that analyses from a larger number of cows would be necessary to give any conclusive results of this character. The potash and phosphoric acid seem to be the most variable constituents. It will be seen that the ash from the Holstein milk contains more potash than that from the other two breeds. On the other hand, the Jerseys show a much larger percentage of phosphoric acid than the others.

These differences are insignificant, however, when compared with the individual differences shown in the two Ayrshire cows, Nancy Avondale and Queen Linda. The small amount of potash in the case of the former seems to be compensated for in part by a correspondingly larger quantity of soda and lime. On the other hand, the ash from the milk of Queen Linda contains more phosphoric acid and less sulphuric acid and chlorine than that from the milk of Nancy Avondale.

Pounds of Ash Ingredients in 1000 Lbs. of Milk.

HOLSTEIN.

	Whole Milk.			Skimmed Milk.		
	Jansje.	Agnes Smit	Average.	Jansje.	Agnes Smit.	Average.
Potash	1.79	1.59	1.69	1.86	1.67	1.76
Soda	.60	.55	.57	.51	.56	.54
Lime	1.49	1.15	1.32	1.58	1.22	1.40
Magnesia	.22	.14	.18	.19	.15	.17
Iron oxide	.03	.02	.03	.04	.02	.03
Phosphoric acid	1.77	1.72	1.74	1.84	1.81	1.82
Sulphuric acid	.17	.08	.13	.17	.11	.14
Chlorine	.91	.74	.83	.99	.78	.79
	6.98	5.99	6.49	7.18	6.32	6.75
Oxygen equivalent to chlorine	.21	.17	.19	.22	.18	.20
	6.77	5.82	6.30	6.96	6.14	6.55

AYRSHIRE.

	Whole Milk.			Skimmed Milk.		
	Nancy Avondale.	Queen Linda.	Average.	Nancy Avondale.	Queen Linda.	Average.
Potash	1.33	1.61	1.47	1.37	1.68	1.52
Soda	.83	.47	.65	.71	.50	.61
Lime	1.91	1.49	1.70	1.95	1.57	1.76
Magnesia	.22	.15	.18	.20	.17	.18
Iron oxide	.03	.01	.02	.04	.02	.03
Phosphoric acid	1.81	1.88	1.85	1.91	1.92	1.92
Sulphuric acid	.23	.09	.16	.24	.11	.17
Chlorine	.95	.66	.80	1.00	.72	.86
	7.31	6.36	6.83	7.42	6.69	7.05
Oxygen equivalent to chlorine	.21	.15	.18	.22	.16	.19
	7.10	6.21	6.65	7.20	6.53	6.86

JERSEY.

	Whole Milk.			Skimmed Milk.		
	Agnes.	Ida.	Average.	Agnes.	Ida.	Average
Potash	1.69	1.79	1.74	1.78	1.76	1.77
Soda	.61	.67	.64	.64	.65	.64
Lime	1.99	1.66	1.82	2.12	1.76	1.94
Magnesia	.19	.19	.19	.22	.19	.21
Iron oxide	.04	.02	.03	.04	.02	.03
Phosphoric acid	2.45	2.47	2.46	2.65	2.50	2.57
Sulphuric acid	.21	.07	.14	.20	.15	.18
Chlorine	.79	.80	.80	.89	.85	.87
	7.97	7.67	7.82	8.55	7.88	8.21
Oxygen equivalent to chlorine	.18	.18	.18	.20	.19	.19
	7.79	7.49	7.64	8.35	7.69	8.02

Total Contents of Ash in the Milk of Each Cow for One Year —Holstein.

	Whole Milk.			Skimmed Milk.			Cream.
	Yield Milk —pounds.	Ash—per cent.	Total ash—pounds.	Yield milk —pounds.	Ash—per cent.	Total ash—pounds.	Total ash—pounds.
Jansje	9176	.677	62.13	7578	.696	52.75	9.38
Agnes Smit	7562	.583	44.00	6589	.614	40.45	3.55

Pounds of Ash Ingredients in Total Yield of Milk.

	Whole Milk.			Skimmed Milk.		
	Jansje.	Agnes Smit.	Average.	Jansje.	Agnes Smit	Average.
Potash	16.46	11.98	14.22	14.07	10.97	12.52
Soda	5.52	4.12	4.82	3.88	3.72	3.80
Lime	13.63	8.65	11.14	11.97	8.06	10.01
Magnesia	2.02	1.09	1.55	1.43	.97	1.20
Iron Oxide	.27	.18	.23	.27	.10	.19
Phosphoric acid	16.23	13.04	14.63	13.97	11.92	12.94
Sulphuric acid	1.50	.62	1.06	1.32	.72	1.02
Chlorine	8.39	5.58	6.99	7.53	5.14	6.34
	64.02	45.26	54.64	54.44	41.60	48.02
Oxygen equivalent to chlorine	1.89	1.26	1.57	1.69	1.15	1.42
	62.13	44.00	53.07	52.75	40.45	46.60

Ayrshire.

	Whole Milk.			Skimmed Milk.			Cream.
	Yield milk—pounds.	Ash—per cent.	Total ash—pounds.	Yield milk—pounds.	Ash—per cent.	Total ash—pounds.	Total ash—pounds
Nancy Avondale	6120	.710	43.46	5082	.720	36.58	6.88
Queen Linda	7105	.621	44.12	6147	.653	40.14	3.98

Pounds of Ash Ingredients in Total Yield of Milk.

	Whole Milk.			Skimmed Milk.		
	Nancy Avondale.	Queen Linda.	Average.	Nancy Avondale.	Queen Linda.	Average
Potash	8.17	11.46	9.81	6.98	10.35	8.66
Soda	5.09	3.36	4.23	3.62	3.10	3.36
Lime	11.67	10.61	11.14	9.92	9.63	9.78
Magnesia	1.35	1.03	1.19	1.01	1.02	1.01
Iron Oxide	.17	.08	.12	.22	.12	.17
Phosphoric acid	11.09	13.37	12.23	9.71	11.80	10.76
Sulphuric acid	1.40	.61	1.01	1.19	.71	.95
Chlorine	5.84	4.64	5.24	5 07	4.41	4.74
	44.78	45.16	44.97	37 72	41.14	39.43
Oxygen equivalent to chlorine	1.32	1.04	1.18	1.14	1.00	1.07
	43.46	44.12	43.79	36.58	40.14	38.36

Total Contents of Ash in the Milk of Each Cow for One Year.

Jersey.

	Whole Milk.			Skimmed Milk.			Cream.
	Yield milk, pounds.	Ash, per cent.	Total Ash, pounds.	Yield milk, pounds.	Ash, per cent.	Total Ash, pounds.	Ash, pounds.
Agnes	6540	.779	50.94	4979	.835	41.57	9.37
Ida	4381	.749	32.83	3373	.769	25.94	6.89

Pounds of Ash ingredients in Total Yield of Milk.

	Whole Milk.			Skimmed Milk.		
	Agnes, lbs.	Ida, lbs.	Average, lbs.	Agnes, lbs.	Ida, lbs.	Average, lbs.
Potash	11.03	7.86	9.44	8.85	5.94	7.39
Soda	3.97	2.94	3.46	3.18	2.20	2.69
Lime	13.03	7.26	10.15	10.58	5.95	8.27
Magnesia	1.27	.85	1.06	1.11	.65	.88
Iron Oxide	.23	.07	.15	.20	.05	.12
Phosphoric Acid	16.00	10.82	13.41	13.20	8.42	10.81
Sulphuric Acid	1 38	.31	.84	1.00	.50	.75
Chlorine	5.20	3.51	4.36	4.45	2.88	3.67
	52.11	33 62	42.87	42.57	26.59	34.58
Oxygen equivalent to chlorine	1.17	.79	.98	1.00	.65	.82
	50.94	32.83	41.89	41.57	25.94	33.76

In connection with these results it may be of interest to consider the amount of fertilizing materials contained in the ash of milk. Of these, the only constituents of importance are potash and phosphoric acids. The other ingredients are usually found in sufficient quantities in the soil, or are to be obtained so cheaply that it is not necessary to notice them here. From the preceding tables we find that the average amounts of potash and phosphoric acid contained in the milk of a single cow for one year are as follows:

	Potash.		Phosphoric Acid		Total Value.
	Pounds.	Value.	Pounds.	Value.	
Whole milk	11.16	$0.50	13.42	$1.07	$1.57
Skimmed milk	9.53	.43	11.50	.92	1.35
Cream, by difference	1.63		1.92		$0.22

These constituents are estimated at their market values, viz.: 4½ cents per pound for potash, and 8 cents per pound for phosphoric acid. If the whole milk from one of these cows were sold, it would carry from the farm potash and posphoric acid valued at $1.57. If only the cream were sold, the skimmed milk being used upon the farm, the loss for one cow would be but 22 cents.

The average amount of manure from one cow is estimated at nine tons, or two and one-fourth tons of dry matter. One ton contains about fifteen pounds of potash and seven pounds of phosphoric acid. The milk of a single cow, therefore, contained as much potash as three-fourths of a ton of the manure, and as much phosphoric acid as two tons.

As nitrogen is not contained in the ash, it has not been noticed here But in view of the fact that it is found in large quantities in milk and is the most valuable ingredient of manures it should be considered. Six thousand eight hundred and fourteen pounds of milk, the average product of one cow contains 37.48 pounds of nitrogen (.55 of one per cent) worth at least fifteen cents per pound, or $5.62 per year for the milk of a single cow. One ton of manure contains about twelve pounds of nitrogen, worth $1.80. The milk from a single cow, therefore, contains in one year as much nitrogen as three tons of manure. As in the case of the other constituents, however, the greater part of this is retained in the skimmed milk.

THE FAT GLOBULES OF MILK.

By L. H. Merrill.

The size of the fat globules in milk has an undoubted influence upon the completeness with which the cream separates. Prof. Babcock, in the Report of the New York Experiment Station for 1885, describes a method by means of which the relative number and size of the globules in different samples of milk may be ascertained.

Omitting details, the method is briefly this: Capillary tubes of glass are filled with a very dilute sample of the milk, temporarily mounted in glycerine and placed in a horizontal position until the globules have risen to the upper sides of the tubes. The slide is then placed upon the stage of a microscope, the internal diameter of the tube measured by an eye piece micrometer, and the number of globules in a given length of the tube counted. The results of a number of observations are calculated for a tube of uniform length and diameter. The figures thus obtained serve to show the *relative number* of globules in a given quantity of the sample. The *relative size* of the globules may be obtained by dividing the per cent of fat in the milk by the number of globules.

This method was applied in the examination of the milk of five of the Station cows, representing three breeds, Holstein, Jersey and Ayrshire. Samples of the whole and skimmed milk were taken on four successive days. Considerable variation was shown from day to day, yet the individual peculiarities were well marked, as is shown in the following table, which gives the average of the results for the four days:

Relative Number and Size of Globules in Milk.

	Relative number of globules.	Per cent fat.	Relative size of globules.
Jansje, whole milk	213	3.75	182
" skimmed milk	89	.70	81
Nancy Avondale, whole milk	293	3.75	130
" " skimmed milk	79	.43	55
Queen Linda, whole milk	188	3.32	178
" " skimmed milk	75	.47	65
Agnes, whole milk	138	4.57	332
" skimmed milk	19	.10	54
Ida, whole milk	140	5.29	390
" skimmed milk	24	.18	81

As might have been expected, the lager globules have gone into the cream, leaving only the smaller ones in the skimmed milk. In no case do these average one-half the size of those in the whole milk, and in the case of Agnes they are less than one-sixth as large. It is noticeable, also, that the globules in the milk of the two Jerseys, Agnes and Ida, are double the size of those of the other breeds, a fact which must in large part account for the ready creaming of this milk.

REPORT ON TUBERCULOSIS.

By Dr. F. L. Russell.

Last fall there were discovered among the herd of cattle at the State College farm two cases of tuberculosis. One was a year old Guernsey heifer, and the other was a six-year-old cow, the dam of the heifer. They were both killed and buried, but the occurrence has given rise to considerable comment, and reports have been circulated that were either untruths or but half truths, so that many have gained an entirely wrong conception of the whole matter. It is the purpose of this article to briefly state the simple facts pertaining to the subject.

In the spring of 1889, when funds become available for restocking the college farm, the trustees instructed three of their number, who constituted the farm committee, to make the purchases.

The farm committee acted upon the policy that has been adopted of having the different prominent breeds of cattle represented in the college herd, and bought two Jersey heifers, five Guernseys and three Holsteins; also six grade cows. There was already on the farm a Jersey bull belonging to the college, bred by J. R. Bremer, Hingham, Mass., (a cattle club bull) and in the Experiment Station herd two Jersey cows and a calf, two Ayrshire cows and a Holstein cow.

Four of the Guernseys, viz.: a five-year-old cow, Sard 4th, two two-year-old heifers, Velma 2d and Mayland Lady, and a year-old heifer, Margheita, were purchased the first of May, 1889, at Wayland, Mass., of Mr. Wm. P. Perkins. About the same time, the Holsteins consisting of a six-year-old cow, Nitalia, a four-year-old heifer, Agnes Smit, and a bull calf, Archer Aberdare, were purchased of Mr. Wm. A. Russell, No. Andover, Mass. The Guernsey bull, "Jack Stately" was bought of Mr. D. M. Clark of Portland, Me., the following December. The Jersey heifers were purchased in August, 1889, of Mr. Bailey of Winthrop, Me., and the grade cows were bought about the same time of different parties in Kennebec county.

After the Guernsey cow Sard 4th was purchased, but before she was moved, she dropped a heifer calf, so there were eight animals in the herd brought from Massachusetts in May, 1889, five Guernseys and three Holsteins.

When they arrived here I examined them with considerable care, and aside from Sard 4th's calf they seemed to be in excellent health. This calf was scouring badly when she came here, a natural result of the excitement and exposure to which Sard 4th was subjected in a long journey at that season of the year. With little treatment, except attention to her feed, the calf soon recovered, and although her growth was checked she soon began to gain again and continued to develop in a satisfactory manner.

When the trustees met the last of June, I made a favorable report to them on the condition of the herd. After receiving my report, the trustees instructed their secretary to request the State Veterinarian to examine the herd. The last of July, 1889, after the cattle had been here about two months, the State Veterinarian, Dr. Bailey of Portland, came to examine them. Although he informed me a few days in advance of his coming, I was away on my vacation and unable to meet him here. He pronounced the health of the herd entirely satisfactory with the exception of the temperatures of the three Guernsey heifers, Mayland Lady, Velma 2d and Margheite, which he thought slightly elevated, and he left word with Prof. Balentine for me to take them again at different times and report to him. I took the temperatures as requested four or five times during the next three months and communicated to him the results. In December, 1889, Dr. Bailey wrote to the Secretary of the Trustees that the herd was in a satisfactory condition of health, making no exceptions. In the meantime, two of the heifers had calved and were doing well, as they have continued to do up to the present time.

The first evidence that any of the stock was affected with tuberculosis was discovered October 18th, 1890. The Guernsey heifer, at this time a year old, that was brought here a young calf by the side of Sard 4th, was turned out in the spring of 1890 with four other heifers. She was seen frequently during the summer, and up to October 18th seemed to be doing finely. At this time she was found away from the other heifers and not feeding. She was evidently sick and was taken up to the barn. When my attention was called to her perhaps an hour later, I found her very gaunt but in good flesh.

Her temperature was 105° (F) but she had no appetite. But slight respiratory murmur could be detected on the left side and there was marked dullness on percussion. On the right side the respiratory murmur was much increased. She had a persistent hollow cough. The heifer was quarantined until October 31st, when the farm committee were here to attend a meeting of the Station Council, and then she was killed. In the meantime her appetite was irregular and she continually lost flesh and became weaker. Her temperature was taken frequently and varied from 101° to 105°.

When killed, her left lung was found adherent over a large part of its area and contained a large abscess with a capacity of nearly two quarts. Attached to the surface, and particularly within the substance of this lung, were many tubercles, varying from the size of a pea to that of a large goose egg. The right lung had a few small tubercles in its substance, but no abscesses. Attached to its inferior and posterior borders, also to the walls of the thorax and the right side, were many tubercles, most of them small. In the right thoracic cavity attached to the diaphragm was a mass of tubercles weighing over a pound. Many of the thoracic lymphatic glands were enlarged, and one of them contained an abscess of considerable size. The liver contained a number of small abscesses and had a few tubercles attached to its surface.

When this heifer was found to have tuberculosis, her dam Sard 4th was carefully examined and although up to this time she was considered perfectly sound and was in apparently fine condition, the examination revealed a little trouble in the left lung. When the heifer was killed and her condition ascertained, the Cattle Commissioners were notified as required by law, and two of the commissioners, Dr. Bailey and Mr. Beal, came here. At this visit they only examined Sard 4th, and they pronounced her diseased. November 10th, they came again to examine the rest of the herd.

At this second visit they examined Sard 4th again, after she had been exercised a little, but there was no apparent change for the worse. Indeed after taking her temperature, which was slightly below the normal, and carefully examining both lungs, Dr. Bailey said, "I should not be able to condemn her from what I have seen of her to-day."

Sard 4th was killed and the right lung appeared sound. The anterior lobe of the left lung was slightly adherent, contained a small tuberculous abscess, and adhering to its surface and within its substance were a number of small tubercles. The diseased portion of the lung was so far forward that the difficulty in detect-ing the extent of the disease in the living animal was accounted for. An examination of the rest of the herd failed to reveal any more diseased animals, although one heifer was regarded with some suspicion, which has not been confirmed by a more recent examination.

Thus it will be seen that we have had two cases of tuberculosis, Sard 4th and her calf, and the rest of the thirty animals in the herd are pronounced sound.

It may interest some to know what the cattle of the college have for feed. Sard 4th and the other mature cows giving milk have been fed two quarts of shorts and one of corn meal at a feed twice a day, and what good hay they would eat. The heifers are raised on skimmed milk and as soon as they are old enough a few shorts are given them and the amount gradually increased until it reaches two quarts when they are two years old. No corn meal or other grain than shorts is given to the heifers. In the summer all the stock is turned out to pasture and while the feed is good they get no grain.

The question very naturally arises, Where did these two animals contract tuberculosis? Were they diseased animals when they were brought here, but in so slight a degree that it could not be detected by a careful examination, or were they infected after they came?

That there is some ground for taking the latter view must be admitted. There is too much tuberculosis walking about in human form for us to be sure that any inhabited locality is free from the elements of infection, and no greater change than these animals underwent would probably render them somewhat more susceptible for a time. That there was sufficient time for these cases to develop as the result of infection after they were brought here is abundantly shown by the fact that very much the most advanced case of the two was brought here as a young calf. There is no conclusive evidence either one way or the other, so that if any one cares to think both cases were the result of accidental infection, occurring after they were brought here, there is no proof to the contrary. But much the more probable theory is that they were already infected animals when they came to Maine. Indeed, it is possible that the ultimate source of their disease is the native home of the Guernseys, as I understand that Sard 4th was imported in her dam. It is much more likely that Sard 4th conveyed the disease to her calf than that both of them contracted it independently and all the rest of the herd escaped, although exposed to the same danger.

The greater advance that the disease made in the heifer may be accounted for by her exposure to wet and cold, while her dam was housed every night. During the first part of October, before the heifer was found sick in the pasture, we had two or three long cold rains, and when the heifer was brought to the barn she was evidently suffering from a severe cold that doubtless hastened her decline.

We are frequently asked if there is danger that we will have more cases of the same kind. There can be but one answer to this question. We are liable to at any time, and the same possibility exists in relation to every herd of cattle in the State, though we do not regard this danger as very serious. But in one respect the college herd has the advantage of most other herds in the State, as these animals have been subjected to a rigid examination and pronounced sound, while a similar examination of all the cattle in the State would doubtless reveal some cases of tuberculosis that are not even suspected at present.

The idea seems to prevail that there is especial danger from tuberculous cattle, and on that account extraordinary efforts should be made to exterminate bovine tuberculosis. But the fact is we have little reason to suppose that much progress will be made in suppressing consumption and kindred tuberculous diseases so long as our efforts are confined to killing off diseased cattle. Indeed if it were possible to go through this State and all states and countries and kill all the cattle affected with any form of tuberculosis, but very little real progress would be made in stamping out the disease. If the disease were confined to cattle, this would be the very course to pursue. But this is only one of the measures to be adopted, and by no means the most important, in order to make any real progress in ridding ourselves of this deadly disease. Great stress is laid upon the fact that diseased cattle may convey tuberculosis to man; while the more important fact that consumptive men, by means of their sputum, which they spread broadcast wherever they go, may, and doubtless do, give tuberculosis to other men and cattle is often disregarded. Almost no effort is made to limit the danger from this source, which is regarded by the best informed as by far the most important means for the spread of tuberculosis.

In recent years great advance has been made in the knowledge of the cause of tuberculosis and the means by which it is spread; but it seems to me that boards of health and physicians are slow in putting this knowledge into practice in limiting the spread of disease. Persons affected with scarlet fever are kept carefully secluded with good results, while patients affected with the more surely fatal tuberculosis are permitted to live on terms of closest intimacy with their families, and to frequent public resorts without any limitations or attempt to guard others from infection As a result we see the members of large families falling victims to this disease one after another, and about one-tenth of the whole human race dying from this one disease. If Asiatic cholera should gain as many victims in one year as tuberculosis gains *every* year, it would be regarded as an alarming condition of affairs, and every available means would be used to check it.

We do not want to take any backward steps in the matter of controlling, and so far as possible exterminating, bovine tuberculosis, but this work is rendered of almost no avail so long as scarcely any measures are taken to limit human tuberculosis. No one who is acquainted with the facts will deny that a large proportion of human tuberculosis is preventable. An extreme conservatism and disregard of the value of human life should no longer be allowed to hinder the adoption of such practical means as will save countless lives. There are evident difficulties to be encountered in carrying out any effective measures, but they are not insurmountable, and the end to be attained will justify the adoption of radical measures for the good of humanity.

RELATIVE YIELD OF DIGESTIBLE MATERIAL IN EARLY-CUT AND LATE-CUT TIMOTHY HAY.

The old discussion with regard to the best time of cutting grass for the purpose of making hay, cannot be said to have ceased, neither can it be safely asserted that the problem involved in this discussion has been solved. To be sure, quite an amount of experimental work has been done with reference to this question, but this work, much of it, has not been especially exhaustive. We have contented ourselves with measuring out plots of grass of as uniform character as possible, cutting these plots at different periods of growth and weighing the resulting hay. This is good as far as it goes, in fact, up to a certain point, is the best we can do. The true standard for judging the production with any given crop, is the resulting amount of digestible material rather than the total weight of the crop. The writer believes that in testing this matter of the economical time for cutting grass, two things are essential in order to obtain reliable results.

(1) That a large number of tests shall be made, including a series of years.

(2) That not the weight of the crop merely, but the amount of digestible material shall be ascertained.

Investigations of this kind are now being conducted in accordance with the above views. Whatever tests are being made of production with any crop, are being made in this way. The following experiment is the second one undertaken by this Station, that has had for its object the determination of the amount of digestible material in early-cut and in late-cut Timothy hay. The first experiment is reported in the Station Report for 1889, pages 44 to 45. In the summer of 1889, fourteen equal sized plots of very uniform grass were measured out, ten of these plots being located in one field and four in another. The size of each of the ten plots was 30x50 feet, and of each of the other four plots, 33x90 feet. One-half of these plots was cut on July 1st and the other half on July 18th. At the first cutting the Timothy was in full bloom. The hay was successfully cured and was then stored in the Station barn after careful weighing. On April 7th, the two lots of the hay were re-weighed. Below can be seen the weights of the hay as put in the barn and on April 7th, together with the percentage of loss during the time of storage.

Yield of Early-cut and Late cut Timothy Hay.

	Yield of seven plots—lbs.	Yield per acre. Weight when stored—lbs.	Yield per acre. Weight dry hay April 7th—lbs.	Loss per acre by drying—lbs.	Per cent of loss after storage.
Early-cut Timothy, cut July 1......	1560	5070	4225	845	16.6
Late-cut Timothy, cut July 18......	1910	6208	5086	1122	18.1

This hay has not only been analyzed, but the digestibility has been determined by feeding to sheep. We have, therefore, as the total data by means of which to calculate the relative feeding value of the two lots of hay cut at different dates, its weight, composition and the digestibility of the various ingredients. All this data can be found in the following tables:

Composition of Timothy Hay.

	Per cent water.	Per cent ash.	Per cent protein Nx6 25.	Per cent fiber.	Per cent nitrogen-free extractive matter	Per cent fat.
CXIX, Timothy hay, early-cut.	10.40	4.86	7.06	32.51	41.67	3.50
CXX, Timothy hay, late-cut...	9.70	4.38	6.12	30.32	46.17	3.31

Composition of Feces.

	Per cent water.	Per cent ash.	Per cent protein.	Per cent fiber.	Per cent nitrogen-free extractive matter	Per cent fat.
Feces, sheep 1..............	8.45	6.42	7.81	33.15	40.93	3.24
" " 2..............	9.45	6.27	7.31	35.62	38.55	2.80
" " 3..............	8.70	6.49	8.19	32.31	41.19	3.12
" " 4..............	8.55	6.07	7.16	36.52	39.16	2.54

Digestibility of Timothy Hay.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extractive matter.	Fat.
CXIX, TIMOTHY HAY, early cut.							
Sheep 1.							
Fed in five days, grs.	3136.0	2965.0	170.1	247.1	1137.8	1458.4	122.5
Excreted in five days, grs.	1391.6	1293.9	97.6	118.7	503.8	622.1	49.2
Digested, grs.	1744.4	1671.1	72.5	128.4	634.0	836.3	73.8
Per cent digested	55.6	56.4	42.6	51.9	55.8	57.3	59.8
Sheep 3.							
Fed in five days, grs.	3136.0	2965.0	170.1	247.1	1137.8	1458.4	122.5
Excreted in five days, grs.	1369.5	1272.1	97 3	122.8	484.6	617.8	46.8
Digested	1766.5	1692.9	72.8	124.3	653.2	840.6	75.7
Per cent digested	56.3	57.1	42.8	50.3	57.4	57.6	61.8
Av. per cent digested by 2 animals	5.95	56.7	42 7	51.1	56 6	57.4	60.8
CXX, TIMOTHY HAY, late cut.							
Sheep 2.							
Fed in five days, grs.	3160.5	3007.2	153.3	214.2	1061.2	1615.9	115.8
Excreted in five days, grs.	1512.2	1407.5	104.7	122.1	594.8	643.7	46.8
Digested	1648.3	1599.7	48.6	92.1	466.4	972.2	69.0
Per cent digested	52.1	53 1	31.7	42.9	43.9	60.1	59.6
Sheep 4.							
Fed in five days, grs.	3160.5	3007.2	153.3	214.2	1061.2	1615.9	115.8
Excreted in five days, grs.	1673.5	1562.4	111.1	131.0	668.3	716.6	46.5
Digested	1487.0	1444.8	42.2	83.2	392.9	899.3	69.3
Per cent digested	47.0	48.4	27.5	38.8	37.2	55.6	59.8
Av. per cent digested by 2 animals	49.5	50.7	35.1	40.8	40.5	57.8	59.7

It seems that the yield per acre of the grass cut on July 1st, was 4,225 pounds of dry hay, and of that cut July 18th, 5,086 pounds. As would be expected from all previous analyses, the early-cut hay proved to be the more nitrogenous and also the more digestible. From the early-cut hay 56.07 per cent of the organic matter was digested and from the late-cut hay only 50.70 per cent. Of total digestible material the late-cut hay proved to contain the more, the amounts per acre being, early-cut 2,028 and late-cut 2.212 pounds. These figures stand somewhat in opposition to those obtained from the crop of 1888, where the larger amount of digestible material was obtained from early-cut hay. It is only by repeating these tests and taking an average of a series of years that we shall obtain results that will apply to practice.

FEEDING EXPERIMENT WITH COLTS.

The object in view in conducting this experiment was to determine the relative economy of feeding oats for producing growth in colts, as compared with certain other commercial foods. The grain ration selected with which to make a comparison with oats was a mixture of pea meal and wheat middlings. The animals selected for the experiment were three grade Percheron colts of the following ages at the time the experiment was begun:

Colt No. 1, bay filly, age, 18 months.
" 2, black gelding, age, 16 months.
" 3, gray filly, age, 9 months.

These animals were fed through three periods, during the first of which they received hay and a grain ration made up of one-third pea meal and two-thirds wheat middlings. During the second period they received hay and for the grain ration oats alone. During the third period they were returned to the mixture of pea meal and middlings, which was mixed in the proportion of one part pea meal to four of middlings. Below are given the exact weights of hay and grain fed daily during each of the three periods.

	Colt No. 1.	Colt No. 2.	Colt. No. 3.
Period 1, Feb. 13 to April 2,	15 lbs. hay. 8 lbs. mixed grains.	14 lbs. hay. 7 lbs. mixed grains.	12 lbs. hay. 6 lbs. mixed grains.
Period 2, Apr. 3 to May 28,	15 lbs. hay. 8 lbs. oats	14 lbs. hay. 7 lbs. oats	12 lbs. hay. 6 lbs. oats.
Period 3, May 29 to July 2,	15 lbs. hay. 8 lbs. mixed grains.	14 lbs. hay. 7 lbs. mixed grains.	12 lbs. hay. 6 lbs. mixed grains.

The weights of these colts were obtained at the beginning and end of each feeding period, and those recorded here are the average of three weighings taken on three consecutive days.

	Colt No. 1, pounds.	Colt No. 2, pounds.	Colt No. 3, pounds.
PERIOD 1. *Hay, Peas and Middlings.*			
Weight February 13th to 15th	922	767	612
" March 3d to April 2d	977	827	658
Gain in 46 days	55	60	46
Daily gain	1.19	1.30	1.00
PERIOD 2. *Hay and Oats.*			
Weight March 3d to April 2d	977	827	658
" May 26th to 28th	1042	867	713
Gain in 56 days	65	40	55
Daily gain	1.16	.71	.98
PERIOD 3. *Hay, Peas and Middlings.*			
Weight May 26th to 28th	1042	867	713
" June 30th to July 2d	1053	918	748
Gain in 35 days	11	51	35
Daily gain	.31	1.46	1.00

	Average weight of Animals—lbs	Digestible material consumed daily—lbs.	Digestible material consumed daily for each 1000 lbs. live weight—lbs.	Nutritive ratio.	Daily gain in weight—lbs.	Digestible material consumed for each pound of gain—lbs.
PERIOD 1. (46 days)						
Colt 1	950	12.9	13.6	1:7.2	1.19	10.9
" 2.	797	11.8	14.8	1:7.3	1.30	9 0
" 3	635	10.1	15.7	1:7.3	1.00	10.1
Average	794	11.60	14.70		1.16	10.00
PERIOD 2. (56 days)						
Colt 1	1009	12.2	12.1	1:8.3	1.16	10.5
" 2	847	10.9	12.9	1:8.4	.71	15.4
" 3	685	9.4	13.7	1:8.4	.98	9.6
Average	847	10.80	12.9		.95	11.4
PERIOD 3. (35 days.)						
Colt 1	1047	12.87	12.3	1:7.5	.31	41.00
" 2	892	11.69	13.1	1:7.6	1.46	8.00
" 3	730	10.00	13.7	1:7.7	1.00	10.00
Average	890	11.52	13.0		.92	12.5

Unfortunately the growth of these colts was somewhat irregular, so that the results do not allow as definite conclusions as would otherwise be the case. It is especially noticeable that in the third period animal No. 1 made a very small growth, a fact which is due to some cause that is not evident. But notwithstanding this irregularity of increase in weight, the outcome of the experiment is such as to show no superiority for the oats as food for producing growth merely. In fact, if anything is indicated it is that the advantage was with the mixture of peas and middlings. A gradual decrease in the average daily growth in passing from one period to another, may be fairly charged to the increase in the weight of the animal without a corresponding increase of the amount of food. Granting that the ration of mixed grains was not inferior, at least, to the ration of oats for producing growth, the important question then becomes that of the relative cost of the two rations. Of course the peas were a costly food and were used in the case of this experiment merely because they constituted a nitrogenous food which is a perfectly safe one for horses. It is fair to assume that gluten meal would have answered the purpose equally well. Now a mixture of gluten meal and wheat middlings, if in the same proportion and quantity as were the peas and middlings in the first period, would cost about eleven cents a day, whereas an equal weight of oats would cost about sixteen cents a day, basing our estimates of course upon the present prices of grain. With different prices for grain, the relative cost of the feed rations might not be the same. The lesson of the experiment is then, if it is fair to draw any lesson from it, that unless oats are essential for producing a desired quality in the growing colt, a grain ration of any other kind is likely to be much more economical. This experiment is to be repeated with other animals, using gluten meal and middlings for the mixed grain ration.

FEEDING EXPERIMENT WITH STEERS.

In the fall of 1888, a feeding experiment was undertaken with six steers which had a two-fold object.

(1) To test the relative growth of steers of different breeds when feeding rations of the same character.

(2) To determine the effect of two rations having quite different nutritive ratios, when these rations are fed for a long period of time or until the animal is quite fully matured.

The breeds represented in the experiment were Holstein, Shorthorn and Hereford, two animals of each being used. The history and age of the animals were as follows:

Holstein No. 1 ..	Age, 6½ months..	Bred by Charles H. Fitch, Pepperell, Mass.
" " 2 ..	" 5 " ..	" Maine State College.
Shorthorn No. 3..	" 7 " ..	" E. E Parkhurst, Presque Isle, Me.
" " 4..	" 7 " ..	" Howard & Ellis, Fairfield, Me.
Hereford No. 5 ..	" 8 " ..	" M. M. Bailey, Winthrop, Me.
" " 6 ..	" 6½ " ..	" A. J. Underwood, Fayette, Me.

The experiment began early in November, 1888, when the animals were from five to eight months old. Three of the steers, one from each breed, were fed hay, mostly Timothy, and a grain ration consisting of equal parts of cotton seed meal, ground oats and wheat bran. The other three steers. one from each breed, were fed hay, and a grain ration consisting of equal parts of corn meal, ground oats and wheat bran. The animals were fed in this manner throughout the time the experiment was continued, excepting that in the following spring a portion of the hay was replaced by a certain amount of corn ensilage.

It would be gratifying to be able to report this experiment as having been completed in accordance with the original plans, but owing to a surprising number of accidents this cannot be done. Early in the summer of 1889 one of the Holstein steers received an injury which interfered with his growth, and in the following October a workman employed in painting the new Station barn carelessly left a pot of paint sitting in the yard where the steers were running, from which two of them drank more or less, thus causing their death. For these reasons it is impossible to report the experiment later than July 27th, 1889. The results that were obtained are given here, not because of having any special value as a comparison of breeds, but because they give important testimony in regard to one of the prominent problems in animal nutrition.

The quantity and kinds of food eaten by each animal are shown in the following table:

The hay was fed according to the appetites of the steers, but of the grain a weighed quantity was given each day, the amount being three pounds daily per animal during the first five months of the experiment, and four pounds during the last three months.

It is to be noticed that the amount of food consumed by the different animals did not vary greatly.

Food Consumed by Steers, November 7th to June 27th, 233 days.

	Holstein.		Shorthorn.		Hereford.	
	Steer 1, lbs.	Steer 2, lbs.	Steer 3, lbs.	Steer 4, lbs.	Steer 5, lbs.	Steer 6, lbs.
Hay	2340	2220	2168	2275	2240	2235
Cotton-seed meal	272	-	272	-	272	-
Ground oats	272	272	272	272	272	272
Wheat bran	273	273	273	273	273	273
Corn meal	-	272	-	272	-	272
Ensilage	1894	1841	1871	1878	1844	1770
Hay eaten daily (average)	10.0	9.5	9.3	9 8	9.6	9.6
Grain eaten daily (average)	3.5	3.5	3.5	3.5	3.5	3.5
Ensilage eaten daily (average)	8.1	7.9	8.0	8.0	7.9	7.6

The figures of the next table show the weights of the animals at the beginning and at the end of the experiment, the total gain in weight and the average daily gain.

	Holstein		Shorthorn.		Hereford.	
	Steer 1. lbs.	Steer 2, lbs.	Steer 3, lbs.	Steer 4, lbs.	Steer 5, lbs.	Steer 6, lbs.
Weight of steers Nov. 7-9	380	332	342	413	459	429
" " " June 25 26	822	720	707	808	802	791
Gain in 233 days	444	388	365	395	343	362
Daily gain	1.90	1.66	1.57	1.70	1.47	1.55

If this experiment were to be considered as a fair trial of breeds, it would be necessary to state that the Holstein steers made the largest growth and the Hereford the least, but it would be decidedly unfair to assume that in a two years' test the relative growth would stand in the same order. The amount of growth was very satisfactory with all the animals, ranging from 1.46 pounds per day with one of the Herefords to 1.9 pounds per day with one of the Holsteins, the average for the six animals being 1.64 pounds.

The most important testimony which this experiment gives is in regard to the influence of the kind of food upon the amount of growth produced. As before stated, three of the animals, one from each breed, were fed a much more nitrogenous ration than were the other three. Those animals which ate cotton seed meal in the place of corn meal were the ones consuming the larger amount of protein, and if it were true that any deviation from the standards given in German tables is detrimental to the nutritive effect of the ration, the more highly protein fed steers should have made much the larger gain. This we do not find to be the case. The Holstein steer eating the cotton seed meal made a greater gain than the one eating corn meal, but in the case of the steers of the other two breeds this order was reversed. There are, however, no marked differences in the rates of growth, except possibly, with the two Holstein animals. The nutritive ratio of the ration containing cotton seed meal was 1 :6.7 and of the other ration made up in part of corn meal it was 1 :10

The figures below were reached by assuming the foods to have an average composition. The coefficients of digestibility used for the hay and bran, were those that have been found by experiments at this Station, but for the corn meal and cotton seed meal they were taken from the table of German coefficients. The hay was assumed to be all Timothy, whereas it actually contained a very small amount of Alsike clover, which would of course make the nutritive ratios slightly narrower than those given, although not affecting them relatively.

	Holstein.		Shorthorn.		Hereford.	
	Steer 1, lbs	Steer 2, lbs.	Steer 3, lbs.	Steer 1, lbs	Steer 5, lbs.	Steer 1, lbs
Digestible protein consumed	258.3	174 0	252.4	176.0	251.1	173.0
Digestible nitrogen-free extract consumed including fiber	1478.00	1537.9	1402.9	1563.2	1434.1	1535.1
Digestible fat consumed	100.9	77.4	98.3	78.2	99.4	77.1
Total digestible material retained..	1837.2	1789.3	1753.6	784.6	817.4	1785.2
Nutritive ratio	1:6.7	1:9.9	1:6.5	1:10	1:6.7	1:10
Digestible material eaten daily	7.90	7.7	7.5	7.8	7.7	7.7
Digestible material eaten for 1000 pounds live weight	13.2	14.6	14.3	12.8	12.2	12.6
Digestible material eaten for each pound of gain	4.16	4.61	4.80	4.60	5.2	4.9

	Pounds of nutrients fed daily for each 1000 lbs. live weight.			Total nutrients—lbs.	Nutritive ratio—lbs.	Daily gain—lbs.
	Protein.	Carbohydrates.	Fat.			
Steer No. 1	1.78	10.6	.72	13.2	1:6.7	1.90
" " 2	1 42	12.5	.63	14.6	1;9.9	1.66
" " 3	2.06	11.4	.80	14.3	1:6.5	1.57
" " 4	1.23	11.0	.55	12.8	1:10	1.70
" " 5	1.71	9.8	.68	12.2	1:6.7	1.47
" " 6	1.21	10.8	.54	12.6	1:10	1.55
German Standard, animals 6 to 12 months old	2.50	13.5	.60	16.6	1:6	
German Standard, animals 12 to 18 months old	2.00	13.0	.40	15.4	1:7	

The figures in the last of the above tables were arranged so as to show clearly how the rations fed to these steers compare with the standard German rations for growing animals. In order to make this comparison easy there has been calculated the pounds of the various nutrients fed to each animal for 1,000 pounds live weight. Two things are noticeable :

(1) That in no instance was the total amount of digestible nutrients so large as called for in the standard rations, and (2) there was no case where the proportion of digestible protein was as large. In three cases the amount of protein fell very much below the theoretical ration. Of course if the total amount of digestible material had been larger, gain would in all probability have been greater, and in this respect the German standard is very likely nearer right than the rations actually fed. However this may be, it cannot be doubted that the experiment adds much to the increasing volume of testimony that for growing animals so large an amount of digestible protein is not necessary as is called for by the German standards. While there is undoubtedly a limit which we cannot fall below without seriously affecting the efficiency of the ration, that limit is unquestionably considerably below two and one-half pounds of digestible protein daily for each 1,000 pounds of live weight.

Whether or not any special care is necessary to prevent an unbalanced ration, or whether the ordinary cattle foods may be combined indifferently without regard to their composition, there being no danger of a deficiency of protein in any case provided the animals are fed generously, is a question to be settled by future careful investigation What is found to be most economical in feeding for growth may not, and does not seem likely to be true, in feeding milch cows.

FEEDING EXPERIMENT WITH DIFFERENT BREEDS OF SWINE.

The following breeds of swine were represented in this experiment: Berkshire, Cheshire, Poland China, Chester White and Yorkshire. Two animals were used of each breed, one male and one female, both of which were from the same litter.

The persons of whom the pigs were purchased and the ages of the animals at the time of beginning to feed them, were as follows: Berkshire, bought of J. W. True, New Gloucester, Me., age, six weeks; Cheshire, bought of C. C. Phelps, Vernon, N. Y., age, eight weeks; Poland China, bought of Hon. Rufus Prince, South Turner, Me., age, six weeks; Chester White, bought of F. J Fogg, Dexter, Me., age, five weeks; Yorkshire, bought of B. F. Briggs, Auburn, Me., age five weeks.

As can be seen farther on, the feeding began the last of April and the first of May. The food of the pigs consisted of skimmed milk and wheat middlings throughout the entire experiment, with the exception of a small amount of Hungarian grass and corn fodder which were fed in September. On August 20th, one of the Berkshire pigs appeared to be somewhat lame, and a few days later her appetite began to diminish. Late in October, one Poland China and one Chester White began to be lame and exhibited a poor appetite. The Cheshires and Yorkshires continued to be in perfect condition throughout the entire experiment and showed greater power to withstand confinement and high feeding than did the animals of the other three breeds. It is not claimed, however, that this is a general characteristic of these breeds. This experiment was divided into three periods, the first of which ended on August 2d, at the time when the amount of skimmed milk was considerably diminished. The second period extended from August 3rd, to September 6th, at which latter date the amount of milk was again diminished. From September 7th, to the end of the experiment constitutes the third period, during which time but little milk was fed, wheat middlings constituting nearly the entire amount of feed, although during this time 150 pounds of Hungarian grass and corn fodder were given each lot of animals.

The first table which follows gives the weights of the pigs at the beginning and end of each feeding period, the increase in weight of each lot for each period, as well as the daily rate of gain. The average rate of gain throughout the entire experiment is also stated.

Growth of Various Breeds of Swine.

	Lot 1—Berkshire.	Lot 2—Cheshire	Lot 3—Poland China.	Lot 4—Chester White.	Lot 5—Yorkshire.
Period I:					
Date of beginning to feed	Apr. 23	Apr. 23	May 3	May 3	May 10
Weight of pigs at beginning—lbs. ..	26	66	31	30	30
Weight of pigs August 2d—lbs......	232	263	211	217	197
Gain in weight—lbs.	206	197	180	187	167
Number of days fed	102	102	92	92	85
Daily gain—lbs.	2.02	1.93	1.95	2.03	1.97
Period II:					
Weight of pigs August 2d—lbs. ...	-	263	211	217	197
Weight of pigs September 6th—lbs..	-	396	316	326	314
Gain in weight—lbs.	*76	133	105	109	117
Daily gain (35 days)	2.2	3.8	3.0	3.1	3.3
Period III:	Nov. 15	Nov. 26	Oct. 25	Oct. 25	Nov. 20
Weight of pigs, ending Sept 6—lbs.,	188	396	316	326	314
Weight of pigs, ending Sept 6—lbs.,	245	602	388	410	476
Gain in weight—lbs.	**57	206	72	84	162
Number of days fed................	70	81	49	49	75
Daily gain—lbs....................	.8	2.5	1.4	1.7	2.2
Total gain in three periods—lbs.	*339	536	357	380	446
Total number days fed	207	218	176	176	195
Daily gain of one animal—lbs	1	1.23	1.01	1.08	1.14

*Only one animal after August 22d.

**Only one animal

In the second table can be seen the weights of milk and middlings that were fed during each period.

Amounts of Food Consumed by Various Breeds of Swine.

	Lot 1—Berkshire.	Lot 2—Cheshire.	Lot 3—Poland China	Lot 4—Chester White.	Lot 5—Yorkshire
Period I:					
Total milk fed—lbs	1286	1286	1186	1186	1116
Total middlings fed—lbs.	376	459	366	362	353
Period II:					
Total milk fed—lbs	396	438	438	438	438
Total middlings fed—lbs	238	415	320	320	320
Period III:					
Total milk fed—lbs	91	182	182	182	182
Total middlings fed—lbs.	337	1087	455	427	721
Hungarian grass—lbs.	60	90	90	90	90
Fodder corn—lbs.	30	60	60	60	60
Milk fed in three periods—lbs.	1773	1906	1806	1806	1736
Middlings fed in three periods—lbs.	951	1961	1141	1109	1394

In the third table we have given the total amount of digestible food consumed by each lot of animals, and also the amount of digestible food required in each case to produce one pound of growth.

Relation of Growth to Food with Various Breeds of Swine.

	Lot 1—Berkshire.	Lot 2—Cheshire.	Lot 3—Poland China	Lot 4—Chester White.	Lot 5—Yorkshire.
Period I (to August 2d):					
Gain in weight—lbs.	206	197	180	187	167
Total digestible material eaten—lbs,	378	435.2	361.9	359.1	346.4
Lbs. digestible food for each lb gain,	1.83	2.21	2.01	1.98	2.08
Period II (August 3d to Sept. 6th):					
Gain in weight—lbs.	76	133	105	109	117
Total digestible material eaten—lbs.,	200.6	326.4	261	261	261
Lbs. digestible food for each lb. gain,	2.64	2.46	2.48	2.40	2.23
Period III (Sept. 6th to completion):					
Gain in weight—lbs.	57	206	72	84	162
Total digestible material eaten—lbs.,	252.6	785.1	349.7	330.4	532.97
Lbs digestible food for each lb gain,	4.43	3.81	4.85	3.93	3.29
Total gain in weight—lbs.	339	536	357	380.	446
Total digestible food eaten—lbs.	831.2	1546.7	972.6	950.5	1140.4
Digestible food consumed for each lb. gain—lbs.	2.45	2.88	2.73	2.50	2.5

In commenting upon these results it should be remarked in general, that no striking differences are observed in the rate of growth, or in the relation of the amount of food to growth, with these several breeds of swine.

(1) The daily rate and growth of our animal is seen to have been: Cheshires, 1.23 pounds; Yorkshire, 1.14 pounds; Chester White, 1.08 pounds; Poland China, 1.01 pounds; Berkshire 1 pound.

(2) It does not appear that the animals growing most rapidly required the least food for a pound of growth. The weights of digestible foods consumed for each pound of growth made are the following: Cheshire, 2.88 pounds; Poland China, 2.73 pounds; Yorkshire, 2.55 pounds; Chester White, 2.5 pounds; Berkshire, 2.45 pounds. Although the Berkshire pigs made the smallest gain they required the least food for each pound of growth, and the Cheshire making the largest gain consumed the most food for each pound of increase of weight.

(3) A careful study of the first of the above tables shows plainly that the ratio of food to growth was very different during the early part of the experiment from what it was the latter part. In Period 1, including approximately the first one hundred days of the experiment, not far from two pounds of digestible food produced one pound of growth, while during the last fifty days, or thereabouts, the ratio was four pounds of digestible food to one of growth. The ratio of the second period stands between those of the first and third.

(4) It is worth remarking that certain of the animals, notably the Berkshires and Chester Whites, made during the first three months a larger percentage of their entire growth than did the other breeds. The difference, however, is not very marked.

FERTILIZER EXPERIMENTS.

Prof. WALTER BALENTINE.

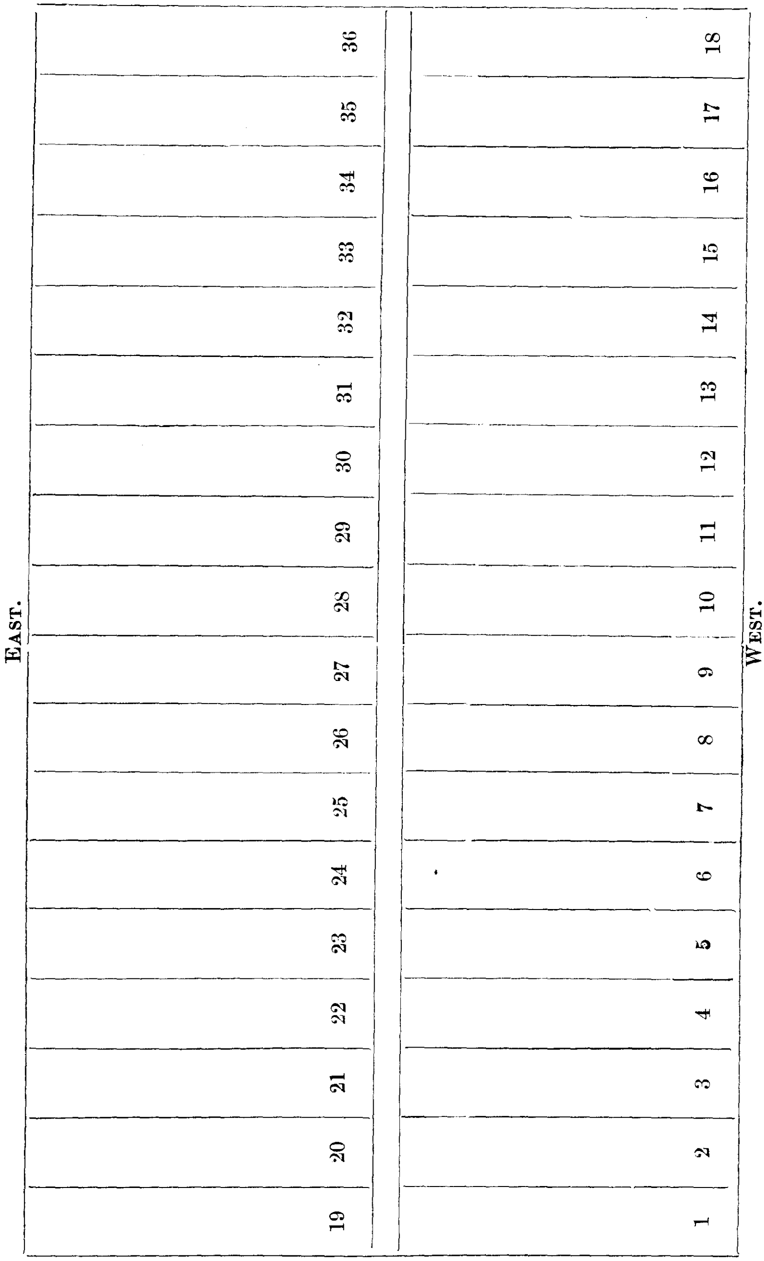
EFFECT OF DIFFERENT FORMS AND MIXTURES OF FERTILIZERS.

In 1886 the Station commenced a series of plot 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 partial as compared with complete fertilizers; (4) A comparison of the effect of different quantities of fertilizers.

The soil selected for this work is a clay loam situated near the southern boundary of the college farm. This field was laid off into thirty-six plots, as shown in the diagram. Each plot contains one-twentieth of an acre, being eight rods long by one rod wide. They are separated by strips of land eight feet wide, through which runs a ditch sufficiently deep to take off all surface water. At the commencement of the experiment the ground was in condition to produce a fair crop of grain. For further information in regard to the state of cultivation of this field at that time, see Station Report for 1886.

DIAGRAM OF EXPERIMENTAL FIELD No. 1.

SOUTH.



NORTH.

On the first year of the experiment the plots were manured as indicated in the following table, three plots in each case receiving the same treatment as to fertilizers. The entire field was seeded to oats, the plots receiving the same cultivation.

Plot 1 " 7 " 13	Received no fertilizer.
Plot 2 " 8 " 14	Dissolved bone black, 400 lbs. per acre. Muriate of potash, 100 lbs. per acre. Sulphate of ammonia, 200 lbs. per acre.
Plot 3 " 9 " 15	Fine ground bone, 360 lbs. per acre. Muriate of potash, 100 lbs. per acre. Sulphate of ammonia, 140 lbs. per acre.
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 lbs. per acre.
Plot 22 " 28 " 34	Dissolved bone black, 200 lbs. per acre. Muriate of potash, 50 lbs. per acre. Sulphate of ammonia, 60 lbs. per acre.
Plot 23 " 29 " 35	Dissolved bone black, 300 lbs. per acre. Muriate of potash, 100 lbs. per acre. Sulphate of ammonia, 120 lbs. per acre.
Plot 24 " 30 " 36	Dissolved bone black, 400 lbs. per acre. Muriate of potash, 150 lbs. per acre. Sulphate of ammonia, 180 lbs. per acre.

On the second year of the experiment the same kinds of fertilizers were applied and again a crop of oats was raised. With the oats, the second year, grass seed was sown, so that in 1888 or the third year, the field was in grass and no fertilizers were used.

The results of these three seasons of cropping are to be found in the Station Reports for the corresponding years. In 1889, the fourth year of the experiment, fertilizers were applied again as in the years 1886 and 1887, and the field was planted to corn, but the season was such as to render it apparent that the crop would not be a success, hence the land was summer tilled.

The fifth year (1890) a crop of pease was grown on the field without the further addition of fertilizers.

In table A are given the results obtained from the first tier of plots. These furnish data on the comparative value of soluble phosphoric acid in dissolved bone black and the insoluble phosphoric acid in fine ground bone and fine ground South Carolina rock, also on the comparative value of commercial fertilizers and stable manure.

Both of these points are of great practical importance. The phosphoric acid of dissolved bone black is soluble but more expensive than the insoluble phosphoric acid of fine ground bone and South Carolina rock. It is believed that a large portion of the soluble phosphoric acid becomes insoluble in water soon after application to the soil. On the other hand, it is believed that there are agencies at work in the soil which make the phosphoric acid of the mineral phosphate more available for plants as time goes on.

The question naturally arises whether manuring continuously with insoluble mineral phosphate might not from a financial standpoint prove more advantageous.

It often happens that a farmer finds it desirable to cultivate more land than he can manure well with the farm manures he has at hand, and the question arises whether it will be better to purchase stable manure at a neighboring village, or to make up the deficiency with commercial fertilizers.

Table A.

	No manure.		Dissolved bone black, 400 lbs.; muriate of potash, 100 lbs., and sulphate of ammonia, 200 lbs. per acre.		Fine ground bone, 360 lbs.; muriate of potash, 100 lbs., and sulphate of ammonia, 140 lbs per acre.		Fine ground South Carolina Rock, 300 lbs.; muriate of potash, 100 lbs., and sulphate of ammonia, 200 lbs. per acre.		Muriate of potash, 100 lbs., and sulphate of ammonia, 200 lbs. per acre.		Stable manure, 40,000 lbs. per acre.	
	Lbs. pease	Lbs. straw.	Lbs. pease.	Lbs. straw.	Lbs. pease.	Lbs. straw.	Lbs. pease	Lbs. straw	Lbs pease.	Lbs. straw.	Lbs. pease	Lbs. straw.
Plot 1.....	38.0	38.0										
7.....	35.5	33.5										
13.....	38.0	28.0										
Plot 2.....	-	-	47.0	42.0								
8.....	-	-	43.0	37.0								
14.....	-	-	45.5	48.3								
Plot 3.....	-	-	-	-	47.5	48.7						
9.....	-	-	-	-	46.0	45.0						
15.....	-	-	-	-	48.3	52.7						
Plot 4.....	-	-	-	-	-	-	35.5	39.0				
10....	-	-	-	-	-	-	53.3	46.7				
15.....	-	-	-	-	-	-	40.0	51.5				
Plot 5.....	-	-	-	-	-	-	-	-	36.3	34.3		
11.....	-	-	-	-	-	-	-	-	37.0	18.0		
17	-	-	-	-	-	-	-	-	41.0	46.7		
Plot 6.....	-	-	-	-	-	-	-	-	-	-	74.0	58.5
12.....	-	-	-	-	-	-	-	-	-	-	69.0	62.0
18.....	-	-	-	-	-	-	-	-	-	-	61.0	71.9
Average,	37.11	33.2	45.1	47.4	47.3	48.8	42.4	45.7	38.1	33.0	68.0	64.1

Table A shows, that of the phosphates applied to this field with this crop, fine ground bone gave the highest yield of peas, while dissolved bone black stood next, the lowest yield being with the South Carolina rock. The table also shows that muriate of potash and sulphate of ammonia have little or no effect when applied alone, and that by far the largest yield of peas was obtained from the plots manured with stable manure.

Table B gives the average yield in bushels of the sets of three plots subjected to the different methods of manuring, and also shows the cost of the gains due to the phosphates and the stable manure.

Table B.

	Fertilizers per acre, in pounds.	Average yield of peas per acre, in bushels.	Average yield of straw per acre in pounds.	Average increase of peas per acre in bushels.	Average increase of straw per acre in pounds.	Cost of increase due to phosphoric acid.	Cost of increase per bushel.
Nothing..............	-	12.3	660				
Dissolved bone black .. Muriate of potash .... Sulphate of ammonia..	400 100 200	15.0	840	2.3	180	$5 20	$2 26
Fine ground bone..... Muriate of potash..... Sulphate of ammonia ..	360 100 140	15.7	980	3.00	320	5 04	1 68
Fine ground S. C. rock, Muriate of potash..... Sulphate of ammonia..	300 100 200	14.3	840	1.60	180	2 40	1 50
Muriate of potash..... Sulphate of ammonia..	100 200	12.7	660				
Stable manure	40000	22.7	1280	10.0	620	20 00	1 87

In table B it has been assumed that all gains on the plots to which phosphates were applied, above what was produced on the plots manured with sulphate of ammonia and muriate of potash, were due to the phosphates, and that the increase on the stable manure plots over the unmanured plots was due to stable manure.

Practieally the entire gain of the plots to which phosphates were applied was due to phosphoric acid, as the plots receiving no fertilizers produced as great a yield of peas as the plots receiving muriate of potash and sulphate of ammonia.

The cost of gain is based on the following prices: $26.00 per ton for dissolved bone black, $28. per ton for fine ground bone and $16.00 per ton for fine ground South Carolina rock. The price of the South Carolina rock is much too high in comparison to the other phosphates but is what was actually paid in this case. The cost of the increase produced by the stable manure is reckoned on a basis of one dollar per ton for the manure.

The crop of peas on these plots would probably have been much larger had it not been for the severe cold rains in the early part of the season, which proved damaging to most crops during the year 1890.

Table C shows the method of manuring and the crop produced in studying the question of partial and complete fertilization, *i. e.*, in studying the question whether in all cases it will be more profitable to apply nitrogen, phosphoric acid and potash or to omit one or two of these substances.

This question is one into which every farmer in the State who uses commercial fertilizer should inquire. The standand brands of commercial fertilizers contain all three of the above named substances, and it may happen that only one of them is of use to him. In such a case the cost of the crop has been unnecessarily increased by what he has paid for the fertilizing elements that have not materially added to the yield of his land.

Table C.

		No manure.		Muriate of potash 100 lbs., and sulphate of ammonia 200 lbs. per acre.		Dissolved bone-black 400 lbs per acre.		Dissolved bone-black 400 lbs., and muriate of potash 100 lbs., per acre.		Dissolved bone-black 400 lbs., muriate of potash 100 lbs., and sulphate of ammonia 200 lbs. per acre.		Dissolved bone-black 400 lbs., muriate of potash 150 lbs., and sulphate of ammonia 180 lbs. per acre.	
		Peas, pounds.	Straw, pounds,	Peas, pounds.	Straw, pounds	Peas, pounds	Straw, pounds	Peas, pounds.	Straw, pounds.	Peas, pounds.	Straw, pounds.	Peas, pounds.	Straw, pounds.
Plot	1......	38.0	38.0										
	7......	35.5	33.5										
	13.. ...	38.0	28.0										
	19.....	47.5	50.3										
	25 . ..	38.0	38.5										
	31	29.0	39.5										
Plot	5	-	-	36.2	34.2								
	11......	-	-	37.0	18.0								
	17......	-	-	41.0	46.7								
Plot	20 . ..	-	-	-	-	52.2	51.2						
	26.....	-	-	-	-	43.0	52.7						
	32....	-	-	-	-	32.5	34.5						
Plot	21......	-	-	-	-	-	-	52.7	53.5				
	27......	-	-	-	-	-	-	48.0	53.0				
	33	-	-	-	-	-	-	43.0	46.5				
Plot	2......	-	-	-	-	-	-	-	-	47.0	42.0		
	8......	-	-	-	-	-	-	-	-	43.0	37.0		
	14......	-	-	-	-	-	-	-	-	45.5	46.0		
Plot	24......	-	-	-	-	-	-	-	-	-	-	56.5	37.5
	30.....	-	-	-	-	-	-	-	-	-	-	37.3	43.7
	36 .	-	-	-	-	-	-	-	-	-	-	49.5	42.5
Average		37.6	37.9	38.1	33.0	42.6	46.1	47.9	50.7	45.2	42.0	47.8	41.2

It is seen in table C that the average yield of the plots to which no manure was applied is practically the same as the average yield of those plots which were manured with muriate of potash and sulphate of ammonia. The plots manured with dissolved bone black show a decided increase over the unmanured plots. The highest yield is given with dissolved bone black and muriate of potash.

The following table (D) shows the average yield per acre under the various methods of fertilization, the gains on the manured plots over the unmanured plots and the cost of same.

This experiment shows quite clearly that for the soil on which the experiment was carried out and for this crop, the nitrogenous manure was not needed, and that it only served to increase the cost of the crop.

Table D.

	Fertilizer per acre—lbs.	Average yield of peas per acre, in bushels.	Average yield of straw per acre, in pounds.	Average gain per acre of peas, in bushels.	Average gain per acre of straw, in lbs.	Cost of gain per bushel.
Nothing	-	12.7	854			
Dissolved bone-black	400	14.2	924	1.5	70	$2 40
Dissolved bone-black Muriate of potash	400 100	15.9	1020	3.2	166	1 79
Dissolved bone-black Muriate of potash Sulphate of ammonia	200 50 60	14.9	844	2.2	—10	2 29
Dissolved bone-black Muriate of potash Sulphate of ammonia	300 100 120	13.7	872	1.0	18	9 18
Dissolved bone-black Muriate of potash Sulphate of ammonia	400 150 180	15.9	824	3.2	—30	4 16

The amount of commercial fertilizers that can profitably be used in growing the staple agricultural products is a question that every farmer must settle for himself, because of the varying conditions under which farmers are working. But the experiments at the Station present matter that is worthy of consideration.

Table E shows the crop producing power of the field without fertilizers in the results obtained from the unmanured plots, together with the results obtained from the use of different amounts of commercial fertilizers.

In table F are shown the gains per acre and the cost of the fertilizers producing them.

Table E.

	No manure.		Dissolved bone black, 200 lbs.; muriate of potash, 50 lbs.; sulphate of ammonia, 60 lbs. per acre.		Dissolved bone black, 300 lbs.; muriate of potash, 100 lbs.; sulphate of ammonia, 120 lbs. per acre.		Dissolved bone black, 400 lbs.; muriate of potash, 150 lbs.; sulphate of ammonia, 180 lbs. per acre.	
	Lbs. peas.	Lbs. straw.	Lbs. peas.	Lbs. straw.	Lbs. peas.	Lbs straw.	Lbs. peas.	Lbs. straw.
Plot 1	38.0	38.0						
Plot 7	35.5	33.5						
Plot 13	38.0	28.0						
Plot 19	47.5	50.3						
Plot 25	38.0	38.5						
Plot 31	29.0	39.5						
Plot 22	–	–	45.3	40.8				
Plot 28	–	–	52.5	44.5				
Plot 34	–	–	36.3	41.5				
Plot 23	–	–	–	–	45.0	45.0		
Plot 29	–	–	–	–	34.3	38.7		
Plot 35	–	–	–	–	44.0	47.0		
Plot 24	–	–	–	–	–	–	56.5	37.5
Plot 30	–	–	–	–	–	–	37.3	44.7
Plot 36	–	–	–	–	–	–	49.5	42.5
Average	37.66	37.96	44.7	42.26	41.1	43.56	47.76	41.56

Table F.

	Average yield per acre.		Gain per acre.		Cost of grain per bushel.
	Peas, bush.	Straw, lbs.	Peas, bush.	Straw, lbs.	
No manure	12.7	854			
Dissolved bone-black 200 lbs. Muriate of potash 50 lbs. Sulphate of ammonia 60 lbs.	14.9	846	2.2	—8	$2 64
Dissolved bone-black 300 lbs Muriate of potash 100 lbs Sulphate of ammonia 120 lbs.	13.7	872	1.0	18	10 36
Dissolved bone-black 400 lbs Muriate of potash 150 lbs. Sulphate of ammonia 180 lbs.	15.9	824	3.2	—30	4.35

From the results given in table F it would seem that for peas, on the land on which this experiment was carried out, the smallest quantity of fertilizers applied produced the best results financially; and that in no case was the increased yield produced by the fertilizers sufficient to pay for the cost of the fertilizers.

SYSTEMS OF MANURING.

The object of this experiment is to compare a system of manuring with stable manure and systems of manuring with commercial fertilizers, and of cropping without manuring.

In 1888, a ten acre field of grass land located south of the college farm stables was carefully surveyed and divided into four plots extending nearly east and west, each plot being 177 5-10 feet wide by 613 52-100 feet long, and containing two and one-half acres. This land is a clay loam and excellent grass land.

For two years no fertilizers were applied to any of the plots, the grass being cut and weighed carefully to determine the relative condition of the plots as to fertility. The plots are numbered 1, 2, 3 and 4, commencing with the plot on the north side. Their yield of hay for the two years is shown in the following tables:

Table Showing Yields of Hay per Plot and per Acre.

	Per plot, pounds.	Per acre, pounds.
FOR THE YEAR 1888.		
Plot 1	7,386	2,952
" 2	6,460	2,584
" 3	5,930	2,372
" 4	7,055	2,822
FOR THE YEAR 1889.		
Plot 1	5,320	2,158
" 2	5,625	2,250
" 3	4,485	1,792
" 4	5,485	2,194

Table Showing Total Yields of Hay per Acre and per Plot for the Years 1888 and 1889.

	Per plot, pounds.	Per acre, pounds.
Plot 1	12,710	5,084
" 2	12,080	4,832
" 3	10,415	4,164
" 4	12,530	5,010

Table Showing the Average Yield of Hay per Plot and per Acre for the Two Years.

	Per plot, pounds	Per acre, pounds.
Plot 1	6,355	2,542
" 2	6,040	2,416
" 3	5,207	2,082
" 4	6,265	2.510

Taking Plot 4, which is the plot under cultivation without mauure, as the standard from which to reckon the productiveness of the other plots from time to time had they been cropped without manuring, and representing the yield of Plot 4 by the number 100, the following table shows the yields of the different plots that might be expected without the addition of fertilizers, in per cent of the yield of Plot 4.

The figures below show the average yield of hay for the years of 1888 and 1889 in per cent of Plot 4.

Plot 1, 101 per cent.
" 2, 96 "
" 3, 80 "
" 4, 100 "

In the spring of 1890, the entire ten acres were plowed and the plots treated as follows as to fertilizers:

Plot 1 } Received 50 loads of manure from the cow stables, or at the rate of 20 loads to the acre, requiring 3 loads to the cord.

Plot 2 } Received 2,500 lbs. of finely ground South Carolina rock, 250 lbs. of muriate of potash, 165 lbs. nitrate of soda and 40 lbs. sulphate of ammonia.

Plot 3 } Received 1,250 lbs. of acid South Carolina rock, 250 lbs. of muriate of potash 165 lbs. of nitrate of soda and 40 lbs. sulphate of ammonia.

Plot 4 —Received no fertilizers.

At the time of planting it was thought desirable to couple with this experiment one to determine the comparative amounts of barley and peas that could be produced on the same area under the same system of manuring and cultivation, and also to determine which of the two varieties of peas, the Black-eyed Marrowfat or the small Canada, would give the largest yield.

With the above named objects in view one-half of each plot (1 1-4 acres) was sowed broadcast to barley. The remaining half plots (1 1-4 acres) were each divided into two parts of five-eighths acres, one part of which was in each case planted to the small Canada pea, in drills with a Eureka Corn Planter at the rate of two bushels per acre. The other five-eighths acre was drilled to Black-eyed peas.

The peas were cultivated twice between rows to keep down grass and weeds.

The following diagram shows the field and manner of seeding:

Experimental Field No. 2.

No. 1. Twenty loads (6⅔ cords) stable manure per acre—2½ acres.	⅝ acre.	Black-eyed peas.
	⅝ acre.	Canada peas.
	1¼ acres.	Barley.
No 2. One thousand lbs. South Carolina rock, 66 lbs. nitrate of soda, 16 lbs. sulphate of ammonia and 100 lbs muriate of potash per acre—2½ acres.	⅝ acre.	Black-eyed peas.
	⅝ acre.	Canada peas.
	1¼ acres.	Barley.
No. 3. Five hundred lbs. acid South Carolina rock, 66 lbs. nitrate of soda, 16 lbs. sulphate of ammonia and 100 lbs muriate of potash per acre—2½ acres.	⅝ acre.	Black-eyed peas.
	⅝ acre.	Canada peas.
	1¼ acres.	Barley.
No. 4. No manure—2½ acres.	⅝ acre	Black-eyed peas.
	⅝ acre.	Canada peas.
	1¼ acres.	Barley.

The season was very unsatisfactory for experimental work both at the opening and at the close, on account of heavy rains. This work was carefully carried through, however, and though the crops were much less than would have been the case in an ordinary season, they will serve to show the comparative effect of the fertilizers used in growing them and the comparative yield of stock food produced by the different crops under the conditions of the experinent.

Below is given a table showing the combined yield of barley and peas on each plot and the amount per acre, together with calculated yields of Plot 1, 2 and 3 had no fertilizers been applied, the average yield for the two years that the field was in grass, calculated in per cent of Plot 4, being taken as a basis.

Amounts of Fertilizer Applied per Acre.	Total yield per plot of 2½ acres—lbs.	Total yield per acre—lbs.	Calculated yield per acre without fertilizer—lbs.	Calculated gain per acre due to fertilizers—lbs.
Plot 1—20 loads stable manure	5520	2208	1129	1079
Plot 2—1000 lbs. S. C. rock, 66 lbs. nitrate of soda, 16 lbs. sulphate of ammonia, 100 lbs. muriate of potash	4280	1712	1062	640
Plot 3—500 lbs acid S C. rock, 66 lbs. nitrate of soda, 16 lbs sulphate of ammonia, 100 lbs muriate of potash	3555	1422	894	528
Plot 4—No fertilizer	2795	1118		

The highest yield is given here with stable manure. Then follows the plot to which the finely ground South Carolina rock was applied. Next in order comes the plot receiving acid South Carolina rock, while the lowest in the scale is the unmanured plot. There is nothing remarkable in the yield of Plots 1 and 4. They produced relatively about what was expected of them. Plots 2 and 3 were treated alike as to fertilizers, excepting in the amount and condition of phosphoric acid. Plot 2 received about 200 pounds of insoluble phosphoric acid per acre, while Plot 3 received seventy pounds of soluble phosphoric acid per acre. It would seem from these results that the 200 pounds of insoluble phosphoric acid was more effective in producing an increase in the total weight of the crop than the seventy pounds of soluble phosphoric acid.

In order to study the effect of the fertilizers on the relative yield of barley and peas separately, and the comparative amount of stock food produced by the barley and the two varieties of peas, the following diagramatic table of the experimental field is presented:

PLOT 1. (2½ acres.) Stable manure, 20 loads per acre	Black-eyed peas, 405 lbs., straw, 585 lbs. (⅝ acre.) Canada peas, 199 lbs., straw, 821 lbs. (⅝ acre) Barley, 552 lbs , straw, 2958 lbs. (1¼ acres)
PLOT 2. (2½ acres.) 1000 lbs. South Carolina Rock; 100 lbs. muriate of potash; 66 lbs. nitrate of soda, and 16 lbs. sulphate of ammonia, per acre	Black-eyed peas, 326 lbs., straw, 325 lbs. (⅝ acre.) Canada peas, 127 lbs,, straw, 433 lbs. (⅝ acre.) Barley, 553 lbs., straw, 2527 lbs. (1¼ acres.)
PLOT 3. (2½ acres.) 500 lbs. acid South Carolina Rock; 100 lbs. muriate of potash; 66 lbs. nitrate of soda, and 16 lbs. sulphate of ammonia, per acre	Black-eyed peas, 251 lbs , straw, 450 lbs. (⅝ acre.) Canada peas, 122 lbs., straw, 393 lbs. (⅝ acre) Barley, 542 lbs., straw, 1799 lbs. (1¼ acres.)

PLOT 4. (2½ acres.) No manure.................. } Black-eyed peas, 257 lbs., straw, 418 lbs. (⅝ acre.) Canada peas, 160 lbs, straw, 430 lbs. (⅝ acre.) Barley, 220 lbs., straw, 1310 lbs (1¼ acres)

In order to study the relative effects of the fertilizers on the crops of peas and barley, the following tables have been made showing the yield per acre of barley, Black-eyed peas and Canada peas, on the different plots, together with the calculated yields had no fertilizers been applied, and the calculated gains due to fertilizers.

Barley.

		Yield of barley per acre.		Calculated yield per acre without fertilizers.		Calculated gain per acre.	
		Barley lbs.	Straw, lbs	Barley lbs.	Straw, lbs	Barley lbs	Straw, lbs
Plot 1	20 loads of stable manure........	441	2766	178	1058	263	1708
Plot 2	1000 lbs South Carolina rock .. ; 66 lbs. nitrate of soda .... ; 16 lbs. sulphate of ammonia ... ; 100 lbs muriate of potash	442	2216	169	1006	273	1210
Plot 3	500 lbs. acid South Carolina rock ; 66 lbs. nitrate of soda ..... ; 16 lbs. sulphate of ammonia ... ; 100 lbs. muriate of potash	434	1438	141	834	293	604
Plot 4	No manure...................	176	1048				

Black-Eyed Peas.

Amount of fertilizers applied per acre.	Yield of peas per acre.		Calculated yield per acre without fertilizers.		Calculated gain per acre.	
	Peas, pounds.	Straw, pounds	Peas, pounds	Straw, pounds.	Peas, lbs.	Straw, lbs
Plot 1 —20 loads of stable manure ...	648	920	425	655	223	225
Plot 2 — 1000 lbs South Carolina rock ; 66 lbs. nitrate of soda...... ; 16 lbs. sulphate of ammonia. ; 100 lbs muriate of potash ..	522	520	375	652	147	132
Plot 3 — 500 lbs. acid S. C. rock..... ; 66 lbs. nitrate of soda ..... ; 16 lbs. sulphate of ammonia. ; 100 lbs. muriate of potash ..	402	720	329	526	73	194
Plot 4 —No manure	411	658				

Canada Peas.

Amount of fertilizers applied per acre.	Yield per acre.		Calculated yield per acre without fertilizers.		Calculated gain per acre.	
	Peas, lbs.	Straw, lbs.	Peas, lbs.	Straw, lbs.	Peas, lbs.	Straw, lbs.
Plot 1 —20 loads of stable manure..	318	1314	259	695	59	619
Plot 2 { 1000 lbs. South Carolina rock 66 lbs. nitrate of soda...... 16 lbs. sulphate of ammonia. 100 lbs. muriate of potash . }	203	697	245	660	42	37
Plot 3 { 500 lbs. acid S. C. rock .... 66 lbs. nitrate of soda ...... 16 lbs. sulphate of ammonia. 100 lbs. muriate of potash .. }	195	596	204	550	9	46
Plot 4 —No manure	256	688				

Considering first the effect of the fertilizers on the barley, it will be seen that the calculated gain of grain is largest with the acid South Carolina rock and least with the stable manure, while the fine ground South Carolina rock is mid way between the two.

With the calculated gain of straw the order is reversed, the stable manure giving the highest gain of straw, fine ground South Carolina rock ranking next, while the acid South Carolina rock stands lowest.

But in whatever light the figures be examined we can but come to the conclusion that the South Carolina rock has assisted in increasing the crop of barley to an extent nearly equal to, if not greater than, acid South Carolina rock.

With the black-eyed peas the stable manure gives the best results, South Carolina rock standing next in order, and the acid South Carolina rock at the foot of the list, so far as the yield of peas is concerned. With pea straw the South Carolina rock gives the lowest returns. The effect of the phosphatic manures on the yield of the Canada peas was but slight, and the greatest effect of stable manure was in increasing the straw. The gain in this direction was 619 pounds per acre while the yield of peas was only increased fifty-nine pounds.

There is no way of accounting for the failure of the manures to increase the yield of this crop in proportion to that of the black-eyed Marrowfat peas.

In considering the yields of the crops grown on this field from the standpoint of the amount of stock food produced by each under like condition of fertilization it is but fair to state that the peas possess about twice the value of the barley as a source of albuminoids. The following table shows the yield per acre of barley, black-eyed peas and Canada peas :

	Barley.	Black-eyed peas.	Canada peas.
Plot 1	441 lbs.	648 lbs.	318 lbs.
" 2	442 "	522 "	203 "
" 3	434 "	402 "	195 "
" 4	176 "	411 "	256 "

The conclusions to be drawn from these figures are obvious. Under the conditions of this experiment the growing of peas for stock purposes is to be preferred to growing barley. The black-eyed Marrowfat pea yields double the amount of the Canada pea.

FERTILIZER EXPERIMENTS BY FARMERS.

In 1889, the Station sent out sets of experimental fertilizers to several farmers designed to test the availability of insoluble phosphates.

Two of these sets fell into the hands of farmers whose land evidently needed phosphoric acid more than anything else. One of them, Mr. H. L. Leland, has kindly consented to continue his experiment this year without further manuring.

This experiment was conducted on a dry, slaty loam, which previous to 1889, had received no manure for thirty years and had been subjected to continuous cropping. At the time it was plowed up it was cutting only half a ton of hay per acre. The experiment was conducted on one-tenth acre plots, and the amounts of phosphates applied were such that the plots receiving crude phosphates obtained our times as much insoluble phosphoric acid as was received of so uble phosphoric acid by the plots to which the acid phosphate was applied.

Mr. Leland writes that the bad weather seriously interfered with the experiment for this year.

The results are valuable, however, as showing the relative effect of the phosphoric acid from the various sources.

In 1889 the average increase of the plots receiving phosphoric acid with sulphate of ammonia and muriate of potash over the plots receiving only sulphate of ammonia and muriate of potash was for Acid South Carolina Rock, 194 per cent; Fine Ground South Carolina Rock, 113 per cent; Fine Ground Caribbean Sea Guano, 62 per cent.

In 1890 the gains were for Acid South Carolina Rock, 124 per cent; Fine Ground South Carolina Rock, 65 per cent; Fine Ground Caribbean Sea Guano, 42 per cent.

The following tables show the results obtained by Mr. Leland for the years 1889 and 1890;

Experiment of H. L. Leland for 1889—Crop Potatoes.

No. of plot.	Name of Fertilizer.	Amount per acre—lbs.	* Yield per acre of potatoes—bush.
1	Acid South Carolina rock Sulphate of ammonia Muriate of potash	500 150 100	68⅓
2	Fine ground South Carolina rock Sulphate of ammonia Muriate of potash	1000 150 100	50
3	Caribbean Sea Guano Sulphate of ammonia Muriate of potash	725 150 100	40
4	Sulphate of ammonia Muriate of potash	150 100	22
5	No fertilizer	-	30
1a	Acid South Carolina rock Sulphate of ammonia Muriate of potash	500 150 100	65
2a	Fine ground South Carolina rock Sulphate of ammonia Muriate of potash	1000 150 100	48⅓
3a	Caribbean Sea Guano Sulphate of ammonia Muriate of potash	725 150 100	33⅓
4a	Sulphate of ammonia Muriate of potash	150 100	21⅓
5a	No fertilizer	-	29⅓

*Rust killed potato vines about August 15th, or the yield would probably have been greater.

Experiment of H. L. Leland for 1890—Crop Beans.

No. of plot.	Name of Fertilizer.	Amount per acre in lbs.	Yield of beans per acre in bushels.
1	Acid South Carolina rock Sulphate of ammonia Muriate of potash	500 150 100	9.7
2	Fine ground South Carolina rock Sulphate of ammonia Muriate of potash	1000 150 100	8.7
3	Caribbean Sea Guano Sulphate of ammonia Muriate of potash	725 150 100	6.3
4	Sulphate of ammonia Muriate of potash	150 100	4.0
5	No fertilizer	-	4.0
1a	Acid South Carolina rock Sulphate of ammonia Muriate of potash	500 150 100	10.5
2a	Fine ground South Carolina rock Sulphate of ammonia Muriate of potash	1000 150 100	6.4
3a	Caribbean Sea Guano Sulphate of ammonia Muriate of potash	725 150 100	6.4
4a	Sulphate of ammonia Muriate of potash	150 100	4.9
5a	No fertilizer	-	3.7

Five sets of experimental fertilizers were sent out to farmers last spring having the same general object as those that were sent out in 1889, namely, the determination of the availability of phosphoric acid in crude phosphates. These sets were arranged for tenth acre plots like those in the preceding year. The phosphates used for crude material were South Carolina rock and Thomas' Slag.

The latter is a fertilizing material that has come into notice within a few years. It is a by-product resulting from the maufacture of a certain grade of steel and contains a considerable quantity of free lime, together with a varying amount of phosphoric acid. The lot purchased by the Station carried twenty per cent of phosphoric acid, of which six per cent was soluble in ammonium citrate.

Rather remarkable results have been obtained by the use of this material in experimental work, and the question has arisen, in the minds of some, whether the favorable action of this phosphate was not in part due to the free lime it contains. Hence two plots have been arranged which receive an equal amount of phosphoric acid in South Carolina Rock, to which is added an amount of free lime equal to that contained in the Thomas' Slag. The nitrogen in this set was furnished in the form of nitrate of soda and the potash as muriate of potash.

EXPERIMENT BY J. P. MOULTON, OF SPRINGVALE.

Mr. Moulton reports as follows: "The soil is a heavy, rocky loam, yellow sub-soil with a hard pan from two and a half to three feet below the surface; land inclining gradually to the south-west. It was seeded seven years ago and cut three-fourths of a ton of hay per acre in 1889. The ground was plowed the first of May, 1890, and planted from the twelfth to the fifteenth of the same month. Fertilizers applied as directed. Seed was a small eight rowed corn and the hills were two feet eight inches apart each way.

The following table shows the kind and quantity of fertilizers used and amount of crop produced on the several plots:

No. of plot.	Name of Fertilizer.	Amount per acre in pounds.	Total yield per plot in pounds.	Yield of No. 1 husked corn per plot in pounds.	Yield of No. 2 husked corn per plot in pounds.
1	Acid South Carolina rock Muriate of potash Nitrate of soda	500 100 150	705	233	103
2	Fine ground South Carolina rock Lime Muriate of potash Nitrate of soda	1000 200 100 150	705	112.5	175
3	Thomas' slag Muriate of potash Nitrate of soda	1000 100 150	712.5	269.5	108
4	Fine ground South Carolina rock Muriate of potash Nitrate of soda	1000 100 150	820	192.5	100
5	Muriate of potash Nitrate of soda	100 150	825	173.5	88
6	No fertilizers	-	706.5	107.5	134
1a	Acid South Carolina rock Muriate of potash Nitrate of soda	500 100 150	987.5	279	90
2a	Fine ground South Carolina rock Lime Muriate of potash Nitrate of soda	1000 200 100 150	1082.5	225	90
3a	Thomas' slag Muriate of potash Nitrate of soda	1000 100 150	1094	270	115
4a	Fine ground South Carolina rock Muriate of potash Nitrate of soda	1000 100 150	735	239	97
5a	Muriate of potash Nitrate of soda	100 150	560	171	88
6a	No fertilizer	-	457.5	143.5	82

Observations and remarks of Mr. Moulton in regard to the crop.

"The corn was harvested the first of October. Plots 1, and 1a, were very dry and ripe when harvested.

These plots were more forward than any of the others through the entire season and in ripening were two weeks ahead, but the kernels were not as plump or the ears as well filled.

The fertilizers applied to plots 2 and 2a, seemed to have a bad influence on the germination of the seed. The corn on these plots had a backward appearance through the season.

Plots 3 and 3a gave the best and largest yields of corn, though the fodder of 3 was not as much as in some other cases.

Plots 4 and 4a were an average pair.

The fertilizer applied to plots 5 and 5a seemed to effect the seed in the same way as on 2 and 2a. Only about half of the seed germinated.

Plots 6 and 6a surprised me more than all the others. No one supposed that the corn would mature."

In Mr. Moulton's experiment all of the phosphates seem to increase the crop over muriate of potash and nitrate of soda. Slightly more corn was produced by the Thomas Slag than with acid South Carolina rock. The experiment gives no evidence that the superior effect of the Thomas Slag over fine ground South Carolina rock is due to the free lime contained in the Slag.

EXPERIMENT OF MR. O. B. KEENE, EASTON, AROOSTOOK COUNTY.

No description of soil accompanied this report. The results obtained are quite remarkable, though they show little evidence of any benefit to the crop from the use of crude phosphates.

The plots in this case as in the experiment by Mr. Moulton and Mr. Leland were one-tenth acre plots.

The crop cultivated was potatoes. The number of hills per plot 870. Mr. Keen reports many missing hills which might have been due to bad seed.

In the following table are given the quantities of fertilizers used; the number of missing hills; the actual yield per acre and the calculated yield per acre had all of the hills on the plots yielded as did those producing potatoes.

No. of plot.	Kind of Fertilizer.	Amount per acre in lbs.	No missing hills.	Total yield per acre in bushels.	Yield per acre in bush., comput'd for 870 hills per plot.
	Acid South Carolina rock	500			
1	Muriate of potash	100	220	218	292
	Nitrate of soda	150			
	Thomas' slag	1000			
3	Muriate of potash	100	301	182	278
	Nitrate of soda	150			
	Fine ground South Carolina rock	1000			
4	Muriate of potash	100	458	134	281
	Nitrate of soda	150			
5	Muriate of potash	100	576	104	255
	Nitrate of soda	150			
6	No fertilizers	-	434	128	155
	Acid South Carolina rock	500			
1a	Muriate of potash	100	327	213	344
	Nitrate of soda	150			
	Thomas' slag	1000			
3a	Muriate of potash	100	251	192	270
	Nitrate of soda	150			
	Fine ground South Carolina rock	1000			
4a	Muriate of potash	100	221	151	203
	Nitrate of soda	150			
5a	Muriate of potash	100	230	202	276
	Nitrate of soda	150			
6a	No fertilizer		-	84	169

This experiment is interesting in showing the remarkable effect of commercial fertilizers on some soils. The average of the plots receiving no fertilizers was 132 bushels per acre. The average of the plots receiving nitrate of soda and muriate of potash was 262 bushels per acre. Here the crop was doubled by adding 150 pounds of nitrate of soda and 100 pounds of muriate of potash.

The cost of the chemicals in this case was $5.50.

The extra cost of 130 bushels of potatoes was about 4.2 cents per bushel.

No addition to this crop was produced by using South Carolina rock or Thomas Slag. But the use of 500 pounds of acid South Carolina Rock, costing $4.50, caused an additional gain to that made by the nitrate of soda and muriate of potash of fifty-six bushels at a cost of eight cents per bushel.

This experiment has a local value, if Mr. Keene and his neighbors have much soil of this character, as indicating what they shall use for fertilizers in growing potatoes.

TESTS OF VARIETIES.

Prof. WALTER BALENTINE.

For several years the Station has grown a lage number of varieties of potatoes, oats, barley and peas to test their comparative value, each year cultivating the varieties produced the preceding year and adding new varieties.

The present year the old varieties have been dropped and only a few varieties of garden vegetables that have been advertised as novelties have been tested. The season has been unfavorable for giving these a fair trial, being cold and wet both in the first and last part leaving only a few weeks in the middle portion of really favorable weather for producing such crops.

Quite a number are not reported on as it was quite evident that the fault was more with the weather than the variety.

Below are given the results of these trials:

BEANS.

Early Golden-Eyed Wax Bush Bean.

Planted, May 24th. Blossomed, July 18th.

Large enough for string beans, July 31st.

Ripe, September 20th. Quality medium.

Yosemite Mammoth Wax Bush Bean.

Planted, May 24th. Blossomed, July 24th.

Large enough for string beans, August 4th.

Ripe, October 1st. This variety rusted so badly as to be worthless.

Henderson's New Bush Lima Bean.

Planted, May 24th. Blossomed, August 4th.

Large enough to shell September 25th. This bean is too late for profitable culture in this section of the State.

Early Golden Cluster Wax Pole Bean.

Planted, May 24th. Blossomed, August 2nd.

Large enough for string beans, August 18th. Quality good.

Failed to ripen on account of wet weather.

Black-Eyed Wax Bush Bean.

Planted, June 9th. Blossomed, July 30th.

Large enough for string beans, August 8th.

Ripe, September 20th. Quality good.

Champion Bush Bean.

Planted, June 9th. Blossomed, July 30th.

Ripe, September 29th. Quality, good. Fairly prolific.

SWEET CORN.

The following varieties of sweet corn were tested:

Burbank's Early Maine Sweet Corn.

Planted, May 24th. Spindled, July 26th. Silked, August 4th.

Ears large enough to boil, August 30th. Quality, inferior.

New Gold Coin Sweet Corn.

Planted, May 24th. Spindled, August 13th. Silked, August 27th.

This variety was very late. The kernels did not arrive at the milky stage before the frost killed the crop.

Ne Plus Ultra Sugar Corn.

Planted, May 26th. Spindled, August 13th. Silked, August 25th.

Failed to produce ears far enough advanced for boiling before the frost killed the crop. The variety is too late for this climate.

PEAS.

But one variety of pea was planted, the Dwarf Champion. Planted, June 9th. Blossomed, July 20th. Large enough to shell, August 4th. This variety is fairly prolific and of good quality.

BEETS.

Mitchell's perfected earliest turnip beet proved to be of superior quality.

SQUASH AND PUMPKINS.

Four varieties of squash were planted for testing and one variety of pumpkin. The season proved so unfavorable that none ripened before the frost killed the vines on September 25th.

REPORT OF BOTANIST AND ENTOMOLOGIST.

Prof. F. L. Harvey.

Below is given an outline of the subjects considered by the division of Botany and Entomology during the past season.

BOTANY.

1. Germination experiments.
2. Testing varieties of grasses.
3. Spraying Experiments for Apple Scab and Codling Moth.
4. Spraying Experiments to determine minimum amount of Paris Green for Potato Beetles.
5. Causes of Potato Scab. Consideration of investigations by Messrs. Bolley and Thaxter.
6. Correspondence about Strawberries.
7. *Plantago lanceolata*, Linn. Rib Grass or English Plantain described and illustrated.
8. *Leontodon autumnalis*, Linn. Fall Dandelion considered and illustrated.

ENTOMOLOGY.

9. *Platysamia Cecropia*, (Linn). Cecropia Emperor-moth.
10. *Orgyia leucostigma*, (Sm. & Abb.) White-marked Tussock-moth.
11. *Hyphantria cunea*, Drury. Fall Web-worm.
12. *Tmetocera ocellana*, (Schiff.) Eye-spotted Bud-moth.
13. *Schizoneura lanigera*, (Hausm). Wooly-louse of the Apple.
14. *Œdemasia concinna*, (Sm. & Abb.) Red-humped Apple-tree Caterpillar.
15. *Anisopteryx pometaria*, Harris. Fall Canker-worm.
16. *Clisiocampa sylvatica*, Harris. Forest Tent-caterpillar.

Plants of Economic Importance Received for Examination in 1890.

No.	Common Name	Scientific Name.	From Whom.	Depredations, etc.
1	Orange Hawk weed.	Hieracium aurantiacum.	Geo S. Paine, Winslow, Me.	Weed in meadows.
2	Field Sow Thistle.	Sonchus arvensis, L.	H. H Cook, Presque Isle.	Weed in grain fields.
3	Reed.	Phragmites communis, Trin.	M. F. Reed, East Bradford.	Growing in low ground.
4	Black Knot.	Plowrightia morbosa, Saco.	J. Q A Butts, Canaan.	Parasitic on cherry trees.
5	Oats.	Avena sativa.	Joel Richardson, N. Newport, Me.	Specimens turned yellow by wet weather. No parasite.
6	Rib Grass or Eng. Plantain	Plantago lanceolola, L.	Various parties.	A weed in fields and meadows.
7	Fall Dandelion.	Leontodon autumnalis.	Various parties.	Weed in fields, meadows and along roadsides.

Insects Reported and Examined—1890.

No.	Common Name.	Scientific Name.	Depredations.
1	Cecropia Emperor-moth	Platysamia Cecropia (Linn)	The cocoon was received.
2	White-marked Tussock-moth	Orgyia leucostigma (Sm and Abb.)	On apple trees and rose bushes.
3	Fall Web-worm	Hyphantria textor, Harris	On apple trees.
4	Eye-spotted Bud-moth	Tmetocera ocellana (Schiff.)	In blackberry buds.
5	Woolly-louse of the Apple	Schizoneura lanigera (Hausm)	On leaves and twigs of apple trees.
6	Red-humped Apple-tree Caterpillar	Œdemasia concinna (Sm and Abb.)	On leaves of apple trees.
7	Fall Canker-worm	Anisopteryx pometaria, Harris	On shade and apple trees.
8	Forest Tent-caterpillar	Clisiocampa sylvatica, Harris	On forest, shade and fruit trees.
9	The May-beetle	Lachnosterna fusca (Frohl)	Feeding in larval state on grass roots.

REMARKS.

Those of the above named plants and insects that have been studied and are of sufficient importance are considered below. The fine plates illustrating Rib Grass and Fall Dandelion were prepared by Miss Kate Furbish, Brunswick, Me. The cuts illustrating insects were obtained from J. B. Lippincott & Co., and are after cuts in Saunder's Insects Injurious to Fruits.

Mr. F. P. Briggs, as assistant, has rendered efficient aid in conducting germination tests, looking after the grass plots, conducting spraying experiments and collecting material for the herbarium. Hereafter the experiments with insecticides will be under the direction of Prof. Munson and any one wishing information on spraying apparatus or insecticides should address their letters to him. Those who wish information regarding plants or insects, especially injurious fungi or insects are requested to send specimens to the writer. Directions for sending specimens may be found in Station Report, 1888, p. 194, or in Maine Agricultural Report, 1888, p. 158.

We invite correspondence. It is to the interest of farmers to cultivate the habit of noticing insects and fungi when they first make their appearance and not wait until pests are beyond control before reporting them. It will be largely through correspondence that the Station learns of insects doing damage in the State.

GERMINATION EXPERIMENTS.

The seeds tested during the year were germinated as in previous years, in pockets or folds of cloth, which were kept moist by a flap of the cloth dipping into water. The entire apparatus was described in the Annual Report for 1888. The conditions, it is believed, were as favorable as possible, and the results obtained seem to prove that such was the case, for in many instances every seed sprouted.

The material for this year's work was obtained from James J. H. Gregory, Marblehead, Mass., and E. W. Burbank, Fryeburg, Me. Following are tables showing the results of the experiments.

Results of Germination Tests.

Serial number.	Station number.	Description.	Weight of 100 seeds in grams.	Number of seeds sprouted each day.														Per cent. sprouted.	No. of days required for one half to sprout.
				1st	2d.	3d.	4th	5th.	6th.	7th.	8th	9th.	10th.	11th	12th	13th.	14th		
		GREGORY.																	
310	324	Refugee bean	31.770	0	0	10	40	27	2	0	0	0	0	0	0	0	0	79	4
311	325	Marrowfat pea........	38.706	0	0	9	60	31	0	0	0	0	0	0	0	0	0	100	4
312	326	Field corn......... ...	30.676	0	3	22	52	16	1	0	0	0	0	0	0	0	0	94	4
313	327	Sugar pumpkin.	15.173	0	0	0	12	18	8	2	0	1	0	1	0	0	0	42	
314	328	Imperial barley	2.962	75	15	5	0	0	1	0	0	0	0	0	0	0	0	96	1
315	329	Saskatchewan wheat ..	2.892	40	40	9	2	2	0	1	0	0	0	0	0	0	0	94	2
316	330	Race Horse oats	2.672	10	67	19	0	0	1	0	0	0	0	0	0	0	0	97	2
317	331	Spring rye...........	2.094	90	3	1	0	0	0	0	0	0	0	0	0	0	0	94	1
318	332	German millet	.210	86	3	3	1	1	1	0	0	0	0	0	0	0	0	95	1
319	333	Eclipse turnip beet....	1.427	5	17	11	1	3	2	0	0	0	0	1	0	0	0	40	
320	334	Hollow Crown parsnip,	.435	0	0	0	1	9	7	8	0	2	3	2	3	0	0	35	
321	335	All Seasons cabbage...	.394	3	23	9	3	1	2	2	1	0	1	0	1	0	0	46	
322	336	White Spine cucumber,	2.808	25	65	3	2	0	2	0	0	1	1	1	0	0	0	100	2
323	337	Danvers carrot	.122	0	5	16	12	5	0	2	2	0	1	0	0	0	0	43	
324	338	Long Scarlet radish....	1.362	31	24	5	4	7	1	1	0	1	1	0	0	0	0	75	2
325	339	Paragon tomato	.335	0	2	40	20	10	4	0	0	0	0	0	0	0	0	76	4
326	340	Hanson lettuce	.127	72	18	10	0	0	0	0	0	0	0	0	0	0	0	100	1
327	341	White Dutch turnip ..	.213	97	0	0	1	0	0	0	0	0	0	0	0	0	0	98	1
328	342	Yellow Danvers onion,	.345	8	40	17	3	5	3	0	0	0	2	0	0	0	0	78	3
329	343	White Solid celery....	.046	0	0	0	0	3	8	5	2	5	2	1	1	0	0	27	
330	344	Alfalfa	.202	35	10	5	1	1	0	1	0	0	0	0	0	0	0	53	3
331	345	Red clover.	.156	62	20	3	1	1	0	0	0	0	0	0	0	0	0	87	1
332	346	White clover.........	.061	25	20	3	18	1	0	0	0	0	0	0	0	0	0	67	4

333	347	Orchard grass	.075	0	1	10	11	11	10	4	3	4	3	1	2	0	0	60	8
334	348	Timothy	.037	0	70	19	3	0	0	0	0	0	0	0	0	0	0	92	2
		BURBANK.																	
335	349	Sweet corn	24.248	0	0	0	4	9	24	40	12	1	1	0	1	0	0	92	7
336	350	Turnip beet..........	2.240	0	0	0	7	30	15	8	6	3	1	1	0	0	0	71	6
337	351	Sibley squash	14.415	0	0	5	32	3	0	0	2	1	0	0	0	0	0	43	
338	352	Long Green cucumber,	2.705	0	0	17	20	32	1	0	2	0	0	0	0	0	0	72	5
339	353	Phinney's watermelon,	9.214	0	0	0	0	2	6	60	10	0	0	0	0	0	0	78	7
340	354	Fottler's cabbage	.412	0	30	56	2	1	0	0	0	0	0	0	0	0	0	89	3
341	355	Improved carrot	.123	0	0	3	8	32	8	4	0	0	0	0	1	0	0	56	6
342	356	Purple Top turnip.....	.312	9	90	1	0	0	0	0	0	0	0	0	0	0	0	100	2
343	357	Hollow Crown parsnip.	.442	0	0	0	0	1	4	10	6	1	3	5	0	0	0	30	

COMPARISON OF SEEDS TESTED.

During the years 1888, 1889 and 1890, we have tested seeds grown and sold in the State, and also some of those sold in Maine on commission, which are grown in other states. The results have been published in the Reports for these years respectively, but for the purpose of comparison we give below a rèsumè of the larger part of the work. The seeds tested were put up by the following parties: Lewis Atwood, Winterport, Me.; E. W. Burbank, Fryeburg, Me.; Edwin Chick & Co.; Bangor, Me.; Department Agriculture, Washington, D. C.; A. H. Dunlap & Sons, Nashua, N. H.; R. B. Dunning & Co., Bangor, Me.; Thos. W. Emerson & Co., Boston, Mass.; D. M. Ferry & Co., Detroit, Mich.; James J. H. Gregory, Marblehead, Mass ; Kendall & Whitney, Portland, Me.; David Landreth & Sons, Philadelphia, Pa.; E. W. Lyman, Springfield, Mass.; Delano Moore, Presque Isle, Me.; J. B. Rice, Cambridge, N. Y.; James M. Thorburn & Co., New York, N. Y.

Put up by.	Varieties tested.	Average per cent sprouted.	Put up by	Varieties tested.	Average per cent sprouted.
Lettuce.			*Lettuce.*		
Atwood	2	63	Emerson	1	10
Chick	1	99	Ferry	2	90
Department of Agriculture.	2	90	Gregory	1	100
Dunlap	3	83	Lyman	1	0
Dunning	1	77	Rice	3	71
Turnip.					
Atwood	3	73	*Turnip.*		
Burbank	1	100	Ferry	5	83
Chick	1	76	Gregory	1	98
Dunlap	3	29	Lyman	1	4
Dunning	1	29	Moore	1	99
Emerson	1	97	Rice	2	73
Cabbage.					
Atwood	1	48	*Cabbage.*	1	92
Burbank	1	89	Emerson	4	85
Chick	1	69	Ferry	1	46
Department of Agriculture.	4	80	Gregory	1	91
Dunlap	3	49	Lyman	3	77
Dunning	1	88	Rice		
Parsnip.			*Parsnip.*		
Atwood	2	22	Ferry	3	55
Burbank	1	30	Gregory	1	35
Chick	1	44	Lyman	1	0

Put up by.	Varieties tested.	Average per cent sprouted	Put up by.	Varieties tested.	Average per cent sprouted.
Parsnip.			*Parsnip.*		
Dunlap	5	36	Moore	1	82
Dunning	1	34	Rice	2	58
Emerson	1	49			
Celery.			*Celery.*		
Atwood	1	58	Ferry	2	35
Chick	1	27	Gregory	1	27
Dunlap	1	10	Lyman	1	33
Dunning	1	62	Rice	2	45
Onion			*Onion.*		
Atwood	1	73	Ferry	1	67
Chick	1	74	Gregory	1	78
Department of Agriculture	10	83	Lyman	1	0
Dunlap	4	34	Rice	2	87
Emerson	1	95	Dunning	1	62
Beet.			*Beet.*		
Atwood	2	52	Emerson	1	77
Burbank	1	71	Ferry	3	83
Chick	1	63	Gregory	2	60
Department of Agriculture	6	76	Lyman	1	48
Dunlap	4	79	Moore	1	84
Dunning	1	18	Rice	4	72
Carrot.			*Carrot.*		
Atwood	1	57	Ferry	2	58
Burbank	1	56	Gregory	1	43
Dunlap	2	56	Moore	2	82
Dunning	1	51	Lyman	1	22
Emerson	1	48	Rice	2	45
Tomato.			*Tomato.*		
Atwood	2	52	Gregory	1	76
Department of Agriculture	4	58	Lyman	1	57
Dunlap	1	78	Rice	3	91
Ferry	2	81			
Radish.			*Radish.*		
Atwood	2	4	Gregory	1	75
Dunlap	2	79	Lyman	1	80
Ferry	2	69	Rice	3	84
Sweet Corn			*Sweet Corn.*		
Burbank	2	95	Gregory	1	94
Department of Agriculture	2	82	Moore	1	90
Ferry	1	99	Rice	3	86
Clover.			*Clover.*		
Chick	3	86	Landreth	1	78
Dunning	4	88	Moore	1	81
Gregory	2	77	Thorburn	5	86
Kendall & Whitney	5	83			

EXPERIMENTS WITH CORROSIVE SUBLIMATE.

In all of the germination experiments care has been taken to destroy all fungoid germs by boiling the cloths used, for about thirty minutes, and thoroughly scalding the tray and everything connected with it. Yet the seeds have moulded more or less during the two weeks they remained in the germinator. Those that sprouted in a few days moulded but little, or not at all, while those that sprouted slowly, or failed to germinate moulded considerably, and sometimes very badly. The germs of the mould must in these cases have been on or in the seeds themselves. The question arose whether the mould interfered in any way with the sprouting of the seeds. As was stated in last year's report, a weak solution of corrosive sublimate, (mercuric chloride) one part to ten thousand parts of water was used, in which the seeds were dipped, after which they were washed in water that had been boiled, and then placed in the germinator. Only a few were tried in this way and no conclusions could be safely drawn from the results. This year more experiments were made, in about the same way. Two solutions were used each stronger than the first, one having one part of the corrosive sublimate to one thousand parts water, and the o her, one part to five hundred parts water. Below are tables showing the per cent sprouted, with and without being dipped in the solutions.

Corrosive Sublimate One Part to One Thousand Water.			Corrosive Sublimate One Part to Five Hundred Parts Water.		
Kind of seed.	Not treated.	Dipped in solution.	Kind of seed.	Not treated.	Dip'd in solution.
Bean	79	79	Corn	92	88
Parsnip	35	37	Beet	71	31
Cabbage	46	43	Squash	43	25
Carrot	43	50	Cucumber	72	67
Radish	75	78	Watermelon	78	78
Tomato	76	82	Cabbage	89	82
Celery	27	7	Carrot	47	56
Alfalfa	53	58	Turnip	100	100
Red clover	87	89	Parsnip	30	3

One thing is proven by these experiments, that in some cases at least, the sublimate did not injure the vitality of the seeds, and in no case did it destroy *all* of the seeds, if it affected them in any way. The average of the two columns is nearly the same. Those that vary the most have the lowest percentage, while those that average above seventy-five per cent differ but little. Another thing is sure, that the sublimate destroys the germs of the fungus. None moulded after being treated, except the squash, and that but little, while before being dipped it was completely covered with a dense forest of fungus. And yet, more squash seeds sprouted when they were not treated with the solution. This makes it impossible to say at present whether it is of any advantage to use the sublimate solution. In seven cases out of the eighteen, more germinated when it was used. In eight cases, more when it was not used, and in three instances there was no difference. Till more data is obtained all we can assert is that a solution of corrosive sublimate of proper strength will destroy the germs of mould without destroying the vitality of the seeds, and probably without injuring them.

EXPERIMENTS WITH GRASSES

In Experiment Station Report, 1889, p. 161, will be found a consideration of forage plants tested on small plots to determine their adaptability to the soil and climate of Maine. On page 169 of the same report is a table of the most promising ones. Of these, eleven kinds were selected the past season and grown in one-eight acre plots, and next season a record will be kept regarding them.

SPRAYING EXPERIMENTS.

APPLE SCAB.

It was intended to conduct some spraying experiments the past season with copper compounds, to determine their value in preventing or checking apple scab. For various reasons mentioned below the work was abandoned. Arrangements were made with Mr. F. M. Woodward, Winthrop; Mr. Chas. S. Pope, Manchester, and Mr. E. F. Purrington, Farmington, to conduct these experiments. The material for the work at Winthrop was ordered early, but by delay in transportation did not reach its destination in time to make the first application before the leaves started. The bloom was so light and the rains so heavy and frequent it was thought best to abandon the work for the season. Mr. Pope writes that he made the first application but a heavy shower washed it off almost immediately, and as the rainy weather continued he did not spray again. One of the difficulties in using these compounds is that they are washed off by rains and the disease is always worse in rainy seasons. The copper compounds are quite rapid in their action upon vegetable spores and would destroy them in a few days. Much good would therefore be done if the compounds remained only a few days before being washed off. Care should be taken to make the applications immediately after showers. These experiments will be conducted another season if possible. The experiments conducted by Prof. Taft in Michigan, and Prof. Goff in Wisconsin, in 1890, and considered in Maine Experiment Station Report, 1889, p. 182, indicate that the copper compounds will materially check this disease and at a very small cost. We would like to see the method carefully tested in Maine and hope many will spray for the scab another season and report the results. Directions for spraying and apparatus were considered in the Station Report for 1889. Additional information if needed will be given by correspondence.

CODLING MOTHS.

Complaints of Codling moth ravages continue to be reported to the Station. It is a surprise that the arsenic compounds are not used to check this pest. It is conceded by many fruit growers in other states, who have tried spraying with Paris green and London purple for Codling moths, that they are effective remedies. Why do not the orchardists of Maine avail themselves of this remedy? The process is simple, free from danger, effective and the materials and apparatus inexpensive in relation to the benefits received. In the interests of successful orcharding in Maine may we not strongly urge the great importance of spraying? In our Report for 1889 it was suggested that perhaps the first application should not be made until the apples are larger than peas This is based upon the belief that the moths come out later in Maine, than has been supposed. We hope those who spray will watch the first appearance of the moths about the trees and report the same to the Station.

EXPERIMENT WITH PARIS GREEN UPON POTATO BEETLES.

It is well known by those who use Paris green to destroy Potato Beetles, that there is more or less difficulty in obtaining a mixture of the right strength to kill all the insects, without "scorching" the leaves.

In order to determine the least amount of Paris green required to do effectual work, four different strengths were used. The amounts taken were one and one-half, one, one-half and one-fourth teaspoonfuls to two gallons of water. As a teaspoonful weighs very nearly eight grams, and there are 454 grams in one pound avoirdupois it would be at the rate of one pound Paris green to about 75, 112, 125, and 250 gallons of water respectively. The poison was applied to four adjacent rows, all being badly infested with young beetles. There was no rain at the time, or anything to interfere with the experiments so far as known. After thirty-six hours the results were noted as follows:

First row, one and one-half teaspoonfuls to two gallons water, nearly all the insects killed.

Second row, one teaspoonful to two gallons water, same as first, so far as one could perceive.

Third row, one-half teaspoonful to two gallons water, perhaps one-half the beetles dead.

Fourth row, one-fourth teaspoon to two gallons water, could only find an occasional one dead.

The leaves were not scorched in any of the rows.

From these experiments we see that one teaspoonful of Paris green to two gallons of water, or at the rate of one pound to 112 gallons, did as effectual work as the stronger mixture, while the lesser amounts were not sufficient. This is perhaps as good a rule as can be given, and the amount may be varied more or less, if the strength of the Paris green is found to vary.

CAUSES OF POTATO SCAB.

Since my last Report some very important investigations into the cause of potato scab have been made at the Indiana Experiment Station by Mr. H. L. Bolley and at the Connecticut Station by Dr. Roland Thaxter. Though there were differences of opinion, botanists had about concluded that this disease was due to chemical or mechanical conditions and not to a vegetable or animal parasite, but the investigations of these gentlemen have opened the question anew. They claim to have discovered specific forms of organisms that will when introduced into healthy potato tubers produce the scab, and wherever the disease occurs these organisms are present. It is exceedingly interesting to know that the species of bacterium found by Mr. Bolley, and regarded by him as the cause of the disease, is entirely different from the filamentous fungus found by Dr. Thaxter. It is reasonable to conclude as is done by Dr. Thaxter that there are two kinds of potato scab, the organism studied by Mr. Bolley producing what is called *shallow* or *surface scab* and the one found by Dr. Thaxter causing the *deep scab*. The investigations of these gentlemen seem so thorough it is hard to find any errors in their work and the conclusions reached seem inevitable. Now that the parasitic nature of the disease is established the theories of mechanical and chemical irritation, insect depredation, excess of moisture in the soil, and the attacks of larger fungi must be discarded as *primary* causes. It is well established by many observers and many experiments, that rubbish, garbage, excess of vegetable matter, fresh stable manure, saw dust, chip manure, ashes and lime, excessive moisture in the soil and growing potatoes from year to year on the same field aggravate the disease. It is therefore certain, that the agents and conditions before regarded as *primary* causes are secondary, aggravating the disease by producing conditions favorable to the growth of the parasites. The investigations of Dr. Thaxter indicate that the fungus causing the disease may be a form common in manure and other fermenting organic matter and would be transferred to the soil in such material and reach the potato tubers. Should this prove to be true it would open the question how far diseases affecting farm crops are due to the germs carried to the field in infested fertilizers and lead to the necessity of adopting means to sterilize fertilizers. Certainly it would do but little good to select clean potatoes for seed and plant them in a soil fertilized by material teeming with the organisms that causes potato scab. If the disease is caused by vegetable parasites, as seems quite probable, then scabby seed and infested fertilizers are the sources of the disease, or the germs may live in the soil over winter. By selecting clean seed and not planting successive seasons on the same ground, two of the sources would be eliminated. This would leave the fertilizing material as the remaining source of infection.

It would also be necessary to avoid all general conditions as poorly drained soil, etc., that are known to favor the development of fungi.

Although neither Mr. Bolley nor Dr. Thaxter have suggested any definite remedies, it is a long stride in the right direction to know the cause of a disease, and as Mr. Bolley says, "The facts secured must of necessity affect the future investigations in the line of prevention; and the indications are very favorable to the belief that results in that direction may be reached which will have a financial value to the potato grower." Those who wish to read the investigations of Mr. Bolley and Dr. Thaxter will find articles by the former in Agricultural Science, Knoxville, Tenn., September and October, 1890, and by the latter in Connecticut Experiment Station Bulletin, No. 105, December, 1890.

Since the above was written, Prof. Thaxter has been successful in producing the scab disease by inoculating healthy tubers with the fungus, but thinks the similar fungus found in horse dung will not produce it.

STRAWBERRIES.

The following correspondence regarding strawberries may be of sufficient interest to place on record.

After receiving Mr. Fowler's letter the writer asked Prof. Maynard of Amherst, Mass., some questions regarding strawberries and below his answer is given, also Mr. Fowler's letters. The facts contained therein may be suggestive to others who are growing strawberries. The Station is testing varieties of strawberries (see Experiment Station Report, 1889, p. 256) which will be reported upon in the future.

SEARSMONT, ME, Aug. 27, 1890.

Prof. F. L. HARVEY:

Dear Sir:—I wish some information in regard to strawberries. My patch looks very nice and I expected a nice yield but they were small and *ill shaped*. I think the most of them are Crescent seedlings and am afraid there are not enough Wilsons. What I wish to know is this, will natives do to set out with the Crescent seedlings next spring?

Very truly,

M. A. FOWLER.

AMHERST, MASS., Sept. 22, 1890.

Prof. F. L. HARVEY:

We have discarded both the Crescent and Wilson, but they are suitable to grow together as the one is about as poor as the other. I do not know how the last succeeds with you, but with us it is worthless on account of its lack of vigor. The Crescent is vigorous and productive but poor quality. Would advise the trial of Bubach No. 5 in place of the Wilson, and if you find the Crescent valuable perhaps the May King, Warfield or Haviland would please you as a fertilizer for both. It would be far more profitable to set some other variety than the wild seedling to fertilize the Crescent unless you wish to save the seed, in which case it might give some interesting crosses.

Very truly yours,

S. T. MAYNARD.

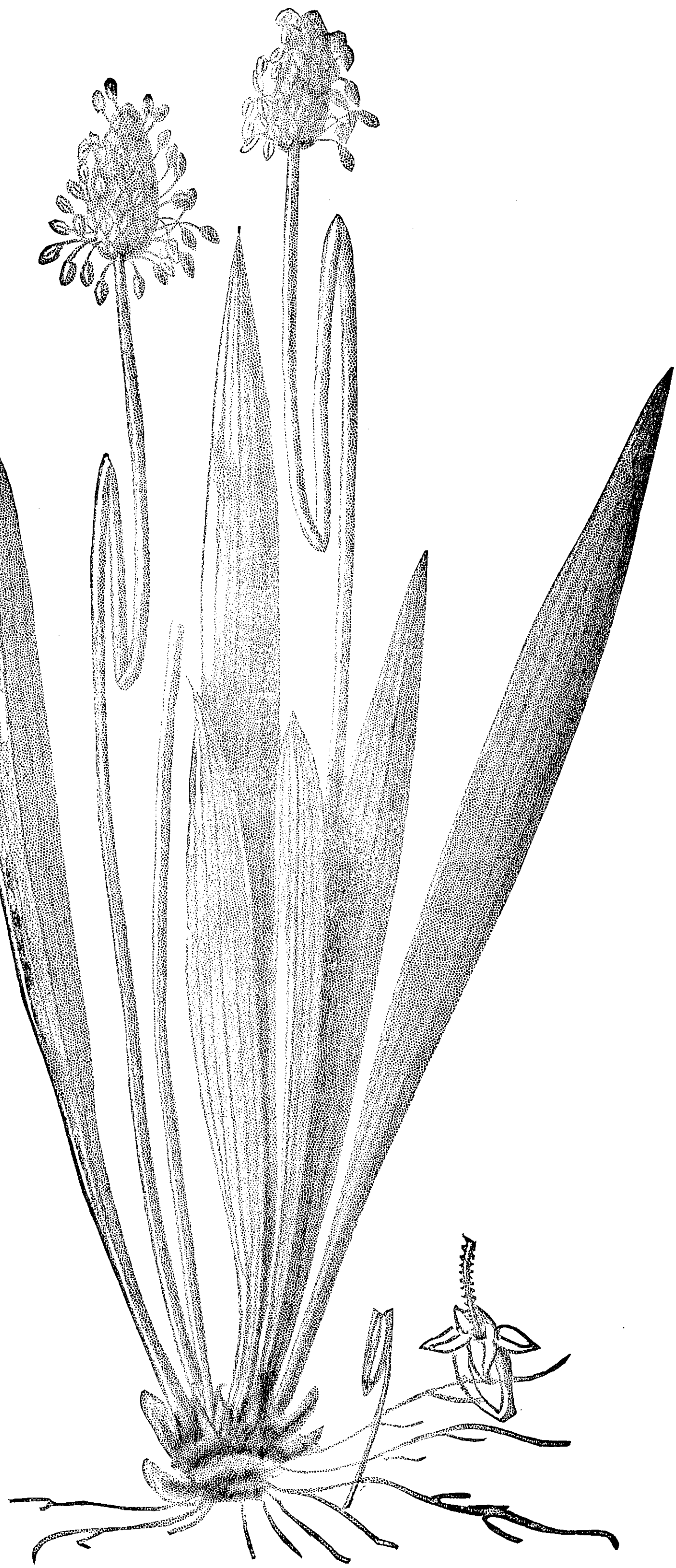
SEARSMONT, ME., Oct. 28, 1890.

Prof. F. L. HARVEY:

Dear Sir:—As to my strawberries I am in a fix. I must have some 15,000 plants and I can't get enough of any variety but natives to set out, so shall be compelled to set them or none. The berries formed this year and some grew well, also had some Wilson berries among them, but most of the berries were ill shaped, small and did not ripen good or refused to grow larger than a Champion of England pea. I gave them a heavy coating of manure in August and cultivated it in with spring tooth cultivator and now have an abundance of nice plants. Expect to get some Haviland or some other variety in the spring to set out for sets the next year. My plants were hurt last winter and spring by ice and rain.

Very truly,

M. A. FOWLER.



RIB GRASS OR ENGLISH PLA…

RIB GRASS, OR ENGLISH PLANTAIN.

Plantago lanceolata, L.

This weed belongs to the Order *Plantaginaceæ* (Plantain Family) and was introduced from Europe. *Plantago* comes from the Latin and means *sole of the foot.* It was originally applied to the door-yard plantain, which grows in foot paths. *Lanceolata* refers to the lance-shaped leaves. It may be known by the following description :

Root living from year to year, stem grooved, angular, nine inches to two feet high ; leaves hairy, narrow, three to five ribbed and in a cluster at the root. The flowers small, whitish, borne in a thick short spike at the end of the long flower scape. The pod opens at the top by means of a lid and allows the two oblong boat shaped seeds to escape. These seeds are smaller than clover seed and may be distinguished by the brownish color, oblong shape and hollow or groove on the inner face. They look like a diminutive boat. Attention is especially directed to this weed, as it is being introduced into the State in clover seed. Complaints have been received about fields overrun with it, that were seeded to clover. The seeds of the plantain being smaller and duller colored are liable to escape notice, being hidden by the bright yellow color of the clover seed. Great care should be exercised by farmers in purchasing clover seed, so as not to introduce this detestable weed. We hear complaints of its occurrence in other states. Being a perennial it is a hard weed to exterminate. It is hardy and will cover the ground with a mat of leaves. Cultivation in a hoed crop would be the best way to control it.

Accompanying the Report for 1889 was an envelope containing New York Red Clover seed, adulterated with about ten per cent of Rib Grass seed, (*Plantago lanceolata, L.*) This seed was purchased at a prominent seed store in Maine and was highly recommended. It was distributed that farmers might learn to distinguish the seed of Rib Grass and avoid it.

That farmers may recognize this weed when they see it growing, we publish on the opposite page a fine crayon drawing made by Miss Kate Furbish, Brunswick, Me. The plate also shows one of the flowers, and one of the stamens enlarged.

FALL DANDELION.

Leontodon autumnalis, L.

This plant belongs to the Order *Compositæ* or Sunflower Family and was introduced from Europe. The genus name *Leontodon* comes from two Greek words and means lion-toothed, referring to the toothed leaves. The specific name *autumnalis*, means blooming in the autumn, but is hardly applicable to this plant as it blooms from June to November. This weed can be readily determined by the following description: The plant from five inches to two feet high; branched and bearing heads at the ends of the scaly thickened branches, which are composed of many yellow strap shaped flowers. Leaves clustered at the root, lance shaped, hairy and cut toothed. Perennial, growing in meadows and along roadsides, and blooming from June to November. It has spread from New England to Arkansas. Where found along roadsides it should be dug up. The seeds, which bear at one end a row of tawny bristles, (*pappus*) are easily carried by the wind to cultivated grounds. When introduced, cultivation in a hoed crop is the best way to kill it.

On the opposite page is shown a fine cut of this weed made from a crayon drawing executed by Miss Kate Furbish, Brunswick, Me. This will enable farmers to tell the plant when they see it. The plate shows the plant natural size and also one of the seeds magnified and with the bristles (*pappus*) attached at the end.

FALL DANDELION. (*Leontodon autumnalis, L.*)

THE CECROPIA EMPEROR MOTH.

Platysamia Cecropia, (*Linn.*)

We received a cocoon of the above insect from Mr. R. C. Higgins, attached to a Juniper twig. The cocoon was put away and on June 10th the moth came forth, and essentially the following letter was sent to Mr. Higgins, which may be of interest to others:

"*Dear Sir:*—The cocoon you sent some weeks ago produced to-day a beautiful moth (five and a half inches spread of wing) known as the Cecropia Emperor Moth. This insect belongs to the *Bombycidæ* which embraces the Chinese silk worm *Bomby mori*. It is the largest species of moth found in the United States. It usually feeds upon the apple, plum and cherry and a variety of other shrubs and trees. Taking it upon a Juniper is novel to me, and I find no record of it feeding upon coniferous plants. The caterpillar probably wandered to the Juniper tree to spin its cocoon. This insect is not abundant in nature and though classed as one of the pests of the orchard does but little damage. It is kept in check by ichneumons, other insect parasites and birds.

The moth, caterpillar and cocoon of this insect all being so large and conspicuous they attract attention and specimens are frequently sent. The *moths* may be known by their large size, the rich brown color of the wings, each bearing near the middle a kidney shaped white spot usually shaded with red and edged with black. The *caterpillars* are three or four inches long and nearly as thick as a man's thumb; pale green with carrot red warts on the third and fourth segments of the body, yellow warts upon the back of the other segments, excepting the second and last, on which they are blue, as well as the smaller warts along the sides.

The *cocoons* are about three inches long, pod shaped, rusty gray or brown, and firmly attached by one side to a limb. They are composed of two layers of silk, an outer papery and loose fibrous one and an inner densely woven oval one containing the chrysalis. The moths come from the cocoons in June. The eggs are soon laid and in a week or ten days the caterpillars appear. They are voracious feeders. When full grown in the fall they spin their cocoons and remain in this state until the following spring. The cocoons are frequently found in the orchard or woods after the leaves have fallen, attached to the branches.

This moth is consided in Saunder's *Insects Injurious to Fruits*, p. 73, and all the stages figured It is also considered in *Insects Injurious to Vegetation*, Harris, pp. 385–388.

THE WHITE-MARKED TUSSOCK-MOTH.

Orgyia leucostigma, (*Sm. & Abb.*)

During the past two years specimens of the above insect, in the egg, larval and wingless female stages of its life history have been received at the Station from various parts of the State. Being apparently widely distributed and having attracted considerable attention we give below an account of its habits.

Eggs, three or four hundred in a mass attached to the empty grayish cocoon previously occupied by the female moth. Egg mass convex, smooth. grayish white; composed of several layers of eggs with a frothy, gelatinous material between them.

Larva, when mature, over one inch long; bright yellow; head and two small protuberances on the back carrot red; back ornamented with four cream colored brushes like tufts; two long black plumes near the head and one near the posterior end of the body; sides clothed with yellow hairs; brown or black stripe on the back, and a dusky stripe on each side. See Figure 1.

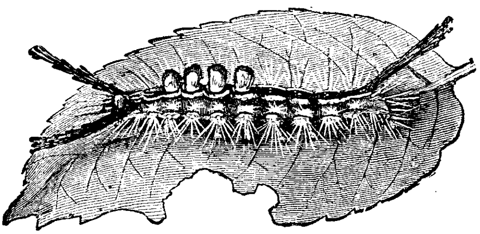


FIG. 1.

Cocoon, gray, spun on the inside of a leaf. Texture loose and the silk interwoven with numerous hairs from the caterpillar.

Chrysalis, enclosed in the cocoon, oval, brown or sometimes whitish below, covered with whitish hairs or down. Figure 2 d shows the male chrysalis and Figure 2 c the female chrysalis.

Perfect Insect (*female*) wingless or wings mere rudiments, light gray, oblong oval, body distended with eggs; legs long. Figure 3 represents the female resting upon the empty cocoon from which she emerged.

Perfect Insect (*male*) winged, expands an inch and a quarter, fore wings crossed by wavy bands of darker shade; a small black spot on the outer edge of the wing toward the tip, beyond it an oblique blackish stripe, near the outer hind angle a minute white crescent. Body gray with a small black tuft near the base of the abdomen, antennæ feathered. Figure 4 represents the male moth natural size.

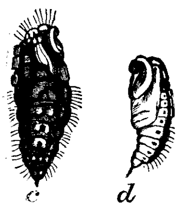


FIG. 2.

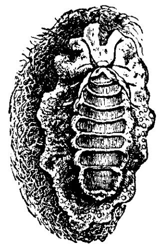


FIG. 3.

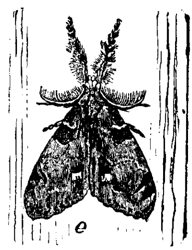


FIG. 4.

LIFE HISTORY.

During the winter months there will be found occasionally in the orchard, dead leaves attached to the branches of the trees. Upon examination these will usually be found to contain an empty, gray cocoon with a mass of eggs attached to it, as described above. These eggs hatch in Maine about the first of June or earlier farther south. The young larvæ at once begin to devour the leaves of the tree. When disturbed they lower themselves by means of a silken thread which they climb when danger is past. The beautiful caterpillars described above feed about two months and then spin their cocoons. The moths soon emerge and the females being little more than animated masses of eggs are sluggish. The males having wings are able to fly and they meet the females while resting upon the empty cocoon to which the mass of eggs is finally attached. The eggs soon hatch, producing the *second* brood of caterpillars which complete their growth late in the season and enter the chrysalis state. The moths soon emerge, mate and the eggs are deposited and remain on the trees during the winter.

REMEDIES.

The female is wingless and always attaches her eggs to her empty cocoon, hence the insect does not readily spread from tree to tree. The caterpillars sometimes wander when their food supply is gone, or are accidentally carried from tree to tree, or eggs are introduced on young trees. From the nature of the insect it is not usually very injurious, but sometimes does great damage to the leaves of apple trees and also gnaws the surface of the fruit. Though partial to the apple tree it also feeds on the plum, pear, cherry, rose, and occasionally on the elm, maple, horse chestnut, linden, oak, locust, butternut, black walnut, hickory, spruce, fir, larch and other plants. The orchard should be examined during the winter months for leaves attached to the branches and if they contain egg clusters collect and *burn* them. Any cocoons without egg clusters should not be molested, as they probably contain parasites of this pest and should be protec.ed. Mr. Saunders says that nine different species of parasites, four and two winged flies, are known to prey upon this insect in the caterpillar state.

THE FALL WEB-WORM.

Hyphantria cunea, *Drury*. (*H. textor*, *Harris*.)

While in Cumberland County, Me., last season attention was directed to an orchard badly infested by this insect. Though it was only July 5th, the webs were already quite conspicuous. In *Forest Insects*, just issued from the Department of Agriculture, Dr. Packard, on p. 244 says: "The name *Fall Web-Worm* is most expressive for New England and other northern states where the insect is single brooded, appearing there during August and September, while in more southern regions it is double brooded." Though we have not traced this insect through its life history in Maine and cannot *positively* say there are two broods, yet the fact that the webs were conspicuous and the larvæ fully three-fourths of an inch long early in July would indicate two broods in western Maine. A few webs were observed about Orono during the fall months, probably those of the second brood or late single brood.

This is a native insect which has from time to time done great damage to forest and fruit trees. It is a general feeder, having been observed to feed upon over one hundred different species of trees, shrubs and herbs. This species makes a web which is sometimes very conspicuous, attaining dimensions of several feet. The web can readily be told from that of the Apple-tree Tent-caterpillar. The *former* insect does not leave the nest to feed. As soon as hatched the young larvæ spin a small web for themselves.

Under the shelter of this they feed in company upon the upper portions of the leaf, leaving the veins and lower surface. As they grow they connect their web to adjoining twigs and leaves until finally a whole branch several feet long may be inclosed. The web of the *latter* is more frequently made in the fork and is not usually extended along the branches and the caterpillars leave the nest to feed, returning for the night and to rest. Below is given an account of the insect in all the stages of its life history.

Egg 4 mm. (.16 in.) in length, bright golden yellow, globular, ornamented with numerous regular pits, which according to Packard give it under the magnifying lens the appearance of a beautiful golden thimble.

Larva (young) pale yellow with two rows of black marks along the body, a black head and sparse hairs.

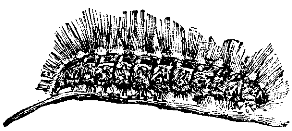


Fig. 5.

Full grown larva usually pale yellowish or greenish with a broad, dark stripe along the back and a yellowish stripe along the side, covered with whitish hairs that spring from black and orange yellow warts. The caterpillars are somewhat variable as to depth of color and marking, even on the same tree. The fall brood is generally darker colored than the spring brood. The larva is shown in Fig. 5.

Cocoon, thin, almost transparent, composed of a slight web of silk intermixed with a few hairs from the caterpillar, or sometimes mixed with sand when the cocoon is spun in the soil.

Pupa, length, 0 60 in.; breadth in the middle at the bulge, 0.23 in.; dark brown, smooth, polished, faintly punctate, and bulged in the middle a little all round.

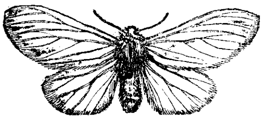


Fig. 6.

Perfect insect, a moth which varies greatly in size and color. These color varieties have received different names by entomologists but are now reduced to H. cunea, Drury. The most common form is white or slightly fulvous with white wings, but the wings show variations from pure white to those profusely dotted with black and brown; front thighs tawny yellow, sometimes marked with a large black spot; feet blackish; expanse of wings 1 1-4 to 1 2-3 inches; male moth usually smaller with the antennæ doubly feathered beneath. The antennæ of the female possess two rows of minute teeth. The moth is shown natural size in Fig. 6.

LIFE HISTORY.

The female deposits her eggs in a cluster on the upper or under side of a leaf, usually near the end of a branch. The clusters consist of many eggs laid in regular rows, if the surface of the leaf admits. Sometimes the eggs are laid in smaller irregular patches. Each female lays on an average about five hundred eggs. The eggs for the first brood are deposited by the last of May or during June, and the time required for them to hatch depends upon the weather. Under favorable circumstances they mature in about ten days, or those of the second brood in eight days. As soon as the caterpillars hatch they spin a small silken web which soon becomes conspicuous. Under this they feed together upon the upper surface of the leaves. As they grow other leaves and branches are included until the web reaches considerable size and contains dead leaves and the molt skins of the larvæ. If their food supply gives out they quit the web and drop to the ground and crawl directly toward other trees with almost unerring instinct, or when disturbed let themselves down by a thread and by this regain the tree when the danger is past.

When full grown they are 1.11 inches long and leave the web and wander about for suitable places to spin their cocoons. They select crevices in bark, the angles of tree boxes, rubbish about the base of trees, and other similar situations, while the fall brood prefer to bury themselves in the earth if possible, but adapt themselves to circumstances. They soon spin their cocoons. The pupæ contained in these hatch into the second brood of moths about the first of August, and the moths lay eggs which hatch into caterpillars that feed, mature and spin their cocoons during August and September. The insects invariably spend the winter in the chrysalis state in the cocoon and the following spring the moths emerge and lay their eggs, thus completing the life history.

REMEDIES.

As these insects do not leave the web to feed and are protected by it, spraying to kill them would do no good. The best way is to strip the webs from the extremities of the branches with the hand as soon as they appear, and destroy them with the included young caterpillars. The twigs bearing the small webs should be cut off with a knife when on the low branches, or with long handled pruning shears if on high branches and burned. These insects should be destroyed while the webs are small. There is no excuse for allowing them to remain until large branches are involved in the web. The webs are unsightly and even when the insects are not abundant enough to do serious damage they should be destroyed.

The natural enemies of this insect are many. Outside of insect parasites and predacious insect enemies, screech owls, cuckoos, the common toad and several species of spiders feed upon them. They have but few bird enemies, being so hairy birds will not eat them. Those mentioned above and the common toad eat the whole insect, while the spiders suck the soft parts out and leave the shell.

Among the predacious insects, the Mantis or rear horse in the south, and the wheel bug and other hemipterous insects in other parts of the country help to hold them in check. The true parasites are those that lay their eggs in the eggs or caterpillars of the web-worm and destroy them. They consist of hymenopterous or ichneumon like insects and tachina flies. Of the former one species infests the eggs, and two others lay their eggs in the caterpillars. One species of tachina at least is known to infest the larvæ of the web-worm. The eggs of the parasites hatch and their larvæ destroy the web-worm, and from their chrysalids or cocoons the parasites come forth.

THE EYE-SPOTTED BUD-MOTH.

Tmetocera ocellana, (*Schiff.*)

FIG 7.

The following letter was received last May:

ROCKLAND, ME., May 20, 1891.

ENTOMOLOGIST EXPERIMENT STATION.

SIR:—I send you some blackberry buds that are infested with maggots. I have about one-fourth of an acre and I think three-fourths of the buds on the piece contain one or more of these maggots. I noticed them for the first time last year, when I found a few of them. When the buds are small they eat into the heart of them and spoil them. The eggs are deposited in the buds early in the spring or in the fall. I have found some of them on rose bushes and also on a peach tree standing near the blackberries. My family and I have killed a great many of them but still they will injure the bushes very much.

Yours respectfully,

JOHN N. INGRAHAM.

The specimens sent by Mr. Ingraham were put into a breeding cage to transform and proved to be the eye-spotted bud-moth. This species was considered and figured in the Annual Report of the Experiment Station, 1888, p. 169, and in the Maine Report of Agriculture, 1888, p. 133, as a pest upon apple trees. We find no record of this species attacking blackberries, therefore the habit is new. The observations of Mr. Ingraham would indicate that this species also feeds upon the peach tree and roses. As there are several *bud-moths* that infest our fruit trees and shrubs it is not safe to conclude that this species did the injury on the peach trees and roses, though they were near the blackberries, until the insect has been reared from them. It is not improbable that the eye spotted bud-moth feeds upon peaches and roses, as it is known to feed upon plums and cherries, plants belonging to the same family.

The larvæ we transformed went into the pupa state the last of June and the moths appeared in July. As the moths are on the wing in July, the eggs must be laid in the summer or fall, and as the larvæ are apparently nearly grown and have done much damage early in June the eggs must hatch very early or else the larvæ hybernate. When this insect was considered in 1888 we did not have the writings of Mr. James Fletcher, who expresses the opinion in his Report for 1885, p. 24, as Entomologist to the Department of Agriculture of Canada, that it passes the winter in the larva state on the branches of apple trees, protected by a covering of silk. Since the above was written there has appeared from the pen of Prof. Fernald in Bulletin No. 12, April, 1890, Massachusetts Experiment Station an interesting article upon this insect.

This article contains such an exhaustive and careful study of the egg and larval stages we quote that portion of it *verbatim*.

"The fore wings expand about three-fifths of an inch. The head, thorax, and basal third of the fore wings, and also the outer edge and fringe are dark ash gray, the middle of the fore wings is cream white, marked more or less with costal streaks of gray, and in some specimens this part is ashy gray, but little lighter than the base. Just before the anal angle are two short horizontal black dashes followed by a vertical streak of lead-blue and there are three or four similar black dashes before the apex, also followed by a streak of lead-blue.

The hind wings above and below and the abdomen are ashy gray. The under side of the fore wings is darker, and has a series of light costal streaks on the outer part.

The moths pair and the female lays her eggs, when in confinement, in clusters of from four to ten or eleven, often overlapping each other. They are oval, flattened, four-fifths of a millimeter long, and half as wide, sordid white, with a narrow border of clear and transparant white, while the center of the eggs is one complete mass of minute granules. In about three days the center of the egg has grown darker, and the granules larger; and on either side there is a clear, white, oval space about one-third the length of the egg. In about two days more the outer edge of the center is the same color as in the last stage, and inside this is a narrow, lighter band, while in the center is seen the form of a cylindrical larva larger at one end, and both ends slightly curved towards each other; and in one or two days more the whole form of the larva is visible, the head, thoracic and anal shields being black. The egg stage lasts from eight to eleven days.

When the young larva hatches it does not eat the shell of its egg, but goes on to the tenderest leaves and almost immediately begins spinning a microscopic layer of silk, under which it eats the outer layer or epidermis of the leaf. The larva is then about three millimeters in length, of a creamy white color, with head, thoracic and anal shields blackish brown, and a few minute pale hairs on the body; the head is very large for the rest of the body. In a week the larva is nearly four millimeters long, light yellowish brown, with the head, thoracic and anal shields dark brown, and it eats minute holes through the leaf, its silken web now being visible to the naked eye. The larva gradually becomes a trifle more brownish, increases in size and enlarges its web along the side of the midrib.

Late in the fall the silken web is quite heavy and thick, and the larva deposits its excrements in little black pellets in the form of a tube, under the web, within which it hibernates during the winter. Not unfrequently two leaves are fastened together by the silk of the web, and sometimes a leaf is secured to a branch of the tree in the same manner.

About the first of May the larva measures seven millimeters when resting, and eight when in motion It is cylindrical in form, with the head dark brown and of medium size. The body is dark yellowish brown, and the head, thoracic and anal shields very dark, polished brown. There are ten lighter brown protuberances on each segment, from each of which arises one pale hair. On the upper surface of the ninth segment is seen the double undeveloped reproductive organ of a light brown color. The legs are dark brown and the prolegs yellowish brown. About the first of June the larva is from ten to twelve millimeters in length, and the body has changed to a cinnamon rufous color. From the middle to the last of June it curls or draws together several leaves which it lines with silk, and in which it transforms to a pupa."

We show in Figure 7, page 126, a cut of the larva and moth.

Since the above was written, Mr. Ingraham writes that though nearly all the buds were infested and badly eaten, the flower buds were not molested and he had a good crop of blackberries. This may have been due to the well known law, that the last effort of nature is to reproduce, and the diminished leaf surface may show itself next season in a loss of vigor of the new canes. He also writes that this insect was noticed in 1889, but did not do enough damage to attract much attention or require remedial measures. In 1890 it had so much increased as to affect most of the leaf buds. This teaches the important lesson, that orchardists and farmers would save themselves much trouble and expense by carefully watching their orchards and crops to detect new insects when they appear in small numbers, apply remedial measures *at once* and not wait until the entire crop is endangered before active measures are taken. For this reason we urge the importance of sending to the Station for identification insects not known, to learn whether they are friends or foes.

REMEDIES.

Pick and burn the infested buds while the caterpillars are still in them.

Spray the bushes or trees about the time the buds are opening, with Paris green, one pound to two hundred gallons of water. London purple could be used instead of Paris green and in the same way. There would be no danger of poisoning the fruit as the application is made so long before the berries are formed it would all be washed off.

If this insect hibernates in its silken web attached to leaves as stated by Prof. Fernald, then to gather the fallen leaves of infested trees or bushes and burn them would seem a good remedy.

THE WOOLLY-LOUSE OF THE APPLE.

Schizoneura lanigera, (*Hausm.*)

The following letters were received during the fall of 1890:

WAYNE, ME., Oct. 8, 1890.

PROF. HARVEY:

Dear Sir—I send you by to-day's mail a box containing two twigs covered with some kind of a fungous growth. The twigs were taken from a seedling tree set out in the spring of '89, and from the nursery of F. Bowman & Bro., Sidney. The whole top of the tree is affected but otherwise seems healthy. I first discovered it about one week ago. I think I have seen the same growth on black alders. What is it? Is it injurious? If injurious what is the remedy?

Truly yours,

W. A. BURGESS.

FAIRFIELD, ME., Sept. 12, 1890.

F. L. HARVEY:

Sir—I can find no more of the worms like those you already have, but I send a specimen which I have lately discovered on a tree which came from Homer N. Chase, Geneva, N. Y. Will write you more at length about them soon.

W. J. HIGGINS.

The specimens accompanying the above letters were the "Woolly-Louse of the Apple," and as this is quite an injurious insect we consider it at length and illustrate it.

Two forms of this insect are recognized by entomologists. One known as the Apple-root Plant-louse which attacks the roots, producing wart-like excresences or swellings. The other form known as the Woolly-louse of the apple was the one we received. It feeds upon the sap of the trunk and branches. They are regarded as the same species living under different conditions. We do not know which was the original form and which the variety, whether it was a northern species feeding upon the trunk and branches and adapted itself to a southern life by seeking a habitat on the roots, or whether it is naturally a root species seeking the trunk and branches in a cool, moist, northern climate. Its more frequent occurrence on the roots would suggest the latter. The above ground form occurs most abundantly in this country in New England. This insect is more common in Europe and Australia than in America, where it is more destructive, and is called the "American Blight." Entomologists differ in their opinions regarding its nativity, some accredit it to America, most are inclined to think it originated in Europe. It would not be much honor to either country to produce such a pest.

This insect in the root form was noticed in this country as early as 1848, when thousands of trees were found so badly infested that they had to be destroyed. Since then the insect has been reported as doing more or less damage in every section of the country. The above letters indicate that this pest was distributed upon nursery stock, and gives us another opportunity to reiterate the importance of carefully examining nursery stock before setting.

DESCRIPTION AND HABITS.

Eggs—Minute, requiring a magnifying glass to see them. They are laid in the crevices of the bark at near the surface of the ground.

The young when first hatched appear like specks of mold, being covered with fine white down. As they get older the cottony covering becomes more distinct, apparently issuing from the pores of the skin of the abdomen and attaining considerable length. The young have beaks longer than the body and when grown this organ is fully two-thirds the length of the body. By means of the beak they attach themselves to the root or branches, and when abundant, draw heavily upon the vitality of the tree, or may even kill it.

When full grown the females are about one-tenth of an inch long, oval, head and feet black, legs and antennæ dusky, abdomen yellowish, body covered with white mealy powder, a tuft of long, easily detached down upon the hinder part. Under each patch of down is usually found a female and her young. During the summer the females are wingless and the young are produced alive. Toward fall the broods contain both winged females and winged males, which have not much down on them and are nearly black and plump. The fore wings are about twice as long as the narrow hind ones. These winged females fly to other trees and lay eggs, establishing new colonies. During the early part of the season this form of the insect is found in clusters about the base of the trunk, upon suckers or twigs springing from the trunk. but in autumn they commonly affect the axils of the leaves and sometimes cover the whole under surface of the limbs and trunk, making the tree look as though whitewashed.

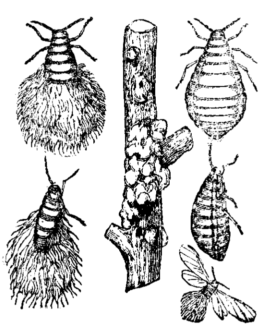


FIG. 8.

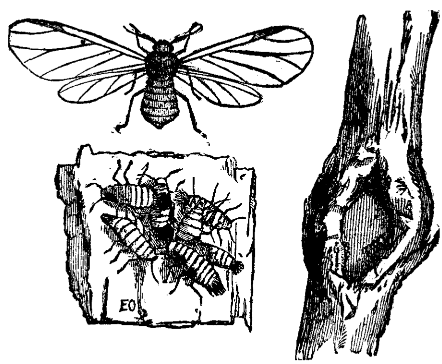


FIG. 9.

Figure 8 shows the insect magnified. The centre of the figure represents a portion of a twig showing how the lice collect about the axils of the leaves.

Figure 9 shows the winged insect much enlarged, a cluster of the young enlarged and an apple twig natural size, showing an opening in the bark caused by the puncture of this insect.

REMEDIES.

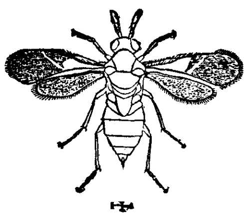


FIG. 10.

Natural remedies.—This louse is preyed upon by a small chalcid fly known as *Aphelinus mali*, Hold, and shown much enlarged in Figure 10. The real size is shown by the crossed lines below. The lady birds and their larvæ, also the larvæ of the lace-wing flies and syrphus flies, which feed upon plant lice, also hold this species in check. (A consideration of these useful parasites will be found in Station Report, 1888, under the head of the *Apple-tree Aphis.*) Spiders devour large numbers. They spin their webs over the colonies entrapping them and then devour them at their leisure. We find no record of birds feeding upon them.

Artificial remedies.—The presence of this insect can be readily detected by the moldy or whitewashed appearance of the trunk or branches where the colonies are located. If a tree seems sickly and the leaves turn yellowish, it would be well enough to examine the roots, by laying them bare, to ascertain whether the root form of this species is present. If the lice are found in the crevices, they can be killed by scalding water freely poured upon the roots. If the trees are in the ground the water can be applied nearly boiling without injury. If nursery stock, taken up to transplant, the water should not be hotter than 150° Fahrenheit. The roots may be drenched with strong soapsuds followed by a dressing of ashes on the surface of the ground.

It is said that mulching should precede the treatment, as it causes the lice to come near the surface of the ground where they can be more easily reached. When the lice are on the branches strong soapsuds, kerosene emulsion, or Paris green in water applied in the usual way would prove effective. As the winged females no doubt fly to other trees, more or less, and start new colonies, the lice should be treated before the fall broods appear. It would always be well to carefully examine nursery stock before setting it. At least it should be carefully watched the first season for any new pest that might appear in few numbers, so as to destroy them.

THE RED-HUMPED APPLE-TREE CATERPILLAR.

Œdemasia concinna, (Sm. & Abb.)

This pest of the apple tree has made its appearance in Maine, as shown by the correspondence given below, which is perhaps important enough for permanent record. That the insect may be more easily recognized by orchardists we give Figure 11 an illustration of the moth life size, Figure 12 the full grown larva and Figure 13 the pupa.

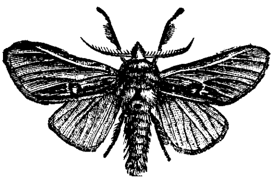


FIG 11.

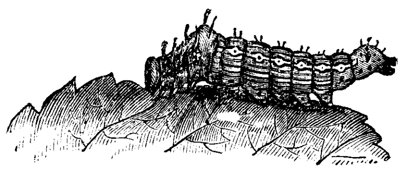


FIG. 12.

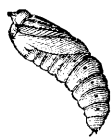


FIG 13.

[For the Maine Farmer.]

PEST OF THE APPLE TREES.

[The following note, together with the box of insects, was sent to Prof. Harvey of the State College, for his investigation. We give his clear and very satisfactory reply. ED.]

Mr. Editor:—Please give through your columns, the history and habits of the pests I send you. I find them stripping the leaves off my apple trees, leaving nothing but the main stem of the leaf. I never saw anything like them before, as I can recollect.

Yours truly,

WM. J. HIGGINS.

FAIRFIELD, ME.

Editor Maine Farmer:—The insects which you forwarded by express came to hand in good condition. They are the half grown larvæ of the Red-humped Apple-tree Caterpillar; *Œdemasia concinna*, (Sm. & Abb.)

The perfect insect is a moth which measures from an inch to an inch and a quarter across the wings. The fore wings are dark brown on the inner, and grayish on the outer margin. There is a dot near the middle, a spot near the angle and several longitudinal streaks along the hind margin, all dark brown. The body is light brown, and the thorax of a darker shade. These moths are on the wing late in June or July. The female deposits her eggs on the under side of a leaf in a cluster, usually during July. They soon hatch into small caterpillars. These caterpillars, while young, feed upon the tender tissues of the under side of the leaf, leaving the upper surface unbroken, but when large they devour greedily the whole leaf. They reach maturity during August or September. The specimens sent were about half grown, and were about three-fourths of an inch long. When full grown they are often an inch and a quarter long. The full grown larvæ may be known by the coral-red head and a hump of the same color on the fourth ring or segment from the head. The body is striped lengthwise with narrow yellow, white and black lines. There are two rows of black spines along the back, and rows of shorter black spines on the sides. Each spine bears a fine hair. The spines on the coral-red hump are more prominent than the others. The hinder end of the caterpillar tapers and is usually elevated when the insect is at rest. When handled, a fluid with a strong acid smell is emitted. When mature they descend to the ground and hide under leaves or rubbish, or sometimes burrow a little into the ground and slowly change to the chrysalis state, where they remain until the following spring, when the moths appear, completing the life history. At the north there is only one brood during the summer, but in the south two broods appear.

The species is widely distributed, though not usually abundant. It prefers the apple, but will feed upon the plum, cherry, rose, thorn and pear, plants belonging to the *Rose* family.

As these caterpillars go in flocks, and when not feeding remain close together, they could easily be destroyed by cutting off the branch on which they appear and burning it. They might be destroyed by jarring the limb, and when they fall to the ground trample them with the foot. If the trees are not in bearing, the insects would be destroyed by spraying with Paris green in suspension in water, one pound to 150 gallons. They emit such an odor birds do not eat them. It is said that Ichneumons are parasitic upon them and hold them in check.

This is the first complaint we have had of this insect in Maine. It may have been introduced on nursery stock from farther south. The history of its appearance and the extent of its depredations at Fairfield would be interesting, and we hope Mr. Higgins will tell us more about it. Those who have a copy of "Saunders" Insect Injurious to Fruits," will find this pest figured and considered on pages 63 and 64.

F. L. HARVEY,

Entomologist for the Station.

ORONO.

THE FALL CANKER-WORM.

Anisopteryx pometaria, (Harris.)

This species was considered and illustrated in Station Report, 1888, to which the reader is referred for an account of the life history and remedies. We expressed there a want of information regarding its distribution in the State and damages. Since then we learn it is widely distributed and does considerable damage to the foliage of orchard and shade trees. About Orono it has steadily increased for the past two years and this season did considerable damage. We think that by spraying with Paris green or London purple in the usual way, when the worms are small, they could be readily destroyed. This worm is known by the farmers about Orono as the "Green Inch-worm." Last November we received the following letter, which with the answer, we place on record.

BELFAST, ME., 11, 10, 1890.

F. L. HARVEY:

Enclosed find specimens of Lepidoptera, *Anisopteryx*, I think female, with eggs accompanying. They are to-day found in large numbers on the outside of the front door of my dwelling house in this city.

Are they A. *esculuria* or A. *pometaria?* I was not aware before that they deposited their eggs on buildings. Perhaps they are a new insect. Can you tell?

Haste,

GEO. E. BRACKETT.

MR. GEO. E. BRACKETT.

Dear Sir:—Your letter containing insect specimens was received during my absence from home. It now claims attention. The specimens enclosed are the females and eggs of *Anisopteryx pome-*

taria, Harris, the Fall Canker-worm. This species usually deposits its eggs upon the branches or twigs of trees. The females being wingless, when they emerge from the ground, crawl to the base of trees, which they climb. The tendency to climb is so strong in these insects they blindly ascend fences and houses, as well as trees, and deposit their eggs. The eggs thus laid would hatch, but the young larvæ would perish. This shows that the instinct of insects is not the infallible guide claimed by some. They make mistakes in judgment, like us mortals. This species has been abundant here this season. My boys had quite a box of females and eggs which they took upon fence posts during my absence. So this blind habit of laying the eggs seems common, though I have never seen it recorded in any of the entomological works. Will make note of it some time in the future, and give you credit for the observation. Will be pleased to answer questions about insects any time.

Yours truly,

F. L. HARVEY.

ORONO.

THE FOREST TENT-CATERPILLAR.

Clisiocampa sylvatica, Harris.

The Forest Tent-caterpillar was so abundant the past season in several localities in the Penobscot Valley that it caused serious alarm upon the part of many, as to the safety of our forests and orchards. Several articles bearing upon the subject appeared in the local papers. It is no doubt true that it is a great drain upon the vitality of forest trees to lose their leaves and have to replace them. They probably do not regain their normal vigor for several years and many die from this cause. There is, however, no need of serious alarm, as the history of this insect shows it does not continue to increase many years in succession, but generally disappears almost entirely after the second season. To ascertain how far parasites were destroying this pest the writer took 135 cocoons last fall and from them was able to rear only twenty moths.

This shows that only about fifteen per cent survived the attacks of parasites and other mishaps. From the cocoons came forth about ninety parasites; two species of Ichneumons and two species of Tachina flies. As only twenty moths came forth this leaves about twenty-five deaths to be accounted for in some other way. Some of the cocoons seem affected by a disease, probably bacterial, that may account for part of the mortality. This spring, 1891 and previously, we have bred a Chalcid fly from the eggs of this species. Thus the efforts of fungi, larval and egg parasites combined, aid in holding them in check. The parasites have increased rapidly the past season and there will be comparatively few caterpillars in 1891. The parasites bred were *Pimpla conquisitor*, (Say), *Anomolon* near *exile*, Prov., *Tachina clisiocampa*, Townsend and *Phorocera promiscua*, Townsend.

The Tachinas were new to entomologists and were named and described by Prof. C. H. Tyler Townsend in *Psyche* for May, 1891. The *Phorocera* was very abundant. Eighty of the one hundred and thirty-five cocoons collected at random were infested by it. This spring we bred from the eggs of this species as stated above, a minute four-winged fly which we sent to Prof. C. V. Riley for identification and received the following reply, which we record for the benefit of entomologists, it being too technical for the comprehension of those not versed in entomology: "The specimen is a species of *Tetrastichus*, a genus in which we have an indefinite number of undescribed species in this country, which are very difficult to separate. Your species is probably undescribed. *Tetrastichus* is invariably, so far as we know, hyper-parasitic and the primary parasite, is, in your case, probably, a Telenomus or a Trichogramma."

FRUIT TESTS.

With few exceptions the plants set in 1889 lived and made a vigorous growth during the season of 1890. In accordance with the purpose noted last year, scions of the most promising varieties of apples were sent to some of the leading orchardists in various parts of the State, for the purpose of determining the adaptability of these varieties to the widely varying conditions existing in different localities. A blank form was sent with all scions that the system of records may be uniform.

The following fruits were added to the experimental plantations in 1890:

Apples—Excelsior, Fall Pippin, Golden Russet, Gideon, Martha, Mann, Munson's Sweet, October, Peter, Primate, Red Russet, Tallman Sweet, Vandevere, Wealthy, William's Favorite, White Pippin, Antononka, Aport, Arabskoe, Bogdanoff, Early Sweet, Golden Reinette, Mallet, Romna, Striped Winter, Table Apple, Tetofsky, Titvoka, Titus Riga.

Pears—Anjou, Angouleme, Bartlett, Clairgeau, Clapp, Flemish Beauty, Hardy, Howell, Keiffer, Lawrence, Le Coute, Louise Bonne, Seckel, Sheldon, Souvenir des Congres, Superfine, Winter Nellis.

Plums—Green Gage, McLaughlin, Moore's Arctic, Quackenbos, Pond's Seedling, Prunus Simoni, Smith's Orleans, Washington, Weaver, Wild Goose.

Cherries—Yellow Spanish, Black Tartarian, Belle Magnifique.

Grape—Lindley.

REPORT OF METEOROLOGIST.

PRESIDENT FERNALD, METEOROLOGIST TO THE STATION.

MAINE EXPERIMENT STATION.

Lat. 44°, 54′, 2″, N. Long. 68°, 40′, 11″, W.

Following the purpose indicated in the last report, the Experiment Station seeks not to duplicate the meteorological work of the College, but rather to study carefully certain meteorological conditions which are more or less intimately connected with practical agriculture.

It therefore addresses itself to an examination of the meteorological phenomena regarded of greatest interest to the cultivator of the soil.

The most of the instruments employed have been manufactured by H. J. Green of Brooklyn, N. Y. Mr. Robert H. Fernald of Orono, has been observer during the two years that this work has been carried on. In this report the results of observations made during the years 1889 and 1890 are combined. The instruments have remained unchanged in position during the two years.

The several problems considered will appear 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 and 1890.

The monthly averages are given in the following tables on the scale of 100.

PERCENTAGES OF MOISTURE.

Hygrometer No. 1—In Open Field.

	1889. 7 A. M.	1890. 7 A. M.	1889. 1 P. M.	1890. 1 P. M.	1889. 7 P. M.	1890. 7 P. M.	Mean.
April,	81	74	53	50	66	58	64
May,	84	81	60	62	71	74	72
June,	88	83	67	72	81	75	78
July,	85	85	65	74	75	79	77
August,	95	90	70	63	80	77	79
September,	93	93	68	76	83	85	83
October,	94	90	66	62	79	79	78
Mean results,	89	85	64	66	76	75	76

Hygrometer No. 2—In Open Field.

	1889. 7 A. M.	1890. 7 A. M.	1889. 1 P. M.	1890. 1 P. M.	1889. 7 P. M.	1890 7 P. M.	Mean.
April,	78	70	52	46	65	56	61
May,	80	78	53	61	68	74	69
June,	84	78	66	68	74	75	74
July,	79	80	60	63	69	71	70
August,	87	88	67	62	75	73	75
September,	91	91	60	67	81	83	79
October,	93	91	66	62	81	79	79
Mean results,	85	82	61	61	72	73	72

Hygrometer No. 3—In Forest.

	1889. 7 A. M.	1890. 7 A. M.	1889. 1 P. M.	1890 1 P. M.	1889. 7 P. M.	1890. 7 P. M.	Mean.
April,	81	78	62	61	69	69	70
May,	83	87	63	74	73	81	77
June,	89	87	80	77	84	82	83
July,	94	93	86	85	91	83	89
August,	91	94	89	80	93	84	88
September,	96	96	88	87	92	92	92
October,	96	96	90	86	90	90	91
Mean results,	90	90	80	79	85	83	84

Hygrometer No. 4—In Forest.

	1889. 7 A. M.	1890. 7 A. M.	1889. 1 P. M.	1890. 1 P. M.	1889. 7 P. M.	1890. 7 P. M.	Mean.
April,	83	79	65	60	77	71	72
May,	89	88	66	73	80	84	80
June,	92	89	81	77	86	84	85
July,	93	91	79	79	87	85	86
August,	95	91	86	78	91	85	88
September,	96	97	83	86	90	92	91
October,	96	94	80	80	90	89	88
Mean results,	92	90	77	76	86	84	84

PERCENTAGES OF MOISTURE.

Results for 1889 and 1890 Combined.

	7 A. M.	1 P. M.	7 P. M.	Mean.
Hygrometer No. 1, in open field,	87	65	76	76
" " 2, " "	83	61	72	72
" " 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 Nos. 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 that from observations covering the period of growth of two 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.

It was noticeable in the investigation made that proximity to running water during two-thirds of the period of experiment only compensated for the loss of moisture resulting from the more open character of the forest where hygrometer No. 4 was situated as compared with No. 3.

It is designed that this examination of the effect of forests on the moisture of the atmosphere shall be continued.

SOIL TEMPERATURES.

In this investigation a knowledge of the temperature of the soil at different depths, during the growing season, is sought.

The periods covered by the experiment are from May 1 to November 1, 1889, and from April 1 to November 1, 1890, with thermometers placed in the soil to the depths of 1, 3, 6, 9, 12, 24 and 36 inches.

The thermometers were allowed to remain in place during the winter intervening between the two 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 two seasons by monthly averages is given in the annexed table.

Soil Thermometers.

	One Inch.			Three Inches.			Six Inches.			Nine Inches			Twelve Inches			Twenty-four Inches.			Thirty-six Inches.		
	7 A. M. Degrees.	1 P M Degrees.	7 P. M. Degrees.	7 A. M. Degrees.	1 P. M. Degrees.	7 P. M. Degrees.	7 A. M. Degrees.	1 P. M. Degrees	7 P. M. Degrees.	7 A. M. Degrees.	1 P. M. Degrees	7 P. M. Degrees.	7 A M Degrees.	1 P. M. Degrees.	7 P. M. Degrees	7 A. M. Degrees.	1 P. M. Degrees	7 P M. Degrees.	7 A. M. Degrees.	1 P. M. Degrees.	7 P. M. Degrees.
1889.																					
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	54.73	54.84	54.79
Mean temperature for six months		60.50			60.77			59.63			58.78			58.26			56.40			54.79	
1890.																					
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	51.93	50.70	50.83	50.78
Mean temperature for seven months		54.63			54.92			53.96			53.26			53.31			51.96			50.77	

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. Degrees.	1 P. M. Degrees.	7 P. M. Degrees.	Mean. Degrees.
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. Degrees.	1 P. M. Degrees.	7 P. M. Degrees.	Mean. Degrees.
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

Table Showing Changes of Temperature in the Soil for Increased Depths.

1889.

Depth of Thermometer.	Mean temperature for six months, May to Oct. inclusive—deg.	Difference in mean temperature—deg.	Changes in temperature for one inch—deg
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 seven months, April to Oct. inclusive—deg.	Difference in mean temperature—deg.	Changes in temperature for one inch—deg.
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

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 one inch during the period of observations was 5°.62 ; at the depth of three inches, 5°.26 ; at the depth of six inches, 1°.90; at the depth of nine inches, 1°.18, and below twelve inches, very slight.

At the depth of three inches, the average temperature of the soil was somewhat higher than at the depth of one inch. The surface soil averaged about five degrees warmer than the soil thirty-six 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.

Comparing soil temperatures with air temperatures during the two seasons under notice, the following mean results appear. At the depth of one inch, the temperature of the soil was lower than that of the air by 2°.40; at the depth of three inches, by 2°.11; six inches, by 3°.16; nine inches, by 3°.94; twelve inches, by 4°.18; twenty-four inches, by 5°.78, and at the depth of thirty-six inches, by 7°.18.

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, and from April to October inclusive, 1890.

TABLE SHOWING LOSS OF HEAT BY TERRESTRIAL RADIATION—1889.

	May Deg.	June Deg.	July Deg.	Aug. Deg.	Sept. Deg.	Oct. Deg.	Mean Deg.
Mean of minimum temperatures...	46.63	53.25	55.08	53.65	49.07	33.91	48.50
Mean of Tem. 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 Deg.	May Deg.	June Deg.	July Deg.	Aug. Deg.	Sept. Deg.	Oct. Deg.	Mean Deg.
Mean of minimum temperatures..................	29.17	42.52	48.71	53.61	53.52	45.32	36.05	44.13
Mean of Tem. 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

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 2d, 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 two seasons was 6°.48.

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 or 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 growth 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 Deg.	June Deg.	July Deg.	Aug. Deg.	Sept. Deg.	Oct. Deg.	Mean Deg.
Mean of readings, Sun Ther.	133.02	134.22	139.55	137.56	122.79	105.86	128.83
Mean of Maximum Tem	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 Deg.	May Deg.	June Deg.	July Deg.	Aug. Deg.	Sept. Deg.	Oct. Deg.	Mean Deg.
Mean of readings, Sun Ther...........	119.19	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

From the above records it appears that the average excess of solar intensity above that given by the maximum thermometer for the growing period of 1889 and 1890 was 60°.02.

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.

BRIGHT SUNSHINE IN HOURS—1890.

May, 180 ; June, 186 ; July, 216 ; August, 193 ; September, 126 ; October, 133.

During this period, the average hours of bright sunshine per day was 5.6 or 41 per cent of the possible amount.

WIND AND RAIN.

The velocity of the wind has been determined by a Robinson's Anemometer 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. Mean distance travelled per day. Miles.	WIND. Velocity per hour. Miles.	RAIN. 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. Mean distance travelled per day. Miles.	Velocity per hour. Miles.	RAIN. 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

For the full year 1890, the mean monthly velocity of wind was 211.16 miles, and the mean hourly velocity, 8.90 miles. The rainfall in May, 1890, amounting to 10.13 inches was larger than in any other month in twenty-two years.

CONCLUSION.

This report covering simply the growing periods of two years, is based upon and contains summaries of more than twenty thousand independent observations. In order to show more definitely the nature and daily requirements of the meteorological work in progress, I append the records for one month, selecting the month of July, 1890. Their examination will disclose many points of interest which cannot be incorporated into a brief report.

By lapse of time such records and their antecedent observations become increasingly valuable, and their thorough discussion, as expressed in my former report, "adds to the sum of available knowledge and furnishes rules for guidance useful alike for the scientist and the farmer."

Hygrometer No. 1.—In Open Field.

JULY, 1890.

Day.	7 A. M.				1 P. M.				7 P. M.			
	Dry bulb Degrees.	Wet bulb. Degrees.	Dew point. Degrees.	Humidity. Degrees.	Dry bulb Degrees.	Wet bulb. Degrees.	Dew point. Degrees.	Humidity. Degrees	Dry bulb. Degrees.	Wet bulb. Degrees.	Dew point Degrees.	Humidity. Degrees.
1.........	59.2	59.2	59.2	100	81.0	68.0	61	51	68.5	62.2	58	71
2.........	62.0	59.0	57	84	71.8	61.9	56	57	64.8	59.0	55	71
3.........	59.7	59.7	59.7	100	63.6	63.6	63.6	100	62.2	62.2	62.2	100
4.........	66.0	64.0	63	90	71.7	67.5	66	81	67.0	65.2	64	91
5.........	62.0	62.0	62	100	73.5	73.5	73.5	100	73.8	69.5	67	81
6.........	62.5	56.8	54	71	75.2	63.3	72	91	71.8	64.6	61	68
7.........	65.0	62.2	60	86	74.1	66.0	62	66	70.0	64.0	60	72
8.........	66.3	64.0	62	88	81.2	75.7	73	78	76.7	72.8	71	83
9.........	73.8	68.0	65	75	70.4	61.6	55	61	59.7	54.0	50	69
10.........	51.2	48.0	45	79	66.3	56.2	48	53	63.2	58.2	55	74
11.........	53.7	49.6	44	70	73.0	66.8	69	85	72.7	67.8	66	78
12.........	56.7	55.7	55	94	76.4	64.3	57	52	70.3	66.4	62	77
13.........	66.7	61.6	59	76	70.2	62.0	57	63	62.9	57.8	55	74
14.........	60.0	58.2	57	90	74.0	65.3	61	63	76.2	69.0	66	69
15.........	66.8	64.0	62	86	80.9	76.5	77	86	82 2	76.5	74	78
16.........	73.2	69.0	67	81	82.6	82.6	82.6	100	78.3	74.3	72	83
17.........	66.1	63.0	61	85	78.0	73.0	71	79	68.0	65.1	63	85
18.........	58.7	55.0	53	80	64.5	56.0	50	59	68.0	55.3	64	87
19.........	60.0	54.3	50	69	60.0	57.5	56	86	56.5	56.5	56.5	100
20.........	56.3	54.5	53	89	66.3	57.8	51	59	61.3	58.0	55	82
21.........	55.0	53.0	52	88	72.0	63.5	59	63	68.1	62.0	58	71
22.........	58.1	55.0	53	83	74.0	65.7	61	65	67.0	62.3	60	77
23.........	62.5	60.0	59	87	74.0	69 0	67	78	65.2	59.0	55	69
24.........	62.2	61.5	61	96	72.7	64.2	60	63	67.8	59.8	59.8	63
25.........	61.7	61.1	61	97	67.0	65.0	64	90	62.3	62.3	62.3	100
26.........	67.1	66.1	66	95	70 2	69.0	69	94	67.8	67.0	67	96
27.........	70.0	65.6	63	79	77.3	66.4	76	95	74.7	66.8	63	66
28.........	65.1	61.2	59	80	80.3	71.8	68	66	72.8	69.7	69	86
29.........	71.8	67 5	65	80	84.1	71.4	66	54	73.3	66.0	62	68
30.........	64.6	64.2	64	97	86.0	78.3	75	71	78.0	71.6	68	73
31.........	70.0	67.0	66	86	80.0	72.5	69	70	75.1	72.0	71	87
Means				85				74				79
Mean for month ...			83									

Hygrometer No. 2 —In Open Field.

JULY, 1890.

Day.	7 A. M.				1 P. M.				7 P. M.			
	Dry bulb. Degrees	Wet bulb. Degrees.	Dew point. Degrees.	Humidity. Degrees	Dry bulb. Degrees.	Wet bulb Degrees.	Dew point. Degrees.	Humidity Degrees.	Dry bulb. Degrees	Wet bulb. Degrees.	Dew point. Degrees.	Humidity Degrees.
1.........	63.3	61.5	60	90	86.0	69.2	60	43	89.3	62.3	58	67
2.........	71.0	64.5	61	70	78.3	65.8	58	51	67.0	60.0	55	66
3.........	61.0	60.0	59	94	64.4	64.4	64.4	100	63.1	63.1	63.1	100
4.........	68.4	65.8	64	88	74.5	68.5	66	74	69.2	66 3	64	86
5.........	63.2	62.7	62	97	74.0	74.0	74.0	100	80.6	72.0	69	66
6.........	66.7	58.8	54	62	77.0	65.0	58	52	75.9	66.7	62	62
7.........	66.7	63.0	61	82	77.6	66.6	61	56	73.4	65.3	61	65
8.........	71.0	67.3	66	83	84.8	74.8	71	63	80.7	73.1	70	70
9.........	74.8	68.0	64	71	70.3	58.0	48	47	60.6	51.4	44	53
10........	54.0	48.0	42	64	68.6	57.9	51	52	67.0	60.6	56	69
11........	56.2	51.6	48	74	73.6	63.2	57	56	79.0	77.5	77	94
12........	63.2	61.4	40	90	82.0	68.3	61	49	69.8	66.3	65	83
13........	70.2	63.2	59	68	76.0	64.0	57	52	68.0	57.5	50	52
14........	66.6	61.3	48	74	77.6	66.0	50	54	82.6	68.8	62	50
15........	70.6	66.0	64	79	85.1	77.0	74	70	86.4	78.1	75	69
16........	77.0	73.0	71	83	83.1	83.1	83.1	100	82.5	75.8	74	74
17........	70.5	66.2	64	80	82.5	70.8	66	57	69.2	65.7	63	83
18........	60.0	55.7	52	76	65.8	55.8	48	53	71.0	58.1	48	45
19........	63.0	57.0	53	69	61.0	58.7	57	88	57.2	57.2	57.2	100
20........	58.0	55.7	54	87	65.5	57.0	51	59	63.0	58.2	55	75
21........	59.0	55.3	53	80	71.8	59.5	51	48	74.2	61.4	52	47
22........	66.3	60.8	57	73	77.5	62.1	49	39	69.7	59.7	53	55
23........	68.3	63.2	60	76	75.0	64.8	59	57	67.3	60.3	55	66
24........	66.4	61.2	58	74	74.1	64.0	58	58	70.0	61.1	55	60
25........	63.0	61.6	61	92	68.6	65.8	64	87	63.0	63.0	63	100
26........	67.8	66.3	66	93	70.6	69.2	69	93	68.6	67.0	66	93
27........	71.8	66.3	93	75	79.0	68.0	62	57	75.6	68.6	66	70
28........	73.0	66.3	63	70	81.1	68.4	62	52	74.6	65.7	61	62
29........	72.4	68.0	66	81	87.0	74.0	68	54	75.6	67.1	63	64
30........	66.0	64.7	64	93	89.3	81.0	77	70	79.0	73.5	71	77
31........	70.6	67.6	67	86	80.3	72.5	68	69	74.3	71.3	70	86
Means				80				63				71
Mean for month ...							71					

Hygrometer No. 3.—In Forest.

JULY, 1890.

Day.	7 A. M.				1 P. M.				7 P. M.			
	Dry bulb. Degrees.	Wet bulb. Degrees.	Dew point. Degrees.	Humidity. Degrees.	Dry bulb. Degrees.	Wet bulb Degrees.	Dew point Degrees.	Humidity. Degrees.	Dry bulb. Degrees.	Wet bulb. Degrees.	Dew point. Degrees.	Humidity. Degrees.
1	58.0	57.2	56	95	74.3	69.5	67	79	66.6	63.2	61	83
2	60.3	58.6	58	91	70.8	67.0	65	82	65.2	63.0	62	89
3	59.3	58.7	58	97	64.0	61.0	61	100	59.8	59.8	59.8	100
4	63.8	63.3	63	97	67.8	66.8	67	95	65.3	64.1	63	94
5	61.6	61.6	61.6	100	70.2	70.2	70.2	100	70.3	68.2	67	90
6	60.2	58.3	57	89	70.8	66.8	65	81	69.4	67.7	67	92
7	62.4	61.2	60	94	69.7	67.0	67	87	68.0	66.2	65	91
8	63.8	63.0	62	96	76.7	74.8	74	91	74.8	73.3	73	93
9	70.8	68.4	68	88	68.4	64.5	72	83	58 7	56.0	55	85
10	52.4	50.9	49	90	62.4	58.6	55	80	63.3	60.0	57	83
11	50.6	49.2	48	90	68.3	64.7	62	83	66.2	63.0	61	84
12	53.0	52.0	51	94	72.0	67.8	66	81	75.2	65.8	60	60
13	64.3	62.4	61	90	68.8	61.0	56	64	61.4	59.6	58	90
14	57.3	56.0	55	92	69.8	66.6	66	85	69.7	67.2	67	88
15	62.0	61.0	60	95	78.0	75.8	75	90	78.3	76.0	75	90
16	69.0	67.2	66	91	70.8	67.9	69	86	73.0	72.0	72	95
17	63.0	61.8	61	94	71.2	67.9	66	85	66.7	64.2	63	88
18	59.3	58.0	57	93	62.3	57.1	53	73	63.9	58.7	62	76
19	54.7	53.0	53	90	59.2	58.5	58	96	55.4	55.4	55.4	100
20	55.5	54.7	54	95	61.9	60.0	59	89	59.5	57.4	57	89
21	50.8	50.0	49	94	66.3	59.0	53	64	62.1	58.2	55	79
22	56.8	54.6	54	87	67.7	63.2	61	78	64.3	62.2	61	90
23	59.6	58.9	59	96	71.0	68.0	67	86	61.7	59.2	58	87
24	59.1	58.0	57	94	68.0	64.1	62	81	66.0	63.7	62	88
25	61.0	60.5	60	97	65.8	65.2	65	97	61.7	61.7	61.7	100
26	66.8	66.2	67	98	70.0	69.6	70	98	67.6	67.0	68	98
27	67.2	66 0	66	94	75.3	72.3	71	87	71.0	69.0	68	91
28	59.4	57.8	57	92	75.8	68.0	64	67	70.3	66.5	64	82
29	63.4	62.2	61	94	79.5	76.8	77	88	72.2	70.6	70	93
30	64.6	64.0	64	97	80.6	78.1	77	90	76.3	74.6	74	92
31	68.7	66.9	65	91	76.3	74.5	73	92	74.1	72.5	72	93
Means. ...				93				85				83
Mean for month....							87					

Hygrometer No. 4.—In Forest.

JULY, 1890.

Day.	7 A. M.				1 P. M.				7 P. M.			
	Dry bulb Degrees.	Wet bulb. Degrees.	Dew point. Degrees.	Humidity. Degrees.	Dry bulb. Degrees.	Wet bulb Degrees.	Dew point Degrees.	Humidity. Degrees.	Dry bulb. Degrees.	Wet bulb. Degrees.	Dew point. Degrees.	Humidity. Degrees.
1.........	58.0	58.0	58	100	74.6	69.0	67	76	66.8	63.3	61	83
2.........	60.3	58.9	58	92	71.9	64.8	61	69	66.1	62.2	60	80
3.........	60.0	59.0	58	94	61.6	61.6	61.6	100	58.9	58.9	58.9	100
4.........	65.2	65.2	65.2	100	68.3	67.7	68	98	65.6	64.8	64	96
5.........	61.7	61.7	61.7	100	70.1	70.1	70.1	100	71.7	69.3	69	88
6.........	60.9	58.0	56	84	71.0	64.3	61	69	69.4	66.8	65	88
7.........	63.0	61.2	60	90	69.0	65.0	63	81	67.0	63.3	61	82
8.........	64.6	63.2	63	92	77.8	73.2	71	81	74.5	71.7	71	88
9.........	69.8	67.0	66	87	68.3	62.7	59	74	57.8	52.5	49	70
10.........	52.1	50.0	48	87	62.4	58.2	55	78	61.2	59.0	58	88
11.........	50.3	49.0	47	91	69.0	60.6	55	61	65.6	59.3	55	69
12.........	53.1	52.3	51	95	74.6	66.3	62	65	69.0	61.7	57	66
13.........	65.0	61.6	59	82	69.0	63.0	59	72	61.2	56.1	52	73
14.........	57.8	56.0	55	90	67.1	62.2	59	76	68.5	64.0	62	78
15.........	62.8	61.2	61	92	78.8	74.9	78	83	78.5	74.6	73	83
16.........	69.8	67.3	67	88	72.0	68.8	68	85	73.3	72.0	71	94
17.........	63.3	62.3	61	95	72.0	68.0	66	82	67.3	64.6	63	87
18.........	58.9	57.1	56	90	62.7	56.2	52	67	61.5	57.0	54	76
19.........	55.3	53.3	52	88	59.2	58.1	57	94	55.0	55.0	55	100
20.........	55.7	54.6	54	64	62.3	57.7	54	76	59.1	57.7	57	92
21.........	51.6	50.2	49	90	68.1	60.0	55	63	61.0	57.0	57	78
22.........	57.3	54.2	52	83	67.9	59.0	53	58	63.6	61.1	60	87
23.........	61.6	60.2	60	92	72.7	68.2	66	80	61.8	58.6	57	83
24.........	61.0	58.0	56	84	68.8	60.2	57	65	66.8	63.4	61	83
25.........	61.2	60.5	60	96	66.0	65.0	64	95	61.5	61.5	61.5	100
26.........	66.8	66.2	67	98	69.8	69.3	70	98	67.0	67.0	67	100
27.........	67.7	66.2	66	93	74.0	69.1	67	78	69.0	65.8	64	85
28.........	60.0	59.0	58	94	74.2	69.7	67	80	69.6	65.0	93	79
29.........	64.1	63.0	62	95	81.0	73.9	71	72	71.4	67.0	64	79
30.........	65.0	64.2	63	96	81.4	77.2	76	84	76.0	72.1	70	82
31.........	69.6	67.1	67	88	77.0	73.3	72	84	74.0	70.6	69	84
Means. ...				91				79				85
Mean for month ...						85						

Soil Thermometers.

JULY, 1890.

Day.	Depth 1 inch.			Depth 3 inches.			Depth 6 inches.			Depth 9 inches.			Depth 12 inches			Depth 24 inches.			Depth 36 inches.		
	7 A. M. Degrees	1 P. M. Degrees	7 P. M. Degrees	7 A. M. Degrees.	1 P. M Degrees.	7 P. M. Degrees.	7 A. M Degrees.	1 P. M. Degrees	7 P. M. Degrees	7 A. M. Degrees.	1 P. M Degrees.	7 P. M. Degrees.	7 A. M. Degrees.	1 P. M. Degrees	7 P. M. Degrees.	7 A. M. Degrees.	1 P. M. Degrees.	7 P. M. Degrees.	7 A. M. Degrees.	1 P. M. Degrees.	7 P. M. Degrees.
1...............	60.5	66.7	66.4	60.5	66.0	65.7	60.2	61.4	61.3	60.0	60.0	60.0	59.5	59.5	59.5	55.7	56.0	56.0	53.5	53.5	53.5
2...............	61.1	66.5	65.5	60.6	65.3	65.1	61.0	61.8	63.0	61.0	60.9	61.5	60.8	65.5	60.8	56.2	56.5	56.5	53.7	53.8	53.8
3...............	61.5	61.0	60.7	61.0	61.0	61.5	61.0	61.0	60.8	61.2	60.7	60.5	61.0	60.5	60.5	56.5	56.5	56.5	54.0	54.0	54.1
4...............	62.3	64.0	61.8	62.0	63.6	61.0	61.3	62.0	61.0	61.0	61.0	62.2	60.5	60.6	60.8	56.8	57.0	57.0	54.2	54.3	54.3
5...............	63.0	67.3	66.8	62.6	66.7	66.2	62.2	63.0	63.7	61.5	61.7	62.0	61.0	61.2	61.4	57.0	57.0	57.0	54.5	54.5	54.5
6...............	60.9	66.4	67.2	60.3	65.5	67.0	60.0	62.5	64.5	61.2	61.6	62.7	61.0	61.5	61.7	57.0	57.5	57.6	54.5	54.8	54.9
7...............	63.6	66.5	66.6	63.5	65.7	66.2	63.2	63.7	64.4	63.0	62.8	63.2	62.5	62.4	62.5	57.7	56.9	58.9	55.0	55.1	55.2
8...............	64.0	69.1	69.6	63.7	68.2	69.3	63.3	64.5	66.0	63.0	63.0	63.9	62.6	62.5	63.0	58.0	58.2	58.3	55.1	55.4	55.4
9...............	66.4	68.9	65.7	66.0	68.3	66.0	65.2	65.7	65.8	64.5	64.5	64.8	63.8	63.6	63.7	58.5	58.6	58.7	55.5	55.6	55.6
10...............	60.6	67.8	64.9	61.6	67.2	65.2	61.1	62.7	63.0	63.0	63.3	63.6	63.4	63.5	63.5	59.0	59.0	59.0	55.9	56.0	56.0
11...............	59.7	65.5	65.3	60.0	64.5	64.8	60.7	62.3	63.1	61.2	61.6	62.1	61.7	61.8	62.0	59.0	59.0	58.9	56.0	56.0	56.2
12...............	59.5	67.3	66.7	59.5	67.1	65.2	60.6	62.4	62.4	61.5	61.8	62.2	62.0	62.2	62.4	58 8	58.8	58.8	56.1	56.1	56.2
13...............	63.3	66.0	66.0	63.0	65.0	65.6	62.5	63.0	63.3	62.5	62.5	63.0	62.5	62.4	62.7	58.8	58.8	58.8	56.3	56.2	56.2
14...............	62.0	67.0	67.0	61.5	66.0	66.5	62 0	63.0	64.3	62.5	62.5	63.0	62.6	62.3	62.5	58.9	59.0	59.0	56.1	56.3	56.3
15...............	63 2	68.7	69.2	63.0	67.4	67.9	63.0	61.2	65.7	63.2	63.3	64.0	63.1	62.9	63.3	59.0	59.3	59.2	56.4	56.5	56.6
16...............	66.0	69.2	69.6	65.5	69.0	69.2	65.0	67.4	66.9	64.5	61.7	65.3	64.2	64.5	64.5	59.3	59.4	59.5	56.5	56.5	56.7
17...............	65.0	67.5	67.2	65.0	66.7	66.9	65.0	66.0	65.5	65.0	65.0	64.8	64.6	64.3	64.2	59.6	60.0	59.7	56.7	56.9	56.9
18...............	63.3	66.8	65.4	63.5	66.5	65.5	63.0	66.0	64.7	64.0	64.5	64.0	64.0	64.2	63.6	59.8	59.8	59.8	57.0	57.0	57.2
19...............	59.7	61.8	60.0	59.5	61.3	60.6	61.0	61.2	61.0	62.1	61.5	61.0	63.0	62.2	62.0	59.9	59.8	59.6	57.0	57.0	57.0
20...............	59.8	62.8	63.1	60.3	62.0	63.0	60.5	61.0	62.0	60.7	60.5	61.0	61.5	61.1	61.0	58.4	59.4	59.2	57.1	57.1	57.1
21...............	59.1	64.0	63.5	58.5	63.0	63.5	60.0	60.6	62.1	60.2	60.0	60.8	61.0	60.5	60.6	59.0	69.0	59.0	57.0	57.0	57.0
22...............	57.8	69.9	67.5	58.0	69.5	68.2	59.0	62.5	65.6	59.9	60.7	62.9	60.8	60.5	61.4	58.8	59.0	58.8	57.0	57.0	57.0
23...............	60.6	70.5	67.4	60.7	69.9	68.5	61.2	64.0	63.6	61.8	62.1	62.3	60.2	61.7	61.7	58.9	59.0	59.0	56.8	57.0	57.0

24	61.8	70.6	67.8	61.9	70.2	68.5	62.3	65.1	66.9	62.6	63.0	64.5	62.6	62.3	63.0	59.2	59.2	59.1	56.9	57.0	57.0
25	63.4	66.5	65.3	63.5	66.3	65.7	63.6	64.5	64.2	63.5	63.5	63.5	63.0	62.9	62.7	59.3	59.4	59.4	57.0	57.0	57.0
26	66.9	68.7	67.1	66.7	68.5	67.2	63.8	64.3	65.7	63.5	63.5	64.0	62.5	62.7	63.1	59.3	59.4	59.5	57.0	57.0	57.2
27	65.3	72.4	71.2	65.2	71.4	71.3	64.5	66.3	68.7	64.0	64.5	66.5	63.5	63.5	64.2	59.6	59.8	59.8	57.4	57.5	57.5
28	63.5	72.5	71.1	63.6	61.9	71.5	64.7	67.3	69.1	65.1	65.5	66.7	64.5	64.3	64.7	60 0	60.3	60.4	57.5	57.6	57.6
29	65.5	75.7	73.4	65.6	74.8	73.6	66.0	69.3	71.0	65.9	66.7	68.1	65.2	65.2	65.7	60.5	60.8	60.7	57.9	58.1	58.0
30	67.0	76.2	74.7	67.0	75.0	74.6	67.2	69.6	71.8	67.0	66.7	78.8	66.3	66.2	66.6	60.9	60.8	61.5	58.1	58.3	58.4
31	69.2	71.6	71.3	69.3	71.2	71.2	69.0	69.1	69.8	68.2	68.0	68.3	67.0	67.0	66.9	61.6	61.6	61.7	58.4	58.5	58.6
Means	62.82	64.69	64.03	62.66	66.93	66.81	65.91	64.11	64 87	62.85	62.95	68.89	62.70	62.60	62.78	58.77	58.84	58.77	56.20	56.28	56.34

JULY, 1890.

Maximum and Minimum Thermometers and Record of Sunshine				Terrestrial radiation thermometer—degrees.	Solar thermometer—degrees.	Precipitation.			Anemometer observed at 1 P. M.—Movement of Wind.	
Day.	Maximum—degrees	Minimum—degrees	Hours of sunshine.			Time of beginning.	Time of ending.	Amount of rain—inches	Number of miles in last 24 hours.	Average velocity per hour—miles.
1....	82.9	51.2	12½	45.5	151.0	-	-	-	195.4	8.14
2 ...	75.5	50.3	7	42.0	154.0	-	-	-	116.3	4.85
3 ...	64.2	50.1	0	42.3	82.8	6.30 A. M.	-	-	158.2	6.59
4 ...	72.0	60.2	0	57.8	96.0	-	-		303.8	12.66
5 ...	77.3	61.0	3½	56.1	145.3	-	2 P. M.	1.20	147.5	6.15
6....	78.9	59.3	12½	40.0	152.0	-	-	-	77.9	3.25
7 ...	75.6	59.1	6½	50.5	137.0	-	-	-	109.2	4.55
8....	82.7	60.5	8	51.4	143.0	7.30 P. M.	8 30 P. M	1.20	130.8	5.45
9 ...	75.4	64.0	9½	57.1	152.2	-	-	-	323.0	3.46
10....	69.7	43.6	13½	34.0	153.4	-	-	-	284.8	11.87
11....	75.5	50.0	11½	33.6	159.9	-	-	-	184.9	7.70
12....	79.9	43.1	10½	34.1	151.0	-	-	-	66.8	2.78
13....	74.0	57.2	6	47.5	139.6	-	-	-	177.3	7.40
14....	77.1	49.9	9	40.0	150.0	-	-	-	185.1	7.71
15....	84.5	49.9	7	45.8	147.6	10.30 A. M.	10 45 A M.	.02	131.9	5.50
						2.45 P. M	1.30 P M	.10		
16....	84.5	61.0	12½	49.6	153.0	Night	Night	.02	179.2	7.47
17 ...	79.0	57.5	0	46.0	119.1	7.30 P. M	Night	.04	53.9	2.25
18 ...	70.7	54.9	12	43.9	146.7	-	-	-	199.6	5.38
19 ...	68.0	43.0	1½	31.4	124.0	-	-	-	146.8	6.12
20....	66.8	52.0	3	46.3	153.5	2.30 P. M.	3 30 P. M.	.01	126.2	5.96
21 ...	73.5	43.5	12½	33.8	153.2	-	-	-	83.1	3.46
22 ...	75.3	46.9	11	35.8	138.7	-	-	-	68.5	2.85
23 ...	77.1	48.2	9½	36.1	139.8	-	-	-	182.5	7.52
24....	73.9	50.2	9	38.7	139.3	-	-	-	256.8	10.70
25....	67.8	55.2	0	48.3	100.0	Early morning	-	-	165.9	6.91
26....	76.0	62.0	½	57.0	97.5	-	5 P. M.	1.21	214.3	8.93
27....	81.0	63.7	11	56.2	152.0	-	-	-	242.6	10.11
28 ...	81.5	52.2	11	43.1	146.3	-	-	-	114.7	4.30
29 ...	84.4	58.6	7	49.0	151.0	-	-	-	175.6	7.32
30....	86.8	58.6	0	39.1	114.8	-	-	-	195.0	8.13
31....	80.8	58.1	0	39.0	126.9	6.30 A. M.	3 P. M.	.04	257.1	10.71
Totals	-	-	216½	-	-	-	-	3.84	5154.7	
Means	76.53	53.61	7	44.55	139.37	-	-		166.28	6.95

APPENDIX.

Annual Report of the State Pomological Society.

1890-91.

FARMINGTON, June 1, 1891.

HON. Z. A. GILBERT,

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 1890-91.

Yours respectfully,

D. H. KNOWLTON, *Secretary.*

MAINE STATE POMOLOGICAL SOCIETY.

Transactions for the Year 1890–91.

INTRODUCTORY.

Gradually as people realize that fruit growing is becoming a source of profit to those who are engaged in it, there are many evidences of renewed interest in all that pertains to the industry. In recent years there have been unusual attractions offered to men and capital to remove to distant states, and for the time being the grand opportunities for profitable fruit culture in Maine were overlooked. The past few years the liberal returns from fruit enterprises in the State ought to satisfy the most incredulous of certain returns for well directed labor and the investment of capital in fruit growing. It is certain that no other agricultural industry can point to such profit as our leading fruit growers are receiving. It is gratifying to note that our farmers are realizing more and more that fruit growing does pay. While some are groping in the darkness, as it were, and suffering from a lack of practical knowledge in growing and handling fruits successfully, many are seeing the light ahead and are making great progress. It has been the special effort of the officers of this Society to extend, so far as possible, a knowledge of the best methods of fruit culture, and further to point out the possibilities Maine offers to all who may choose to avail themselves of them. The present volume, in some measure, will illustrate the general work of the Society. Special attention, however, is invited to so much of the contents as set forth the practices of some of our most successful fruit growers, and also to the profitable results already reached in fruit culture.

The year 1890 was not a fruit season. The trees blossomed generally quite full but over a large part of the State little fruit was set, and that which did mature was of inferior quality, being infested with worms and more or less injured by the scab. Some localities were more favored, and while there was less than an average crop and more inferior fruit, the high price of fruits brought more than the average receipts. This was especially true in parts of Kennebec, Franklin, Androscoggin and Oxford counties. Buyers came early, and the first price made for average No. 1 fruit was from three dollars to four dollars per barrel, while later in the season the choicest No. 1 Baldwins sold in Boston as high as six dollars, and the Northern Spy in several instances brought eight dollars per barrel. There was an unusual demand for evaporated and canned fruit, and all the apples that were not considered good enough to sell in a green state found their way to market at a profit to the grower. In some instances the best evaporated apples have sold as high as sixteen to eighteen cents per pound. Where fruit was largely evaporated or canned, the parings and cores found a market at a paying price. The season was an exceptionally favorable one for the growth of the trees. The winter of 1890-1, however, was one of unusual severity, and the Baldwin and some of the tender varieties were injured in consequence.

It is exceedingly surprising that more small fruits are not raised in the State. As yet our growers are unable to supply the local markets. The rule is that growers find the industry profitable and are planting more extensively. Of raspberries and blackberries there has been a large increase in the number of plots. There is just enough of this sort of fruit growing done to indicate that those who engage in it more largely are going to realize results from Maine lands never dreamed of before.

The officers of the society have endeavored to use their influence to secure for the fruit growers of the State all that the importance of the industry demands. The Executive Committee urged upon the officers of the State College the desirability of so extending their work at the college and experiment station as to give the interests of horticulture greater prominence. It was also their pleasure to urge His Honor, Governor Burleigh, in behalf of Maine fruit growing to recommend an appropriation in his annual message for the World's Columbian Fair. Later, in the interests of the fruit growers, the president and secretary joined with the representatives of other agricultural organizations and attended a hearing of the State College trustees in Bangor. During the session of the last legislature they also appeared with others before the Committee on Agriculture, asking for larger appropriations for institute work and the Secretary of the Board of Agriculture. In each instance, the objects sought were gained, and, as a result, we may expect more extensive training in horticulture at the college; and the undivided attention of the Secretary of the Board of Agriculture with larger appropriations for the purpose will secure a better representation of fruit industries at the farmers' institutes in various parts of the State.

There has been about the usual increase in the membership of the Society. The treasurer's report does not show any increase in the permanent fund, as the State aid was not received until after the report was made up. The fund however, will be increased during the present year and the Society's debt to the fund will be reduced thereby. The Executive Committee, in view of the fact that the permanent fund should be made to yield the largest revenue possible to the Society, directed the treasurer to purchase four shares in the First National Bank of Farmington at par, which was being organized at the time. This investment is a conservative and safe one and will prove more profitable than a deposit in any of our savings banks.

The various newspapers in the State are among the most efficient agencies in securing the rights of the people and in promoting the interests of every industry. The secretary, in behalf of the Society, wishes to acknowledge the valuable aid they have rendered the interests of fruit culture. They have freely published our notices, and given liberal space for the reports of our meetings.

Our Society is a general organization, whose object is to promote the interests of pomology in all parts of the State. It is not local in any sense. The premiums it offers are open to all parts of the State; its winter meetings are held in localities where the most can be accomplished for the cause, and its transactions are available for all. Again, we urge fruit growers to send us items of interest bearing on fruit culture. The more we know of their successes and failures the better able we shall be to render them efficient service. It is the purpose of the officers to do all they can with the means at their disposal. If in any way the Society can do more to promote the industry, the officers of the Society are its servants.

D. H. K.

OFFICERS FOR 1891.

President.

CHARLES S. POPE, Manchester.

Vice Presidents.

S. H. DAWES, Harrison.

O. C. NELSON, New Gloucester.

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, South Paris.
Penobscot	"	C. A. Arnold, Arnold.
Piscataquis	"	H. L. Leland, East Sangerville.
Sagadahoc	"	H. S. Cary, Topsham.
Somerset	"	James S. Hoxie, North Fairfield.
Waldo	"	Alonzo Butler, Union.
Washington	"	L. S. Allen, Dennysville.
York	"	B. F. Pease, Cornish.

Member of Experiment Station Council.

D. H. Knowlton, Farmington.

Committee on Nomenclature.

Z. A. Gilbert, 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
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
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
Richard, John T................Gardiner
*Richardson, J. M.............Gardiner
Ricker, A. S ....Turner
Roak, George M..................Auburn

*Deceased.

LIFE MEMBERS—Concluded.

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
Varney, James A. .... The Dalles, Oregon
Vickery, James .... Portland
Vickery, John. .... Auburn
Wade, Patrick. .... Portland
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, 1890.

Abbott, Farrington. .... Auburn
Arnold, C. A .... Arnold
Bartlett, B. W .... East Dixmont
Bartlett, M. E .... East Dixmont
Beals, Miss Laura B. .... Turner
Blossom, L. H. .... Turner Center
Brown, Henry W. .... Newburg
*Butler, B. F. .... Mt. Vernon
*Cary, Henry S. .... Topsham
Chandler, Lucy A. .... Freeport
Chase, George C. .... Lewiston
Davis, Jacob L .... New Gloucester
Dudley, Allen. .... Mapleton
Dudley, J. W. .... Castle Hill
Dunbar, E. W. .... Damariscotta
Dunton, John. .... Lewiston
Eastman, E. E.. .... Dexter
Gurney, Lemuel .... Hebron
Hathaway, W. S. .... East Auburn
Hawkins, M. P. .... Auburn
Larrabee, O. L. .... West Levant
Libbey, W. M. .... North Gorham
Nelson, O. C. .... Upper Gloucester
Nowell, F. E .... Fairfield
Nutting, James. .... East Perham
Perkins, L. J. .... Portland
Pike, George A. .... Winthrop
Ridley, B. H .... Jay
Ring, A. P. .... Richmond
Ring, Miss Cora E .... Richmond
Scribner, S. B .... Lewiston
Stanley, Cora H. .... Winthrop
Timberlake, S. H. ..North Turner Bridge
Towle, J. J .... South Carthage
True, J. W .... New Gloucester
Walker, Charles S. .... Peru
Waterman, Mrs. E. D ...... East Auburn
Weston, C. M. .... Belgrade
Whittier, Phineas...... Farmington Falls
Wright, Fred. .... Bath

ANNUAL MEMBERS, 1891.

Allen, W. H .... Augusta
Ballentine, Walter .... Orono
Cook, Elijah .... Manchester
Coombs, Philip. .... Bangor
Crosby, Mary G. .... Bangor
Merritt, E. W .... Houlton
Munson, W. M. .... Orono
Nelson, O. C .... Upper Gloucester
True, J. W .... New Gloucester
Wheeler, Joseph .... Corinth

ANNUAL MEMBER, 1892-3.

Allen, W. H .... Augusta

*Deceased.

Annual Statement of the Maine State Pomological Society for the Year Ending Dec. 31, 1890.

RECEIPTS.

Amount in treasury December 31, 1889	$ 99 05	
Cash from State Treasurer, bounty for 1889	500 00	
Agricultural Society for 1890	500 00	
Manufacturers' National Bank note	250 00	
life members	50 00	
annual members	44 00	
State for winter meeting	6 20	
interest on permanent fund	16 96	
overpaid by Treasurer	4 90	
		$1,471 11

EXPENDITURES.

Cash paid Secretary's salary, 1889 and 1890	$225 00	
expenses, 1890	55 90	
clerk	9 90	
for expenses of executive committee	105 73	
Knowlton, McLeary & Co	33 49	
Smith and Reid for 1888 and 1889	16 34	
Geo B. Sawyer	26 65	
C. H. George	8 00	
A. S. Ricker, expenses	15 65	
Mrs. H. C. Beedy, winter meeting	5 40	
C. M. Weston, "	6 20	
F. L. Harvey, " etc	16 25	
Dr. C. D. Smith	15 00	
premiums	8 00	
Stecher Lithographic Company	10 50	
Harry Stanley	2 07	
John W. Perkins & Co	3 73	
Lewiston Journal	1 75	
Wiscasset Savings Bank, interest in favor of permanent fund	16 96	
Manufacturers' National Bank note	250 00	
interest and discount on the above	5 09	
premiums for 1890	633 50	
		$1,471 11

Financial Condition of the Society December 31, 1890.

ASSETS.

Due from State treasurer bounty for 1890	$500 00	
Property owned by the Society, estimated	150 00	
Permanent fund, First National Bank, Farmington	400 00	
Permanent fund, Wiscasset Savings Bank	57 68	
		$1,107 68

LIABILITIES.

Due Manufacturers' National Bank	$250 00	
from treasurer (overpaid)	4 90	
		$254 90

Permanent Fund.

CREDIT.

By fees of 100 life members to Dec. 31, 1889	$1,000 00	
5 " Dec. 31, 1890	50 00	
		$1,050 00

DEBIT.

To amount in stock in Farmington National Bank stock	$400 00	
deposit Wiscasset Savings Bank	57 68	
balance due permanent fund	592 32	
		$1,050 00

A. S. RICKER, Treasurer.

TURNER, February 17, 1891.

This certifies that we have examined the foregoing accounts of A. S. Ricker, Treasurer, for 1890, and find the same correct.

C. S. POPE,
D. H. KNOWLTON,
H. W. BROWN,
J. W. TRUE,
Executive Committee.

Maine State Pomological Society.

Report of the Eighteenth Annual Exhibition Held in Lewiston, September 9, 10, 11 and 12, 1890.

The members of our Society have in recent years been so well pleased with the exhibition arrangements made with the Maine State Agricultural Society, that the executive officers again decided to unite with that Society. The eighteenth annual exhibition was accordingly held in the exhibition hall of the State Fair Park, Lewiston, September 9, 10, 11 and 12, 1890. The officers of the two Societies acted together in all matters of common interest, and the pleasantest of relations continued from first to last. The place of exhibition is not an ideal for that purpose, but in view of the fact that our fruit and floral displays form an important part of a great fair, which is attended by many thousand people, it seems best to join with them in making up a grand exhibition of Maine agriculture. Nor is the time of holding the fair the most favorable for fruit industries, for our fruit does not reach its full maturity with the exception of the earliest varieties until several weeks later. But our Society has only limited means available for exhibition purposes, hence it becomes necessary to make such arrangements as we can with other bodies.

Reports from various parts of the State before the fair indicated that the fruit display would be small and of inferior quality. Many localities famous for fine fruit were hardly represented at all; but where there was good fruit special effort was taken by growers to bring in the best they had. As a result the tables were well filled, though it was noticeable by all that our usual standard of excellence was not reached. The fruit was of fair size and well colored, but there were few specimens not affected by either scab or worms.

The pears shown were of good quality, and the interest shown in this part of the exhibition clearly indicates that the people of Maine are realizing that they can raise their own pears. There were fine specimens of plums, though not as many varieties as sometimes shown.

There was an unusually large and effective display of flowers and plants. These were arranged by President Pope and his assistants with great taste, and the exhibition as a whole was well arranged and attractive to visitors. During the first day the storm clouds burst over the fair grounds and at intervals the rain poured down through the week. This kept many from bringing in exhibits and very materially reduced the number of visitors.

There were several collections of fruit from Aroostook county. It is gratifying to note that gradually more fruit is being produced there. The specimens were not large, but some were of good size and quality. It is especially pleasant to the members of our society to welcome Aroostook people among our exhibitors.

There were insufficient assurances for us to announce in advance that the Hon. Henry E. Van Deman, Pomologist of the Agricultural Department was expected, but this only made his presence all the more agreeable when he actually arrived among us. The fruit-growers of the State were delighted to meet him, and to welcome him to the Pine Tree State. About the fruit tables he rendered efficient service in the identification of varieties, and freely imparted to all any information he possessed. He expressed himself as agreeably disappointed with the quality of our fruit, and did not hesitate to assure us that fruit growing ought to be more generally extended in the State. At our evening meeting Mr. Van Deman gave the fruit growers a valuable lecture on the industry and the work of his department. We only regret that more of our fruit growers did not meet him while here. Since meeting with us he has shown an active interest in all that affects the industry in the State and heartily co-operates with us in every effort to promote it. His visit will be remembered with pleasure by the officers especially, who will be delighted to meet him or any of his official associates in Maine hereafter.

List of Premiums Awarded at the Eighteenth Exhibition, 1890.

APPLES—General Collections.

Best general exhibition of apples grown by the exhibitor in any part of the State: S. H. Dawes, Harrison, $15; F. E. Nowell, Fairfield, $10.

COUNTY EXHIBITIONS.

Best general exhibition of apples grown by the exhibitor in Androscoggin county: D. J. Briggs, South Turner, $8; D. P. True, Leeds Centre, $6; John Dunton, Lewiston, $4.

For same in Aroostook county: Allen M. Dudley, Mapleton, $8; James Nutting, East Perham, $6.

For same in Cumberland county: S. R. Sweetser, Cumberland Centre, $8; J. W. True, New Gloucester, $6.

For same in Franklin county: M. C. Hobbs, West Farmington, $8; B. H. Ridley, Jay, $6; D. C. Averill, Temple, $4.

For same in Kennebec county: H. G. Fairbanks, Mcnmouth, $8; E. A. Lapham, Pittston, $6; C. I. Perley, Cross Hill, $4.

For same in Knox county: Alonzo Butler, Union, $8.

For same in Lincoln county: E. W. Dunbar, Damariscotta, $8.

For same in Oxford county: C. H. George, South Paris, $8; Lemuel Gurney, Hebron, $6.

For same in Penobscot county: C. A. Arnold, Arnold, $8; O. L. Larrabee, West Levant, $6; E. H. Kenniston, Arnold, $4.

For same in Sagadahoc county: H. S. Cary, Topsham, $8; Fred Wright, Bath, $6; A. P. Ring, Richmond, $4.

For same in Somerset county: J. S. Hoxie, North Fairfield, $8.

For same in Waldo county: D. W. Bartlett, East Dixmont, $8; M. E. Bartlett, East Dixmont, $6; Mrs. A. B. Strattard, Monroe, $4.

For best collection crab apples, J. S. Hoxie, Fairfield, $1.

SPECIAL PREMIUMS.

For best dish of Baldwins, Gravensteins, Rhode Island Greenings, Roxbury Russets, King of Tompkins County, consisting of twelve specimens each.

Baldwins: S. H. Dawes, Harrison, $5; J. W. True, New Gloucester, $3; C. I. Perley, Cross Hill, $2.

Gravenstein: O. L. Larrabee, West Levant, $5; A. S. Ricker, Turner, $3; J. W. True, New Gloucester, $2.

Rhode Island Greening: S. R. Sweetser, Cumberland Centre, $5; E. A. Lapham, Pittston, $3; W. S. Hathaway, East Auburn, $2.

Roxbury Russets: C. A. Arnold, Arnold, $5; Lemuel Gurney, Hebron, $3; F. E. Nowell, Fairfield, $2.

King of Tompkins County: S. H. Dawes, Harrison, $5; C. H. George, South Paris, $3; D. J. Briggs, South Turner, $2.

SINGLE VARIETIES.

Alexander: M. C. Hobbs, $1; F. E. Nowell, 50c.; American Golden Russet; A. K. Bickford, $1; F. E. Nowell, 50c.

Ben Davis: Thurston M. Lombard, $1; Alonzo Butler, 50c.

Benoni: C. H. George, $1; J. S. Hoxie, 50c.

Deane: B. H. Ridley, $1; J. S. Hoxie, 50c.

Duchess of Oldenburg: S. H. Dawes, $1; H. G. Fairbanks, 50c.

Early Harvest: B. H. Ridley, $1; James Bickford, 50c.

Fallawater: C. I. Perley, $1; O. L. Larrabee, 50c.

Fall Harvey: C. H. George, $1; S. H. Timberlake, 50c.

Fameuse: S. R. Sweetser, $1; Alonzo Butler, 50c.

Garden Royal: E. G. Woodside, $1; S. H. Dawes, 50c.

Grimes Golden: W. M. Libby, $1; Alonzo Butler, 50c.

Hubbardston Nonsuch: S. H. Dawes, $1; C. I. Perley, 50c.

Jewett's Fine Red: S. H. Dawes, $1; Geo. A. Pike, 50c.

King Sweeting: Geo. A. Pike, $1; F. E. Nowell, 50c.

Large Yellow Bough: A. K. Bickford, $1; Alonzo Butler, 50c.

Milding: C. I. Perley, $1.

Munson Sweet: S. R. Sweetser, $1; E. W. Dunbar, 50c.

Northern Spy: S. H. Dawes, $1; S. R. Sweetser, 50c.

Peck's Pleasant: J. S. Hoxie, $1; H. G. Fairbanks, 50c.

Porter: John Dunton, $1; D. P. True, 50c.

Pound Sweet: S. H. Dawes, $1; C. I. Perley, 50c.
President: I. T. Waterman & Son, $1; F. E. Nowell, 50c.
Primate: J. S. Hoxie, $1; C. I. Perley, 50c.
Pumpkin Sweet: H. S. Cary, $1. B. H. Ridley, 50c.
Red Astrachan: S. R. Sweetser, $1; B. H. Ridley, 50c.
Red Canada: C. A. Arnold, 50c.
Rolfe: S. R. Sweetser, $1.
Russell: D. C. Averill, $1.
Stark: A. K. Bickford, $1; E. F. Purington, 50c.
Somerset: F. E. Nowell, $1; S. R. Sweetser, 50c.
Starkey: C. I. Perley, $1; J. Hoxie, 50c.
Talman's Sweet: W. M. Libby, $1; C. I. Perley, 50c.
Tetofsky: D. H. Knowlton, $1; S. H. Dawes, 50c.
Wagener: S. H. Dawes, $1; W. M. Libby, 50c.
Wealthy: S. R. Sweetser, $1; A. K. Bickford, 50c.
Williams' Favorite: H. S. Cary, $1; J. S Hoxie, 50c.
Winthrop Greening: H. G. Fairbanks, $1; F. E. Nowell, 50c.
Yellow Bellflower: J. H. Merrow, $1; D. H. Knowlton, 50c.
Yellow Transparent: E. F.Purington, $1; B. H. Ridley, 50c.

PEARS—General Exhibition.

S. H. Dawes Harrison, $10; C. M. Weston, Belgrade, $8; L. J. Perkins, Portland, $5.

SINGLE VARIETIES.

Clapp's Favorite: S. H. Dawes, $5; A. S. Ricker, $3.
Bartlett: A. S. Ricker, $5; S. H. Dawes, $3.
Belle Lucrative: Alonzo Butler, $1; E. G. Woodside, 50c.
Beurre d'Anjou: S. H. Dawes, $1; C. H. George, 50c.
Beurre Hardy: E. M. Leavitt, $1.
Beurre Superfin: D. P. True, $1; S. H. Dawes, 50c.
Beurre Diel: D. J. Briggs, $1; I. W. Emerson, 50c.
Buffum: D. P. True, $1; S. H. Timberlake, 50c.
Duchess d'Angouleme: S. H. Dawes, $1; Geo. C. Chase, 50c.
Doyenne Boussock: I. W. Emerson, $1; C. I. Perley, 50c.
Eastern Belle: J. S. Hoxie, $1.
Flemish Beauty: E. F. Purington, $1; C. I. Perley, 50c.
Fulton: L. J. Perkins, $1.
Glout Morceau: D. J. Briggs, $1.

Goodale: C. I. Perley, $1.
Howell: C. I. Perley, $1; S. H. Dawes, 50c.
Lawrence: S. H. Dawes, $1; John Dunton, 50c.
Louise Bonne de Jersey: S. H. Dawes, $1; E. M. Leavitt, 50c.
Nickerson: Geo. A. Pike, $1.
Seckel: D. J. Briggs, $1; E. F. Purington, 50c.
Sheldon: S. H. Dawes, $1; I. W. Emerson, 50c.
Swan's Orange: J. S. Hoxie, $1; C. I. Perley, 50c.
Souvenir du Congres: L. H. Blossom, $1.
Urbaniste: D. J. Briggs, $1.

PLUMS—General Exhibitions.

S. H. Dawes, Harrison, $6; John Dunton, Lewiston, $4; E. W. Dunbar, Damariscotta, $2.

SINGLE VARIETIES.

Bavay's Green Gage: D. P. True, $1.
Bradshaw: Lemuel Gurney, $1.
Coe's Golden Drop: C. H. George, $1.
Green Gage: Mrs. James Dunning, $1; D. H. Knowlton, 50c.
Prince's Imperial Gage: S. H. Timberlake, $1; C. H. George, 50c.
Purple Gage: E. W. Dunbar, $1; D. P. True, 50c.
Red Gage: F. E. Nowell, $1; D. P. True; 50c.
General Hand: F. E. Nowell, $1.
Jefferson: J. W. True, $1.
Lawrence: C. H. George, $1; D. P. True, 50c.
Lombard: C. H. George, $1; D. P. True; 50c.
McLaughlin: D. P. True, $1; Mrs. James Dunning, 50c.
Moore's Arctic: Thurston M. Lombard, $1; Mrs. James Dunning, 50c.
Niagara: E. W. Dunbar, $1;
Smith's Orleans: T. M. Lombard, $1; E. W. Dunbar, 50c.
Washington: E. F. Purington, $1; J. S. Hoxie, 50c.
Yellow Egg: Lemuel Gurney, $1; J. W. True, 50c.
Greely: Dr. Samuel Rolfe, $1; S. R. Sweetser, 50c.
Guii: John Dunton, $1.

GRAPES—Single Varieties.

Muscadine: B. H. Ridley, $1.
Blood Seedling: B. H. Ridley, 50c.

MISCELLANEOUS ARTICLES—Canned Fruit, Preserves, &c.

Best dish of peaches: S. H. Dawes, $2; Chas. S. Libby, $1.

Snyder Blackberries: L. H. Blossom, $1.

Cultivated Cranberries: B. F. Butler, $2; D. J. Briggs, $1.

Collection nursery stock: D. P. True, $5.

Collection canned fruits, etc.: Mrs. E. D. Waterman, $8; Mrs. C. L. Emerson, $5; Mrs. W. H. Waterman, $3.

Canned blackberries: Myrtie V. Averill, 50c.; D. P. True, 25c.

Canned blueberries: Mrs. W. H. Waterman, 50c.; Mrs. E. D. Waterman, 25c.

Canned cherries: Mrs. W. H. Waterman, 50c.; Mrs. E D. Waterman, 25c.

Canned gooseberries: A. A. Eastman, 50c.; Mrs. D. P. True, 25c.

Canned peaches: Mrs. E. D. Waterman, 50c.; Mrs. Francis Hoyt, 25c.

Canned plums: A. A. Eastman, 50c.; Mrs. E. D. Waterman, 25c.

Canned quinces: Mrs. W. H. Waterman, 50c.; Mrs. Francis Hoyt, 25c.

Canned raspberries: A. A. Eastman, 50c.; Mrs. E. D. Waterman, 25c.

Canned strawberries: Mrs. D. P. True, 50c.; Mrs. Francis Hoyt, 25c.

Canned tomatoes: Mrs. Francis Hoyt, 50c.; Mrs. W. H. Waterman, 25c.

Canned pears: Myrtie V. Averill, 50c.

Canned currants: A. A. Eastman, 50c.

Preserved apples: Myrtie V. Averill, 50c; Mrs. W. H. Waterman, 25c.

Preserved currants: Miss E. B. Butler, 50c; Mrs. W. H. Waterman, 25c.

Preserved cherries: Mrs. D. P. True, 50c.; Mrs. Francis Hoyt, 25c.

Preserved pears: Mrs. E. D. Waterman, 50c.; Mrs. Francis Hoyt, 25c.

Preserved plums: Mrs. D. P. True, 50c.; Mrs. W. H. Waterman, 25c.

Preserved quinces: Mrs. W. H. Waterman, 50c.

Preserved raspberries: Mrs. W. H. Waterman, 50c.; Mrs. D. P. True, 25c.

Preserved strawberries: Mrs. W. H. Waterman, 50c; Mrs. D. P. True, 25c.

Assorted pickles: Mrs. E. A. Lapham, 50c.; Mrs. Francis Hoyt, 25c.

Tomato catsup: Mrs. Francis Hoyt, 50c.; Mrs. W. H. Waterman, 25c.

Collection apple jellies: Mrs. W. H. Waterman, $2.

Apple jelly: Miss E. B. Butler, 50c.; Mrs. C. L. Emerson, 25c.

Currant jelly: Mrs. E. D. Waterman, 50c.; Mrs. Francis Hoyt, 25c.

Grape jelly: Mrs. Francis Hoyt, 50c.; Mrs. W. H. Waterman, 25c.

Quince jelly: Mrs. Francis Hoyt, 50c.; Mrs. W. H. Waterman, 25c.

Raspberry jelly: Mrs. C. L. Emerson, 50c.; Mrs. E. D. Waterman, 25c.

Rhubarb jelly: Mrs. C. L. Emerson, 50c.; Mrs. W. H. Waterman, 25c.

Strawberry jelly: Mrs. Francis Hoyt, 50c.; Mrs. W. H. Waterman, 25c.

Maple syrup: Myrtie V. Averill, 50c.; Lemuel Gurney, 25c.

Evaporated apples: J. J. Towle, $2.

CUT FLOWERS.

Best display cut flowers: Chas. S. Walker, Peru, $10; Mrs. Chas. Stanley, Winthrop, $8; Miss Cora E. Ring, $5; Mrs. A. B. Strattard, $3.

Exhibition roses: John Burr, $5.

Dahlias: Chas. S. Walker, $2; Mrs. Chas. Stanley, $1.

Chinese pinks: Chas. S. Walker, $1; Mrs. Chas. Stanley, 50c.

Carnations: John Burr, $2.

Lilies: Mrs. Chas. Stanley, $2; Chas. S. Walker, $1.

Asters: Chas. S. Walker, $1; Master E. C. Pope, 50c.

Pansies: Mrs. Chas. Stanley, $1; S. B. Scribner, 50c.

Zinnias: Mrs. Francis Hoyt, $1; Mrs. Chas. Stanley, 50c.

Phlox Drummondii: Mrs. Chas. Stanley, $1; Master E. C. Pope, 50c.

Stocks: Mrs. Chas. Stanley, $1; Mrs. G. K. Staples, 50c.

Balsams: Mrs. W. H. Waterman, $1; E. C. Pope, 50c.

Petunias: Mrs. E. D. Waterman, $1; Mrs. A. B Strattard, 50c.

Gladioli: Chas. S. Walker, $2; Lucy A. Chandler, $1.

Verbenas: S. B. Scribner, $2; Chas. S. Walker, $1.

Calendula: Mrs. D. H. Knowlton, $1; E. C. Pope, 50c.

Nasturtiums: E. C. Pope, $1; S. B. Scribner, 50c.

Parlor bouquet (professional): John Burr, $2.

Parlor bouquet (amateur): Mrs. Charles Stanley, $1; S. B. Scribner, 50c.

Wall bouquet (professional): John Burr, $1.

Wall bouquet (amateur): Mrs. D. H. Knowlton, $1; Mrs. Charles Stanley, 50c.

Hand bouquet (professional): John Burr, $1.

Hand bouquet (amateur): Mrs. Francis Hoyt, $1; Mrs. D. H. Knowlton, 50c.

Floral design (professional): John Burr, $8.

Floral design (amateur): Mrs. Charles Stanley, $5; Ellen B. Roak, $3.

Floral wreath: Lucy A. Burr, $2; Mrs. A. B. Strattard, $1.

Floral dinner decoration: Mrs. D. H. Knowlton, $2.

Dish of cut flowers: Cora H. Stanley, $2; Ellen B. Roak, $1.

Artistic exhibition dried grasses: Mrs. Charles Stanley, $2.

Basket cut flowers: Miss Edith F. Pope, $2; Mrs. D. H. Knowlton, $1.

Artistic exhibition everlasting flowers: Mrs. D. H. Knowlton, $1; Mrs. Charles Stanley, 50c.

GREENHOUSE AND POT PLANTS.

Exhibition greenhouse plants: John Burr, $15.

Pot plants: Lucy A. Chandler, $10; Miss L. M. Pope, $8.

Ferns: John Burr, $3.

Geraniums: John Burr, $2.

Begonias: John Burr, $2.

Coleus: John Burr, $2.

Specimen Double Geranium: John Burr, 50c.

Single Geranium: John Burr, 50c.

Single Foliage Begonia: John Burr, 50c.

Single Flowering Begonia: John Burr, 50c.

Single Coleus: John Burr, 50c.
Single Fuchsia: John Burr, 25c.
Single Carnation: John Burr, 50c.
Single pot plant: Mrs. J. B. Walker, $1; John Burr, 50c.

SPECIAL PREMIUMS.

Floral design arranged by boy or girl under fifteen: Lucy A. Burr, $3; Farrington Abbott, $2.

Cut wild flowers: Clarence H. Knowlton, $3; Mrs. E. C. Waterman, $2; Mrs. Charles Cushman, $1.

Pressed wild flowers: Miss Laura B. Beals, $4; Theresa H. Soule, $3; Mrs. E. C. Waterman, $2.

Summary of Premiums Awarded.

On apples	$307 50
On pears	68 00
On plums	37 00
On grapes	1 50
On canned fruits	53 75
On flowers	165 75
Total	$633 50

Business Transactions.

MEETINGS OF EXECUTIVE COMMITTEE.

March 7, 1890. Meeting of Executive Committee held in Lewiston.

By invitation of President Prince the committee met the trustees of the Maine State Agricultural Society, and it was mutually agreed between the officers of the respective societies to hold the next annual fair with the State Agricultural Society. The terms and conditions being the same as last year. The time of the exhibition was fixed for September 9th, 10th, 11th and 12th.

April 25th, 1890. Called for the revision of Premium List. The following assignments were made for the fair:

General and county exhibitions of apples, L. H. Blossom.

Display of single varieties of apples, H. W. Brown.

Pears, plums and miscellaneous articles, J. W. True.

Flowers and potted plants, Charles S. Pope.

September 13, 1890. During the fair orders were drawn for sundry purposes. The treasurer was instructed and authorized to invest $400 of the Permanent Fund in the First National Bank of Farmington.

December 1, 1890. Met in Lewiston for the purpose of auditing the exhibition accounts and other matters of importance to the society.

Treasurer was directed to pay the premiums and for this purpose and to meet other bills he was authorized to make a temporary loan not to exceed the sum of four hundred dollars.

The following vote was passed and copy of same was forwarded to President Fernald:

That in behalf of the Maine State Pomological Society, its Executive Committee in session this first day of December, 1890, in the city of Lewiston, respectfully request, in the interests of horticulture and pomology in our State, that there be established in connection with the State College of Agriculture and the Mechanic Arts a department of horticulture; that in our opinion an efficient department of this nature will necessitate the appointment of a competent professor, and the employment of a practical and skilled horticulturist and gardener; that the magnitude of the interests thus represented demands the expenditure in this department of sufficient funds to secure efficient instruction and direction of the department, and practical ability to intelligently operate the greenhouse, improve and beautify the college grounds, and, under the direction of the Director of Experiment Station and the Professor of Horticulture conduct such experiments as they may determine from time to time.

The following letter was shortly after received from President Fernald:

ORONO, MAINE, December 13, 1890.

D. H. KNOWLTON, ESQ.,
Secretary Maine State Pomological Society.

DEAR SIR:—Your favor of the 9th inst. containing vote of the Executive Committee Maine State Pomological Society relative to Horticultural Department of the College has been received.

I hardly need say that the subject of which it treats and its suggestions will receive very careful consideration.

Progress is making in the matter of filling the chair of Horticulture although final action has not been taken.

When once it is filled, it will be very natural to confer with the incumbent and to be guided to an extent, by his ideas as to the nature and amount of assistance needed.

Now that we have a good plant-house and conditions favorable for the establishment of a department of Horticulture, the effort will be made to make it serve, as completely as possible, the interests of the College, the Station and the State.

Thanking you for your letter and its suggestions which will be presented to the full committee having the subject in charge,

I am, yours very truly,

M. C. FERNALD.

With reference to the World's Columbian Fair it was

Voted, That whereas under the authority of Congress a World's Fair is to be held in the city of Chicago in 1893; that whereas, the State of Maine has a general interest in making the exhibition a credit to our great and prosperous nation; that whereas, it will prove an advantage to our varied industries to have them well represented at the fair:

Therefore, we most respectfully request His Excellency the Governor of the State, in his annual message to urge upon the Legislature the passage of such acts and the appropriation of such funds as will secure for the State an exhibition of her products and industries; that among these industries we consider fruit culture especially important and destined under favorable conditions to great development in the future, and we most respectfully urge that this great industry be given the prominence its extent and importance demand.

And furthermore that we commend the subject of the World's Fair to the favorable consideration of the Legislature about to assemble, and urge upon its members respectfully the importance of passing such laws and appropriating such funds as in their wisdom may be deemed necessary to secure the desired object.

February 26, 1891. At the close of the winter meeting, the executive committee arranged to have the interests of the society represented at the farmers' institutes to be held during the spring.

In the matter of the unpublished transactions for the years 1879-80-81, it was voted to instruct the secretary to publish only so much of the transactions referred to as shall show the organization of the society and its financial condition during these years.

PUBLIC MEETINGS.

September 10, 1890. Annual meeting, held in Park Hall, Lewiston, at 6.30 P. M. Officers for 1891 were elected. See p. 6.

September 11. Fruit Growers' Convention. Addressed by Hon. Henry E. Van Deman, Pomologist of the Agricultural Department at Washington. An abstract of his address appears among the papers in another part of the transactions.

February 24th and 25th. During the winter meeting in Bangor the following business was transacted:

Report of treasurer presented and accepted. See pp. 9 and 10.

The secretary read a communication from Mr. Frederick H. Moses of Bucksport inviting the members of our society to visit his greenhouses. It was announced that trains would run so as to accommodate all who wished to visit Bucksport on the day following the meeting.

Professor W. H. Jordan, Director of the Experiment Station also extended an invitation to all to visit the station and College at Orono.

The President appointed J. W. True, Phineas Whittier and C. A. Arnold, a committee to examine the fruit on exhibition. Later the committee having made their examination reported as follows:

REPORT ON FRUIT EXHIBITED AT WINTER MEETING.

For Best Collection of Apples—S. C. Harlow, Bangor, 1st; Phineas Whittier, Farmington Falls, 2d; O. L. Larrabee, West Levant, 3d.

Baldwins—J. W. True, New Gloucester, 1st; S. H. Dawes, Harrison, 2d; G. K. Staples, Temple, 3d.

Tompkins King—D. J. Briggs, South Turner, 1st; S. H. Dawes, 2d; Mrs. A. B. Strattard, Monroe, 3d.

Northern Spy—G. K. Staples, 1st; S. H. Dawes, 2d; D. J. Briggs, 3d.

Rhode Island Greening—J. W. True, 1st; D. J. Briggs, 2d; C. A. Arnold, Arnold, 3d.

Roxbury Russets—Davis Weeks, East Wilton, 1st; Abbie Macomber, East Wilton, 2d; D. J. Briggs, 3d.

Ben Davis—C. A. Arnold, 1st; J. W. True, 2d.

Hubbardston Nonsuch—D. J. Briggs, 1st; Abbie Macomber, 2d; G. K. Staples. 3d.

Jewett's Fine Red—J. W. True, 1st; S. H. Dawes, 2d.

Talman's Sweet—D. P. True, Leeds Center, 1st; G. K. Staples, 2d; C. A. Arnold, 3d.

Pound Sweet—J. W. True, 1st.

Naked Limb Greening—Mrs. A. B. Strattard, 1st; C. A. Arnold, 2d.

B. Red—C. A. Arnold, 1st.

Black Oxford—G. K. Staples, 1st; C. A. Arnold, 2d.

Fallawater—B. C. Wing, 1st; O. L. Larrabee, 2d.

Yellow Bellflower—O. L. Larrabee, 1st; Mrs. E. H. Gregory, Hampden, 2d.

American Golden Russet—B. C. Wing, 1st; Mrs. A. B. Strattard, 2d.

Also, many other kinds of apples were exhibited, of which only *one* plate of a kind were on exhibition, such as Wagener, Mann, Gravenstein, Bailey Sweet, Gideon, Fameuse, Ribston Pippen, Harvey, Wealthy, Red Canada, Lady, Spitzenberg, Red Rambo, and several seedlings, some of which were fine looking apples.

I. T. Waterman, East Auburn, exhibited three plates of very fine Baldwins.

Several specimens of pears in fine condition were exhibited by D. P. True, including Vicar of Winkfield and Kieffer. Lawrence and native pears were also exhibited by D. J. Briggs.

The committee chosen for the purpose consisting of Z. A. Gilbert, W. A. Luce and C. E. Wheeler, presented the following resolutions which were accepted:

Resolved, That the thanks of the Maine State Pomological Society and the State Board of Agriculture are hereby tendered to the Bangor Horticultural Society and to their associate organizations, the Penobscot County Pomona Grange and the County Farmers' Club for the cordial reception tendered to this meeting, and the many courtesies received at their hands.

Resolved, That our thanks are specially due the choir who have so faithfully attended on our meetings and by their music have contributed so much to the pleasure of the occasion.

Resolved, further, That our thanks are extended to the Windsor House for reduced rates, and to the Maine Central and other railroads for the courtesy of half-fare over their lines to attend this meeting.

Resolved, That our thanks are hereby tendered to the newspapers for the notices they have published of our meetings, and for the excellent reports they have given of our transactions.

Resolved, That our thanks are hereby tendered to the speakers for the excellent papers they have contributed, and for the interest they have shown in the exercises of our meetings.

February 26. Regarding the Bucksport trip the following report of the pleasures enjoyed by those visiting Mr. Moses greenhouses appeared in the *Maine Farmer*:

Thursday, following the meeting of the Pomological Society in Bangor, the members, by invitation of Frederick H. Moses, visited his extensive greenhouses in Bucksport. The party consisted of about twenty-five, including officers and members of the society and ladies. The train reached Bucksport about nine o'clock, where they were met by Mr. Moses and conducted to his office, where introductions were made to himself and prominent citizens of Bucksport, who had been invited in to greet the company. The greenhouses, with all their floral wonders, were looked over with great pleasure and satisfaction. Mr. Moses has developed a large and successful floral trade, and everything about his greenhouses evinced his skill and thorough knowledge of the business. After hastily viewing the greenhouses, the party repaired to Mr. Moses' beautiful residence, where they were received by Mrs. Moses, assisted by Mrs. Charles G. Atkins and Mrs. Moses' sisters. In due time the visitors repaired to the dining room, where a dainty feast was served. The table was adorned by an exquisite floral piece consisting of passiflora, begonia leaves and ferns. The train for Bangor was delayed an hour, and the company enjoyed the delay in a most agreeable manner. Before separating President Pope called the meeting to order, and Professor Cook of Manchester, in behalf of the company, expressed his pleasure and thanks for the courtesies they had received at the hands of Mr. and Mrs. Moses, and the managers of the M. C. R. R. The unanimous vote of the company approved of the Professor's motion. On returning the beautiful public library was visited with great pleasure. The return trip to Bangor was made very pleasant, and the company separated at the station with many expressions of gratitude to Mr. Moses for the pleasure his courtesies had afforded the company.

PAPERS, DISCUSSIONS, REPORTS, ETC.,

PRESENTED AT THE

UNION WINTER MEETING

OF THE

Maine State Pomological Society and the State Board of Agriculture,

HELD IN

CITY HALL, BANGOR,

February 24th and 25th, 1891.

Where no counsel is, the people fall: but in the multitude of counsellors there is safety.

—*Bible.*

The Union Winter Meeting.

INTRODUCTORY.

So far as possible it has been the effort of the Pomological Society to extend the benefits of its work to all parts of the State. The first exhibition of the Society was held in connection with the State Agricultural Society in the city of Bangor, in the autumn of 1873. Since the organization of the Society none of its winter meetings have been held in the easterly part of the State. On conferring with members of the Bangor Horticultural Society regarding the desirability of extending the work into the eastern part of the State, that Society voted to extend an invitation to hold the annual winter meeting in City Hall, Bangor. It was a pleasure to the executive committee to accept the invitation in behalf of the Pomological Society. Later the Pomona Grange of Penobscot county and the Penobscot Farmers' Club joined in the invitation.

The union meetings held in recent years have proved so satisfactory to all concerned, that Secretary Gilbert of the Board of Agriculture accepted the invitation of the executive committee to join in holding another union winter meeting. Accordingly it was arranged to hold the winter meeting in City Hall, Bangor, Tuesday, and Wednesday, February 24 and 25, 1891.

The following programme was announced in due time:

TUESDAY, A. M.

Opening Exercises. Reports of Officers.
Address of Welcome.

Response,	Z. A. Gilbert.
President's Address,	Chas. S. Pope, Manchester.
Report on Experiment Station,	Prof. W. H. Jordan, Director.

AFTERNOON.

Cultivation of Small Fruits,	S. H. Dawes, Harrison.
Varieties of Strawberries and Marketing,	Willis A. Luce, South Union.
Results of Spraying (Illustrated by Specimens of Fruit.)	S. C. Harlow, Bangor.
Plum Culture,	Elijah Low, Bangor.

EVENING.

Care and Embellishment of Cemeteries,
John G. Barker, Supt. Forest Hill Cemetery, Jamaica Plains, Mass.
Agriculture—Its Present Condition and Future Prospects,
Prof. Elijah Cook, Manchester.

WEDNESDAY, A. M.

Better Care of Orchards, J. W. True, New Gloucester.
Orchard Fertilizers, Prof. Walter Ballentine, State College.
Fruit Growing in Aroostook, Hon. James Nutting, Perham.

AFTERNOON.

Fruit Culture—Its Possibilities in Maine,
D. H. Knowlton, Farmington.
Inexpensive Means of Fertility.
Poultry, Dr. Geo. M. Twitchell, Lecturer State Grange.
Swine, Prof. I. O. Winslow, St. Albans.
Sheep, By Discussion.

EVENING.

Poem—A Suggestion. Miss E. L. Pope, Manchester.
Plants for House Culture and Mode of Treatment,
W. H. Allen, Gardener and Horticulturist, Insane Asylum, Augusta.
Our Homes and How to Improve Them,
John G. Barker, Jamaica Plains.

The programme was supplemented by several important papers, letters and discussions. As a rule the various subjects were ably treated, and almost without exception by speakers engaged in horticultural affairs. The papers, discussions, &c., following clearly indicate that Maine fruit growers are working in the right direction. The papers deserve careful reading by all interested in the culture of fruits.

The display of fruit was of excellent quality, and represented the best fruit growing sections of the State. The exhibition made by S. C. Harlow of Bangor, one of our oldest members, was the best single collection shown for years at a winter meeting. Other collections in quality were equally as good but none contained so large a number of varieties. The autumn and early winter specimens were in a fine state of preservation.

It is highly proper in this connection for the officers of the society to express their gratitude to the members of the Bangor Horticultural Society for the cordial reception given to the fruit growers of the

State. Especially would we recognize the zeal of Mr. B. A. Burr, and the valuable services he rendered us, though at the time suffering from a fatal malady, which a few weeks later caused his death. We take this opportunity of extending our sympathy to the bereaved family in their affliction.

The hall was appropriately decorated for our use and the officers of the Bangor Horticultural Society were very attentive in their efforts to make the gathering one of profit and interest to all. The press of the State have freely published our notices of both meetings and exhibition. The Bangor papers especially deserve our thanks for the careful and extended reports of the meeting which they published in their columns.

In the following papers, discussions, &c , the reader should bear in mind that the ideas are not necessarily endorsed by the society. They are, however, from some of our most successful fruit growers and authorities on matters pertaining to fruit culture.

OPENING EXERCISES.

At the appointed hour Tuesday, February 24, 1891, in City Hall, Bangor, Maine, A. L. Simpson, President of the Bangor Horticultural Society called the meeting to order, and in behalf of the Bangor Horticultural Society and other local organizations gave the following

ADDRESS OF WELCOME.

Ladies and Gentlemen: "The Bangor Horticultural Society," which welcomes you here to-day, was organized March 30, 1860. Then but little attention had been given to the cultivation of small fruits and flowers; few pears were raised in this State, and apples in general, were poor.

About that time, Albert Noyes, who was an active member of said Society, commenced to cultivate strawberries. He found it difficult to dispose of the few he raised, at any price; while now, immense quantities of them are produced in and about Bangor each year, and find a ready market at good prices. The increase in all kinds of small fruits, as well as flowers, has been equally great in all parts of the State. The growth of pears has become large and profitable; while the advancement in the production and quality of apples has been very great and remunerative to the grower. Large shipments of apples are made to Europe each year, where a ready market is found for them ; while their sale at home has been largely increased, and their use has become so common that they are now considered one of the necessary articles of food. More interest has been manifested in the cultivation of flowers, so that now they are used for adornment on all occasions. To-day they add much to the beauty and appearance of this hall.

"The Maine State Pomological Society" acquired its charter February 17, 1873, under the auspices of the "State Board of Agriculture," which had then been organized many years, and was doing much to encourage the cultivation of fruits and flowers. To these various organizations, the County Farmers' Clubs and the County Pomona Granges, the State owes this great progress. To the harmonious actions, meetings and discussions of these organizations is due also great improvement of the finer and intellectual characteristics of the people. In furtherance of this progress, in the cultivation of fruits and flowers, and of the intellectual advancement of our people, "The Bangor Horticultural Society" most cordially welcome you to our beautiful city, trusting that your meeting here may be both interesting and beneficial.

RESPONSE BY HON. Z. A. GILBERT.

The members of this Society years ago caught on to something of the possibilities of the business of fruit growing in our State from their own experience and from opportunities of observation which had been open to them. But the extent to which it had then been carried on was limited. The orchards were small as compared with the present day and nowhere among us very numerous. The idea was entertained that the business ought to be developed. Out of that idea the Society came into existence. It was incorporated by the legislature with an annual appropriation of $500 for its use, subject to the condition that a sum not less than the amount named should first be awarded and paid out in premiums.

The method adopted for carrying on the work of encouragement to the industry by the faithful men who had banded themselves together was through exhibitions where results could be impressively illustrated through a representation of the profits of the business, and through such measure of instruction as could be conveyed by word of mouth at the public meetings of the society. In these lines up to the present time the work of the society has been carried on and we believe we can rightly claim that a measure of results has come from the efforts. It has been purely a labor of love, or rather perhaps of duty, on the part of the workers, they feeling fully compensated if the people could be drawn together to imbibe a measure of the inspiration which prompted their efforts.

These efforts thus put forth we pride ourselves have brought forth fruitful results. Under their influence orchards have enlarged their borders and many enclosures otherwise of limited value and of little income are now annually loaded with delicious fruit bringing to the farm its needed revenue.

But, ladies and gentlemen, the society realizes full well that the work thus accomplished is not all that is called for. We are coming on to, if not already entered upon, an age of specialities. This calls for skilled workmen. Skill comes from training, which is only an unused term for schooling. Here is a field of work broad and deep that the society has been able to enter upon only in its most crude and bungling manner. Our day is calling for schooling in fruit growing as it is in those other industries which go to fill the measure of want demanded by a cultured people. It is not enough in this age that our boys and girls be educated for the purpose merely of *knowing something*. The demand is that they may therefore be aided in *doing something*. The boy to-day who can only dig out a Greek root or demonstrate a problem in the Calculus is no match for him who can cover a field with luscious strawberries or hang a tree with red-cheeked Baldwins. This is schooling that reaches results which the great world of to-day cannot do without. Our accepted definition of education needs modifying to correspond with the day in which we are now living.

This society possibly may not be so well equipped for this latter class of work, but it can and should point out to other instrumentalities that which is called for, and thus still make the organization instrumental for good in this broader relation. This I am glad to say the society is endeavoring to do. It is making itself cognizant of what is going on in the great field of education among us, and is disposed to use its influence to see to it that our horticultural interests be accorded that measure of attention rightfully their due. In this connection it is pleased to recognize the introduction of horticultural education at our State College, and purposes to aid in every legitimate way all movements connected therewith promising to make that work effective. It asks of you, members of the Bangor Horticultural Society—it asks of you, members of the Penobscot County Farmers' Club—it asks of you, men and women, members of Penobscot Pomona Grange, that you join with us in helping on this later phase of educational work, not only in the line in whose interest we are here assembled, but also in its broader application to the various industries of life. That you accept the truism that "he is most entitled to public praise who best cultivates his soil," is proof that you have accepted this modern idea of education.

We are glad to join hands with you in the work, glad to meet with a people who fully appreciate our aims and purposes. Your presence alone is enough to give encouragement, but if you see fit to add a membership to our society you will be doing a double good. The fee for life membership is but $10, and that for annual membership $1. Some money is necessary to the work and any membership will be gladly received.

Thanking you for your invitation to meet with you, and for the interest you have manifested in the meeting, we hope that our horticultural interests will receive substantial encouragement from our association, and that you will be repaid for the interest manifested.

MR. BURR'S PAPER.

The local arrangements for the meeting in Bangor were largely perfected by Mr. B. A. Burr, member of the Board of Agriculture from Penobscot county. It was the occasion of general regret to those in attendance, that Mr. Burr in consequence of sickness was unable to be present. For several weeks he had been confined to the house. At the time of the meeting his courage was good and he was anticipating the pleasure of being present at the opening exercises. His physician, however, feared the exposure and the excitement, and would not permit his patient to leave the house. The disease proved fatal, and our hearts were made sad a few weeks later to learn of his death. He was an active friend of the farmer and his influence among the fruit growers in eastern Maine was very great. He will be greatly missed at the agricultural gatherings in the State, but the lessons he taught during his life will endure. Cordial, earnest and true-hearted the influence of his words and character will live long in the memory of those who knew him. It was a pleasure, however, to have a paper from him read by the chairman. It was one of his last and written during his sickness. The paper follows:

In answer to the letters of the Secretary of the State Pomological Society, proposing to hold their winter meetings in this city, stating that it was their desire to hold it where it would be best appreciated and likely to do the most good, I did not hesitate to inform him that he need look no farther, but fix dates and arrange a good programme, and if the society did not find an attentive, intelligent and appreciative audience here, there would be but one to blame, and that one the member of the board from Penobscot.

No doubt the query suggested itself to the mind of the Secretary: "If, as the writer intimates, the farmers of Penobscot county are an intelligent and wide-awake class, how could they have made such a mistake in selecting their member of the board."

Of all the occupations men engage in for the purpose of gaining a livelihood, by the application of capital, there is not one in which a varied and accurate stock of knowledge is not only desirable, but so absolutely necessary for obtaining the greatest returns, as in farming. The farmer's operations are not few and unvarying like the manufacturer, who is not affected by heat or cold, wet or dry, snow or frost. The farmer, necessarily, lives apart, which prevents him from seeing much beyond what he does himself, so it is only through reading and attending these meetings that he can receive the benefits of the successful and valuable experiments which are constantly being made.

The subjects to be discussed at these meetings are of the deepest interest to the whole community. A comparison of methods and results, failures and successes, the interchange of ideas help those engaged in the various branches of agriculture to receive the full benefit of their untiring attempts to succeed.

Farm life, from the effects of these gatherings, is constantly growing more social and attractive to old and young. The farmer now takes with him his wife, sons and daughters, that they may share the benefits of social interchanges of thought and action of the outside world. No thoughtful man, no intelligent woman, no bright boy or girl who has become familiar with the benefits and pleasures derived from these meetings, will neglect them without the best of reasons; they are of common interest and universal benefit; they not only help the farmer to raise the best and most perfect fruits, flowers, vegetables, grains and grasses, but to fill his position as a citizen honorably.

All intelligent citizens look to the soil as the great source of national and individual wealth; and consider every advance which is made in its improvement adds to the means of their happiness. Land and labor are the great sources of public and private wealth. The more fertility we impart to the one, and the more intelligence we infuse into the other, the greater will be the returns and the greater our means and power. Wealth rightly employed procures for us all the substantial enjoyments of life—it renders us as individuals or as a nation, independent. The character and power of a state depend upon the knowledge, industry, enterprise and independence of the rank and file of society, not upon the very few rich men, nor the few wise men.

The appellation of "*great* and *good*" can surely be applied to those who concentrate their efforts to improve any particular branch of agriculture, as they are thereby promoting the welfare of the whole community and the happiness of the whole human family.

The efforts of such persons as we have with us to-day to improve the various branches of agriculture, by imparting scientific, as well as the best practical instruction, are better appreciated and are receiving more credit and encouragement from men of property, culture and influence than ever before. Many of us can well remember the time when the worst stumbling blocks in the way of improvement and progress were a few farmers themselves; they were distrustful of all institutions and associations that were being inaugurated for the special benefit of agriculture; they were noted for their skill in the art of "holding back"—no ox was ever more skilled in this direction. But now, when such a one strays into our meetings we have to look a long time before finding a mate for him, for no two were ever known to "back" or "pull," together.

Prof. B. F. Koons when asked to read a paper on "Insects Injurious to the Apple," before a pomological society, said his first thought was: "No, I dare not confront such an assemblage of men who are well informed upon this important subject;" and then after giving a sober second thought to the matter, it occurred to him that what he said there and the deliberations of that body would not stop there, but its proceedings would find their way into the public prints —that the reports would appear in the annual report of the Board of Agriculture, and thus be perused by a hundred others for every hearer present at that time. He also related several of his experiences he had had as he mingled among men. On one occasion, in conversation with one of the most intelligent men in a certain community, he said he never knew before that the caterpillar feeding upon his plants in the garden would ever develop into a butterfly; he supposed it was once and always a disgusting worm. At another time a horticulturist of some experience, a man of great intelligence, too, came with a few army worms in a bottle, and with great solicitude said: "Why, they tell me that they will march across the country at the rate of five or six miles a day, sweeping everything before them!" When told that his field of cabbage was safe, because they rarely attacked plants with netted-veined leaves, he drew a long breath, as much as to say, "Saved!" Another community was afflicted by the same worm, and sent for the Cattle Commissioner.

While we believe our citizens are as intelligent as the average New Englanders, many of us may be found to be as ignorant of some of the specialties allotted to the speakers at these meetings as those referred to, but I can assure you that the most intelligent know there are yet many important lessons to learn, and they will be your most attentive listeners, for they know you to be thoroughly in earnest in this work, believing that the diffusion of useful knowledge is a help to men and women in a struggle for livelihood.

In this community he is most entitled to public praise who best cultivates his spot of ground, and whose motto is, "The improvement of the mind as well as the soil."

Mr. Charles S. Pope, President of the Pomological Society, was introduced and presented his

ANNUAL ADDRESS.

Ladies and Gentlemen, Members of the Pomological Society:

When we call to mind the lively interest you have always taken in horticultural matters, and remember that this is the home of many noted fruit growers, some of whom have been originators of valuable varieties of pears and plums, we feel confident no better place could have been selected for our winter meeting. The close proximity of the agricultural college, with its corps of professors, with the knowledge of, and interest in our department, makes another argument in favor of the present locality.

The officers of our society, on learning of the additional appropriations for the benefit of the State College, took an active interest and used what influence they could, that a due proportion should be expended to establish and successfully carry on a department of horticulture. From what we can learn the officers of this institution are in full sympathy with us, and are taking pains to secure efficient professors for this department. Closely connected with this is the State Experiment Station, and we would here mention the timely aid afforded by its officers in working out some of the problems which are puzzling the fruit growers. We believe their efforts will soon be acknowledged to be of vast benefit. If a remedy should be discovered, which will hold in check that terrible scourge, the apple scab, it will pay for the expenditure of thousands of dollars, for we believe this one disease is worse than all others combined. From the little study we have made of this disease, we are inclined to charge most of the failure of the apple crop in our own orchard the past year, to this cause. The time is coming when those who keep posted as to the best methods of destroying the myriad enemies of the orchardist, and thus be able to successfully fight them, will reap the benefit. For such men destructive insects and diseases will actually prove advantageous, although his fruit is obtained at such cost and labor, because those who successfully fight the borer, codling moth, maggot and apple scab, will ever be in the minority, and the choicer fruit raised by such orchardists will always command remunerative prices. There is one class of men I wish we could reach and influence. I refer to those, who having had good success in fruit culture are either too conceited or too selfish to share their knowledge and experience with others. It requires a great deal of faith in possibilities, and at best is up-hill work and sometimes rather tedious, to go from place to place, year after year, trying to awaken an interest in fruit culture and the beautifying of farmers' homes, and to urge that, even if this brings no returns in dollars and cents, it will bring delight and comfort, and what those who are obliged to purchase count luxuries. For what end is money making, but to purchase bodily comforts and pleasure? The wealthy citizen pays immense sums every season for fruits and flowers that any farmer may raise on his own grounds, with small outlay of time and money, and also have the advantage of having them fresh for the gathering.

The beginner in fruit raising may, for lack of experience. make a failure the first few years, but when he is able to place upon his table a few quarts of choice berries, with only the outlay of a few hours' work, he will then count them a necessity as well as luxury. The outlay for a beginner is so small that it is hardly worth naming, as it is much better to get some of the standard varieties of small fruit in his own neighborhood, than to send abroad for new and untried varieties. Most fruit growers have a surplus of young plants, and being as a class free-hearted and generous, are ready to assist the beginner, and charge only the cost of digging.

I know men thoroughly interested in any subject are liable to give it undue importance. Any object too near the eye obstructs the vision, shutting out and dwarfing all else. Nothing is more natural than for an orchardist to feel and say that fruit growing is the surest way to fortune, and to urge everyone to engage in it. But I think if you take notice you will find that those who make a success in the business are men who not only have faith in it but a love for it, which leads them to devote their time and attention to the orchard, to the exclusion of everything else. This love is by no means universal, as many a man has found to his cost, when, in a fit of enthusiasm caused by his neighbor's success, he sets a young orchard, and then, for want of this love, lets it die out. I have vivid memories of sitting on the limb of a sweet apple tree, devouring the half-grown fruit, and in imagination building castles in the midst of immense orchards. Though the castles are not built, I have so far carried out my dream of the orchard that should surround it, that I have every spring set more trees, and a big orchard is more likely to become a fact than any other of my childish dreams.

It is so easy for a child to become interested in watching the growth of a seed he has planted, and from this beginning he may be led by easy steps, through growth, to the flower and fruit of his tiny plant, the requisites for its growth, and even the study of the brown, unattractive soil that nourishes it. I believe the people of Sweden are correct in the theory that if you wish to teach horticulture to the people, it is better to begin with the children. The government employs twenty-five men to visit the schools, superintend the planting of nurseries and school gardens, and assist the teachers in giving instruction in these branches. I believe a system like this would awaken an interest in horticulture in Maine as well as in Sweden. Practical object lessons by experienced fruit growers would accomplish more than would be possible by any other method. The raising of nursery stock, planting of trees and vines, pruning, grafting and budding are easily taught, together with the care of small fruits and vegetables. The knowledge thus gained will surely lead to the raising of the fruits at home, and thus to a business at once satisfactory and remunerative.

I cannot close without once more calling your attention to the resources of our own goodly State. Why will our capitalists insist on investing their surplus in Western lands, or the orange groves and peach orchards of the South, when our hillsides, adapted by nature to orcharding, wait for occupation? It is not only a safe, but sure foundation these investments in Maine rest upon, for they will yield sure returns. We agree with some of her recreant sons that Maine is a good State to be born in, but we also firmly believe that she is still a better one to live in, and that in no State we can receive surer returns than she gives to the industrious and intelligent orchardist.

BETTER CARE OF ORCHARDS.

By J. W. TRUE, New Gloucester.

A recent agricultural writer has taken a great deal of pains to study up the world's supply of foods, cotton, petroleum, &c., and tell us that within five years "good land anywhere in the United States will be worth $100 per acre," and that all food products will be in quick demand at good prices; but it seems to us that such statements should be guarded against, that they may not lead us astray, for cannot we all think of countless acres that can be made to double their yield with intelligent and thorough cultivation. The more the great farms of the West, within a certain limit, are cut up the more cattle they will produce, the more food products they will furnish; therefore it stands us in hand to be on our guard, to be on duty and see to it that we get the most from our acres, doubling the product by a little timely care, and in no other branch of our farm operations is this more true than of our orchards and fruit trees.

In the first place, how many in planting an orchard properly prepare the ground before the trees are set? Probably not one in ten. At least a vast majority of our fruit trees are put into the ground and the planter virtually bids them "good by," and the tree is expected to do all the rest of the work from that time onward, making its annual growth, and in the regulation time loading itself with large quantities of No. 1 fancy fruit. How many of such trees set in that way ever have or ever will pay for themselves and the cost of planting, no matter how quick the demand or how high the price? Our preference would be to have the land well plowed, where it is practicable, a year previous to the time of setting the trees, the soil appears to get in a finer condition and the roots take hold more readily and we get quite a growth the first year, by giving the land a liberal supply of dressing. Other crops may be raised on the land to good advantage even to the extent of paying all the bills. With us potatoes is a good crop for the first year after the trees are set, then perhaps corn not planted too thick or very near the trees, it is preferable to rotate the crops not planting the same crop two years in succession, to be continued from eight to ten years, when if proper care has been taken, you will have an orchard that will begin to *show*, and if the whole matter has been properly handled will only have cost the first outlay for trees and the setting.

The distance that trees should be set apart is a matter of considerable importance, thirty feet appearing to be the better distance, all things considered. We have in mind an orchard that has been set some eighteen years, the trees being forty feet apart and they are not neighbors yet, and the prospect is that they never will be. That appears to be the extreme in that direction. There is also another orchard in the same town where the trees are 16½ feet apart, have been set seven years and they already have the appearance of being crowded, it being impossible to work a team among them, thereby making it very expensive to give it the care it should have to make it a thrifty orchard and paying investment.

Perhaps the subject of pruning next to that of fertilization is the most neglected and should receive vastly more care than is now given to it. In the first place the head of the tree should be properly formed, and where nursery stock is bought, that part has already been attended to and in such a manner that the tree is a perfect little image and looks in the most perfect proportion. When the tree is properly set the trunk or body of the tree is about two and a half feet up to the limbs, then the branches come out just right for a small tree, perhaps four or five branches coming out from the main stock in as many inches of space and at the end of six or seven years it begins to dawn upon the planter that the limbs of his trees are too low, appearing to be very near the ground, making it impossible to get near them with a team and very nearly so for the man himself; and the branches have the appearance of all starting from the same point on the main stock, and in a majority of cases there appears to be a very poor union of the limb to the stock, allowing water to enter and reach the wood of the tree, and decay rapidly sets in; and in many cases before the tree has reached the profitable stage of its life it will go to pieces, perhaps one limb at a time, and quite often will follow each other in rapid succession. When the head is formed the orchardist should have the outline of his future tree distinctly in his mind. When a limb is allowed to grow think how it will look when it is six inches in diameter, and give it room accordingly on the stock and if it starts properly it will almost invariably make a perfect union with the trunk, and in that case the life of the tree is greatly prolonged. The length of the trunk, or in other words, a high head or a low one, is a subject for careful study; for ease of cultivation the high head is preferable, but for the less hardy varieties it will not do to get the body of the tree too long as it is more liable to disease and winter killing. If fairly hardy the head should be set from four to five feet; this allows, with a large number of varieties, of its being cultivated with comparative ease; it is also much more convenient dressing and mulching it after it has come into bearing.

The pruning should be carefully attended to, ever having in mind that it costs just as much to grow a branch that is not required as it does the most needed and useful ones. If possible do all the cutting with the small blade of a pocket knife for the first ten years. If every tree is made a subject of study, find out its habits and peculiarities, and have the future tree clearly outlined in the mind, allowing no limb to grow that will not contribute to that end. By faithfully carrying out such a policy what an incalculable amount of wasted and worse than wasted energy would be saved, for where large limbs that are not required are taken off it affects the vitality of the tree; decay will often set in and eventually ruin it. After it comes into bearing it should be liberally dressed in order that it may bring a full crop of fruit to perfection and make a thrifty growth of new wood each year.

Half the trees that the majority of our farmers possess to-day, if properly dressed and pruned would produce twice the amount of marketable fruit that they do now. The keeping of a tree that is unproductive is in a degree just as much a tax on the resources of the fruit grower as the keeping of an unproductive cow is upon the dairyman. We should not expect a cow to go on producing rich milk in large quantities day after day and year after year, unless we gave her food and care to that end. No more can we expect our fruit trees to yield us large crops of fine fruit year after year unless we give it a good honest measure, all that it can handle of its food wherewith to manufacture this much desired product in full measure.

Our insect enemies are very numerous and are multiplying rapidly. They are at work from the base of the trunk to the topmost twig, and we must fight them in season and out of season. The borer is one of the first enemies to which we are obliged to turn our attention; it will attack our trees just as soon as they are set and unless they are looked after and removed they will destroy the tree. Our only remedy has been to look them over often with knife in hand and take out the little fellows as soon after they are hatched as possible; in that way we have reduced their ravages and the consequent damages from them to a very great extent. The caterpillar is another enemy that we must look after continually; it is our practice to remove every nest as soon as it is seen, making no difference what we are doing. In that way we greatly reduce the damage from them but do not see that their number is greatly reduced by so doing.

The greatest problem is still before us, which is to save our fruit after we have got our trees already to produce it, and we are anxiously waiting for remedies to be discovered whereby we can protect ourselves from the apple maggot and the apple scab. Spraying appears to have solved the question of protecting our fruit from the codling moth, which perhaps has never been an unmixed evil, oftentimes doing the work of thinning the fruit on overloaded trees, indiscriminately it is true, still a much needed task in some cases. In conclusion, we would say, that as a rule farmers are a hardworking class and perhaps always will be, but is it not possible that if we should devote more time to study, find out more in regard to the best methods of protecting ourselves against our insect enemies and then putting those methods into practice, we should find more leisure to enjoy the beauties of our situation, watching the operations of nature which we have in a measure assisted and directed?

DISCUSSION.

Ques. In trimming trees would you trim to correspond with the habits of growth?

Mr. True. I should have in mind the character of the tree every time. I should train the tree so I could work around it, but not try to make an upright tree out of a spreading grower. You should have in mind, the tree as it will be in ten or fifteen years. If you see a limb three-fourths of an inch in diameter that comes close to another which would interfere, you should remove one of them.

Mr. Phineas Whittier. I have noticed frequently, when two limbs come out together, where two branches make the main top; that in those crotches between the limbs you would see a dead place; it would begin to die from that each way, as long as they remain in that shape, the place would grow larger and larger every year; the water would get in, and when it would freeze that would crowd it apart. The first intimation you have that there is a dead spot in the crotch of these trees, cut one of them off slanting. Where two branches make the main top, you cannot tell which would make the best top. If you cut out one you cut half the tree off and so with the other; but you must cut *one* out. I have generally cut out the northern one and let the southern one be to shade it, even if the northern one would make the best looking tree; because if you cut out the southern one, the hot sun is liable to injure the tree. It will heal over and you will be surprised to see how you can balance the top, by checking limbs from growing on the full side. Any sprouts that come out above where you cut the other branch out, let them grow, and in a few years you will have a balanced top; but if you leave them on, it is growing worse all the time, and as soon as it loads with fruit the wind will split it.

There has been one question in my mind and that is, the particular *time* to prune trees.

Mr. Walker. You can form a tree as you wish by commencing at the right time. I don't cut out the branches, but I trim everything from the inside of the tree until I get it in good shape. I never allow grafts to extend upward, beyond what I think will make a good formed tree. I go around twice in the season and cut the tops of the high scions back. Remove those that go through the top and you have then an open top and can pick your apples easily.

The Northern Spy is the worst tree we have for getting a handsome top but I have as good formed trees of the Northern Spy by paying attention to it, as from the Baldwin and Greening. I trim my trees twice a year, as much as I comb my head every day.

I have come to the conclusion that October or November is the best time to trim trees. If you trim a tree in the fall, you want to go through in March and take off every sprout and they will soon begin to show no signs of sprouting; but in the spring you will have sprouts.

I have only a few leading kinds; these are Greenings and Northern Spys. If you have a great many kinds, you cannot use your apples so well as if you had only a few kinds.

There were two things I got beaten on; the first thing was the caterpillar. I saw in the papers about putting factory cloth around the tree and tar it. I went to work on a hundred trees, not knowing the result. I saw the leaves began to decay and out of that effort I lost forty trees. I learned something. The next thing is to take care of the caterpillars. Next month is a good time. I have a pole sixteen or eighteen feet long with a knife at the end. I have a colored glass, which is a magnifying glass, that enables me to see every place around the limbs where the eggs are and I can get them off rapidly. I take them before they are hatched out and don't have much trouble with the caterpillars. This book knowledge is worth a good deal, but I never saw a good farmer with book knowledge and no experience. The most take these things and experiment, and when we touch the right thing, hang to it. I am glad these college fellows are giving us some things, but we old men who have fought trees and mosquitoes know what it means.

Prof. Munson. Mr. Walker says our knowledge must come by experimenting. I agree with him that we can form the tops of trees in any desired shape; but perhaps I don't make myself clear. We should not try to give the Northern Spy the same form as the Greening. With your Spys you train from the center; with Greenings you train from the outside in. You have a different picture for the Spys in mind, than with the Greenings. The natural habits of the tree must be borne in mind in pruning.

With regard to the caterpillar I would recommend putting a band of cotton cloth around the tree. The codling moth is often confounded with the canker worm. The first flies and the other crawls up the tree.

Mr. BARKER. Now that I am here, I want to say a word on that line, in regard to this beautiful exhibition of apples; that I can carry back to the Massachusetts Horticultural Society such a report. It does pay to take care of trees, as you have the evidence here before you. I was talking with Prof. Saunders and these were the words he used: "You Massachusetts fellows like to use the knife pretty well and when you get done you have a nice shaped tree with foliage so thick that the air cannot circulate through and you get a quantity of small fruit. You want to go home and tell others to thin out more." Then I asked what his rule was, he said, "Your judgment; but you want to thin out a tree sufficiently to get the light and a good circulation of air." He went and showed me his orchard and showed me what he meant; and I went home and carried out those suggestions and I had fruit that, I am happy to say, the Massachusetts Horticultural Society gave a prize, and I am indebted to Mr. Saunders for it.

Mr. GILBERT. In this connection I want to speak of the caterpillar. There has been for two years a remarkable visitation of various tree caterpillars in the north part of this county. They have travelled over the forests and the orchards in this county. Many who own these orchards have called them the ordinary caterpillar; but there is a distinction between the two. If this visitation is to be repeated this year and they are to travel on to other fields among the orchards, it is necessary that we should have a little information that may be of importance to us. We travelled through an experience of two years in connection with the work and we have learned our lesson. If we had known at first, what we knew before we got through it would have been thousands of dollars to our benefit; we would have saved the lives of thousands and thousands of apple trees; and that is, how to prevent this forest tree caterpillar from traveling on to pastures new. When they eat the foliage off from one tree, they travel on to others and if you would check their work, you have simply to prevent their approach to the tree. We tried everything that the ingenuity of man could invent for the purpose of keeping the caterpillers from going upon the tree. We finally discovered one thing that was effective and that was to cover the trunk of the tree with a coat of sulphur and lard; and no caterpillar will travel over it. The sulphur protects the lard from the effects of the heat and it remains there. Tar will stick, if applied on card paper and not coming in contact with the bark; and was effective while fresh; but the sun shining upon it, would harden the surface and the caterpillar would travel over it and the next morning the trees would be loaded with them. Take a stiff paper and wrap it around the trunk of the tree and put the sulphur and lard on the paper and no caterpillar will travel over it.

Prof. Harvey. Last fall, I took 135 cocoons from a locality east of Old Town and put them away. Out of the 135 cocoons there appeared twenty of the perfect insects. Further examiantion showed me that these cocoons were infested with four different kinds of parasites. I examined eighty of those cocoons and found they contained parasites. Nature takes care of this matter; not more than fifteen per cent of these caterpillars will mature. They are subject to great mishaps, beside the moths that come forth. You can tell the eggs of the forest caterpillar from the apple tree. You can tell by the cluster of eggs. The egg of the forest caterpillar is square at the ends and they lay around the twigs, while the ordinary caterpillar's eggs slope off at the ends. I might say that these eggs are subject to parasites. There is a little fly that belongs to the same group and is very small, and after the cluster of eggs is laid it deposits an egg in that cluster in each or a part of them. I took some of the ordinary orchard caterpillars and some of those clusters of eggs and put them into a breeding cage. Out of the cluster, I should think of over a hundred eggs, only about twenty or thirty of the caterpillars came out and there issued from the cluster, fifty or sixty of those minute parasites. I was careful to examine those cocoons often and I think there is a fungous disease that works upon these caterpillars.

Mr. Bennoch. My mode of pruning is in June; I think it is the best time to prune, because the sap is then changed into the saliva condition and cutting at that time, it heals over more readily. Cutting later in the fall, the wood heals badly. I don't think you can change a Greening into a Northern Spy nor *vice versa*. If it is the nature of a tree to spread or grow up, it will do so; I have had a great many of them.

Mr. Briggs. With regard to pruning, I have experimented somewhat and believe if the trees are well fertilized and kept in healthy condition, that you can prune at any time of year. Perhaps if the tree is in an unhealthy condition there may be something in the time of cutting, but I don't think in a sound tree it makes any difference. I never saw any bad effects from pruning any time of year.

ORCHARD FERTILIZERS.

By Prof. WALTER BALENTINE, State College.

In collecting data for a paper on fertilizers for orchards the writer was struck with the unanimity of opinion among orchardists, that the most satisfactory results are obtained by the liberal use of stable manure. The well known value of this material in the production of general farm crops would naturally lead one to the conclusion that it would be equally beneficial to the orchard; for the same nutritive elements are needed for the growth of a tree and its fruit as are required for the production of a crop of grain, hay or roots. And the orchardist who has at command a sufficient amount of stable manure at a low cost is not likely to make a mistake in using it for his fruit trees. But there are many owners of orchards who are so situated as to render the use of stable manure impracticable. These are anxiously inquiring for manures from other sources. They are well aware that commercial fertilizers are expensive and that they need to be used understandingly in order that they may be profitable.

Commercial fertilizers, however, are the only alternative; and this renders a discussion of commercial fertilizers for the orchard imperative.

In discussing the question of manures the fundamental facts have been stated by lectures on this subject over and over again from one end of the State to the other, yet at the risk of being accused of "threshing over old straw," the privilege is taken of restating them here. They are these. All plants require that the following substances be furnished them through their roots, namely, potash, magnesia, lime, iron, phosphoric acid, chlorine and combined nitrogen. Other elements are taken up by the roots of plants but those named are essential. Fortunately only three of these substances are often found deficient in soils and those are potash, phosphoric acid and nitrogen.

The ash of all fruits is rich in potash and phosphoric acid. Wolff's tables gives for the

	Potash.	Phosphoric Acid.
Apple.............	35.7 per cent.	13.6 per cent.
Pear.	54.7 "	15.3 "
Cherry...............	51.9 "	16.0 "
Plum................	59.2 "	15.1 "

Professor Atwater's Report of the Agricultural Experiment Stations, Middletown, Connecticut, for the years 1877-8, gives an analysis of the ash of the Rhode Island Greening with potash, 53.42 per cent; phosphoric acid 4.27 per cent. The average of two analyses of apple tree wood taken from Wolff's tables shows potash, 12. per cent; phosphoric acid 4.6 per cent.

European analyses give in parts of 1,000 parts of fresh apples, potash, 1.0; phosphoric acid, 0.4; nitrogen, 0.65.

As calculated from Prof. Atwater's report cited above, the fresh Rhode Island Greenings analyzed at the Connecticut Station contained per 1,000 parts, potash, 1.5; phosphoric acid, 0 12; nitrogen, 0.43.

Air dry apple tree wood according to Wolff's tables contains per 1,000 parts, potash, 1.3; phosphoric acid, 0.5.

Thus it is seen that our orchards draw heavily on the three fertilizing elements which are most likely to be deficient in our soils, both for the formation of the fruit which is taken away and for the formation of the tree in which these elements become fixed. Notwithstanding the heavy draft in this direction made by our fruit trees, it is no heavier than for the average of other agricultural plants. Wheat and other grains have in the ash of their seed nearly as much potash and more phosphoric acid than is found in the ash of our fruits, while in the ash of the straw as much potash is found as in the ash of the wood of the fruit trees. Peas, beans and other leguminous plants contain in the ash of their seeds as much potash as is found in the ash of the fruits with four or five times as much phosphoric acid, while the straw contains more potash and more phosphoric acid than is contained in the wood of fruit trees.

Hence it is seen that so far as the composition of the ash is concerned fruit trees require about the same manuring as other crops. And any system of manuring which produces good returns in the one case will probably do so in the other.

Special manures for special crops made up with regard to what a particular crop takes out of the soil have not met with general success, because no account is taken of variability of soils in plant food and of the varying ability of different plants to obtain the same nutritive elements from the same soil.

A special orchard fertilizer adapted to all soils and conditions is to be desired, but there is no probability that it will ever be found.

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The orchardist like the general farmer should make a study of the needs of his soil by the means of carefully conducted fertilizer experiments similar to those undertaken by the Experiment Station, the results of which have been given to the public from time to time, and after finding out what his soil needs in the way of fertilizing materials plan his system of manuring accordingly.

The sources of phosphoric acid in forms suitable for application are bone meal and ground bone, Thomas-Slag, bone ash, fine ground rock phosphates, fine ground phosphatic guanos and acid phosphates. All of these materials except the acid phosphates should be thoroughly incorporated with the soil either by plowing and harrowing or by pasturing the orchard with swine.

Acid phosphates may be used as top dressing. The acid phosphates or super-phosphates are quickest in their action, after which would follow the various bone phosphates, Thomas-Slag and some phosphatic guanos while such material as South Carolina rock are slower to yield their phosphoric acid to growing crops. It is of great importance that all raw phosphates (*i. e.* those which have not been treated with acid) be finely ground. Bone meal and ground bone usually contain in addition to seventeen per cent or eighteen per cent of phosphoric acid about three per cent of nitrogen.

The chief source of potash in commercial fertilizers are the German potash salts from the mines of Strassfurt and Leopoldshall. These salts are put upon the market as muriate of potash, which contain an equivalent of fifty per cent—fifty-three per cent of potash.

High grade sulphates of potash and magnesia containing thirty-five per cent—fifty-two per cent of potash. Kainit containing eleven per cent—thirteen per cent of potash and a double sulphate of potash and magnesia containing twenty-five per cent—twenty-eight per cent of potash. The cheapest and perhaps the most reliable source of potash of these salts is the muriate of potash. The average cost of potash in the muriate as reported by the New Jersey station for the year 1886 was four cents per pound, while in the other forms it ranges from 4.2 cents to 6.5 cents per pound.

Another source of potash is wood ashes in which it is always accompanied by phosphoric acid and lime. Wood ashes is a valuable manure on most soils and for most any crop and has been found particularly valuable for orchards. They are quite variable in composition. The total potash varying 1.53 per cent in a sample of unleached ashes from pine wood from saw mill waste to 12.04 per cent in the ashes from birch wood from a spool factory waste.

The average of thirteen analyses made at the Maine Experiment Station of unleached wood ashes from various sources gave 3.65 per cent phosphoric acid, 9.19 per cent potash and 36.48 lime. The highest per cent of phosphoric acid found in any of them was 6.05 per cent in the ashes from birch wood and the lowest was 0.64 per cent in ashes from spruce wood.

Nitrogenous manures are found in the market in the form of nitrate of soda, sulphate of ammonia, dried blood, meat scrap, fish scrap, tankage and in many other forms having doubtful value, such as leather meal, and hoof and horn meal.

Nitrate of soda should contain from 15–16 per cent of nitrogen and sulphate of ammonia from 20–21 per cent. These two manures are readily soluble in water, and if used in large quantities might prolong the period of growth of wood so that it would not ripen sufficiently to withstand our severe winters. The other nitrogenous manures mentioned would have to undergo decomposition in the soil and in consequence would yield up their nitrogen more slowly and could be used for fruit trees with greater safety. A good article of dried blood ought to contain 11 per cent of nitrogen, and dry fish scrap and tankage from 8–9 per cent of nitrogen with 7 or 8 per cent of phosphoric acid.

Nitrogen from whatever source in commercial manures is the most expensive fertilizing material, costing twice as much as soluble phosphoric acid and about four or five times as much as insoluble phosphoric acid and four times as much as potash.

Owing to this fact and that all of the leguminous plants such as the clover, beans, peas etc., act as collectors of nitrogen, it would seem advisable for orchardists who are dependent on commercial manures for their fertilizing material to avoid the necessity of purchasing nitrogenous manures by the liberal use of phosphoric acid and potash and the cultivation of red clover in the orchard and feeding it off either with sheep or swine.

On clay loam soils it is the opinion of the writer that it will be found necessary to grow clover, or some other crop, which will leave a large amount of organic matter in the soil, when using commercial manures exclusively, if the best results from the use of those manures are to be obtained.

The organic matter not only furnishes nourishment for subsequent crops by its decay but it has a physical effect on the soil similar to stable manure and which cannot be produced by commercial manures alone.

At the college farm at Orono the experiments with such raw phosphates as South Carolina rock, indicate that it does not readily yield up its phosphoric acid to red clover the first season, and that acid phosphates furnishing soluble phosphoric acid or raw phosphates furnishing a considerable quantity of citrate soluble phosphoric acid are more reliable for a clover crop.

In selecting phosphates for orchards this point should be taken into account if in addition to supplying phosphoric acid to the trees it is desired to grow clover as a collector of nitrogen and for its physical action on the soil.

Experience in the use of commercial manures has shown that, in general, phosphoric acid is required in larger quantities than either potash or nitrogen and for this reason the mixed fertilizers put upon the market contain the former in a much larger proportion than the latter.

These fertilizers, it is true, are designed for general farm crops, but it has already been shown that the orchard draws upon the supplies of plant food in practically the same lines and proportions as other crops. It is, therefore, a reasonable inference that phosphoric acid should form the larger part of an orchard fertilizer, and in offering the formulas given below this consideration has been kept in mind.

The following fertilizers applied as indicated may be expected to produce good results:

First. Finely ground bone meal at the rate of 500 pounds to 1,000 pounds per acre thoroughly worked into the soil.

Second. Bone meal or coarse ground bone meal at the rate of 500 pounds, and unleached wood ashes at the rate of fifty bushels to 100 bushels per acre mixed together kept moist for six months. This mixture would be most effective when worked into the soil but would be beneficial when applied as a top dressing.

Third. Dissolved bone-black 400 pounds, nitrate of soda 100 pounds, muriate of potash fifty pounds. This mixture may be applied as a top dressing, and would probably need to be repeated after three or four years.

Fourth. Acid South Carolina rock 500 pounds, sulphate of ammonia 100 pounds, and muriate of potash fifty pounds per acre. This may also be used as a top dressing.

Fifth. Acid South Carolina rock, 200 pounds; fine ground South Carolina rock 600 pounds; nitrate of soda, 100 pounds and muriate of potash fifty pounds per acre. To be well worked into the soil.

Sixth. Acid South Carolina rock 200 pounds; fine ground South Carolina rock 800 pounds, and muriate of potash fifty pounds per acre. To be well worked into the soil. The best results will be obtained with this mixture on soils containing considerable organic matter or with a clover seeding.

Seventh. Unleached wood ashes at the rate of 100 bushels to 200 bushels per acre. The best results will be obtained when worked into the soil, but they do well in most cases when applied as a top dressing except mill ashes which have little effect as a top dressing. The first, second and seventh have been used often and in most cases have proved satisfactory on soils needing the elements which they contain.

INEXPENSIVE SOURCES OF FERTILITY—POULTRY.

By Dr. GEORGE M. TWITCHELL, Fairfield.

The value of orcharding in the State of Maine has never been pressed upon the attention of the public as its merits demand. Friends of the apple and plum have been content to carry on a successful business, with no attempt at creating special public interest in this branch of farm husbandry. During the years, hundreds of thousands of dollars have been flowing out into the orange groves of Florida or the vineyards of California, or, later, into the still more hazardous investments in the West and South. Meanwhile the hills of the good old State of Maine remain, the climate is the same, Maine grown fruit has stood at the head, and those who planted here have been gathering year by year sure returns, and seeing their lands steadily increase in value. The special advantages here for orcharding are not appreciated to-day, and we who still keep faith in the old Pine Tree State have a mission to perform. From centre to circumference Maine would sing under the weight of increasing harvests if we would but put a stop to negative teaching and negative examples. While the grape grower of California has been selling his lucious Hamburgs for $15 a ton, the potato grower of Aroostook has received $30 for his Early Rose. While the selected oranges of Florida have brought the growers one cent each, the Baldwin and Greenings of Franklin county have been eagerly sought for at five to six dollars a barrel. While the officials of the State are calling attention to and advertising the abandoned farms, simply to gratify the curiosity of the curios, throwing the unconscious influence of the State against its best growth and prosperity, we must be alive and alert. The farms of Maine for the boys of Maine should be our rallying cry, and by positive work the steps of successful farm husbandry indicated. We do not want to turn our farms over to a foreign population, but rather build up within our own borders, out of our own blood, the wonderful resources of hillside and valley. Here is where our most earnest efforts must be directed; and when we move out of the grooves of habit, it will be to consider how these waste places and abandoned farms can best be made to blossom and bear fruit.

This leads directly to the question of fertilization. If any attempt is to be made to reclaim the rocky hills and knolls lying all about us, it must be by an inexpensive system of fertilizing. Three sources are open to us, which will insure results and yield profit in and of themselves. I believe the time is coming when we shall turn from the fertile fields so easily cultivated, and, as a business investment, seek rougher soils for the trees. Growing these where the moving of barnyard manure is too expensive, we seek the commercial article, and find a measure of relief. But it is when we open the bars to that little animal "with a golden foot" that we begin to realize that profit comes not only from the sheep, but also from their work about the trees. If the orchard be well established, the soil rocky and hard to work, put in a breaking-up plow in the form of some sharp-nosed porkers. They will open the soil, let in the air and sunlight, fertilize the trees, increase both leaf and fruit, and at the same time render pork-making profitable. A miracle can thus be wrought in an old orchard in two years' time, at no expense to the owner. But there is another line of successful fertilization and profit combined, though not so applicable to older trees, unless in connection with the swine, and that is poultry culture. Give the hens the waste places about the farm. You can't afford to yard them in the mowing patch or corn field. Get them into the young orchard, and note how the trees and chickens will become firm friends and helpers of each other. Here is a field at once inviting and profitable, and it is to this I am asked to call your special attention. The poultry industry has within the past ten years assumed gigantic proportions.

The value of the egg product to the State of Maine must to-day be reckoned by the millions. At the same time, consumption has so increased that prices for 1890 ruled higher than for several years. The facts are, that as a people, we are beginning to value articles of food for what they contain, and not with the one thought of first cost; and hence the use of eggs is being extended. There can be no danger of over production, even in brains, because only a small per cent will persist in their work of development. I believe that it would be a paying investment to put a lot of hens in a plum orchard, even if they did not produce an egg. Here is an industry of special value to those living near good markets, or along the line of our railroads. The plums sold in Maine markets are largely grown in California. We pay a living price to the grower there, transport across the continent, and then complain about the quality of the fruit and the poverty of the farms of New England. Hardly a farmer in Maine but might add hundreds of dollars yearly to his income out of a plum orchard, and the hens will take care of the question of fertilization, and also that more important matter, the curculio. A poultry grower in Massachusetts fenced a portion of his plum trees, and stocked with poultry, and found in a series of years that where those on the outside had been stung to the extent of sixty per cent, on the inside the loss was less than two per cent.

In the near future, Aroostook will supply our markets with late plums, and the energetic, business farmers there reap a rich harvest; while those enjoying greater blessings, near to the good markets, will keep on howling about the tariff, the silver bill, or the next candidate for postmaster, and let the golden opportunity slip through their fingers. The results of breeding, feeding and education on the little body we call a hen are such that while her total weight is but about three pounds, she is capable of taking the food we give and converting it, in the wonderful machine within her, into about twenty pounds of eggs yearly, and, at the same time doing faithful service among the trees, seeking for grubs worms and insects, and enriching the land. Lands worth to-day less than five dollars an acre may, within fifteen years, be made to pay for first investment, interest and taxes, and also the labor account in full, and then sell readily for three hundred dollars an acre; while the hens, which have done the work of fertilizing, will have yielded a net income of one dollar and a half per head yearly. All this is possible to any young man of Maine who has faith in himself, in the orchard and the hens, and a liking for the business. Of the value of hens over and above any other animals in taking care of the injurious insects which infest fruit trees, much might with justice be claimed. This will suffice. The man who stocks his orchards with poultry will grow larger and better fruit, while the per cent of choice stock will be greater than his neighbor can possibly secure in any other way. Not an enemy to the fruit or tree, which flies or crawls, but the hens will look after, unless it be the tent caterpillar. With all these facts before us, is not this an industry to be encouraged by any and all the agricultural bodies, or those working in harmony with them? The economic side of this question is what gives it so much importance at the present time. Here are the rocky hills, the light soils, the so-called abandoned farms. Here are all the conditions for successful fruit growing, and here is another industry which may be combined, with but little expense, and while saving in so many ways, be made a source of great revenue.

Young men, you can buy for one thousand dollars a farm of fifty or more acres, with comfortable buildings, in a fairly good location; the poultry houses will cost you from twenty-five to thirty-five dollars each, if you hire the labor done, and they will accommodate fifty hens, and the hens can be bought for from thirty to forty cents each. The standard apple trees can be secured for from fifteen to eighteen dollars a hundred, so that the entire outlay for farm, buildings, for 1,000 hens and fifty trees, will not exceed $2,000. Your hens will be worth what they cost to kill at any time. The net income from the flocks should be at least one thousand dollars, and from that to fifteen hundred, while at the end of ten or twelve years your twelve acres of orchard which sell for at least three hundred dollars an acre, the hens having attended to the question of fertilizing without expense to you. The returns from the orchard meanwhile will surely take care of the interest account, taxes and labor item, leaving the income from the hens *net* to the farmer. This is not an unreal picture, but may be made real to the young men of Maine who fancy the work, and have a high ideal toward which they are constantly climbing. In any line of work to-day, under present exacting conditions, the cost of production must be carefully considered. This necessitates the introduction of economic methods and practices. And right here I rest my claim for inexpensive fertilization of the orchard through the introduction of sheep, swine and poultry, with the balance strongly in favor of the poultry, because by and with it more can be accomplished than otherwise is possible. If one has not the means to start on so extensive a scale, then the door is still open, and with small flocks he may lay the foundation for future prosperity. Viewed in any light the path opens in this direction where, by combining the trees and flocks, the problem of to-day may in a large measure be solved.

If you cannot buy a farm, go up into Franklin county and purchase ten acres of cheap land, which can be secured for from three to five dollars an acre. Buy one hundred trees, and build a single poultry house. Start on an inexpensive scale and grow into the business as you come into a knowledge of the controlling conditions. In ten years' time you will have established a good business, while the acres in bearing trees will sell for from $300 to $500 an acre. The solution of the vexed questions of to-day lies in the door-yard, barns or barnyards, in the wastes about the farms, and in the little things too often overlooked. Let your eyes fall on the little objects we have been stumbling over, and, utilizing these, and the cheap lands, the greater prosperity of the State, and also the individual, will be secured.

INEXPENSIVE SOURCES OF FERTILITY—SWINE.

By Professor J. O. WINSLOW, St. Albans.

The pig is not the least valuable of the animals about the farm. He is able to convert a given amount of food into fat in a very short time. Pigs should not be kept long enough to be called hogs. During the first three months we find the greater profit. The unwise practice of keeping shoates through the winter cannot be too severely condemned. Pig growing, to be profitable, calls for care and attention. The materials necessary to build a body must all be supplied. In a native state he roams at large, and the most simple and practical way for those with orchards, is to fence and stock with pig enough to subdue the grass and work up the turf. At the same time the pigs will fertilize. In the soil, the injurious insects hide, and these are rapidly taken care of by the pigs. A couple strands of barbed wire, with a board at the top, will suffice to restain them. When fattening time comes, place them in small pens and force rapidly for the market. The orchard is the best place to be found for the breeding sows. The farmer who follows this line will find profit from the pigs in the orchard.

RESULTS OF SPRAYING.

By S. C. Harlow, Bangor.

I will endeavor in a plain, practical way to give you some thoughts and observations connected with my experiments in "Spraying" for the destruction of some of the insect enemies of the orchard, of which I shall confine myself to those attacking the foliage and fruit, especially the larvæ of the codling moth, *carpocapsa pomenella* in its attack on apples and pears; the curculio in its attack on plums and cherries and often on apples in localities where the insect abounds and where there is a scarcity of plums and cherries in which to deposit its eggs.

If to the list of the codling moth, curculio, caterpillar, canker worm and currant worm (a most formidable list beginning with C), to say nothing of leaf-rollers, "*et omne genus*," for whose destruction spraying with arsenite has proved to be the only successful remedy, if to this list we could only add one more insect viz., the apple maggot the larvæ of *trypeta pomonella* that great destroyer of the apple whose steadily increasing numbers if not checked may soon make him a rival of the codling moth in his injury to the apple, could we but include him also among this list for which spraying is a specific, it would indeed be the occasion of the greatest rejoicing to the orchardist and would mark a new era in the science of spraying. Insecticides in the case of *trypeta pomonella* cannot help us, I am very sorry to say, "*trypeta*" cannot be destroyed by spraying, viz., the parent fly with its long ovipositor deposits the eggs from which the young maggot hatches so far beneath the skin of the apple as to entirely protect it from the spray, in addition to which fact the lateness of the season at which the eggs are laid would make it unsafe to use insecticide even if the young larvæ were in reach of them. If, as Professor Harvey urges all fruit raisers to do, they would destroy all infected fruit soon after it falls to the ground, before the insect enters the earth, and also burn the refuse of apple bins and barrels in which the fruit was stored, and so prevent escape of the pupæ, it would largely diminish the increase of this pest especially in orchards isolated, and if in addition a law was passed to prevent importation of infected fruit as we do of infected cattle, it would be a most effectual method to prevent its increase. To one at al familiar with the use of the two most common insecticides, viz.: Paris green and London purple, one of the most noticeable features is the great lack of uniformity in results as to the proportion of sound fruit thereby saved by different orchardists and also as to the injury done to the foliage. This injury to foliage is always liable to happen to a greater or less extent, when the numerous conditions or factors involved in successful spraying are not well understood in theory and carried out in practice.

Let us now examine briefly some of the conditions or factors on which successful results in spraying depend. The first one I will mention is the use of the best insecticides which involves a consideration of the comparative merits and demerits of London purple and Paris green. One of the greatest objections to London purple is its entire solubility in water, hence where used in the same proportion as Paris green it often scorches the foliage and scars the young fruit to such an extent as to ruin both for the season. Paris green on the other hand being but slightly soluble in water proves when used in the right proportion not only much safer for the foliage but also equally effective in destroying the young larvæ in the calyx of the fruit.

A second point of merit in Paris green over London purple is found in the fact that while both of them are liable to adulteration, the Paris green is usually but slightly so, being of much more uniform strength than London purple, so that by getting it of a reliable chemist or manufacturer, a nearly pure article of known strength may be used. London purple on the contrary, as is well known, is always adulterated so as to vary greatly in strength, consequently it is impossible to tell without first testing each lot used, by spraying it on foliage and waiting several days or a week to see if injury is done by either its unknown strength or its perfect solubility; whereas the Paris green, being of known strength and nearly insoluble in water, makes it a much safer insecticide.

Having found from its greater purity and insolubility that Paris green is much the safer remedy of the two for the foliage, and equally effective in results, a most important question to answer is, what quantity effective as an insecticide can be used without injuring fruit or leaves of the apple tree. Before attempting to answer this, allow me to mention several important conditions or factors in the science of spraying which have an important influence in the results, viz.: 1st, the variety of tree, as of apple or plum; 2d, the youth or maturity of the foliage, as in the first spraying for the apple at the first of June. the leaves will bear a stronger solution than they will at the last of the month or later. This seemingly curious and anomalous feature is proved true in actual practice; 3d, the momentum with which the spray from the force-pump strikes the leaves; 4th, the fineness of the spray as determined by the fineness of the nozzle; 5th, the condition of the weather at the time of spraying and for a week following. The last and most important factor of all which I will now mention as influencing the amount of Paris green which can be safely used (as in our question before asked) is this, viz: the equal suspension of the Paris green throughout the barrel to which the force-pump is attached. The great specific gravity of this substance, causing it to quickly settle to the bottom of the barrel, thereby precipitating an undue proportion of the insecticide around the suction of the force-pump which always extends to the bottom of the barrel.

Having just simply enumerated these six factors which enter into and greatly modify the results connected with our question before stated, viz.: how much Paris green can be used with safety and effectiveness in spraying for the apple at the first application? In reply, as a general rule I have found that fifteen ounces of a pure article to 300 gallons of water or in the same proportion two and one-half ounces to fifty gallons, is sufficient for the apple; for the pear, plum and cherry not to exceed two ounces to fifty gallons of water as their foliage is more tender. When the conditions above noted are complied with I have no doubt that two ounces to fifty gallons will be found sufficient for the first spraying of the apple and should never use more than that amount for subsequent sprayings. Condition of weather at time of spraying and for the next week I consider one of the most important factors above noted; a very hot sun at the time increases the injurious action of the spray on the foliage, while on the contrary a heavy rain within a day or two after the spraying will destroy all good results from the operation. The limits of this article will not permit explaining the details of other conditions affecting this many sided and most interesting study of spraying. But the most interesting and important fact to which I have not yet referred is that even in its present imperfect state, the conditions already known being observed it will save from the destruction of the codling moth, the curculio and various other insect enemies, at least seventy-five per cent of sound, luscious, full-grown fruit. This proportion of apples and of some varieties a larger one, it has already saved in my own orchard. The science is but yet in its infancy and I shall be greatly disappointed if further developments and practice do not produce a much increased result.

This article would be very incomplete to omit stating the reason for spraying. The wise man has said, "There are times and seasons for everything under the sun." This is eminently true of spraying. The time, varying in early or late varieties of trees and in different localities according to the forwardness of the season, is about the first of June, for the apple at the first application. When the fruit gets the size of a cherry it is an index that the time is at hand for the codling moth (which is rarely seen in the daytime) to be depositing its eggs at night, one only in the calyx of each apple. At this time the calyxes or blossom ends at the fruit are all invariably turned upward toward the sky, in a position to readily receive the egg of the moth and also to receive the spray as it descends on the tree from the force pump. In our climate there are always two broods of codling moths, but we are now only considering the first brood which continues to hatch through the month of June and July. The spraying should be repeated in from ten to twelve days and should be done the third time for the best results to the crop.

The proper season for the first spraying of the plum tree, to destroy the curculio, is just as soon as the blossoms have entirely dropped from the tree. Here let me call attention to a very prevalent mistake in spraying the plum while in blossom, the results of which, in regard to the curculio, are a failure, as its time for work does not begin until the plum is larger than a currant. When sprayed in the blossom, instead of the curculio it is the honey bee which suffers, as well as the owner of them. Not only is the storing of honey checked by the needless destruction of the bees, but also the fertilization of the blossoms of all varieties of trees is interfered with by this worse than useless "slaughter of the innocents."

I am well aware, Mr. President, that in advocating the merits of Paris green over London purple as well as in reducing the amount of it to be used fifty per cent, I have antagonized opinions given in years past, through the columns of newspapers, many of which were not based on careful, practical experiments; but whatever may be the discrepancy between present and past opinions as to the best insecticide and as to the most desirable amount to use, these differences may be partly accounted for by different conditions connected with the various experiments. In conclusion I will say we must not forget that this is pre-eminently an age of progress, that not a year passes but that in the science of entomology, as in all others, new facts and new truths are being discovered which, by their development and application, must soon produce still more satisfactory results than yet obtained, both to the scientific and amateur pomologist as well as the practical orchardist.

DISCUSSION.

Ques. I see that horticulturists are agitated over the fatal effects of Paris green. It is said that it floats in the atmosphere and is very dangerous to human beings?

Ans. Mr. Harlow. I should be glad to read extracts from some of the most able scientists in this county. I have experimented with London purple and Paris green ; it has been fully established that there is not the slightest danger in the results. I will not attempt to go into the scientific investigations. There is not an infinitesimal amount of Paris green in proportion to the water ; the slightest drop of homœopathic strength lodges in the calyx of the apple, and every rain and shower washes and removes every particle so that the strictest analysis fails at the end of the season to find a trace of it. It has been proved also that after one or two heavy rains, there is no danger in cutting the grass and letting the animals run under the trees.

Ques. In spraying the tree, is there enough to hurt the caterpillar?

Ans. If you have caterpillars on your trees, you will see that they will soon leave you, and all other insects.

Prof. MUNSON. There is not much more to be said on the subject. Mr. Harlow has shown conclusively and his display of fruit shows more clearly still the beneficial effects to be derived from spraying. As for the injurious effects to be obtained from the use of fruit after spraying, I think there is no danger of eating the fruit after maturity.

The danger comes in the use of the insecticide itself, rather than the danger after the maturity of the fruit. I was very glad to know that he has proved successful in using a solution as diluted as he does. Commonly, solutions used are not as diluted,—about a pound to 150 gallons of water is the ordinary strength for apples and pears. As for the spraying, I notice in Mr. Harlow's remarks, he says that the spraying is very detrimental to the foliage later in the season, but is not noticed early in the season, when the tree is growing and the foliage comes out rapidly. This defoliation is due to the effects of the hot sun after spraying.

This question of spraying during the hot sun is one we need have no hesitation about discarding; the trouble arising from spraying during the hot sun is very trifling. I think there is no question in the minds of fruit growers as to the advantages of spraying for the codling moth.

Mr. VINTON. I confess that I share in this idea of danger from using Paris green. I made myself sick abed by putting Paris green on my potatoes. I take it for granted that in throwing it into a tree, it is the poison that kills the caterpillar.

Ans. It takes but a small amount of arsenic to kill the caterpillar.

Ques. How does the caterpillar take his first meal?

Ans. By boring a hole from the outside of the calyx into the apple. What little he gets in the calyx of the apple is enough to kill him.

Ques. Suppose there was a man in the tree and the liquid was thrown on him, would it hurt him?

Ans. I think it would; I think he had better get out.

Ques. This Paris green is insoluble in water. It falls upon the tree, the water dries off and leaves the Paris green in a flaky substance to float in the air, does it not?

Ans. Yes, the infinitesimal amount that is used. Some of our ablest professors have experimented and given the results of the experiments that prove beyond a doubt that it is a perfectly safe operation.

Mr. GILBERT. I am cautious about this society recommending the use of a deadly poison in any way. In the use of poisons there is less danger in the form of spraying, than as a powder or flour. We want to reduce it as much as possible—find the minimum amount.

Prof. MUNSON. When a pound to 250 gallons of water was used and the grass was cut and fed to a horse, no injurious results followed.

Mr. GILBERT. Certainly I would go *slow* before I would feed my stock on Paris green. If you don't give Nature time to throw it off it must be harmful. I don't want such an impression to go out.

STRANGER. I have used Paris green for a long time. We must understand that it is a deadly poison ; but with careful management there is no danger. Once in a while we hear of a man being killed with a cart wheel ; but that is no reason why we shouldn't use cart wheels. It is just the same about using Paris green.

MR. POPE. Our men cover their faces with a moist sponge. The first time we used it, two men were sick two days. We have been very careful about the use of it since.

NEW VARIETIES.

During the year the attention of the Society has been called to several varieties, hitherto unnoticed. Many of those received by the officers have been identified as varieties already named. Several seedlings appear to have sufficient merit to warrant testing.

These seedlings were brought to the Secretary by Mr. A. M. Furbush, East Wilton. The trees which bore them were grown from seed planted over eighty years ago. The family has always prized the fruit highly for domestic use, and the apples were named for members of the family years ago. One, the Sally, is a large, handsome yellow-skinned apple nearly covered with red. It is of good flavor, and keeps about the same as the Baldwin. Specimens of the Sally were sent to Mr. Van Deman, who says of it: "The variety which you call Sally is indeed quite a good one and I think worthy of notice. If it is hardy it might do to propagate in the North. In quality it is quite good and the color is also very good, being rather a brilliant red."

Mr. R. S Sampson of Temple called attention to a seedling which certainly has some good qualities. In size and color it somewhat resembles the Early Harvest. The flavor is crisp, tart and agreeable. It keeps well into the winter. Mr. Sampson set scions the past spring and we hope to learn more of the apple in future.

Several seedlings were sent us from Aroostook county. These and others examined from that section afford satisfactory evidence that Aroostook can raise good apples. We are inclined to think there are better varieties that can be produced successfully there, though these may be desirable to propagate from in the future.

FRUIT CULTURE—ITS POSSIBILITIES IN MAINE.

By D. H. KNOWLTON, Farmington.

From my own observation and the information kindly furnished me by a large number of fruit growers, I do not hesitate to affirm that Maine offers rare and unprecedented opportunities for the profitable investment of capital in this industry. And for a term of years to come I doubt if there is any State in the Union where labor is more sure of liberal returns, if properly directed. It is the purpose of this paper to bring before the public two things, as matters of fact not generally known: First, that Maine offers the most favorable conditions for fruit culture; and, second, that the profits are larger than in any other line of agriculture, and sufficiently large to warrant extensive development.

MAINE OFFERS FAVORABLE CONDITIONS FOR FRUIT GROWING.

A very large part of our area is found to be well adapted to the growth of fruit. The apple tree seems to grow in our soil almost spontaneously, and wherever in the past seeds may have been scattered, we may find the trees growing. They may be unthrifty and neglected, and though buried deeply in the drifted snows of winter, the severity of our climate seems, if anything, to increase their vigor. There are growing in many parts of the State, trees that were planted by the men who cleared the land years ago. One of these old orchards from which I have often gathered fruit, is well nigh a century old. The apple trees continue to bear, and pear trees growing among them that sprang from seed planted in 1795, refuse to entertain the blight or any other scourge known to pear growers in more favored sections. Though sadly neglected, these old trees never fail to bring forth good crops of old-fashioned pears, pleasantly reminding us of the industry and life of those long since passed away.

There is an orchard in the town of Union containing 200 trees, and covering two and one-half acres of land. It was planted 70 years ago. In 1888, this orchard, nearly three-quarters of a century old, bore 650 bushels of apples; in 1889, 400 bushels, and in 1890, 350 bushels. From the crops these three years the owner received \$480, \$300 and \$350, respectively, and he is confident that his venerable orchard pays him a net profit of seventy-five per cent. In many places these old trees are sadly neglected. They often bring to the mind sad thoughts, as they remind us of those who cared for them in early days, and from their grateful limbs plucked the first fruits they bore. But they refuse to die, and stand firm as the rocks from whose crannies their roots gather the scanty food allowed them in their old age. They are living witnesses, grown gray and mossy with the years, that the apple tree is thoroughly hardy in Maine. And from this we also conclude that only artificial conditions have given us stock and varieties that will not stand our climate.

SUPERIOR QUALITY OF MAINE FRUITS.

It has not yet been explained why any fruits we can mature in Maine possess such qualities of excellence. That they surpass those grown where the seasons are longer, and one might think, more favorable, is generally conceded. The fruits we can mature to perfection have the most delicious qualities known to the varieties. Some time, as the years roll by, our experiment stations may be able to explain why Dame Nature chooses to make Maine Baldwins a little better than any others in the market. If you will look at the market reports any day, you will find "Maine Baldwins" are quoted by themselves, and that they are a little higher than New York or Western Baldwins. The market has found out the quality, and it is for us to take advantage of it by producing better Baldwins still, and more of them. At the last Bay State Fair, held in Boston, in 1889, the officers of our society decided to show some Maine apples. Of this collection, President Pope said in his annual address, last year: "Care was taken to make a small collection of choice apples, rather than a large one of nondescript fruit. Only twenty-eight varieties were taken, and these were collected mostly in Penobscot and Franklin counties. The exhibit was said to be the finest in the hall, but as there was no premium for best collection of apples alone, it was necessary to enter for premiums in the general collection, which included pears also. In this class they were awarded second premium. The single plates were entered, and seven of them won first premium, two, second, and the other, third. From this it will be seen that the collection was a choice one, and we have reason to be proud of the result. Our object in exhibiting the apples was not to secure premiums, but to show that Maine can grow as fine fruit as any other section."

While we may never be able to raise so fine pears as are produced in other localities, we may safely say that of those varieties that are known to thrive here, we can produce good fruit. There are fewer enemies to the pear in Maine than farther south, and so far as developed, the industry pays well. Cherries and plums are raised as easily in Maine as elsewhere, and the fruit is of excellent quality. So long as it costs $500 a car to bring fruits across the continent, it does not seem that New England, and especially Maine, should not produce a large part of these fruits used in the East. Excellent strawberries and other small fruits are successfully and profitably raised in Maine. The season is just right, for at the time they are ripe they have the monopoly of the market. Railroads and boat lines now make it possible for us to gather fruit one day, and lay it down in the city markets early the next morning. To the extent already developed, the small fruits have paid well. Cranberries and blueberries grow naturally on our mountains and plains. The former respond quickly to culture, and by many found a paying crop. The latter have received little if any attention at the hands of fruit growers. They grow well in my garden, and I am glad to notice that Dr. Sturtevant is giving some thought to their culture, for I believe they will have a place, before many years among cultivated fruits.

PRESENT PROFITS OF FRUIT CULTURE IN MAINE.

I am able to give you some of the present results in Maine fruit growing. As I have examined these figures, they compare favorably with fruit growing in other sections; and so far as agriculture is concerned, it certainly leads any other feature of it here in Maine. From the returns received, I find but few who have been raising apples for market over thirty years. One of these, Mr. Phineas Whittier of Chesterville, began forty years ago. He began labor as a fruit grower by the purchase of ninety acres of old rocky pasture and woodland for the sum of $400, for which, he once told us, he was able to pay only $75 down. During the past ten years, this piece of property has produced, on an average, nearly $2,000 worth of apples each year; and the past three years his receipts were $2,400, $4,200 and $3,000, respectively. Eighteen hundred eighty-eight was the year when so many people said "apples don't pay in Maine." It may be a matter of interest to add here that his No. 1 Northern Spy, for 1889 and 1890, sold as high as $8 per barrel. Mr. Whittier's $400 investment has grown into the most valuable farm in Franklin county, which, with his own industry and energy, he has supplied with fruit-house, evaporator, and other appliances to aid him in his operations. He now has nearly 6,000 trees, and the next ten years I do not doubt that his fruit farm will produce double it has the past ten.

Another gentleman says: "I came into possession of my farm in 1850, and there was quite an orchard on it for those times, engrafted mostly to Roxbury Russets. The Russet is the apple for me to raise, instead of the Baldwin, as it bears every year, while the Baldwin bears only every other year, and by keeping until spring, will bring nearly twice as much per barrel. Take it for ten years, I think I get as many barrels of Russets as I could of Baldwins. In reckoning the net income of the orchard, the dressing, taxes, barrels, interest of money, time spent in digging borers, trimming trees, picking, sorting and barrelling and hauling apples to market, were considered." During ten years, this orchard of about 1000 trees, two-thirds of which are in bearing, has averaged its fortunate owner $1,000 a year; and the net profit, carefully figured, as you will observe from his statements, is fifty per cent.

For market purposes the large majority have not been raising fruit over fifteen years, and a great many not over ten years. From these statements it will appear that the industry is only in its infancy, and that under favorable conditions it ought to grow into an industry of immense proportions.

Depending somewhat upon the stock, varieties and conditions affecting growth of tree, etc , the trees have begun to bear in three to fifteen years, but we find the average time, when the market varieties from trees set have borne in considerable quantity, is from seven to ten years. The Northern Spy and King are among the most tardy. There is one orchard in Franklin county which has been set twenty years. In 1889 there was a King tree in this orchard that bore six barrels of No. 1 apples, that sold for $6.50 per barrel—$39 from a single tree! Suppose we call it $35, an acre of seventy such trees would bring a net income of $2,450. The best Kings have rarely sold for less than $4 the past five years, and at this rate the income from the acre would be $1,680. Or call it, if you please, $2 in an abundant year, and then the acre stands at $840. Multiply this by ten acres, and a man has in Maine a bonanza as rich as a silver mine in Nevada.

There are many small orchards from which the owners the past ten years have realized a steady income, and there are now hundreds of orchards that contain 500 trees and over, and I think I may safely say that not over one-half of the apple trees set for market purposes are bearing fruit. One grower, where land about his orchard is worth from $3 to $5 an acre says: "My crop of apples for 1890 is as follows: Sold 305 barrels for $4 per barrel. I have on hand 2500 pounds of evaporated apples worth sixteen cents per pound. I cannot give you an account of expenses, but this much I will say, it leaves me a fair margin, and is the only crop that will do it." One thousand six hundred and twenty-five dollars from land of such value in Maine! Think of it, young man, before you turn your back upon your native State! Where can you find richer returns in this country for good, honest labor? And this orchard farm is still young, and every year its trees are becoming more fruitful. It is better than corn at fifteen to twenty-five cents a bushel 2000 miles from market. It is better than three or four cent beef on a distant cattle ranch. It is better than ten hours daily work within the walls of a noisy factory. It is life and joy in the open air, it is independence, life and happiness, and all the luxuries for home and loved ones that wealth and competence can secure.

VALUE OF ORCHARD LANDS.

An interesting and important matter connected with the subject under consideration is the remarkably low value of orchard lands. It seems to me that when the price is considered, the opportunities orcharding presents for profitable labor and investment are without a parallel in this country. For instance, Mr. Whittier says in his report that land adjoining his orchard has a market value of $5 to $10 an acre, and that when he began his operations his own land was worth $5. Another grower in Franklin county, who the past four years has realized $500 annually from a small orchard, says land adjoining is now worth only $12 an acre. In Kennebec county, in the town of Winthrop, one of the best orchard towns in the State, the price is given from $10 to $20 per acre. In the town of Turner the Rickers say land is worth $50 an acre, and others place it from $20 to $50. And so I might give figures from all parts of the State, but it will suffice to add that good orchard land may be purchased at prices ranging from $5 to $50 per acre.

As I have investigated the subject, I am satisfied that Maine fruit growers, even after their land is in orchards, do not place a fancy value upon their orchards. There is a wide margin in the figures given, but none of them exceed $500 per acre, and some are as low as $25. But when we consider that before trees were set the land was worth from $5 to $50, we can readily see there has been a large increase in value. This, by the way, is one of the important features of the industry. About ten years ago, a young man in my county bought a tract of land for $10 an acre, and began setting trees upon it. He now values it at $100 an acre, and it is worth it, for with only 100 trees in bearing, the past year, he sold $450 worth of apples. Don't you think this is a good investment for a young man to make?

The orchards in the State are not over-valued, and within my own observation are frequently sold at very low figures. Without locating, I will refer to several. In 1888, the year when croakers said there was no money in apples, a small farm was purchased. Some twenty years before, a previous owner began to set apple trees. The price paid was $5,500. The fruit the same year netted $1,200; the next year the returns footed up the same amount, and when the 1890 crop is all sold the owner expects the amount will be $2,000.

There was another man who got sick of farming, and thought he would rather drive a city truck team. He did not rest content until he had sold his farm for $2,100. There was upon a portion of the farm 300 young, thrifty Baldwin trees, that bore the new owner nearly 300 barrels of No. 1 apples the first year. Each year since it has borne a good crop, and all the while the trees are growing larger, and rapidly gaining in productive capacity.

Only the past year a young orchard, sloping towards a beautiful body of water, was sold for the sum of $3,000. There were many who thought the price was fancy, and that the purchaser, who had orange groves in Florida, had been taken in. Hanging on the trees, without a dollar's expense to himself, the purchaser sold the crop of 1890 for $1,500. The fruit buyers knew what they were doing, too, for when the apples were gathered there were nearly 500 barrels of No. 1 fruit. Do you know of safer or better investments in the West or South?

These opportunities are not numerous in Maine, but at the same time the writer knows of several that offer great inducements to a fruit man who is on the lookout for good investments.

It should be stated that in the figures bearing upon profits in apple culture, with one or two exceptions, the inferior fruit is not taken into account. Nor as yet, so far as I can learn, is any one in Maine producing apples for the purpose of evaporation. This exception is in Winthrop, where an orchard of several hundred Duchess were set for this purpose. The 1890 crop, I am informed, however, was sold green for four dollars a barrel, which ought to be quite as satisfactory to the owner. The demand for canned apples is rapidly increasing, and a foreign demand is already developed far beyond the supply. One of our largest exporters the other day assured me that in his judgment the foreign demand for canned apples would be greater for the next few years than could possibly be supplied.

It is not the purpose in this paper to discuss the difficulties of fruit growing, nor have I any disposition to ignore them. Mice and countless hordes of insect pests are ready to kill our trees and destroy our fruit. Diseases of fruit are apparently increasing in number and severity. But the answer to all this is, that the same skill and industry that makes a man or woman successful in other vocations will win eminent success in fruit culture. Further than this it may be said that fruit culture is free from many of the annoyances of most other pursuits, for active life in the open air, inhaling the sweet odor of flowers and eating luscious fruits, is always rich in the way of health, happiness and prosperity. It may be added that there is no place where childhood is happier than among fruits and flowers, and if there were more of both on our farms there would be less desire on the part of boys and girls to leave them for the weary hum-drum of factory life, or the unhealthy air and crowded homes of city life.

AN INVESTMENT PLAN OUTLINED.

But few orchards are held as investments in Maine outside of the farmers who carry them on. And I am not aware of any organized efforts to produce fruit for market. Some of our most conservative orchardists say that capital is not willing to wait ten or fifteen years for dividends, while an orchard is growing and getting into bearing. We know of some investments that have waited longer and without dividends, but there are none in which the property involved is increased in value as an orchard does. Ten dollars to $50 an acre will purchase desirable land, which at the end of ten years, set in good varieties of fruit, will be worth from $100 to $300, and at the end of fifteen years will yield a large dividend on $300 to $1,000 an acre. This increasing value of the orchard, year by year, forms an important factor in the problem. But I am confident there is no need of waiting so long for profits. Our nearness to good markets and the promptness with which small fruits may be laid down in good markets at a time when they are sure to sell at paying prices, make it possible now to combine the raising of all the fruits that flourish in this climate. So that while the orchard is growing, other fruits will be paying a profit from the same land. My correspondents in various parts of the State on this subject state positively that their orchards are paying them a net profit from 15 to 75 per cent. Not a single grower places the profit less than 15 per cent and the average is nearer 50 per cent. Certainly an investment of this nature ought to meet with favor at the hands of conservative capitalists, more especially when it is considered that the orchard may reasonably be expected, with good care, to bear for years to come, and to steadily increase in value until the trees are fully grown.

In the South and West speculators have organized large fruit companies, purchased land, planted trees and vines, sold capital stock, paid small or no dividends, but promise great things in the future. Now, suppose we should organize a veritable Maine Fruit Company with a capital stock of $100,000 to be acquired by the sale of stock as needed. At favorable points where there are good local markets for small fruits, purchase good fruit land or land already set to trees, in lots of 100 acres or more. Put some of our most successful fruit growers in charge of the enterprise, and let them develop the industry by planting trees and small fruits, erecting suitable buildings when needed, and purchasing tools and appliances. Let them combine the growing of all kinds of fruit, using the same land, and as soon as the apple trees need all the land let the small fruits be abandoned or cultivated elsewhere. The second year the small fruits will begin to respond in crops, and from that time on there will be a steady increase until the apple trees monopolize the land and are in full bearing. Under the same management there might be a half dozen such fruit farms in Maine and perhaps more. I have not the slightest doubt such an enterprise well managed would yield satisfactory returns. Millions of dollars are being invested in securities of doubtful value and sent out of the State to enrich land and stock speculators. The Boston Orange Growers' Company is organized with a capital stock of

$110,000. Their object is to engage in orange culture in Florida. A Boston trust company with a paid-up capital of $1,000,000 endorses each stock certificate and guarantees the interest for six years at six per cent. In his last annual report the bank examiner says there has been an increase of deposits in our savings banks the past year amounting to $4,000,000. An examination of the list of securities held by these institutions shows that from twenty-five per cent to seventy-five per cent of the deposits or funds of each bank are invested in securities of various kinds beyond our own borders. Would it be possible to divert some of these funds into a Maine fruit growing industry? And is there a trust company in Maine that would be willing to endorse a Maine fruit company's certificate? Without capital such an enterprise cannot be built up, but to my mind the opportunities are excellent for a good and profitable investment in a productive industry, based on a real estate foundation, that can not be stolen away by thieves or consumed by the flames.

FRUIT RAISING IN AROOSTOOK.

By Hon. James Nutting, Perham.

The first settlers on the Aroostook river seem to have tried no experiments at fruit raising, but some thirty years ago a few apple seeds were planted on some of the upland farms, but with no results that gave encouragement, as the trees which lived bore no fruit of value. Ten years later the tree peddler made his rounds, and has since made his yearly visits with new and improved varieties, each better than anything yet shown, and perfectly hardy if his story can be believed. Of the various kinds first introduced, the Duchess of Oldenburg (or New Brunswicker), Alexander and Fameuse, are still planted, and the first named is a success in every way on lands that are adapted to the raising of any kinds of apples, but the others are not a success, except in a few cases. Some eight years ago the Wealthy was added to the list of perfectly hardy trees, and also the Tetofsky and Montreal Peach apple, and later on the Yellow Transparent.

Several years age, Mr. J. W. Dudley of Castle Hill Plantation, raised from the seed of the Duchess a tree which has been named Dudley's Winter, which for hardiness, early bearing and size, equals the Duchess, and is a good keeper till late winter or spring. So that we now have the following list: Early fall, the Yellow Transparent; then the Duchess and Tetofsky, and Peach, which will keep till early winter; then the Wealthy from January till spring, and later the Dudley for late winter.

My own experience is as follows: In 1877 I planted out an orchard of one hundred trees, raised at Woodstock, N. B., seventy-three of which were Duchess, of which seventy were in bearing last season, giving an average of a barrel apiece. These trees were planted twelve feet apart, and are now beginning to crowd badly, but have not failed to yield abundantly each year. The other kinds, Alexander and Fameuse, and some other sorts, are not doing as well, but are doing something. In 1885, I set out one hundred Wealthys, which have lived well and are bearing abundantly. I have since planted out some five hundred trees of the same variety, which are coming into bearing and promise well. The following kinds I have tried and consider worthless: Peabody, Greening, Red Astrachan, Pewaukee, McIntosh Red, Haas, Gideon, Mann, Early Russian, Talman Sweet, and several others that are recommended as hardy. I am experimenting with the Red Betinheimer, Scott's Winter, Bloom, and several other varieties which appear hardy, but have not yet commenced bearing. No sweet apple that has yet been proven as good, is on my list, but some of indifferent quality (seedlings) have been set out. A good keeping sweet apple is about all that is now very desirable, and I hope to yet find it in the seedlings being raised in this section. For a crab apple the Hyslop for canning, and the Lady Elgin and Lancaster for dessert, are all that have proven a success. Plum raising is receiving a great deal of attention at present in the Aroostook Valley, with every sign of success. The Moore's Arctic, which originated at Ashland, on the Aroostook river, being the favorite, but the tree requires laying down in the fall to do well. This is not an expensive job, and the tree is a great bearer. Of the small fruits none but the strawberry is successfully cultivated, and if the projected railroad from Bangor to the Aroostook is built, I think a profitable business could be done raising strawberries for the late Boston market.

As to a market for apples, the fact that the valley of the Aroostook is as far north as there is any attempt at orcharding, and that there are 20,000 people in the St. John Valley to be supplied, is answer enough.

Up to the present time there has not been much trouble with insect pests, except the green aphis, which damages the scions the first season to considerable extent. No borers have yet been discovered, and the fruit has been remarkably free from worms. Some kinds, as the Fameuse and McIntosh Red, scab badly, but no others that I have tried, and these, perhaps, might be helped by the Bordeaux mixture.

I think that within ten years Aroostook county will not only raise its own apples, but have a surplus for export, if nothing of a serious nature should befall its orchards, as the southern part of the county already raises more than enough for its home market.

ORCHARDING IN FRANKLIN COUNTY.

By CHARLES E. WHEELER, Chesterville.

I have unbounded confidence in the development of my own county of Franklin, which stretches from the well-known and wealthy agricultural region of the middle Kennebec to the far away frontier of our domain, and whose primeval forests are just now being pierced by the iron rail, and upon its iron track will be borne for decades to come the untold values of these solitudes to supply the great markets of the country. Aye, more, I have a strong and abiding affection for my native town, even though within her limits there may be a few unsightly and sterile openings, yet its extensive plains which have grown the lofty pine to be exchanged for many thousands of dollars for the benefit of its owners, together with the excellent ridges of cultivated soil that have yielded its increase to succeeding generations, makes it a pleasant land in which to dwell. And I hail with unfeigned pleasure each and every fellow worker who has a like confidence in the merits of his respective locality, and will join hands with him in the endeavor to add something to the great whole which will redound to the welfare of our broad and magnificent commonwealth.

In the early settlement of that portion of our State, the pioneers considered it an important duty, after making a clearing sufficiently large to enclose their rude dwellings, to devote the next area to the growth of an orchard. The idea of improved fruit had not yet entered the mind, and as the tree took on a rapid and even growth in the virgin soil, the time required to bring it into bearing was of short duration compared with the present development, and the expectations of the owner were for *quantity* rather than *quality* in the product, for there would invariably be a sufficient number of trees among the many that would give a pleasing variety of the tart and common sweet, and a supply to meet the demands and needs of a rapidly increasing family, and which would be utilized by the frugal housewife in such ways as were common to that early period.

The next generation, however, became imbued with a spirit of improvement, and the orchard received its full share of attention, a careful scrutiny being given to each tree, and all having evidence of a healthy growth were grafted to those kinds which were then considered the best, and resulting after a few years in a most wonderful supply of choice and valuable fruit, which found a market in the large towns and cities of New England.

A few leading spirits, however, after a careful study of the situation, boldly ventured forth into a new line of fruit-raising, and the inspiration seemed to be infused into the hearts of all the people, for upon many a hillside and fertile ridge, upon level stretches of extended field which had received careful cultivation for a century or more, and within the narrow limits of village enclosures, there sprang up as if by magic an almost countless number of trees that are being as tenderly watched and nutured as a provident farmer would bestow upon a field of corn.

And go in whichever direction you will the eye now beholds the thrifty young orchard, which in its season, is bending beneath its load of well-formed and luscious appearing fruit, which has not only gratified the soul of the patient and methodical grower as he has daily watched nature's developments, but will be the means of inflating his pocketbook to an extent unknown since the days when beef brought living prices, and wool and other staples gave to the producer those satisfactory returns so necessary to his financial success. And a pardonable pride may be granted me when I refer to the acknowledged fact that in no other section can the standard apple be brought to that degree of perfection as is found in this portion of our State. Oh, the crispy juiciness and delicious flavor found in the red-cheeked and perfectly formed Baldwin! How the mouth waters as the eye takes in the proportions of its fellow of less ruddy hue, the Northern Spy! And the richness and beauty of the Russet matured in its color of gold, where can its equal be found?

But a query may arise in regard to the permanence of this branch of industry, and the probable condition of the market whence this product must tend The future is wisely hidden from our view, yet the question of supply and demand regulates itself, and I hazard the opinion that fruit grown in the State of Maine will, for an unlimited period of time, find a ready market and bring prices so remunerative that no grower will ever regret the time and capital invested. Men of deep foresight and well-balanced judgment look upon this enterprise now fully inaugurated and so successfully placed upon a broad basis, as only the beginning of that important period when Maine will stand as notably among her sister states as the producer of this delicious and valuable product, as does now California with its great variableness of climate, which sends forth in great abundance the yields of her vineyards and ranches, even to the supply of the large cities of our land, and extending to the farthest reaches of the continent. Then why delay? In nearly every town and neighborhood there are yet unoccupied farms and lots that may be obtained at mere nominal prices, and it only remains for young men, who, like myself, have only brains and muscle to aid in working out a destiny, to lay hold of such opportunities with a courage that knows no abating, coupled with a knowledge that follows experience and close observation, so that in the near future the waste places and abandoned farms will be transformed into a fruitful heritage. I am encouraged in this idea by the fact that in my own county there are numerous instances where changes have been made in the right direction, and not only has there been put a check upon the drifting away to manufacturing centres, but former residents have returned to their first love and have entered with renewed zeal into the laudable work of renovating the old home.

I might refer to many cases where a personal application has been made of the methods herein hinted at, and where a systematic and thorough course has been pursued, the result has no doubtful significance. And in every town in the county there may be found earnest, resolute workers whose end and aim is to carry forward the principles embodied in a just and equitable transaction in all that pertains to the growing of fruit, to a profitable solution. And in this connection I cannot forbear to mention one whose entire course of procedure has been tending in this direction. Phineas Whittier, so well known and so highly successful, whose extensive grounds are hidden from my own home only by a thin veil of forest growth now fast receding, is a living example of what man can do. With such a large area wholly devoted to the raising of fruit, with thrifty, bearing trees counting up into the thousands, and a like number rapidly coming to maturity, with annual product of fruit already exceeding that of any other orchard in the county or State even; with a net income of four or five thousand dollars, and the summit of his ambition not yet reached!

PLUM CULTURE.

By Elijah Low, Bangor.

It certainly would afford me much pleasure, in complying with the request of your secretary, to add to the interest of your visit by writing a short article upon Plum Culture. Whatever I may say, however, must be the result of personal experience and observation, and while I most cheerfully join in the cordial welcome extended to you, winter has put its cold seal upon every vestige of horticultural life; and did I not know of your benevolent feelings toward us, I should adopt the severe rebuke of Joseph to his brethen, "Ye are spies; to see the nakedness of the land are ye come." But were we in the fruitful season of the year, I cou'd not promise that you would find repeated our former horticultural success, as achieved under the skill and effort of such men as James McLaughlin, Henry Little, John S. Sayward, Albert Noyes, Albert Emerson, Dr. Weston, S. S. Low, John E. Godfry, and others, who have left us, but who brought the Penobscot valley in sharp rivalry with the Hudson, for the production of this most valuable and beautiful fruit, the plum. These pioneers of horticulture were men of means and leisure, two important factors in fruit raising, and could produce from their graperies and gardens an exhibition that could not be beat, certainly has not, in any I have seen.

A series of misfortunes have served to depress and render more difficult success in our favorite pursuit of fruit culture. The men who have succeeded those pioneers are not, as a rule, men of leisure and means, but find themselves too much engrossed in their business to devote the time necessary to success in their favorite pursuit, and to confront the changed condition of things. Some years ago the scourge of "black knot" almost blotted out of existence the plum tree. It seemed to commence in the western part of the State, and in a majority of cases so covered the trees that they were abandoned as hopeless, and cut down. When it arrived here the question presented was, shall we fight or surrender! A few of us accepted the challenge and are still fighting. My rule is a sharp knife, and courage to use it; and never go under an infested tree a second time, but cut it out and burn it at once.

Professor Maynard, last week in a lecture before the Massachusetts Horticultural Society, adopted the "fungus" theory, and says, "kerosene will kill it;" and recommends that it be mixed with some dry substance in form of paste, to protect the healthy wood.

For the curculio, I gather up the bitten fruit as soon as it falls, and consign it to the cook stove I have not yet found any variety not affected by these twin enemies.

If Professor Maynard has really solved this mystery of the cause and cure of the black knot, he has rendered a valuable service to horticulture

Among the causes that have tended to depress plum culture in this State, but of which I would not complain, is the time fixed upon for holding our fairs or fruit exhibits. At the time fixed our plums are green, and no pomologist wants to exhibit green fruit.

The facilities offered by railroad communication supply our local fruit dealers with beautiful, tempting, California fruit, which is as tasteless and insipid as it is beautiful. Immense quantities of all kinds of fruit are shipped from more southern climates, but it is brought to us in an unripe condition, consequently it has not the fine flavor of gardens here; neither is our cold climate adapted to their cultivation. Even pears cannot so successfully be raised here as in Massachusetts, yet my little plum garden has taken the first premium at their State Pomological Exhibition, for plums.

The few practical suggestions I would make as the result of my experience are these: first, soil. The natural soil of the plum is clay. I have never known success to follow on a sand or gravel soil. My own garden was once an old brick yard.

Varieties—Select varieties that have succeeded best in your own vicinity. The traveling agents, with their beautifully painted and glowing description of their fruit, are very apt to mislead the inexperienced. Mr. Downing describes about three hundred varieties, from which we can select, if we know the conditions of success required. At one time I had thirty-two varieties, but I have learned to multiply the best and drop the poorest. Those best adapted to this locality are the Washington, McLaughlin, Bradshaw, Green Gage, Lawrence's Favorite, Reine Claude, Smith's Orleans, Penobscot, Columbia, Victoria, Moore's Arctic, Imperial Gage and Lombard.

Fertilizers—I have never used stable manure, but find bone meal and hard wood ashes (and in spring and fall throw broadcast about a pint or coarse salt), the best treatment for plum trees.

DISCUSSION.

Ques. You place the Lombard the last on the list. What do you think of that?

Mr. Low. It is the most productive plum.

Ques. Have you tried the Quackenbos?

Ans. Not to get fruit. If a tree don't respond after the care I give it, I wipe it out of existence. I have almost envied you, in the country, with plenty of land. Here we have but little land;—a man spoke about putting berries four feet apart;—why we should get upon our neighbors. I have a farm out here; when I bought it I used to get thirty-two dollars a ton for my hay; now, I cannot get but six dollars for it.

Ques. How about Moore's Arctic?

Ans. It is a very productive, but not a rich plum. They told me it would be free from black knot,—I have never found any that was *not* recommended,—but I notice that the black knot puts in an appearance. I consider the Washington and McLaughlin two of the richest plums. The Bradshaw is a good, large, purple plum; I think it is a good one.

Ques. How long is the average life of the plum tree?

Ans. I think I have trees in my garden that are over twenty years old. Some years they get overloaded, when a man gets too busy to think to thin out one-half of the fruit; and that requires some courage. I gave my neighbors an invitation to help themselves, and the next year I didn't get any. The trees want to be fed as well as the horse and cattle; you must put back what you take away. This lesson people have to learn.

I think there is a difference in the length of life of the plum tree. I don't think they are so very short lived. I have a McLaughlin in bearing that is said to be twenty years old. They show, something like myself, the infirmity of age. A gentleman in Brewer asked me what ailed his fruit trees. I said, "You have starved them to death; you don't feed them." He says "The idea of *feeding* a tree!" I said, "If you prefer to have them bear leaves instead of fruit, you can." Some think, if you stick a tree in the ground it will do, and leave it to live or die.

Ques. We have a clay soil and underdrain as far as we can. We bought some plum trees but they never have fruit?

Ans. In that case, I should try ashes and bone meal as a fertilizer. When I fix it in large quantities I take a barrel of bone meal and four barrels hard wood ashes and fill a hogshead;—a layer of ashes and a layer of bone meal, an inch of each;—then fill the hogshead with water and let it work through. After it has stood ten days I shovel it out and mix with dry muck. This mixture you can throw around your trees.

STRAWBERRY AND SMALL FRUIT CULTURE.

By S. H. Dawes, Harrison.

My text to-day is "Strawberry and Small Fruit Culture." I am not going to preach. I have not been installed for that purpose. I only have a license from our honorable Secretary to give you a little of my experience and observation since I have been in the business. I do not claim to be any authority whatever in pomological matters, and can only tell you my mode of cultivation. I shall call your attention mostly to the strawberry, for it is the king among small fruits. Beecher said that "God could make a better berry than the strawberry, but He never did." I don't think He ever will till we learn how to cultivate and handle that noble fruit better than we do now.

Ten years ago I commenced in a small way to raise small fruits, and after fooling round three or four years in the garden, orchard and beside the fence, just long enough to find out that I did not know anything about the business, I thought I could see that there was money in it if rightly managed. I did what I would recommend every one to do. I selected the best acre of land I had that was adapted to the purpose. In selecting and preparing an acre for strawberries, it is impossible to give any definite rule that will apply in all cases, for so much depends on the condition of the soil and the quality of the fertilizer, that a man will have to use some judgment of his own as in everything else. But a moist soil is preferable, and there is no danger of getting it too rich. The acre I selected was our common gravelly, rocky upland in grass and all worn out, naturally very wet, so that it had to be thoroughly underdrained. It was then broken up one foot deep, the rocks carted off, a light coat of dressing spread on, and planted to potatoes the first season. As soon as the potatoes were dug I cross plowed it one foot deep, carted off the rocks and harrowed it over three or four times. Then on one-half of this acre I spread a heavy coat of barnyard dressing, and plowed it in eight inches deep the same fall just before the ground froze. The next spring I harrowed it over three times, plowed it again, then spread on another heavy coat of fine, well decomposed barnyard dressing, and harrowed it over five or six times, till it was as smooth as the harrow could make it and the dressing was thoroughly incorporated with the soil. I then spread on forty bushels of wood ashes, raked the surface all over with the garden rake and wheeled off all the small rocks and other debris. I also spread a light coat of dressing on the other half of the acre and planted it to beans. It is no small job to prepare an acre of our rocky soil suitable for planting strawberries, and one reason that so many fail is because they don't half do it. I have found that four things are essential to success—pluck, gumption, lots of dressing and a love for the business. And if a man is greatly deficient in either he will not succeed. There is no branch of agriculture that has so many obstacles to overcome or requires better judgment than small fruits, and none that give so good results when properly managed.

We have now our ground all raked off ready to set the plants, and how shall we set them? That depends on the varieties we intend to set. If you are going to set the old Wilson, and run them two years, I would have the rows three and one-half feet apart and the plants one foot apart in the rows. But if you prefer to set the Crescent Seedling, which I certainly should, and only run them one year, I should have the rows four feet apart and the plants one foot apart in the rows. As soon as you have decided what variety you will plant, drive your stakes accordingly and put on the lines, for I should always set by a line (I abhor crooked rows) and in setting the half acre you want as many as four lines set at once, so that four men can work at the same time. You will find the job will last as long as you wish it to with that number of men to help set, and one to dig and wheel them along. Now take your trowel in hand, get down on your knees, and begin to set the plants, and you will find yourself in a position to get a practical knowledge of the business. I have been there and know something about it. By the time you have set three rows ten rods long, if you don't feel some as an old fellow over in the town of Sweden did, who tried to live a Christian life, your experience will be different from mine. They had a revival in town several years ago, and this old fellow got wonderfully revived. He was naturally a rough sort of a man, and his language was not of the most refined nature. One of his most common expressions was "by thunder," and in his own neighborhood he usually went by that name. He was very active at first and regular to attend and take part in all their meetings. But after a while his Christian duties began to look irksome, as is too frequently the case, and his old habits began to get the better of him. At one of their meetings in which he participated as usual, after relating his troubles and trials, he said, "Brethren, I tell you when you come to live a right down good, honest Christian life, by thunder, 'tis a grunter," and down he sat. By the time you have set three rows ten rods long, look ahead and see that you have four more to set, and the cramp gets you in both legs, you will think it is a grunter. But if you stick to it till you get them all set, I have no doubt but that you will succeed in the business. After you have set your main bed, be sure and set a small piece for plants to set the other half of your acre the next season. I always set a piece every year for plants, and then I get good one-year-old plants without breaking into my main bed, and usually have some to sell my neighbors. After the plants have been set about one week I give them their first hoeing with the garden rake, and have my men go over the piece with shears and cut out every fruit stem, not allowing one of them to bear the first season. Also cut off all the first runners that start, so that it will make the plants vigorous and stocky. After that I let them have their own way and run to their heart's content.

After the first hoeing with the garden rake, I keep up the cultivation with my horse and cultivator, and hoe them with small hoes made expressly for the business. The cultivator that I use is one of my own invention, and is nothing but a small harrow made with steel teeth, with a cutter on behind. It leaves the ground as perfectly smooth as you could leave it with a garden rake, and it cuts up every weed. You don't want to use one of our common cultivators, such as farmers use in cultivating field crops. They leave the ground too rough, and knock the dirt on to the plants. I cultivate and hoe them every other week all through the season, till the frost comes, and by attending to it regularly it is but a slight task. But if you once let the weeds get the start, the game is up. They drive more people out of the business than all other causes combined, and too much importance cannot be attached to the necessity of keeping up the cultivation till late in the season, so that there will not be a weed left, however small, ready to start in the spring. If they are kept perfectly clean, as they should be, all through the season, they will need but very little attention the next year, except to pick the fruit. I know of no business but will bear neglect better than strawberry growing.

After or just before the ground freezes, I cart out and spread over the piece about ten cart loads of decomposed strawy horse dressing. With me this is almost the secret of the whole business, and I should not know how to grow strawberries without doing it, for it not only affords the plants a good winter protection, but it gives them a vigorous start in the spring, makes splendid, large berries, and keeps them out of the dirt. Just before winter sets in, or early the next spring, as soon as the dressing thaws, you want to go round with a hoe, pound up all the lumps, and spread them round on the vacant spots, so that the whole surface will be covered evenly, and the rains will thoroughly soak and leach the dressing into the soil. The next spring I take the other half acre of the ground that was planted to beans, and treat in the same manner.

But why not set the whole piece the first season? You can, if you choose, but with my method of culture it does not come right, for I keep my strawberries on the same ground every year. I plow up one-half and set one-half of the acre every season, and that gives me one-half acre in bearing every year. I can get more berries with less labor and expense in this manner than in any other. If I were obliged to prepare a new bed every second or third year, I should be tempted to go out of the business. It does not cost half as much to dress and run an acre after it has once been prepared, as it would to change round every second or third year, especially on rocky soil.

I am aware that this theory is in direct conflict with some of our best authorities and most experienced growers. But I have run them seven years on the same ground, and my crop the past season was the best I ever raised under the circumstances, for the ice laid in one solid sheet over the whole bed last winter, and just scorched the life out of the best bearing plants, so that in the early part of the season I thought I should not get any, but I marketed fifty bushels of fine fruit, besides what was used for home consumption. Mr Sebastian Smith, an old grower in Oxford, who has been in the business over twenty years, tells me that he has raised them sixteen years on the same ground without their showing any signs of deterioration. I have no doubt but that if the soil is properly fed with mineral and decayed vegetable manures, such as salt, ashes and leaf mould, they can be successfully raised on the same ground for an indefinite length of time.

In regard to varieties, I have experimented with several kinds, and have discarded them all except the Crescent Seedling, for a field crop. There is double the money in that for me that there is in any other I have ever tested. It is a more rampant grower, and throws out more runners than any other variety, and sets all the plants needed for a full crop the first season.

Now comes the debatable question of fertilization, which I shall not try to settle, for I want to leave something for the experiment station to do. I have tried to inform myself on this question, have read all the papers I could get on both sides, and can get no nearer the facts, or tell any more than you can how to exterminate the white grub, or when is the best time to trim apple trees; but I have about come to the conclusion that I can raise more strawberries from a peck of manure than I can from a bushel of literature. This I do know, I have raised them at the rate of one hundred and fifty to two hundred bushels per acre without any fertilizer near them, but how many more I should have had if every third row had been set with the Captain Jack, or any other staminate sort, I cannot tell. But I have observed that there is some human nature in plants as well as people. They delight in having their own way, and need a great deal of training and pruning to keep them where they should be, and it would seem perfectly natural that if every third row was set with some staminate sort that they would be more prolific.

There is one thing more in connection with my mode of cultivation that I consider quite important. As soon as we get through the picking season, we find the ground covered with a thick mat of vines that we want to get rid of, and how shall we do it? "Plow them up," says one. I should like to see you do it. If you had a good crop of berries your ground is a solid mat of vines and runners, and I should as soon think of trying to plow a side of sole leather as to plow them with one of our common plows. But it is very important to have it done at once after the fruit is picked, and the way I do is to run them over with the mowing machine, and then rake them up with my spring tooth horse rake, cart them off and put them around my apple trees. They make an excellent mulch, and it pays to do it, and leaves the ground so that you can plow it by having one man follow and clear the plow. Now the importance of having this done immediately after the crop is harvested is two fold. You prevent the weeds from going to seed, and during the hot weather in the latter part of summer, all the remaining vines and runners that were plowed under become thoroughly decomposed, and you get entirely rid of them. I also sow on about two barrels of refuse salt every other season, just before plowing. I don't think it amounts to much as a fertilizer, but it makes the plants healthy, and is obnoxious to insects. The first time I plow it I go round the piece, and when I plow it again, as I always do just before the ground freezes, I plow just the reverse, and that leaves the ground level and upsets the winter quarters of the grubs. I now cart on about ten loads of barnyard dressing, spread it evenly on the surface, harrow it in, and the ground is all ready to set your plants the next spring, except cultivating and harrowing.

The worst obstacles I have had to contend with have been the weeds, the winter killing caused by the ice, and that detestable pest, the white grub. I wonder if they infest the grounds around the State College? If they do not, I would like to send them a few samples to experiment with. They are a more conspicuous target to shoot at than the codling moth or the currant worm, and it does seem as though they ought to be able to hit them, even if they do fail to extirpate the deadly microbe and trypeta. I can handle the weeds if I take them in season, prevent the winter killing in a measure by a suitable winter protection, but the white grub is more than a match for me, and I will turn him over to the experimental station.

The results I will give you in round numbers in a general way, without going into the details. I have never succeeded in getting what I consider a full crop, in consequence of my experimenting with different varieties, the depredations of the white grub, and the winter killing, caused by the ice. But my crop has never been less than forty-five nor more than seventy-five bushels each season, and the gross receipts have run all the way from one hundred and ninety-two dollars up to three hundred and four. The whole expense, including fertilizer, cultivation and picking will not exceed one hundred dollars per year, leaving a net profit of from ninety-two dollars up to two hundred and four each season, after getting good pay for all my labor, cost of fertilizer, picking, etc.

I also cultivate the other varieties of small fruits, blackberries, raspberries, currants, gooseberries, etc., and beside these, the annual varieties that the tree peddler comes around with every season, that look so beautiful on paper. There is lots of enjoyment in this world in the anticipation of things that we never realize, and I know of no better way to get a share of it than to invest a small sum annually in this direction. But I am not going to weary your patience with the details of their cultivation and treatment, as my method does not differ essentially from those of our best authorities, which you can all get and study at your leisure. Their cultivation is more simple, and so far, with me, they have been almost entirely free from insects and other enemies, and the results have been more satisfactory than any other fruit I have ever raised. The worst enemies that I have to contend with are the birds. The robins and cherry birds just swarm on my bushes. I wish this society would petition the legislature to so amend the law for the protection of birds that it would give the fruit grower the right to protect his own garden and fruit trees, instead of our being taxed to pay a bounty for shooting crows, a bird that does more good than harm.

I raised and marketed, the past season, from seventeen rows of the Snyder blackberries, ten rods long, forty-four bushels, which netted two hundred and three dollars; and from ten rows of the Cuthbert raspberries, twenty-four bushels, which netted one hundred and seventeen dollars. You will observe from this that there was not much difference, either in the yield or the receipts. But as our markets usually run, I think there is the most money in the Cuthbert raspberry.

From what I have already said upon this subject, some of you may think that the cultivation of small fruits is very intricate and laborious. True, there are many things to learn, and I don't deny but there is lots of labor to be performed; but it is a labor in which my soul delights. There is nothing so difficult or laborious connected with the business but that any one who has any taste at all can easily learn. I can cultivate an acre of strawberries, after it has once been prepared, with as little labor and expense as I can an acre of corn, except the picking, and it does not cost as much to run an acre of blackberries and raspberries as it does an acre of corn, after the soil has been prepared and the bushes set. I believe there is no place in the world where they can raise more nice fruits than we can in the State of Maine, or where they can make it more profitable. We have thousands of acres on our hillsides and valleys that are far more desirable, and can be made to pay a better profit than the orange groves of Florida. There is not the slightest reason why we should not excel as a fruit producing State, as well as in producing the best statesmen, the most beautiful ladies and the fastest horses. If our young men would take the same interest, and work as hard to produce fine fruits as they do to play base ball, our success would be assured. But the great drawback in all our agricultural pursuits is the labor connected with them, and its unpopularity, especially with our young people. This labor question is what the world has to contend with in everything, and small fruits are no exception.

If we go back into history as far as we can get, we read that after God had created man, He also made a beautiful garden, and put him into it to dress and to keep it. He did not put him there to live and revel in luxury and ease. He wanted him to labor, dress the garden, and take care of it. But he was so lazy he would not do it, and God had to drive him out. God was not to blame, and I don't think Adam's wife was any more to blame than her husband. But God drove them both out together. (He did not believe in divorce); but he wanted them to go where they would be obliged to get an honest living by the sweat of their brows. There is no doubt but what it was the very best thing that could possibly have been done for them. But they did not believe it. Labor was not popular then, and it is not to-day, especially in connection with agriculture. And I see no way to solve this question but to accept the situation in good faith, and teach our children that it is a blessing from God, and not have them try in every way to shirk its responsibilities. All history teaches us that the industrious workers in all nations, ages, and among all people, are the ones that have prospered and conquered; while the indolent and lazy are constantly being driven out.

There is another thing I will mention in connection with small fruits that I find to be a great convenience and source of pleasure and enjoyment. I have a commodious tent that I erect on a grassy plot near to my berry grounds, where I do all the sorting, crating, and getting the fruit ready for the market. I have a large table on which I can set one hundred boxes, and when it is loaded with ripe, luscious fruit, as I have seen it many times the past season, it is a sight worth seeing. And besides the convenience of having it in close proximity to my fruit ground, where I can do all the work connected with the business, it makes a splendid place to spend a leisure hour now and then, read the papers, etc., and entertain our friends—and we have a host of them, especially in berry time, and are always glad to see them. I have heard a great deal said about the associations connected with the maple sugar camp, but I tell you they are nothing compared with those of the strawberry tent, and I know of none that are (save those of the old school-house), coming as it does at the most beautiful season of the year, when all nature is full of life, and is decked in her royal robes, and the air is filled with sweetest perfumery and the songs of birds. Oh, there is lots of poetry in it, but I can't write poetry, and I will not weary your patience longer.

DISCUSSION.

Ques. How deep do you plow?

Mr. Dawes. I generally plow once a year, one foot deep; I never plow deeper than that.

Ques. How do you prepare your ground for blackberries?

Ans. About the same as for corn. I set the rows eight feet apart for blackberries and seven for raspberries.

Ques. Do you find seven feet far enough for black caps?

Ans. I should prefer to have them eight feet, then run every row twenty feet. I usually cut the tops off.

Ques. What varieties of strawberries have you discarded?

Ans. The old Wilson and Bidwell;—I have experimented with so many different kinds. I have not tested the Haverland or Jewel.

Ques. What variety would you set for the third row?

Ans. The Captain Jack or Wilson.

Ques. Do you find the earlier berries larger than the later ones?

Ans. Yes, the first berries will be largest; I don't know as it is any more so with the Crescents.

Ques. Do you trellis up raspberries?

Ans. I tie them to stakes. Blackberries and raspberries want to be staked. There are some varieties that I don't lay down like the Turner and Brandywine. With blackberries, I dig out one side of the row so they can be canted over, not *bend* them, then shovel dirt enough to hold them down. Lay them all the same way between the rows,—into the center of the row.

Ques. What variety of blackberries do you use?

Ans. Snyder. I would have the bend in the root if I could. In raspberries, I depend upon the Cuthbert for the main crop. I cut them back to about two and one-half feet high. I cut them all off even with shears and they throw up little sprouts that bear just the nicest berries. I get my berries from the laterals from the stalk. I nip them back in summer when they are growing fast, but after that I let them grow and the laterals come up five or six feet high. I let then down the full length and put on dirt to hold them; then in the spring cut them off even. I set them about three feet apart, but they all run together. I let them run together, but not into the rows. I cut blackberries just the same.

Ques. Can you give your strawberries any protection, except the manure?

Ans. I never have, except the straw that was in it. Spruce boughs would do well and in this section it will not be much trouble to get them.

Ques Do you mulch between the rows?

Ans. Yes, I always cover the whole surface. I never use anything but horse dressing. When the ice is as it was a year ago this winter, I don't think it is quite protection enough.

Ques. Can you check the grub?

Ans. I don't know of anything that will do it. I put on the mulch just before the snow comes.

Ques. You don't recommend putting it on later?

Ans. I should rather do it after the ground freezes. I should'nt want to put it on earlier than the first of November.

VARIETIES OF STRAWBERRIES AND MARKETING.

By WILLIS A. LUCE, South Union.

That there are beauties in agricultural life, the people of the State are beginning to realize. Now one of the chief of these beauties is the strawberry plant. The fact that you can take a plant weighing less than two ounces and raise from that, two quarts of the most delicious fruit or produce thousands of plants from, is wonderful. If there is anything more wonderful in the category of plants, I want to see it. The strawberry is not half appreciated, though it is beginning to be. I saw an article from the pen of J. H. Hale, recently,—you remember he spoke at our Pomological meeting at Damariscotta. He said that twenty years ago in the city of New Bedford, they didn't use a hundred crates a day in the height of the season; and the population of the city has not increased but two thousand, and now, instead of one hundred crates a day they use five hundred. They realize the value of the strawberry more and more. As people become educated they eat less meat and more fruit. He said that during the strawberry season they didn't think of eating meats; that good strawberries and cream, and bread and butter were good enough for him. A man can do a sight of work upon them. In my own county of Knox I should say that fifteen years ago, a hundred crates would supply the whole market for the season. Only a few families used them; but I think I can say now from observation that the present season they have used over a thousand crates. That is due somewhat to the summer travel; but where strawberries were not used at all ten years ago, they are now considered a necessity. They are valuable for the health; they come when we need something to sharpen the appetite. Apples are stale and we hail with delight the coming of the strawberry. The first large strawberry was the Hovey, introduced in 1834. This berry has been improved very much. There are thousands of varieties of strawberries, and out of them all, only a very few are worthy of cultivation. Some seem peculiarly adapted to home use and not for the market, while some are good for both.

In the Maine Farmer of January 8th, there was an article on strawberry culture; "Some facts about strawberries" by Mr. Dow of New Hampshire. I suppose he would think Mr. Dawes and myself are in the old ruts; he advised us to get out of them; he didn't want us to cultivate the old sorts, and out of 300 varieties he gave ten or twelve worthy of cultivation. In Garden Notes, he mentions but seven varieties. Think of it; only ten or twelve out of 300. Buying the plants by the dozen, they will cost from $3.50 to $6 a dozen. I don't think he really advises any one to do that. That work belongs to the Experiment Station, but it is the way he does. There are so many new varieties, that the Experiment Station can find out what varieties are hardy and productive and tell us whether it is a fruit desirable for the market. Reports from the Experiment Station place the Bubach ahead;—I have it side by side with the Crescent and I don't think it will give me the amount of fruit that I get from the old Crescent seedling.

Of the new varieties, the Jessie, Bubach and Eureka are three kinds I am interested in and have on trial. I don't try any variety in field culture until I have thoroughly tested it. The varieties that are promising from the outlook are Mitchell's Early, Gaudy, Warfield and Middlefield. I have a communication from C. E. Hunt of the Geneva Station, N. Y. I asked him the variety that was cultivated to the greatest extent and got the word back the *Crescent*; but in certain localities other varieties have taken its place. I don't know as it will under the highest cultivation and in the hands of experts do as well as some others, but I know of none better than the Crescent. All strawberries differ in disposition, as people, and there are plenty of varieties to suit every taste. If you haven't the variety to suit you, you must find one that does. I have a friend in Rockland near the coast; the soil is almost like the flats—heavy soil. He has tried a great many varieties and has discarded them all but the Wilson. That is an old berry, almost the first one. The Wisconsin growers go for the Crescent, and they grow very largely what we do in Maine.

A word as to marketing, a very important branch of farming business. If you grow a fine crop you must put it upon the market at the right time and shape. We have one buyer in Knox county, who I think is the best judge of fruit I have ever met, whether foreign or domestic.

I have sold him Roxbury Russets for five dollars a barrel, when he could buy them on the street from three dollars to four dollars, because he knew he could depend upon their being perfect. When he sees apples in boxes he don't want them, but if handled properly and of first class, he would buy and pay first quality prices.

So with the strawberry crop; it has to be handled carefully and at once; you cannot hold it for higher prices, it must go upon the market, and if you have a large crop of berries you want to know where they are going before they come off. They need to be picked carefully, the baskets neat and attractive.

I have seen them put into baskets and crates not fit for swill. If you should put other products in the same baskets, people would not buy them, but they will have strawberries. If you desire a good class of customers, you must put your fruit in clean, attractive cases.

With this prospect before us, let us take courage. I grow strawberries because I love the work. There is a height and depth that we may never reach or understand; and even this thought lends a fascination. Often as I go out strolling among the flowers, my mind turns to Tennyson's "Song of the Flowers:"

"Flower in the crannied wall
I pluck you out of the crannies,
Hold you here, root and all in my hand,
Little flower; but if I could understand
What you are, root and all, and all in all,
I should know what God and man is."

THE CARE AND EMBELLISHMENT OF CEMETERIES.

By JOHN G. BARKER, Superintendent of Forest Hill Cemetery, Boston.

But I am to speak to you more particularly on the Care and Embellishment of Cemeteries. Did time permit, I should attempt to give some thoughts relating to the laying out of cemeteries more particularly than is possible in this paper; for, in the care of any place, much depends on whether or not it is judiciously laid out in the beginning. A proper understanding of this dependence, or in other words a proper regard for the future, is a point every intelligent landscape gardener should study. Only a few miles from here, in a town where, around the houses of many of the residents, good taste prevails to an unusual degree, I could take you to a small cemetery so injudiciously laid out, with so many needless avenues and paths, that in keeping it merely tidy more than double the amount of labor is required that a place of that size ought to take; and I am sure I make no misrepresentation when I say one-third of the land is wasted. Thus it happens that in compiling accounts of actual outlay in care and maintenance of grounds, we often remark the great cost of the care of some as compared with that of others, of nearly or exactly the same size; there being so many circumstances that differ in any two places compared.

Unless in the case of a flat surface, it is impossible to lay out any cemetery to the best advantage without first viewing the grounds. Any location, be it ever so small, should be seen with all its surroundings before a stake is driven; and before any plan is adopted we should be sure it is what we want. In other words, I should reverse the usual order of work; I should say the grounds for a cemetery should be laid out first, and the plan made last.

There are those who palm themselves off as landscape gardeners, yet cannot lay out two places differently if their lives depended upon it—when you have seen their plan of one place, you get at a look all they have in them; and I can assure you I do not say this at hap-hazard. Some men's bump of adaptation, if they ever had any, seems never to have got developed.

It requires something more than a city office, or the accident of an acquaintance with some influential trustee or lot holder, to enable one to lay out a place for the whole future as well as the present, and in a manner that will always be acceptable. And is it not true, that, in some places under such influence as I have indicated, we witness in our visits a piece of mere heterogeneous botch work; where trees, shrubs, plants, and flowers are huddled in together, without any regard to habit of growth, taste in arrangement, or anything else? And this is called landscape gardening! And when these trees, shrubs, etc., are grown up, who can wonder that even the ordinary man who does his own thinking is dissatisfied? I think it is not difficult to see how it is that some other places look better than such as these.

Of course every cemetery has an entrance of some kind; and let me say, right here, this is the very place where a diligent care of the grounds should be at once apparent. Our visitors are brought there by no ordinary circumstance of life; and we should always be careful that their first impression is cheerful and pleasant. I would make it so attractive, and keep it so neat, that the thoughts and emotions of the person would at once be relieved of gloom, and refreshed by the joyful contemplation of a bright and happy scene.

Be sure of this first impression; but do not stop here—do not expend so much of your energies here that you must neglect the rest of the grounds. Wherever you can plant a rare tree, or a group of nice shrubs, or a bed of flowers, do so; and do not let the marble and granite monopolize the ground anywhere.

A few weeks ago a friend asked me, "Do you ever go to such a place?" "Yes, I have been there," was my answer. "Well," he continued, "I was there a short time ago. The entrance looked nice, and our expectations were all excited; but really that was all there was to it!" Now just imagine such a feeling—one transient good impression at first, and nothing more. We want a sustained impression; good at first, and good all the way through.

Most of our larger cemeteries have adopted the plan of setting apart, at the sale of every lot, a portion of the purchase money, which shall constitute a fund for the perpetual care of the same. The advantages of this plan at once commend it to every purchaser; and it is greatly to be regretted, in the case of many of our cemetery corporations, that they did not have foresight sufficient to add this feature long ago. It will need no extended argument to convince every close observer that a provision for the perpetual care of every lot, combined with the lawn plan of laying out the grounds, makes it much easier to care for them than when they are laid out in the old style, and with liberty to every purchaser to establish his own grade, so that one lot is high and another low. As I am writing I call to mind a cemetery, a portion of which is quite level, and yet on this very part the amount of filling put in is so great that the paths have the appearance of ditches, more than anything else; and long flights of steps are necessarily provided to very many of the lots to make them accessible; and the interments cannot be more than a foot or two, if so much, below the grade of the avenues and paths. Imagine this to take care of!

Have not I succeeded in showing why it is that a man can do double and in some cases treble the effective work, where the grounds are laid out on the lawn plan? In the one case there is a bank or terrace to nearly every lot that he works on, and the sickle is in constant use; in the other, he has little use for anything but his mowing machine and the wooden lawn grass rake. Again, remember that, under our hot suns in July and August, nothing can be more unsightly than a long extent of dried up sun-burnt banks and terraces. Considering all these facts, are we not justified in advocating the landscape lawn plan, both for effectiveness and economy, in the care of our cemeteries?

Practical experience teaches me that an all-important point, in the care of our cemeteries, is a proper division of the work. For years I have laid out our work in sections; assigning two men only to a section. Their duty is to keep all lots trimmed and quite clean, the flower beds free from weeds, and the vases watered; and (when the grass does not grow so fast as to keep them constantly busy) they are also expected to keep the paths and avenues clean, in their respective sections. I hold one of these two men responsible for the work; and, by so doing, if I see a neglected lot at any time, I know just whom to go to about it. He cannot tell me—"I did not do that last." I try to have a general oversight of the work, examining it myself once every day, and twice if other duties do not prevent me. I think it is well the Superintendent should be expected often; and sometimes it is well for him to go when he is not expected. To be still more explicit, I believe the Superintendent should as far as possible know everything that is going on, allow no one to stand between him and his men, and above all, if possible, know all his lot holders. He is the responsible man, and above all others, has need to be completely familiar with all the details of the place; and by this familiarity, together with habitual and systematic planning for his men, he is enabled to use to the very best advantage all the means at his command for the care of the place; and what is true of this department of work is also true of all others.

Having thus, though briefly and imperfectly, considered the care of a cemetery, let us now turn to its embellishment; though one is so much a part of the other that I may not succeed in keeping them distinct. I think we shall all agree that the avenues and paths are very important features. Those at the entrance should always be of a width proportionate to the surroundings; they should be well extended, and the curves easy. I have found that for the principal avenues, aside from those at the entrance, eighteen feet wide is a good standard to adopt; and three feet and six inches for the paths is quite sufficient. The surface should always be rounded enough to throw the water into the gutters. Nothing adds more to the appearance of a place than well kept avenues and paths, and nothing detracts more from it than neglected ones. A job well done is sure of giving good satisfaction; and work of this kind should be of the best.

Wherever it is necessary, and at the same time feasible, to carry off the water, it will be found best to lay a drain pipe in the avenue along its border—a foot deep is enough—with a catch basin at that part where the most water concentrates; so carrying it to the most accessible point of discharge. This is preferable to paved gutters, especially where good stones cannot be obtained for the work. A nicely paved gutter of selected beach stones, of uniform size, makes a handsome finish sometimes; but they cannot be obtained everywhere.

As all cemeteries have more or less of paved gutters, it may not be amiss to speak here of their care. It may be thought that these are very expensive to keep clean, but it is not so; it is very seldom that they have to be weeded by hand. When the grounds have their spring raking up or cleaning, the gutters should be thoroughly swept with a stiff broom. This is generally in the latter part of April; after that, I always keep three barrels of brine on hand, and —weeds or no weeds—these gutters are watered with it once in two weeks; and with an occasional sweeping they are always clean. Use it always on a bright sunny day. This is an easy and very satisfactory way of caring for the gutters; an experience of several years supports my statement. I think this is an important point to attend to in the care of our cemeteries; for, no matter how thoroughly you may do all the rest, if you neglect this it will detract more from the appearance of the grounds than can be made up by any efforts whatever towards other embellishment.

The edges of the avenues and paths should never be so high as to attract notice; keep them low, but properly defined; use the scuffle hoe and fine rake freely when the weeds are scarcely perceptible, and you will be surprised to see what a distance two men can go over in a day.

You will expect to hear something about the lots; and I remark, first of all, that without good grass you may plant whatever else you please, and yet never have a good looking lot. Let all the ground be well prepared; do not be disturbed if the compost heap is reduced. Before sowing, give the seed something to feed on. I cannot recommend attention to this work too strongly. I know by sad experience the great drawbacks from the want of thorough preparation. Proprietors whose lots were graded years ago, and who have them cared for by the year, are surprised that theirs do not look as well as many others; the fact being that, at the time

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those lots were graded, the work was usually let out by the individual purchaser to the man who would do it cheapest; while now every lot, in any well conducted cemetery, is thoroughly prepared before it is sold.

I have in my mind an owner of a large well laid out lot, who is willing to pay any reasonable bill for the care of it. On that lot there is not over four inches of good soil. He is willing to top-dress it—but I have not persuasive power enough to get his consent to make thorough work, by taking out the gravel and replacing with good loam and manure, and then seeding down anew. Top dressing is good, but food for the deep roots is better; a dry spell will soon convince a close observer of this fact. By all means let us have good grassing.

As long as time lasts, I suppose marble and granite will be used for decorative, as well as for memorial purposes. We scarcely ever think how little the original intention of the projectors of Mount Auburn was conformed to, during the many years when fences and granite curbings were permitted to surround the lots, giving it more the appearance of a marble and granite yard than anything else; especially when viewed from a distance. It is not until within a few years, comparatively speaking, that the landscape lawn plan has been carried out there. It certainly is a delightful spot; but only imagine how much more charming a place it would be, were the whole of these naturally beautiful grounds brought into accordance with the intentions of its founders.

Happily many of the old unsightly hedges and fences are giving way, each year, to grassy slopes and rare trees and shrubs; so that in this modern style the views of the founders are becoming realized. I make these remarks in friendly criticism and not in a captious spirit.

Not long ago a lady, who owned a small lot, said to me: "I want some shrubs, or plants, or both, on my lot; what do you advise?"—In the centre was set a weeping Kilmarnock willow (which can be easily removed if a monument is erected), and on each front corner a plant of *Yucca aloifolia;* with a spiræa and a hydrangea placed near the back corners, in the space in the rear of the lot. Properly cared for, this simple arrangement will look well for years to come.

I do not advise flower beds on lots, although many wish for them, but I do think a good-sized vase, well filled, and placed in the centre of the lot (especially where there is no monument), is very desirable.

So far, I have referred more particularly to small lots. Of course larger ones will admit of more extended work; but still the principles for treating small lots will apply to larger ones. We must remember, of course, to attain all the variety we can in the embellishment introduced; and yet also that an effect of neatness and simplicity is what we should equally strive to secure; and that anything like ostentation is entirely out of place.

It is a good thing that tastes and customs change. We all feel how much better it looks to see on a large lot, or indeed on a lot of any size, one handsome monument, with simple markers set at each grave to designate whose it is—than a quantity of head-stones, some of one design and some of another, such as were once common. A superintendent's advice is often sought on this very point. Sometimes the matter is presented in this way: "I have a lot in the old part of the cemetery. I inherited it from my father. I want to improve it and I do not know what to do with it. It looks bad; still I dislike to disturb what my father did." This I know is an ill-advised sentiment; and I would take that friend and reason with him, as kindly as I know how, and would show him, by what had been done on other old lots, what his might be and ought to be made. By taking this course, if he is really in earnest, you can usually win him to your views; but be assured it will take kindness, and not "you must," to gain your end.

I can show you a beautiful vista where once was an assemblage of unsightly hedges and iron fences, with ragged banks and terraces, half dead trees and scraggy shrubs. We now have there a range of well kept lots, with vases and beds of flowers, and choice trees and shrubs; the whole area is a pleasure to all, and not one of the several proprietors would restore its former condition on any account. It took time, of course, to accomplish this result. But it has been done, and this single example has done more to influence others to make like changes than any amount of argument could possibly have done.

On the larger lots, of a thousand or more square feet, a good way is to form a circle, described about the centre of the lot. This will leave spaces in the back and front corners, which may be planted, if you please, with Cut-Leaved Birch on the back corners, *Deutzia gracilis* in the front, or *Yucca aloifolia*, or anything to suit your taste, if not of too strong growth; place a tree in the centre, to occupy it until you are ready with your monument This idea I gain from a plan in my possession, furnished from Spring Grove Cemetery at Cincinnati.

It is a good practice, adopted in many cemeteries, to furnish every owner with a plan of his lot drawn to a scale; and cause all the graves to be correctly defined upon it. A book of duplicates of these plans is kept at the office of the cemetery, one page being devoted to each lot. In this way all mistakes are prevented, even if there is neither monument nor headstone on the lot, as each successive interment is recorded on the proprietor's plan, and also on the book at the office.

While we cannot control all tastes we can influence very many. Some of you will say, tell us how you do it. The first thing is to know your people, and find out what their wants are, and then adapt yourself to them.

WINDOW GARDENING AND HOME DECORATION.

By W. H. Allen, Augusta.

"Window gardening" is a term applied to a method of growing plants in boxes placed in the windows, but it may apply to the cultivation of plants grown in pots as well, and as the pot system is the most in use I will confine myself to the treatment of pot grown plants, though the rule will apply in a general way to the window box.

As experience is considered the best teacher, the horticultural profession is no exception, the oldest person can always learn something new, and the more we cultivate plants the more interested we become in the study of their nature.

As plants subsist chiefly upon the soil, it should be the first to be considered. If we want a healthy plant we must feed it from the roots with soil best suited to the growth and development of a strong stock and healthy foliage. The preparation of potting soil is very simple, and the amateur can prepare it as well as the professional florist. Many people send to the greenhouse for potting soil, thinking they will get a superior article composed of several ingredients known only to the profession, when in reality two are all that is necessary for the growth of nearly all the plants we cultivate—sods, with two or three inches of good loam cut from some old pasture, and well rotted cow or horse dressing. The sods should be cut in the spring and turned grass side down in a heap to decompose. They should be turned and broken a few times during the summer. The dressing is then added, and the whole thoroughly mixed and fined for use, and unless for small pots or seeds it need not be sifted, as in sifting the roots of the sods are left out, and they contain a quantity of fertilizing matter too valuable to lose. The proportion should be about three or four of sods and loam to one of dressing.

Potting plants from the garden for winter window decoration needs not a little good judgment, as this is the time they should receive especial treatment in pruning and shading, in order that they may be healthy when carried to their winter quarters. In pruning or cutting back it should be remembered that plants, as well as shrubs and trees, should be cut back according to the amount they are disturbed when lifted from the ground. The more the earth is removed at this time the more the danger of loss if the plant is not pruned accordingly. The habit of the plant will determine how it is best to prune, whether for a dwarf compact growth, or tree form.

The size of the pot the plant is to be potted in should be in accordance to the size of the plant and quantity of its roots. It is generally better to change once or twice from a four to a five or six inch size, than to pot at once in a size too large, where the earth would soon become sodden, and the plant be likely to stand still until such time as the roots had spread out to take up the extra moisture the earth contained. When potting, one or two inches of charcoal or broken bits of pot should be placed in the bottom for drainage.

One of the most common errors in growing plants in dwelling houses is that of keeping the temperature too high. The greater part of our house plants do not require a temperature higher than from sixty to sixty-five degrees in the day, with ten or fifteen degrees lower at night. To be sure there are plants that require a higher temperature than that. I do not mean to imply that the two classes of plants will not live in the same room at either the high or low temperature, but they certainly will do far better by having the temperature their nature requires. Such plants as geraniums, fuchsias, roses, carnations, callas, azaleas, heliotropes, etc., should be grown in the lower temperature, sixty or sixty-five, while begonias, palms, bouvardias, dracenas, coleus, and plants of the hot house class require the higher degree of seventy to seventy-five.

Watering plants in winter should be done with care, as some plants require more than others. It is more often the case that plants die from over watering than from the lack of water. No set time should be established for applying water, as a few bright days would dry the earth and necessitate watering every day, if exposed to the full rays of the sun, whereas the same number of days in cloudy weather, once in two or three days would be sufficient. Soft wooded plants, such as geraniums, fuchsias, salvias, etc., require more frequent watering than the hard wooded varieties, such as camellias, azaleas, etc. Although the latter would be badly injured if allowed to get dry enough to wilt, much depends on the atmospheric moisture the room contains, in determining the frequency of watering. It is always better to water so as to wet all the earth in the pot at once and refrain from further watering until the soil on top indicates dryness, which by little close attention will soon be determined.

Plants intended for winter blooming may be checked through the summer months by pinching off the buds as soon as they appear, until the first or middle of August; after that they may be allowed to remain, and if care is taken to water thoroughly before removing from the ground, so that the earth will adhere to the roots, potted immediately and placed in the shade for two or three days, they will scarcely show the change, and may then be carried to their winter quarters in safety. Flowers should not be allowed to remain on plants to ripen unless wanted for the seed, as it weakens the plant and it will not blossom so well, as the strength of the plant is fully required and exhausted in the ripening process.

In removing cuttings or slips from plants, due regard should be given to form, but as a general rule cuttings taken from the top where the wood is tender, strike root quicker and make better plants than the ripe hard wood lower down on the stock. Cuttings root readily in clear sand if kept moist and in a warm place, but the sand should never be allowed to get dry. Geraniums and soft wooded plants will generally root in from ten days to two weeks, and should then be potted in not larger than three inch pots, shifting to larger sized as the growth of the plant may indicate, which may be determined by striking the plant out of the pot by turning it over and tapping it gently on the edge. If the roots have filled the soil, grown to the sides of the pot, and begun to turn brown, they show the necessity of more room.

There are but few insects that are very troublesome to plants grown in the house, and the most common among these is the green fly, or *aphis*. While in the greenhouse fumigating with tobacco is resorted to, it would be objectionable to apply it in a dwelling, but it can be steeped in water to the color of strong tea, which would require about one pound of tobacco stems to four or five gallons of water, or in that proportion; it may also be applied in the form of snuff, by dusting the leaves on both sides. It is always better to use it as a preventive, for when once they get a good foothold it takes longer to dislodge them. Either of these methods applied once in two weeks will generally be sufficient.

The "mealy bug" is another troublesome insect. It has a white cotton-like appearance, and infests many of our greenhouse plants. A mixture called Cole's Insect Destroyer put on with an atomizer is a sure cure. The oil of fir will also kill them, but must be diluted so much for tender plants that it is hardly a safe remedy to use. About the easiest, and perhaps the safest way is to brush them off with a fine brush. Brown and white scale insects are often troublesome to the oleanders and some other hard wooded plants, but like the mealy bug, brushing off is the best way to get rid of them.

The red spider is one of the smallest insects we have to deal with, both in the dwelling and greenhouse, but we have a simple and sure remedy for destroying them. As they never appear in a moist atmosphere, it is necessary to shower the plants occasionally, and as they always attack the leaves from the under side, they are not apt to be discovered so readily as other pests, and if left long spin a fine web, and water, unless applied with force, will hardly dislodge them. Their presence can always be detected by the dried porous appearance of the leaves. Therefore if the plants are syringed or dipped in water occasionally they will be of little trouble. These are the principal insects that trouble plants when grown in pots, and while the remedies I have named are what are in general use among the florists, it does not follow that there are no others that may answer fully as well; but any and all remediès should be used, as far as possible, as preventives rather than cures.

There are many plants such as callas, geraniums, and other soft wooded kinds, that grow to foliage with scarcely ever a flower; but it is often the case where the plants do not get the sun only a short time during the day that this occurs. To get the best results from plants that are grown for their flowers, they should be placed as near the window as convenient, as it is the sun and light that bring out the flowers. It will hasten the flowering by thinning out part of the leaves. Callas with twelve or fifteen leaves may be thinned one-half by cutting off the small, poor leaves, letting the centre and best ones remain. I have known this treatment to throw plants into blooming in less than two weeks.

Bulbs are grown for winter flowers to a greater extent each year, and to supply the demand in large cities millions are grown annually, and as some kinds can be grown in the dwelling as well as the green-house, a few words on their treatment may be of interest to those who might want a few of those most interesting flowers for the winter holidays. Chiefly among these are the hyacinths. Two or three bulbs may be put in a six inch pot, using the same earth recommended for the other plants. The bulbs can be pressed down into the soil so as to leave the top uncovered. They should then be watered and put in a cool place. The cellar is perhaps the best, and if it is not too dry one or two waterings will be sufficient until it is time to remove them to the heat, which should not be done until the pots are well filled with roots, which will usually be in from four to six weeks. It is very necessary that bulbs of all kinds should start from the roots before they commence to grow from the crown. The temperature best suited to hyacinths is from seventy to seventy-five degrees, and the nearer to the glass or window the pot is placed the better the flowers will be. Single hyacinths are the most in use for forcing, but the double will do nicely if wanted to remain on the bulb for the room, but are too heavy and large to use for bouquets. Thousands of the *Lilium Harrisi*, or Bermuda Easter lily, are grown for Easter decorations. The treatment is similar in all respects to that of the hyacinth, only that more time is required for the development of the flower, for when the hyacinth will blossom in about two weeks, the Bermuda lily requires from six to eight.

In conclusion, I would say that every encouragement should be given to all who can spare a few moments to cultivate at least a few plants in their homes. They give a cheerfulness that only flowers can produce, and tend to promote that higher happiness that is always a result of a closer communing with Nature. I would also suggest that teachers devote a few moments to the cultivation of plants in and about the school-house for the benefit of the children, (for in my judgment all children should be taught to love and cultivate flowers). They soon learn to appreciate them, and by so doing induce their parents, who for some reason may have neglected this branch of the child's education, to purchase for them a few seeds or plants for the adornment of their homes, for when the love of flowers is once acquired by the child, the influence is felt by all the family.

"They came in sight of a lovely shore,
  Yellow as gold in the morning light;
The sun's own color at noon in wore,
  And had faded not at the fall of night;
Clear weather or cloudy—'twas all as one,
The happy hills seemed bathed with the sun;
Its secret the sailors could not understand,
But they called the country Sunshine Land.

"What was the secret? A simple thing—
  It will make you smile when once you know—
Touched by the tender finger of spring,
  A million blossoms were all aglow;
So many, so many, so small and bright,
They covered the hills with a mantle of light;
And the wild bee hummed, and the glad breezes fanned
Through the honeyed fields of Sunshine Land.

"If over the sea we two were bound,
  What port, dear child, would we choose for ours?
We would sail and sail till at last we found
  This fairy gold of a million flowers.
Yet, darling, we'd find, if at home we stayed,
Of many and small joys our pleasures are made.
More near than we think—very close at hand,
Lie the golden fields of Sunshine Land."

HOME GROUNDS; OR, OUR HOMES AND HOW TO IMPROVE THEM.

By JOHN G. BARKER, Jamaica Plains, Mass.

All great social improvements are from the nature of the case made slowly. A love for the good and beautiful cannot be formed in a few weeks or months; it must be the growth of years, and in no case is it more true than in respect to horticulture. Did you ever see a child, whether raised in the city or country, that was not overjoyed at the appearance of the first spring flower of the opening season? Yet as the life of that child advances, in order to be successful through life, these tastes must be developed and strengthened, and there must be opportunities and means for their cultivation, or there can be very little hopes of success. Hence, from an educational point of view, you have provided schools with all the modern appliances, second to none on our continent, and by so doing you show to our citizens and the world that you do not expect our children to grow up scholars without schools or books. We have in Boston a great love for horticulture, and I hope you have in Maine, but because that love and taste for the good and beautiful exist, shall we be content to stop where we are? By no means. Our motto must be progress. Washington said that agriculture is the most healthful, the most useful, and the most noble employment of man, and certainly horticulture is akin to it, for I am sure I do not know where to draw the line between agriculture and horticulture. What a source of pleasure it must be to those who have their little plot of ground to cultivate, and how many hours of pure enjoyment are spent therein, and how great the loss to those who have never had their little plot. At this very season of the year have you not witnessed how many windows there are filled with plants and flowers? Go where you please you find them, and by these means a taste for flowers is formed, and every means should be extended to increase and encourage their cultivation, both as to window gardening and outdoors cultivation, by offering prizes by local societies for the best examples of each, timely advice what to grow, with perhaps an essay on the subject, to be followed by proposing and answering questions. Let me give you an example. In the year 1885 the Massachusetts Horticultural Society offered a prize of twenty dollars for the best arranged and best kept flower garden. August nineteenth, the Garden Committee, upon invitation of Mrs. Mary C. Goddard, went to Hopedale to visit her garden, and I take great pleasure in giving you a verbatim report of this visit, as the methods employed by this lady are within the reach of many other ladies:

"The ground comprises about twenty-five thousand feet, and is devoted largely to a lawn with flower beds cut in the grass. The most noticeable bed was the one on the right of the walk, near the entrance; it was twenty-eight feet in length by four and a half feet in width, and planted in three sections with phlox drummondii,—Isabellina occupying the center, with coccinea and rosea at the ends, lengthwise in the center of the phlox drummondii. The rosea were Blue Victoria asters, and similarly in the coccinea white asters, and in the Isabellina red asters; a border of ageratum, Tom Thumb, surrounded the whole, the stiff, woody growth of the ageratum serving to hold the phlox upright. By this means all the plants were kept in place without any aid of stakes or twine. The colors of the flowers blended harmoniously, and the whole effect of this arrangement, using but a few varieties judiciously placed, was very pleasing, and fully proved that it does not require a large expenditure of money to have a nice bed of flowers tastefully arranged. Another bed next the wall, sixty feet long and three and a half feet wide, was planted with single dahlias, salvia splendens, and zinnias, with a row of gaillardia in front, and tropœolum spitfire running over the stone wall. In front of the house a circular bed was arranged with cannas in the center, surrounded by a row of coleus verschafettii, and outside of that a row of centaurea gymnocarpa. On the east side of the house a crescent shaped bed contained three varieties of coleus, each color being planted separately. In another bed we noticed tritoma uvaria with canna ehemanni in the center, bordered with portulacca; in the spring this bed contained pansies. The piazza was covered with neatly trained vines of tropœolum lobbianum, cobea scandens, and Thunbergias."

Now how is this done? Mrs. Goddard says: "I sow my seeds in April in very gentle heat, and ought to transplant once before putting into the garden, but for lack of room omit to do so except with a few plants of pyrethrum. I have the flower beds dug very deep and made quite rich, and then a top dressing of phosphate is dug in around each plant, and the earth is loosened at least once a week, until the plants are so large that it is impossible to do so."

Considering that this lady has only a few hot-beds and a bay window in which to raise the plants that filled these beds, we think that no one need to despair of having a pleasant and attractive flower garden. Since bedding plants can be obtained at a very low figure, there has been a tendency of late to undervalue annuals; but here we certainly have a very pleasing example of their effective use. We are informed that, aside from the small sum paid for seeds, and ten dollars paid for extra labor, all the work was done by members of the household; and it was a great pleasure to report that this flower garden was the most neatly kept, tastefully arranged, and economically managed of the kind that we had been called upon to visit.

The Maine Pomological Society is a progressive society, made up from progressive people, and carrying on great industries; and will you let the beautiful art of horticulture fall behind, and not keep pace with the people? I hope not; and that you will meet with a hearty, generous co-operation from the people who are always ready to respond to every good word and work, there is little doubt. The embellishment of our homes and the grounds surrounding them is a subject that can never be off the mind of any one that has a home; but we must acknowledge, and regretfully, too, that the tastes of the majority of the people for the embellishment of their homes is not as strong as we wish it was, but it is growing. I know that the supply of more needed wants, and the gratification of more pressing tastes, will take precedence to the planting of trees, and the ornamentation of the grounds is put off to a more convenient season. I would rather plant my trees and fix my grounds as soon as my house is finished, than to furnish the parlor first, and fix the grounds last. What say you as to the value of trees? I think in the past, to a great extent, at least, false opinions have prevailed that trees do not add much to the value of an estate, if we may judge from the ruthless manner in which they have been cut down in many of our cities. Indeed, too little regard is paid to them in the thriving city of Lynn, where I lived for fourteen years. It seemed to be a sort of understood law that if any one wanted a tree down, it was about sure to come; and sure enough, it generally did, and it was not by any means an uncommon thing to see the best of trees in that city mutilated by fastening horses to them. And to facilitate this barbarous treatment, chains were actually driven in them, inviting them to the abuse. These things, with the additional fact that so many houses were built and left entirely destitute of trees, led me at that time to speak to the people on this same subject.

It seems to me that the influence of this society can not be used to better advantage than to encourage among its members and citizens a live interest in this department of your work. The influence of a few spirited individuals in every town and city would in a few years make a wonderful change, and instead of seeing as we do now only a few trees here and there in some of our streets, (of course there are exceptions) we should see both sides handsomely lined with trees, which would make them attractive to the stranger and pleasanter to ourselves. But how often do we hear people say that it is useless for them to move, while others are perfectly indifferent to any improvement. One of the very best refutations to this do-nothing doctrine is to be found in the city of New Haven, Conn., known as the "City of Elms," which beyond doubt is the best shaded city in Connecticut, and I am not sure but in the New England States, being known all over the country for the grandeur and magnificence of its trees. And this is all due to a single individual, as much as if he had planted every tree himself. What a monument Mr. Hillhouse has erected for himself, and we are glad that it is recorded by Mr. Downing that he lived long enough to see fair and lofty aisles of verdure, where before were only rows of brick and wooden houses; and we doubt not that he enjoyed a purer satisfaction than many great conquerors who have died with the honors of capturing kingdoms and demolishing a hundred cities. Let no individual, therefore, delay planting trees himself and persuading others also to do the same thing.

I have showed you how one man's example inspired the public spirit which fostered the elms that are the pride of the city and the admiration of the stranger. Why not enter upon this work with enthusiasm, and you will soon find that your friends and neighbors are being gradually drawn into your sympathies.

But perhaps some may ask how shall this be done? Let me say, this very meeting is a step in the right direction, and right here let me call your attention to the influence of a local society whose members met at stated times during the winter months and discussed these very subjects. I will give you one instance of the influence of this society. While on a visit to the city of Newton in the autumn of 1874, in riding around with an esteemed friend we came to one of the school houses, and much to my surprise and greatly to my gratification I found the grounds in front were tastily and beautifully arranged with beds of flowers and their appearance indicated good care. Upon expressing great pleasure at this beautiful and unexpected sight, my friend said that it all happened through the influence of the Horticultural Society. Now who can tell what happy influence these flowers had on the minds of the children who daily met there in the pursuit of knowledge, and with the youth is the place to commence all reforms and ingraft new ideas. I know some people will do just as their fathers did, and think that well enough; and if the old school-house that stood on the plains without a tree to shade it, or hardly a spear of grass growing anywhere near, was good enough for them, it is for us and our children. Well, I do not, and I have no idea you do.

But for a moment go back to that school garden with me again. I see it, the building painted and clean, the lovely trees clad in the most beautiful foliage, the flowers bright and almost bidding you welcome, the grass neatly cut, the walks clean, and not a weed to be seen. I contrast it with some I knew then and could find now, which in winter were fit only for skating ponds, in the spring mud holes, and in summer weeds and dust had entire possession, and not a tree anywhere near. Now I am sure if you could have witnessed these two school grounds which I have tried to make you imagine that you have, you would all join with me in a grand chorus when I said: "God bless the Newton Horticultural Society." I appeal to you if you have not a duty in this direction. Anyway, do all you can and you will be surprised how much that is. I hope we may see the day in the very near future when all our school-houses can boast of their lovely school gardens and grounds; and not only the schools but why not the grounds around all our public buildings, (and I mean the churches as well) receive such care and attention by judicious planting so as to present an attraction to citizen and stranger alike.

The trees adapted for shade in our streets are few, the American and English elms are favorites, and when protected from the canker worm, which is the only objection, are the best adapted of the elms to this purpose, unless it be the Huntington elm, which is a strong grown European variety, and as I have watched its growth in the Newton cemetery I have been favorably impressed with it; certainly there is no better tree for our broad avenues. Maples, sugar or rock, are of vigorous growth, form more or less pyramidal and elegant, fall color magnificent, hardy, and one of the best of street trees because pyramidal, in every way an excellent ornamental tree, and one much sought for. In my mind they have no superiors, and are clean and handsome. The red and white are also good street trees, of rapid growth, and fine, symmetrical form, and their autumn hues are unequalled. In speaking of maples, a writer in one of our journals says that there is a little poetry in "all the colors of the rainbow" as applied to Scottish foliage, even in the zenith of its autumn brilliancy; but here, as every observer knows, especially in the mountainous districts, where sugar maples abound, the expression needs no poetic license. Almost all these colors may be found in this single species, to say nothing of the birches, elms, ashes and oaks, with their less varied tints. European travelers tell us that it is worth a voyage across the Atlantic to behold the splendors of the ripening foliage of our forests. The linden has been used, but I do not recommend it, it being one of the latest in producing the foliage in springtime, and one of the earliest to shed it in the autumn. It, however, may be used in some places, being easily transplanted, and will grow in any soil.

But why not plant the oak occasionally for a street tree? It is true I have not seen a street lined with oaks, but on the outskirts of our forests, and in our cemetery, they do well. The white oak is the noblest of forest trees; the scarlet oak, tall, with rich autumnal tints; the pin oak, tall, symmetrical, a pyramidal tree of rapid growth and glossy foliage. I am told that at Flushing, L. I., there is an avenue planted of this tree, and that it is remarkably adapted for street tree, and for ornamental planting there is an innumerable variety all worthy of a place if you have the room for them. Downing says that there are no grander and more superb trees than our American oaks; they are rich in foliage and grand in every part of their trunks and branches.

And then there is the tulip tree. Where deep, mellow soil can be obtained, there is nothing handsomer. It should be transplanted small; the foliage is clean, light green, and the flowers like a green and orange tulip. It is well adapted for avenues, as also the lawn.

What shall I plant for street shade trees? Do not plant the silver maple or the poplar, simply because they grow fast. In a few years you will regret it, on account of their rapid growth. Slower growing trees, such as the sugar maple, and some may like the horse chestnut or the sycamore, you will find preferable, and these are not too large for the streets. Plant well, select good, healthy trees, and success will crown your efforts.

These brilliant tints are increased by the peculiar clearness and brightness of the atmosphere. Again, the trees and shrubs of North America are unquestionably the most splendid and beautiful vegetable productions of the temperate climate of the globe. Without the American magnolias, tulip trees, rhododendrons, azaleas, kalmias, vacciniums, andromedas, and other ornamental plants, not to mention numerous other genera, where would be the beauty of European pleasure grounds? North America has indeed supplied more material for ornamental gardening than all the rest of the world put together, and I am glad that we can supply them with these beautiful productions. But will you allow our foreign neighbors to make their homes more beautiful with our productions, than your own? The answer to the question is for you to solve. God bless your homes, and may they all be adorned not only with nature's beautiful productions, but by His abiding presence, and may they all be the happiest of homes.

DISCUSSION.

Mr. Knowlton. I would like to ask a question of Mr. Barker. In setting out trees with reference to the treatment which he gives them; in the matter of pruning, it is the custom in many parts of our State in setting elms and maples to cut off the top. I do not believe in the practice.

Mr. Barker. I think the Secretary is right in his opinion; when we set out a tree of that nature, like an elm or maple we never prune it, except to prune out the dead wood and some of the short shoots; but we take a great deal of care to prepare the hole thoroughly for the reception and plant it as carefully as we can, never allow it out of the ground but a short time. Mr. Dale of Boston says if you want to spoil a young tree, cut it to pieces when you set it out.

Mr. Knowlton. Regarding maples, especially the sugar maple, there is a point further which I have observed. The maple does not readily heal over when limbs are cut off, for this reason it is important to have the branches set at a height that will be satisfactory after the tree is grown. Cut out the small limbs as soon as one appears where you will not want it to grow when the tree becomes large. In this way you begin to shape the tree when it is set, and all the strength and growth of the tree are directed where they will the most rapidly develop a beautiful tree.

REPORT ON EXPERIMENT STATION.

Prof. W. H. JORDAN, Director.

I am down here with a note or two on a piece of paper to make my report. I really don't like to be always dealing in *promises* to pay. There are some lines of work that the Station has undertaken that have brought returns and I have been able to go before the farmers of the State and speak of the things we have *already accomplished* and not always telling what we are *going* to accomplish. But from the nature of the case, I shall have to speak to-day, more or less about the *future*, as well as the past.

You remember our Station was organized in 1888. We had buildings and equipments and many things to purchase and put there before we could go to work; and very naturally, our work was along those lines most talked about;—fertilizing the soil, dairying and cattle feeding;—so perhaps horticultural work may have at first received secondary consideration. I think it did.

Two years ago the Trustees of the College, in their wisdom, I am confident, invited several associations of the State, to send representatives to our Station that they might tell us what we had better do.

The Pomological Society sent the Secretary, who is one of those insistent, persistent sort of men who don't let things alone; and he said, "do something along the line of Horticulture." He didn't seem to come to say we had *better*, but immediately began to enquire how much money we had spent for horticulture; and asked that question all the time. And the Station, although not equipped at that time, began to lay the foundation for horticultural work;—I mean, in its broad sense.

The best thing we have, with the exception of something I will mention later, is our greenhouse. I presume faults can be found in it, but at the same time we think we have erected there a good plant.

That plant house will be used this spring in starting vegetables for the first time. We have a few acres adapted to large and small fruits, and have set between one and two hundred apple trees, a few plums and small fruits, which constitute the foundation for work along the line of fruits.

In the matter of vegetable work, we have done but little. So you see about where we are, and our promise to pay comes from the addition to our organization, the increased facilities at the present time. The word has been, "Go West, young man;" but two or three years ago one of the graduates of the Michigan Agricultural College began to think, (that is my imagination) that possibly there might be something farther East; that somewhere about the sunrise there might be something learned, so he came East as far as New York, and imbibed all he could at Cornell University and then came towards the sunrise. He came to Maine, reversing the old adage, "Go West!" and he said, *go East*; which I commend to the young men of Maine. We have in that man, an enthusiast along the line; and while he is somewhat ignorant of the conditions of the State, I think he means to identify himself with the market garden interests, and takes hold of the experimental work, not only in the interests of the Pomological Society, but in market gardening you will see him later.

Now this constitutes my report for the station. We are just laying the foundation. We have been late about it; I have no promises to make. I want to throw out this, because the experiment stations of this country are already doing a great deal for agriculture. I believe that to be the fact; but we must remember that we are only *one* of the means of progress. Because the experiment station exists there is none the less need of careful work on the part of individuals or active work on the part of associations. The experiment station will simply do a little in the midst of the *great deal* that is to be done. That is all. It has its existence because it can do a peculiar kind of work that the farmer and fruit grower and the associations cannot do:—which is the study of *principles*; the study of foundation facts to reach knowledge, which if reached in other places and other ways, must be reached much more slowly. That is all that can be expected from the work of the station. They simply propose to apply themselves to a careful study of principles and to an extent to practice, in the various lines in which they are at work.

HORTICULTURAL WORK AT THE STATION.

By Prof. W. M. Munson.

Like Prof. Jordan I came down to learn, rather than to talk. As Prof. Jordan said a few moments ago, I have been coming East for several years. I used to think when I was considerably younger that I should follow Horace Greeley's advice; my ideas turned in the direction of Kansas, but as I studied horticulture the opportunities for work in that line, seemed unparalleled in the East, and the farther East I came the greater the opportunities for work, seemed. The quality of Maine fruits is recognized as superior to any other in our country and glancing over the fruits here to-day one cannot fail to realize the superiority both in appearance and quality.

With regard to the work at the Experiment Station; it is not a good plan to commence by making a big splurge, telling what we are *going* to do; but in the future I shall hope to have the pleasure of meeting with you many times and of telling you what we have done and are doing.

We hope to make horticulture an important feature of the work there, and shall to a large extent follow out the lines undertaken by the State Society, that is, we shall make a special effort to improve the facilities and extend the area of fruit culture in the State; to develop new and hardy varieties, both by selecting those varieties which seem promising in other, colder regions of the country; by crossing, hybridizing some that shall be hardier.

This work cannot be done alone at the Experiment Station. It will necessitate the co-operation on the part of fruit growers throughout the State. We may determine the best fruits for Orono, but not in Aroostook county. The State Pomological Society will be a great aid and we hope to aid the Society in its noble work. We shall also hope to aid in the discovery of remedies for the various insect and fungous enemies of our orchards and gardens; but as you know, reliable information cannot be obtained in a single day or year. We shall endeavor, in our work, to go carefully; do our work thoroughly; not to announce results until we are satisfied that our conclusions are correct. Thus we shall avoid misleading any who may follow our work.

As Prof. Jordan said a few moments ago, we shall aim to determine laws and principles, rather than facts. A *fact* can be such, only under certain conditions;—a *law* is universal. Laws control conditions that make facts possible here as applicable at Caribou, Portland or Texas.

The value of work at the Experiment Station will depend much upon the attention they pay to the determination of laws, rather than individual facts. We shall hope to reach many of the farmers of the State, through their sons.

Our President has said that he thought much of the value of horticultural instruction given to the children; but we have children of larger growth at the college, who by precept and example hope to encourage the practice of horticulture in our young men.

REPORT OF OUR MEMBER OF THE COUNCIL.

By D. H. KNOWLTON, Representative of the Pomological Society.

It has not seemed necessary to your representative to make an extended formal report at this time. The general outline of the Station work in fruit and horticulture was presented to you last year. In addition to this it is a pleasure to state at this time certain matters in connection with the work of the Experiment Station and the State College. By recent legislation of Congress the State College, in addition to other funds available, will receive from the general government $15,000 as the first annual payment, and each year thereafter the sum will be increased by $1,000 until the annual stipend reaches the sum of $25,000. As the college and station are closely associated together, that which increases the efficiency of the former will also add materially to the extent and character of the work done by the latter. So far as can be judged at this time, it is the purpose of the trustees of the college and the faculty to extend the curriculum in the college so as to give a broader scope to agriculture and horticulture. The foremost men engaged in these pursuits are earnestly urging the college authorities to this action, and it is gratifying to note the extent of the new course outlined. As these will not go into full effect until next autumn, it now remains to be seen how fully the people will endorse the action of the college.

The greenhouse erected by the State, is well equipped and is now ready for work. This will be in charge of Prof. Munson, who comes to the Station from the West well prepared to engage in the great undertaking in the interest of horticulture.

There have been two meetings of the council during the year, but circumstances prevented my being present at the April meeting. It was my pleasure, however, shortly after to meet Prof. Jordan and to confer with him in regard to fruit matters at the Station. In this connection it is gratifying to note that Prof. Jordan and his associates are earnestly trying to do all that it is possible for the interests of the great objects represented by the Pomological Society.

As yet in the matter of fruit culture and horticulture, I will say simply this; that I am not satisfied; but I will qualify it by saying, that nothing could be done within the short time that the Station has been at work that would satisfy me; because in this practical world of ours, I have always looked at results, immediate and abundant, as connected with enterprises as the great desideratum; but I will say that there are at work in the institution a corps of interested and devoted men; men whom I consider well qualified and desirous of doing the work which the agricultural interests of the State need to have done; but at the same time we shouldn't go to sleep over the matter and think that these gentlemen, however good they may be, are going to do what we want them to, unless we show them that we are interested in the object, and sort of look after them and see that they do it.

There is one matter suggested by the paper of Mr. Nutting and it is this—the consideration of varieties adapted to those sections of the State where fruit growing has not yet become an established industry. It is a work which has been begun and I hope it may be successfully developed. It is one of the problems which we want the Station to aid in solving.

There is still another although I have spoken of it before, which is this: I do not believe yet that we have got the utmost perfection in our fruit. To be sure the specimens spread out here, are very handsome, but I think there is not a variety on this table that has *all* the excellent qualities combined. We have the Baldwin which is good for the market but not as good as the Northern Spy for the dessert.

Now the work of the Station which we hope may be carried out, will be to take the excellent qualities of the two and other varieties and by crossing them up produce new varieties that shall possess *more* excellent qualities; so we may not only grow the handsomest fruit in the country, but also grow the best in every respect. It is one of the problems propounded to Prof. Munson as the representative of the work which is to be done there. It is full of difficulties, but the object to be achieved will warrant any amount of expenditure of means and labor, if only we can gain it. Certainly we shall not unless we undertake it.

There are many things that we bring up for discussion when we get together in an advisory capacity, and if you as fruit growers in the State or as horticulturists in any direction, desire any particular thing done there, by all means let either your representative or the Station itself, *know* it. They may not be able to undertake every experiment you want tried, but they can undertake some things if they dig into it as they ought and they will get valuable results out of it for us.

DISCUSSION.

Prof. MUNSON: I do not intend to come before you this afternoon to make promises; but I want to emphasize what Mr. Knowlton has said; that if you have work you want done, the only way we can know it, is for you to make yourselves heard. We cannot, at the Station meet the wants of the people, unless we know what those wants are. We cannot reach all the results in a year; we cannot undertake experiments which shall be of value to the people of the southeast part of the State and in Aroostook county at the same time, but those matters which are of interest to the people of the State will receive attention; it is the object of the Station to aid in building up horticulture in the State, and I was glad your Secretary mentioned the matter of improving the qualities of fruits. That is a very important branch of work; this combining beauty of form and color with delicious quality; combining good qualities of any fruit. That will require much time, but it is a work we have planned. I had not said anything about it to the Secretary but it is in my mind; the improvement of qualities of fruits, both orchard and small fruits, by crossing, by hybridizing. This has been worked upon but little, but is of great promise to the horticulturists of the State.

Mr. KNOWLTON. There is one thing further I wish to emphasize. It is, that although the experiment which you want undertaken may seem difficult and expensive, you need not hesitate to ask it just the same, because the institution has funds for particular purposes and it is right and proper and just that those interested in this branch of agriculture or any other branch of agriculture should ask that the problem be undertaken, and if *possible* solved. I speak of this, because some of us, in our peculiar notions, might be modest about asking for what we want. If we do not ask, we may not receive.

Prof. COOK. I am glad of the opportunity to speak upon this subject because it comes home to all of us. The farmers of Maine are elated for two reasons. One is, that their agricultural college, in which they have so much interest, has lately received funds; and you well know that funds in the right hands will accomplish much for the agriculture of Maine, and the farmers are looking to the Experiment Station for great results and they will not be satisfied with any *ordinary* results. They want, they must have great results from that Station, because it is an interest so important to every home; so important to every farmer in the State. We are elated also at the grand possibilities of fruit culture. These interests are to be increased by work at the Experiment Station.

Fruits have enemies; they must be met and overcome. It is the Experiment Station that will help us to overcome these difficulties. We have great confidence in the professors of that institution; we think they have the ability, and the earnest *love* for the business, that is worth as much as the ability itself. We trust and believe that the sons of the farmers will be inspired with love for the grand occupation of the soil. If the professors there have a grand love for it, they will impart it whether they know it or not. Teachers impart to scholars what is in them; it is imbibed by the student. I have heard it said that boys go there and have but little care for that course. I trust this will be largely overcome by the professors there. They are going to do their whole duty in this matter and I trust that not only the head professors will be earnest in the matter, but their assistants will be of the right kind. As much depends upon the assistants as upon the head professors. Let us be determined that the college shall have all the funds it needs as long as it uses those funds intelligently.

I assure the professors that we are perfectly satisfied that we have the right men in the right place; we have great confidence in them and because of that, we expect great results.

MR. BARKER. I visited the State College and was interested in going there, though I could not see anything but the buildings and location; but I thought it was all that could be desired; there is plenty to develop; there is room to grow, and experiment and illustrate.

With what has been said by the gentlemen here this afternoon of the earnestness of the professors, I hope you will back them by saying kind and encouraging words, and then I think they will get along nicely; but I want to impress upon your minds that you must not expect them to succeed every time. If they make a failure, say a kind word and ask them to try again, and I believe they will do it because others have done it. Let me illustrate;—when I first went into the Massachusetts Horticultural Society I had the care of a large orchard garden and I thought I would wipe all those fellows out. I took a collection, bigger than you see on that table, and when the committee come around, what did I get? I didn't get anything. I didn't say a word, but I made a careful comparison and saw my mistake. I wouldn't take $1,000 for that failure; because it was a life long experience to me.

We have near Forest Hill Cemetery an arboretum. I think it is the finest I have seen; there is everything grown under name. The name is printed in English and under that the Latin name, and you can go in at any time and see every tree and shrub that can be grown in Massachusetts right there. One of the benefits of that is this. Perhaps you don't have the tree peddlars in Maine; we do in Massachusetts and they come along with chromos and bewitch everybody, and they buy from that chromo and get badly disappointed. Since I have been at Forest Hill Cemetery, people come and ask what they can ornament their gardens with and I direct them or take them over to the arboretum and if I can find Mr. Dawson he goes around and they put down just what they like and know what they are going to order. They can see it growing right before them. Why cannot the Experiment Station have something of the kind up there? It will add great interest to the institution and be a safe and certain guide to the people of Maine showing what they can grow in their gardens and houses. You can buy seed and get a good selection of the hardy plants. I sent a small order to London for five dollars and you would be astonished to see what a long list it was. We could have the plants themselves but I didn't want them because I could sow those seeds and grow plants, and from there put into boxes and from the boxes to the bed or to the place where they are going to stand; and I can see them develop to the plant full grown. That is why I am so interested. I want to see them grow myself.

There is another department which I am extremely interested in just now, and that is the cultivation of evergreens. I think you can have most all kinds we have in Massachusetts here in Maine. We have a little propagating house on the place. It is divided by a partition, one-third cold part and two-thirds warm. In this cold part I have 13,000 cuttings of evergreens, from twenty to twenty-five varieties. These 13,000 cuttings were put in between the 12th and 14th of December. We have succeeded so far, they are now in a callous condition, just throwing out roots.

Among other things we have the Andromeda. The little cuttings are only about five feet high, and since the 4th day of December they are so firmly rooted, you cannot pull them up and lately they are covered with a tiny white flower; and that isn't all; there is a suggestion comes from that. If those little cuttings will flower so beautifully now, when we get the plant to growing it will be glorious. If this should be of any benefit to the gentlemen who represents the college, I shall be glad. But there is no end of instruction in that department. There is a place to begin but no place to leave off. I thought thirty years ago that I knew it all, but now I know that if I put down what I *don't* know, it would be much more than what I *do* know.

Mr. Gilbert. Mr. Barker has kindly made a most important suggestion, therefore I take courage to make another but in a different direction in connection with this work. I have learned from experience through a number of years, the importance of testing varieties of fruit. In the introduction of fruit into the State, I think that has been one of the most important matters. Lack of knowledge in that direction has been the source of a vast deal of loss through the unproductive results that have come out of this lack of knowledge on our part. Aroostook county is just entering upon the work of fruit growing; they don't know much about what is adapted to the climate. I will say that the orchard, represented by Mr. Nutting's paper is located at a point farther north than any other orchard in the United States and with a very satisfactory degree of success because he had planted varieties that have proved suited to the locality.

Here is a matter that the Station may take hold of and assist in that direction and be of great aid to that department of agriculture. Years ago they caught on to the idea of importing fruit trees from Russia. They made a great mistake in setting scions and cuttings in the gardens of Washington when just adapted to Aroostook county. I believe it is a matter that this society has a right and it is their duty to call the attention of the Station to the fact that measures should be taken to test varieties in that locality for the benefit of that locality. The necessity does not obtain with us, but there, it does. I think the Station can do a great work for the fruit interests of that locality.

Mr. MERRITT. I am delicate about speaking of that, but want to say, that for our soil and climate experiments must be made on the ground. There are more plum trees in Aroostook county than in the State of Maine. More commercial trees than in the State of Maine. One man set out 1,000 of Moore's Arctic variety. They are the only tree we can make successful; or they are more so, we say, than any other tree in the State. All these things need trying; I have tried various kinds of small fruit and apples, and others have tried. Some die from neglect, but more from misdirected efforts like pruning and setting out. Little systematic work has been done. I would speak of where our fruit culture differs from that in other parts of the State. The experiments there are not only with varieties that are hardy, but varieties that will be a profitable and keeping fruit. From my knowledge of the plum raising, I think there is no place so well adapted to plum culture as the Aroostook county.

This fruit growing is in its infancy in our county; we need more encouragement. Experimenting means expense. Varieties that you have on these tables, not any of them will grow in our county, unless the Wealthy will; but we have apples that can be raised there, particularly of the Russian varieties.

In setting out the trees which the Station sent me, fifty-four varieties of trees, I made every one of them live. Suppose one-fourth of these trees turn out valuable trees; I have raised four trees to get one, and I can set out trees that I know to be good instead of having one-fourth of an orchard; so I consider the value of these young trees to be very slight and I propose to experiment on my own hook unless I can get my pay.

Mr. KNOWLTON. In conversation with Professor Balentine, he informs me that arrangements have been made by the Station to compensate parties in this matter of experiments and those who are necessarily at expense of time and labor will be paid. They do not intend to ask men to do work for them without compensation. I don't suppose they intend to pay fancy prices for services but they mean to furnish material and pay a reasonable compensation for undertaking the work.

CONDENSED FRUIT LIST.

As a convenience to those who may wish to consult it, the following condensed fruit list is re-published from last year's transactions. There are many new varieties offered by the nurserymen, some of which we know to be good, but they have not been sufficiently tested in Maine to deserve a place in our list. It is hoped that fruit growers of the State will report on the new varieties they are testing, that others may have the full benefit of their experience. Many are deserving of trial, but for this purpose there is need only of a tree or two; or better still a few scions set on older trees will soon give the information we desire regarding them. Those printed in *italics* are considered the best in quality and those followed by a star (*) are the most pofitable.

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*, *Gravenstein*,* *Munson Sweet*, *Porter*, *Pound Sweet*,* Wealthy.

For trial, Montreal Peach, Somerset, Gloria Mundi.

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.*

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. The Dudley is recommended by those who have tested it as well as the Montreal Peach.

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.

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.

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.

RASPBERRIES—*Red*—Cuthbert, Turner; *Yellow*—Golden Queen; *Black*—Gregg. Ada and Carmen are recommended for trial.

BLACKBERRIES—Agawam, Snyder. For trial, Bangor and native varieties. It is thought by some fruit growers, that the influence of cultivation upon our best native varieties, selected for quality will give us something hardy and of good quality.

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. True's Early, a Maine Seedling, is recommended for trial.

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, Contributed by Maine Fruit Growers, and Collected from Various Sources.

THE SECRETARY'S PORTFOLIO.

WILLIS O. TOWLE.

Willis O. Towle of West Gardiner died at his home in that town September 26, 1890. Your Society has never had a more enthusiastic member on its rolls. He was stricken down while exhibiting fruit (in City Hall, Bangor, 1889) with heart trouble from the effects of which he never fully recovered. At the time of his death he was connected in trade with his brother and also with his father in the management of his extensive farm and orchard business. He was not quite twenty-eight years of age at time of death, but his enterprise had given him an acquaintance not usual to one of his years. Before he was engaged in trade he worked six winters for E. Plimpton & Sons in the manufacture of agricultural implements interesting the kind regards of his employer by his skill and industry, devoting the summers to fruit culture and the business of the farm.

D. P. T.

HENRY S. CARY.

We also note the death of Henry S. Cary, of Topsham, one of our most enthusiastic fruit growers. In recent years he has been a regular exhibitor at our fairs. He was well informed in all matters pertaining to fruit culture. At the fairs he was a close observer of varieties, and few gained more knowledge from these annual gatherings. He was also free to impart any information he had gained from his own experience in fruit culture. He will be long remembered by the members of our Society for his enthusiasm and his cordial greetings.

FRUIT GROWING IN AROOSTOOK.

From Hon. E. E. PARKHURST, Maysville Center.

We are making some advancement in new hardy varieties also in cultivation. The Duchess is our best and safest fall variety. We ask for nothing better for cooking or drying, but for dessert it is not of much account. The Yellow Transparent is equally as hardy and is our earliest, and we consider it *very good.* The Wealthy is hardy and productive, but for a dessert apple cannot recommend it as highly as Dr. Hoskins does. He claims it to be equal to the Baldwin in every respect. For me the flavor is not so good and it is too tart. It is a valuable apple and we can grow them cheap and any quantity of them. I stopped over night last week with J. W. Dudley of Castle Hill and for the first time tried his Dudley Winter. This apple grows as large as the Duchess, resembles it in color and form, is as hardy and productive, is superior to anything I have ever tested as a dessert apple. If it continues to grow and mature as it has this season we shall have no use for Baldwins in Aroostook. It is the coming apple in all cold climates.

This comprises the list as I consider it of anything valuable we have for Northern Aroostook. I have in my orchard the Alexander, Fameuse, Tetofsky, Red Astrachan, and several other half iron clad varieties, but don't want any more of them. There has been several orchards of Moore's Arctic plums started within three years, averaging from 200 to 1,000 trees. They are layed down in the fall and the deep snows in winter protects them from the excessive cold, which saves the fruit buds. They are commencing to bear and trees set two years yielded one peck plums each last fall. This method of handling will prove a success so far as protecting the trees and growing the plums. I fear only one trouble, that is, the injury of the plums by early frosts before harvesting. So far there has been no trouble, and there may be no danger in the future.

FROM HON. PARKER P. BURLEIGH, LINNEUS.

I set out the first apple trees on my farm about the year 1848. There were 312 in number. I set out native trees raised in a nursery in this county, as it was supposed, at that time, that grafted trees could not be successfully raised in this cold climate. For many years after the trees were set out, I was not much of the time engaged in farming, and my apple trees were neglected, and for many years the grass was removed from the orchard and no manure returned, and when I returned to my farm in the year 1884, the trees presented a sad appearance. There were many hollow hearted and nearly worthless trees, and on others there were many dead and dying limbs. I immediately went to work and removed all the worthless trees and set out young grafted trees. I then cut off all the dead and dying limbs from the remaining trees and covered the wounds with gum shellac. I then grafted one-third of the top of each tree selecting the highest limbs. The next year I grafted another third of the tops, selecting the next highest limbs, and the third year, in 1886, I grafted the remaining third or lowest limbs. I have pastured sheep in the orchard every year since I commenced grafting the trees, and have applied a small quantity of wood ashes, salt and lime, and the trees are growing rapidly and none have been winter killed, with the exception of the Rhode Island Greening, Baldwin and Sweet Greening which are too tender for this cold climate.

The varieties I have now growing in my orchard are as follows:

Wealthy, Canada Red, Winthrop Greening, Fall Harvey, Summer Sweeting, Gideon, Summer Russet, Pewaukee, Yellow Belleflower, Golden, White Belleflower, McIntosh Red, Scott's Winter, Sweet Greening, Yellow Transparent, Black Oxford, English Russet, Magog Redstreak, Golden Russet, Granite Beauty, Red Astrachan, Leonard Sweet, Talman's Sweet, Rhode Island Greening, Fameuse, Golden Russet, Blue Pearmain, Ben Davis, Northern Spy, Tetofsky, Duchess of Oldenburg, Nodhead, Alexander, Nonsuch.

All of the trees grafted with the above-named varieties withstand the winter and are not injured by the cold with the exception of the three varieties I have named. I have also several pear trees of the

Flemish Beauty variety, and have for several years raised as nice pears of that variety as I ever saw, until last year they cracked badly for the first time. The trees appear to be hardy and do not winter kill.

Since I commenced renovating my old orchard in 1884, I have set out more or less grafted trees every year, and have now about 450 grafted trees. Many of the grafted trees set out since that year have borne fruit. I have set in all a little more than nineteen thousand scions in my orchard since I commenced grafting in 1884, and have set all of them myself, with the exception that I had a man to help me fourteen days in 1884. I did not sell much fruit after I commenced grafting my trees till the year 1889, when I received ninety-two dollars from the sales of apples. I have not yet sold all the apples raised last year (1890), but shall probably receive about sixty dollars.

TOO MANY VARIETIES.

From H. G. COLE, of Hall & Cole, Boston.

I see by the Lewiston Journal, you meet at Bangor next week to talk over the fruit business. I wish I had gab enough to go and tell the growers what I know about growing too many varieties. Last season it did not make much difference how many kinds they had, but if the time comes when there is a full crop they will be sorry. Wipe the Black Oxfords from the face of the earth if possible. We cannot sell a No. 1 Black Oxford to-day for as much money as we sold Mr. Whittier's No. 2 Baldwins for this week.

ORNAMENTATION OF HOME GROUNDS.

From J. B. STEARNS of Norumbega Castle, Camden.

Although I have in a sort of "rule-of-thumb" manner, made my grounds here look fairly well with some help at first from Mr. Ernest W. Bowditch of Boston, I am sure they would not bear the criticism of a professional landscape gardener, and I am also sure that no one can be more ignorant of the *right way* to lay out and ornament grounds than I am. As for a paper "on the ornamentation of home grounds" it seems to me that grounds vary so much in extent, inclination, surroundings, etc., that even a trained landscape artist could hardly say much of *general* application. If I should presume to give any hints on this subject, I should say:

1. The best grass, well kept, is the best and safest dependence.
2. Be rather sparing of flowers, unless in masses of one kind, or a few kinds.
3. Grade all slopes evenly as possible and make few or no sharp terraces.
4. Set shrubs and vines near, or on the house, but trees at some distance, if at all.
5. Distribute such large ornaments as summer houses, hot-houses, large vases, fountains, etc., so that they shall never be in one line of view, and if possible so that they shall not all be seen at any one time.
6. All buildings and ornamental features of considerable size should be placed at generous distances from each other—the larger, the greater the distances. Of course this implies large grounds.

It is easy, and the temptation is great, to crowd in too many trees, shrubs, and flowers. If one wants many flowers and small shrubs, give them their own places, in a separate garden, but one will be safe in laying out large lawns of the best grass that can be easily and cheaply kept in *best condition.* Many small flower-beds, small shrubs, etc., placed separately in the grounds, give them a spotty appearance. A few kinds in large masses always look well.

Even these few hints, I offer with hesitation.

THE DIVISION OF POMOLOGY.

Remarks made by HENRY E. VAN DEMAN, Pomologist of the Agricultural Department, Washington, during the State Fair Meeting, September 11, 1890.

It is my duty as well as pleasure to see the different sections of the country in regard to the adaptability of each section to different kinds of fruit. This year, as you know, the great staple fruit article of the country is a flat failure. There will not be raised this season one-tenth of the crop of an average year. There are few sections where the crop is worth mentioning, the best crop being in Northern Missouri. This State (Maine) is the only section of the North-eastern United States which will produce even a fair crop of apples, therefore you can pride yourselves that the small and insufficient crop you have raised in Maine is almost the best in the United States, excepting of course that in Missouri, which I have already mentioned. The cause or the failure of the crop this season was this, a mild winter followed by an early spring, causing the trees to bud early, then came on the long cold rains that stopped the growth of everything, and caused the trees to blight.

Here in Northern New England as in other sections of the country, you escaped part of these effects on account of a more tardy spring season, in consequence of which the buds had not started so much when struck by the long cold rains, as in other more southern parts of the country. In this section you have many things to contend with that those in other parts of the country do not. For instance, you are much given to setting Russian trees, and Russian apples are of very poor quality. But you can with reasonable industry and intelligence, raise about all the fruit that you need. There is a class of fruits that you can grow a great deal better here than in many sections of the country. I refer to small fruits—the blackberry, gooseberry, raspberry, strawberry, etc. These are well adapted to the climate of Northern New England. No one has a reasonable excuse for not raising all he wants of these berries. There are certain obstacles, too, in the form of insects and plant diseases. The Department of Vegetable Pathology seeks to aid the people in overcoming these, and your own experiment station and agricultural college are working in the same direction. If you do not keep informed in regard to these matters it is your own fault. One thing which is very troublesome to you is the plum disease known as black knot. This can be overcome to a great extent by simply paring off the knot and then covering the limb with linseed oil, turpentine or shellac to kill spores. The parts cut off should be carefully burned.

There are myriads of microscopical germs floating in the air which collect upon the limb and form the fungous growth. Then there is the disease known as grape rot. In this section it is too cool for this and the germs which produce this disease don't propagate so readily. Sulphate of copper mixed with lime and ammonia made into a wash destroys these germs, and is an effective remedy.

The duty of the division of which I have charge, is to aid the fruit grower by obtaining information in regard to the names of fruits, to gather knowledge in regard to the fruits themselves, but we have no means of gathering statistics. It requires eighty men to run the statistical part of the Agricultural Department, with salaries ranging from $800 to $3,000 per year, besides about 100 agents in the field, and to undertake to gather statistics in regard to fruits would be still more difficult.

I will say in my official capacity, I will be glad to do whatever I can do to aid you if you will address me at Washington. No doubt many of you have varieties of fruit of which you do not know the names. If you will send me a card at Washington, I will send you government franks and boxes prepared for the purpose, so that you can send us specimens and we will do what we can to furnish you the information required.

A great many circulars have been sent out by the Pomological Department asking for information in regard to how fruits are doing. We want to know of the successes and of the failures. All of the members of this society are already registered in my department at Washington, and we will be glad to have all whose names are not upon our permanent list for receiving whatever information we have to give from time to time, to place them there at once.

INSECTICIDES AND FUNGICIDES.

So seriously are our fruits affected by insects and fungi that from all parts of the State there comes frequent calls for reliable information. Mr. A. E. Andrews writes, "What shall we do with our orchards? The percentage of No. 1 fruit is small in comparison with what it was a few years since, and in quality even, these are inferior to the standard of former years." Although much of the present knowledge of the various remedies for insects and fungi has been published in former volumes of our Transactions, the importance of the subject warrants giving space to the following resumé of a paper delivered before the Massachusetts Horticultural Society by Prof. S. T. Maynard, of the Massachusetts Agricultural College:

Bordeaux Mixture—Six pounds of sulphate of copper are dissolved in two gallons of hot water, and four pounds of fresh lime are slaked in water enough to make a thin lime-wash. When both are cooled, pour together, mixing thoroughly and dilute to twenty-two gallons. Strain before using.

Ammoniacal Carbonate of Copper—Three ounces of precipitated carbonate of copper are dissolved in one quart of ammonia, strength 22° Baume. Dilute with twenty-two gallons of water.

Eau Celeste—One pound of sulphate of copper dissolved in twenty-five gallons of water.

Modified Eau Celeste—Two pounds sulphate of copper, two and one-half pounds carbornate of soda and one and one-half pints of ammonia (22° Baume). Dilute with twenty-two gallons of water.

Kerosene Emulsion—One pound common soap dissolved in hot water; one gallon kerosene. Stir or churn together until a smooth, butter-like substance is formed. Dilute with twenty-five to fifty parts of water.

Kerosene Paste—Mix kerosene with any fine dry material or pigment, forming a thin paste or thick paint. Apply with a small brush.

INSECTICIDES. In the discussion of insecticides I have mentioned only Paris green among the arsenites, from the fact that reports from all sources agree that it is less injurious then London purple, and that white arsenic is too dangerous a material to have about where it might easily be mistaken for many harmless substances of a similar color.

SPRAYING PUMPS. Many forms of pumps are now to be found in our markets adapted for the application of the fungicides and insecticides. Of those most in use perhaps the best known are the "Field's Perfection," made by the Field Pump Company, Lockport, N. Y., the Gould pump made at Seneca Falls, and the Mixon, made at Dayton, O., all of which can be attached to casks and placed on a stone boat or wagon.

The knapsack pumps, which are serviceable for small garden plots and small vineyards, would be more useful if some means were provided for filling them without removing them from the back every time. The Excelsior Knapsack Pump, made by William Stahl of Quincy, Ill., is made after a design, I understand, that was sent out from the Agricultural Department last spring.

The French use such pumps very largely, but Americans will make little use of them where much work is to be done, when the horse can be made to draw the liquid for them.

NOZZLES. A nozzle to distribute such liquids as the Bordeaux mixture must have an adjustable opening at the end. Among those to be found in our market are the "Perfection," the "Nixon," the "Cyclone," the "Vermorel," and many others. Professor L. H. Bailey of Cornell University has contrived a clamp, which is attached to the end of a common rubber hose, by the pressure of which the size of the opening is quickly adjusted. Whatever the nozzle used, it must be attached to a long pole to distribute the liquid most evenly at the top of high trees.

Many interesting facts have been brought out in the work of the many experiment stations of the country, the most important of which are mentioned here.

It seems pretty well settled that of the arsenites, Paris green gives the best results as an insecticide.

That the longer the mixture containing the arsenites stands the greater the injury from soluble arsenic.

That the foliage of the peach, plum and cherry is more susceptible to injury than that of the apple and pear.

That the injury varies with the varieties, some being more susceptible than others.

That young leaves are less injured than those fully developed, and are more injured on weak trees than on those that are vigorous and healthy.

That Paris green cannot be used alone with safety stronger than one pound to three hundred gallons of water, but with the lime mixtures it may be safely used at one pound to from fifty to two hundred gallons.

That the foliage is most injured when kept constantly wet by light rains or foggy weather, but that heavy rains lessen the injury.

That the least injury is done when the liquid dries off most rapidly.

That the time of day when the application is made is unimportant.

The conclusions of this paper I have arrived at after a careful summary of the experiments made at the college and a careful study of those of all of the other stations of the country and I feel confident that as soon as we master the details of the application of the two great remedies, Paris green and copper solutions, so as to understand the exact time and quantity to apply under varying conditions, we shall be able to control the insects and fungi attacking our fruits as well as we now control the potato bug.

THE PLACE OF FRUIT IN THE DIETARY.

A recent issue of the "Medical Classics" contained an article on the eating of fruit, by Dr. Ferdinand Seeger, that is most suggestive of thought. He says: "It is an observation not less important than true, that by attending merely to a proper diet, a phlegmatic habit may frequently be changed into a sanguine one, and the hypochondriac may be so altered as to become a cheerful and contented member of society. Experience and observation show that a too frequent and excessive use of animal food disposes the fluids to putrefaction, and, in sanguine temperaments especially, communicates to the mind a degree of ferocity. Nations subsisting chiefly upon the flesh of animals, like the Tartars, are, in general, more fierce than others; and the same effect is manifest in carnivorous animals; they emit a very disagreeable smell, and both their flesh and milk have an unpleasant and repelling taste. Even an infant will refuse the breast when its nurse has eaten too much animal food. Those who eat great quantities of meat and little bread and vegetables must necessarily acquire an offensive breath. It appears, therefore, to be most suitable and conducive to health to combine animal with vegetable food in due proportions."

The proportion of vegetables to meat eaten by each person, Dr. Seeger says, should be two-thirds or three-fourths vegetables to one-third or one-fourth meat. Dr. Seeger gives several authorities for the eating of fruit at the commencement of the meal. He says: "The eating of fruit at the commencement of a meal, while it presents a bland or congenial material to the delicate lining of the membrane of the alimentary organs, forming a welcome precursor to the more substantial articles, many of which require protracted energy for their elaboration into nutriment, at the same time is, to some extent, a safeguard against the overfeeding which comes from reserving the fruits till the stomach is already overloaded with enough, perhaps too much, of other food. Fruits should be ripe when eaten on an empty stomach, and for their laxative effect should be eaten before anything else. In this way constipation may, with many individuals, be obviated, especially when the quantity of other articles of the meal is within reasonable limits."

Constipation is the foundation of many diseases, and the cause of lassitude that depletes working force. This difficulty, Dr. Seeger says, can be removed by attention to the diet. Fruit he highly recommends as a superior regulator, and, in addition, "benefit will be derived from the use of corn bread, cracked wheat, oatmeal, bread of unbolted flour, and such vegetables as green corn, tomatoes, and celery." Biliousness will also yield to careful habits of diet. Dr. Seeger says:

"If our bilious friends would throw aside their liver pills and study nature while she is in her most smiling and bounteous mood, would allow her to tempt them as Eve tempted old Adam, they would take to fruit, and, by pleasant, natural and healthful methods, free themselves of the 'thick, bilious impurities' which make them a nuisance to themselves as well as to all around them. Biliousness is one of those demons that can be pretty well exorcised by proper diet and due amount of exercise. A gentle diarrhœa, brought on by eating ripe fruit in summer, has frequently a salutary effect. Acid and astringent fruit, being rather a medicine than food, is less hurtful to the healthy and to children than is commonly imagined. Instead of being noxious, as some imagine, in inflammatory disorders, it is of the greatest service. Persons of a thick and languid blood cannot eat anything more conducive to health than fruit, as it possesses the property of attenuating and putting such blood in motion."

The diet is the source of health and disease, and while it is in the power of every housewife to select what shall determine the health of the family, it is a subject that receives less study and attention than any other one subject relating to the family life.—*Christian Union.*

The following is just as good for Maine as Minnesota:

We had canned strawberries for New Years, with the June flavor—rich and aromatic. They were our own growing, so cost almost nothing, and as wife and children were enjoying the delicious fruit, we thought of the many children out on the prairies who never have berries in summer or winter, and we wished there could be more missionaries, and that they would carry the gospel of *small fruit culture* into our Minnesota homes, until every farm should have its berry plat—large, well cared for and fruitful—and the hearts of the children should be made glad and their mouths filled with fruit. Then they might have a little taste of heaven here on earth, for as Uncle Toby says, "there isn't much room for grace in the heart when the stomach gets nothing but bread and potatoes."—*Selected.*

CHOICE CULTURE.

The American Newtown Pippin is declared by "The Garden" (English) to be the best apple in the world. When thus written of—March 6—it was still on sale in London, and of high quality yet, after the far voyage and long keeping. This variety well illustrates the advantages of thorough and complete attention to any chosen object of culture on a piece of adopted ground. It must have strong, deep, loamy soil, and must have it all to itself. It must be entirely protected from injury by cattle, insects, harmful pruning and starvation. Its branches and its fruits must be duly thinned, and after the crop ripens it must be cared for as assiduously as the tree. This famous apple has made the fortune of men faithful to it through all steps of its culture, and will make the fortunes of others. But so will other land products if well selected and then well cared for. It is a question for every farmer—"What special thing can I take up and cling to that will yield the most assured profit through a series of years from this piece of ground?"—*W. G. Waring, Sr.*

THE LARGEST APPLE TREE IN NEW ENGLAND.

The largest apple tree in New England, and probably in the world, is in the northwestern part of Cheshire, Conn., standing in Mr. Delos Hotchkiss's dooryard. Its age can be traced by a family tradition to one hundred and forty years at least, and it may be twenty or twenty-five years older. It is at the present time of symmetrical shape; the trunk is nearly round, without a scar or blemish on it; there are eight large branches; five of them have been in the habit of bearing one year and the remaining three the next.

Mr. Hotchkiss has gathered in one year from the five branches eighty-five bushels of fruit, and his predecessor had harvested a crop of 110 bushels from the same five branches. By careful measurement, circumference of the trunk one foot above the ground, above all enlargements of the roots, is thirteen feet eight inches. The girth of the largest single limb is six feet eight inches. The height of the tree has been carefully measured and found to be sixty feet, and the spread of the branches as the apples fall is 100 feet, or six rods.

The fruit is rather small, sweet and of moderate excellence.

ABSTRACTS

FROM TRANSACTIONS OF THE

Maine State Pomological Society,

FOR

1879, 1880 and 1881.

EXPLANATORY.

For various reasons which we will not attempt to explain, no transactions were published for the years 1879, 1880 and 1881. During the winters of 1878-9 and 1879-80 no winter meetings were held. The Society's funds would not admit of publishing the transactions for these years. The Secretary, George B. Sawyer, Esq., prepared the copy for these years, and it was the intention of the officers, as we are informed, to have a single volume printed without expense to the Society. Unforeseen difficulties arose and much to the regret of all the work was never completed. Since that time it has been the hope of the officers that the resources of the Society would admit of its early publication, but as yet the current expenses of the Society call for all the available funds, and this is likely to be the case for several years to come. Copies of the transactions (unbound) have accumulated since 1881, and the officers were agreed that if possible some of them should be bound up for distribution.

Under these circumstances the Executive Committee considered it important to have the missing years included in some form in this year's transactions, and it was voted to instruct the Secretary to publish only so much of the transactions referred to as shall show the organization of the Society and its financial condition during these years—(1879, 1880 and 1881.) For this purpose and with this explanation the following pages have been prepared for the records by the present Secretary. The manuscript, as prepared by Mr. Sawyer, is among the papers of the Society and will be available for future publication.

The annual exhibitions for 1879 and 1880 were held in connection with the annual fairs of the Maine State Agricultural Society; that of 1879 in City Hall, Portland, and that for 1880, in City Hall, Lewiston. The 1881 exhibition was held in Gardiner. The winter meeting for 1881 was also held in Gardiner.

D. H. KNOWLTON, *Secretary.*

Farmington, June, 1891.

Officers for 1880, Elected in Portland, September 18, 1879.

President, Henry Ingalls, Wiscasset; *Vice-Presidents*, Joseph Taylor, Belgrade, Granville Fernald, Harrison; *Secretary*, George B. Sawyer, Wiscasset; *Treasurer*, Henry McLaughlin, Bangor; *Executive Committee*, the President and Secretary, *ex-officio*, Samuel Rolfe, Portland, Charles S. Pope, Manchester, Andrew S. Sawyer, Cape Elizabeth.

Trustees—Androscoggin—D. J. Briggs, South Turner; Aroostook—Henry Tilley, Castle Hill; Cumberland—Henry M. Chase, North Yarmouth; Franklin—S. R. Leland, Farmington; Hancock—C. G. Atkins, Bucksport; Kennebec—W. P. Atherton, Hallowell; Knox — Elmas Hoffses, Warren; Lincoln—John Currier, Waldoboro; Oxford—N T. True, Bethel; Penobscot—S. C. Harlow, Bangor; Piscataquis—H. A. Robinson, Foxcroft; Sagadahoc—J. H. Kimball, Bath; Somerset—Galen Hoxie, North Fairfield; Waldo—J. W. Lang, Brooks; Washington—H. A. Sprague, Charlotte; York—Edmund J. Young, Acton.

Officers for 1881, Elected in Lewiston, September 23, 1880.

President, Robert H. Gardiner, Gardiner; *Vice-Presidents*, Joseph Taylor, Belgrade, Stillman W. Shaw, Minot; *Secretary* and *Treasurer*, George B. Sawyer, Wiscasset; *Corresponding Secretary*, Granville Fernald, Harrison; *Executive Committee*, the President and Secretary, *ex-officio*, Samuel Rolfe, Portland, Charles S. Pope, Manchester, Henry McLaughlin, Bangor.

Trustees—Androscoggin—D. J. Briggs, South Turner; Aroostook—Henry Tilley, Castle Hill; Cumberland—Henry M. Chase, North Yarmouth; Franklin—S. R. Leland, Farmington; Hancock—C. G. Atkins, Bucksport; Kennebec—William P. Atherton, Hallowell; Knox—Elmas Hoffses, Warren; Lincoln—H. J. A. Simmons, Waldoboro; Oxford—N. T True, Bethel; Penobscot—S. C. Harlow, Bangor; Piscataquis—H. A. Robinson, Foxcroft; Sagadahoc—Washington Gilbert, Bath; Somerset—Galen Hoxie, North Fairfield; Waldo—J. W. Lang, Brooks; Washington—H. A. Sprague, Charlotte; York—Edmund J. Young, Acton.

Officers for 1882, Elected in Gardiner, September 22, 1881.

President, Robert H. Gardiner, Gardiner; *Vice Presidents*, Joseph Taylor, Belgrade, Stillman W. Shaw, Minot; *Secretary* and *Treasurer*, George B. Sawyer, Wiscasset; *Corresponding Secretary*, Granville Fernald, Harrison; *Executive Committee*, the President and Secretary, *ex-officio*, Samuel Rolfe, Portland, Henry McLaughlin, Bangor, Charles S. Pope, Manchester.

Trustees—Androscoggin—D. J. Briggs, South Turner; Aroostook—Henry Tilley, Castle Hill; Cumberland—John Burr, Freeport; Franklin—S. R. Leland, Farmington; Hancock—Charles G. Atkins, Bucksport; Kennebec—W. P. Atherton, Hallowell; Knox—Elmas Hoffses, Warren; Lincoln—H. J. A. Simmons, Waldoboro; Oxford—N. T. True, Bethel; Penobscot—S. C. Harlow, Bangor; Piscataquis—H. A. Robinson, Foxcroft; Sagadahoc—A. J. Fuller, Bath; Somerset—James S. Hoxie, North Fairfield; Waldo—J. W. Lang, Brooks; Washington—H. A. Sprague, Charlotte; York—N. D. Witham, Biddeford.

Treasurer's Report for the Year 1879.

Dr.

To cash in treasury, Jan. 1, 1879	$ 39 57	
on deposit in Wiscasset Savings Bank	420 00	
amount received from the State for 1878	500 00	
of State Agricultural Society	230 00	
one life member	10 00	
annual members	32 00	
for interest on deposit	10 50	
		$1,242 07

Cr.

By paid loan of 1878	$275 00	
interest on loans	12 43	
orders of executive committee	44 91	
on account of premiums, 1878	180 75	
1879	354 50	
cash in treasury, December 31, 1879	30 08	
on deposit in Wiscasset Savings Bank	344 40	
		$1,242 07

Assets December 31, 1879.

Cash in treasury	$ 30 08	
on deposit	344 40	
Amount due from the State for 1879 *	354 50	
Property owned by the society (estimated)	100 00	
		$828 98

Liabilities.

Amount due on temporary loan	$140 00	
orders drawn and unpaid	97 53	
Permanent Fund	530 00	
bills not rendered (estimated)	38 25	
Excess of assets over liabilities	23 20	
		$828 98

HENRY McLAUGHLIN, Treasurer.

*The amount allowed and paid by the State on this claim was but $231.00.

Treasurer's Report for the Year 1880.

Dr.

To cash in treasury January 1, 1880	$ 30 08	
on deposit in Wiscasset Savings Bank	344 40	
received from the State bounty of 1879	231 00	
of State Agricultural Society	212 05	
life members	40 00	
annual members	29 00	
		$886 53

Cr.

By paid orders of executive committee	$ 49 88	
premiums of 1880	452 25	
revenue and postage stamps	4 20	
Cash in treasury December 31, 1880	35 80	
Amount on deposit in Wiscasset Savings Bank	344 40	
		$886 53

Assets December 31, 1880.

Cash in the treasury	$ 35 80	
deposited in Wiscasset Savings Bank	344 40	
Amount due from State bounty of 1880*	452 25	
Property of society, estimated	100 00	
		$932 45

Liabilities.

Amount due on loan	$140 00	
Interest on same for April 5, 1880	6 20	
Amount of orders drawn and unpaid	132 53	
due on Permanent Fund	570 00	
of bills not rendered, estimated	25 00	
Balance of assets	58 72	
		$932 45

HENRY McLAUGHLIN, Treasurer.

* The amount allowed and paid by the State on this was but $281.00.

Treasurer's Report for the Year 1881.

Dr.

To cash in treasury January 1, 1881	$ 35 80	
on deposit in Wiscasset Savings Bank	344 40	
amount received for the State on account of bounty for 1880	281 00	
cash received of life members	110 00	
annual members	47 00	
from sale of tickets at annual exhibition	87 60	
fruit at same	23 32	
subscriptions	61 50	
donations	11 50	
interest	13 78	
Temporary Loan	200 00	
		$1,215 90

Cr.

By amount paid interest on loans	$12 60	
orders of executive committee	401 53	
premiums of 1881	429 00	
postage stamps	3 34	
cash in treasury December 31, 1881	25 03	
amount on deposit in Wiscasset Savings Bank	344 40	
		$1,215 90

Assets December 31, 1881.

Cash in treasury	$ 25 03	
on deposit	344 40	
Amount due from the State bounty of 1881	500 00	
Property owned by the society, estimated	100 00	
		$969 43

Liabilities.

Amount due on Temporary Loans	$340 00	
of unpaid orders	97 53	
premiums	120 00	
bills not rendered, estimated	20 00	
Balance, assets over liabilities	391 90	
		$969 43

There is due to the Permanent Fund, from life membership fees, $680.00, which added to other liabilities as stated above makes the total liabilities	$1,257 53	
Deducting available assets	869 43	
		$388 10
Deficiency		

Being the amount required to pay all liabilities and make good the Permanent Fund.

GEORGE B. SAWYER, Treasurer.

INDEX TO AGRICULTURAL REPORT.

INDEX TO EXPERIMENT STATION REPORT.

INDEX TO POMOLOGICAL REPORT.