Public Documents of Maine:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

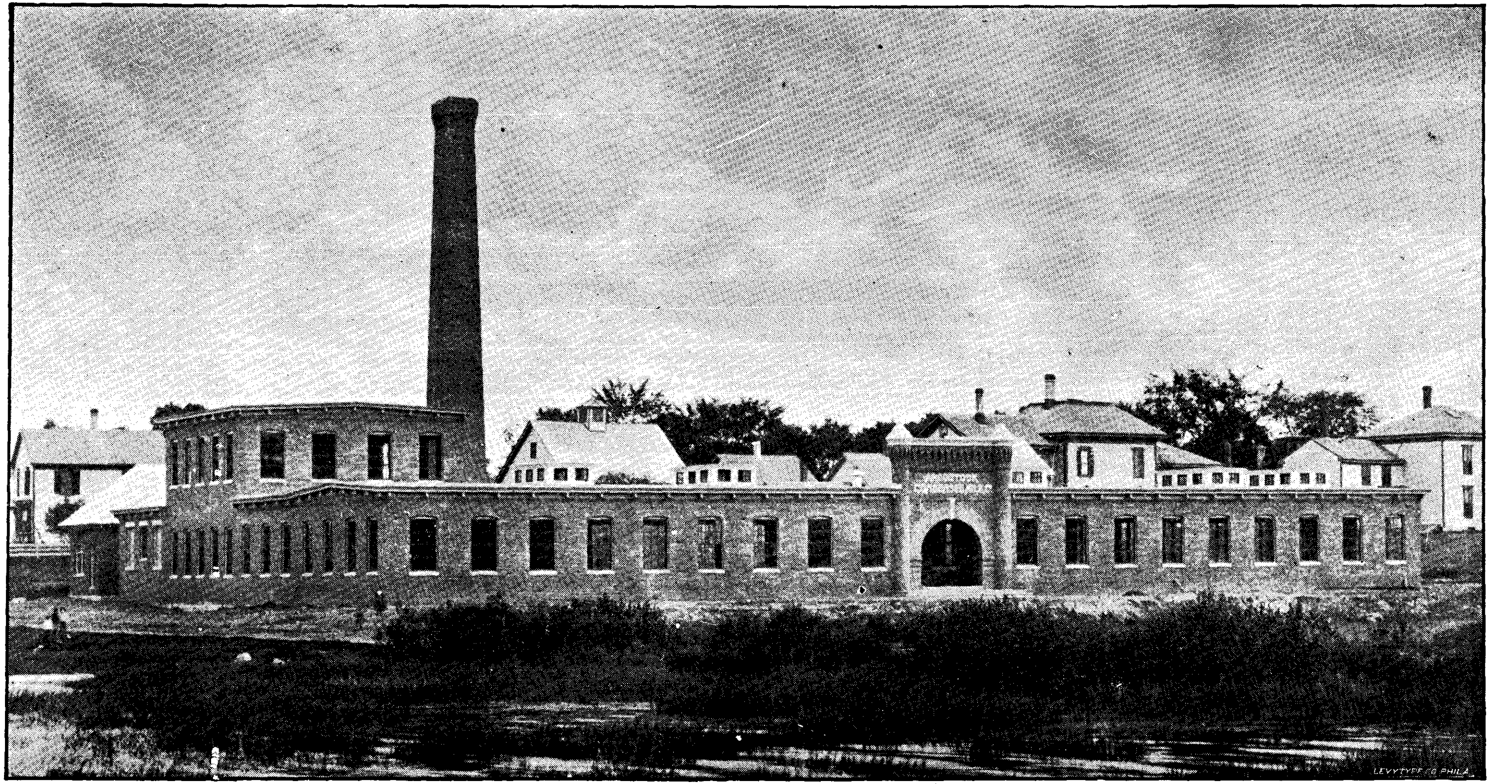
Public Officers and Institutions

FOR THE YEAR

1893.

VOLUME II.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE
1893.



PLANT OF THE AROOSTOOK CONDENSED MILK CO. AT WINTHROP.

AGRICULTURE OF MAINE.

THIRTY-FIFTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

Maine Board of Agriculture,

FOR THE YEAR

1892.

PRINTED BY ORDER OF THE LEGISLATURE.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1893.

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 1892.

B. WALKER McKEEN, *Secretary.*

AUGUSTA, May 1, 1893.

MAINE BOARD OF AGRICULTURE—1892.

OFFICERS.

B. F. BRIGGS, PRESIDENT.

F. S. ADAMS, VICE PRESIDENT.

B. WALKER McKEEN, SECRETARY.

MEMBERS CHOSEN BY COUNTY AGRICULTURAL SOCIETIES.

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

MEMBERS FROM STATE COLLEGE.

President, M. C. Fernald, Orono.

Professor of Agriculture, Walter Balentine, Orono.

ELECTED BY THE BOARD.

B. Walker McKeen, Augusta, Secretary.

*Deceased.

MAINE BOARD OF AGRICULTURE—1893.

OFFICERS.

F. S. ADAMS, President.

A. W. GILMAN, Vice President.

B. WALKER McKEEN, Secretary.

Members Chosen by County Agricultural Societies.

			Term expires 3rd Wed. in January.
Cumberland County,	W. H. Vinton,	Gray,	1894
Oxford "	V. P. Decoster,	Buckfield,	1894
York "	B. F. Pease,	Cornish,	1894
Somerset "	A. R. Smiley,	Skowhegan,	1894
Sagadahoc "	F. S. Adams,	Bowdoin,	1894
Hancock "	Vacancy.		
Piscataquis "	A. W. Gilman,	Foxcroft,	1895
Penobscot "	Joel Richardson,	No. Newport,	1895
Franklin "	T. B. Hunter,	Strong,	1895
Knox "	O. Gardner,	Rockland,	1895
Aroostook "	Ira J. Porter,	Houlton,	1895
Androscoggin, "	B. F. Briggs,	Auburn,	1896
Kennebec, "	F. H. Mooers,	Pittston,	1896
Waldo "	W. H. Moody,	Liberty,	1896
Washington "	L. G. Smith,	Pembroke,	1896
Lincoln "	John M. Winslow,	Nobleboro,	1896

Members from State College.

President, M. C. Fernald, Orono.

Professor of Agriculture, Walter Balentine, Orono.

Elected by the Board.

B. Walker McKeen, Augusta, Secretary.

REPORT.

ANNUAL MEETING, 1893.

The annual meeting of the Maine Board of Agriculture was held at the office of its secretary, State House, Augusta, January 18 and 19, 1893, in compliance with the Statute. The following business was transacted:

Meeting called to order by the President, B. F. Briggs, of Auburn, who made some timely remarks upon the occasion. It was then voted that a committee on credentials be appointed by the chair, and the following named gentlemen were so appointed: Prof. Walter Balentine, W. H. Vinton, and O. Gardner, who subsequently reported the newly elected members, and entitled to seats with the Board, as follows:

B. F. Briggs,	Auburn,	from	Androscoggin	County.
F. H. Mooers,	Pittston,	"	Kennebec	"
John M. Winslow,	Nobleboro,	"	Lincoln,	"
Wm. H. Moody,	Liberty,	"	Waldo,	"
L. G. Smith,	Pembroke,	"	Washington	"

Joel Richardson, No. Newport, for the unexpired term caused by the death of J. W. Green, of Bangor, from Penobscot county; V. P. DeCoster, Buckfield, for the unexpired term, caused by the resignation of B. Walker McKeen, of Fryeburg, from Oxford county.

Voted, A committee be appointed by the chair to receive, sort, and count votes for President and Vice President. The following were named as that committee:

Messrs. Porter, Richardson and Moody, who reported the unanimous choice of B. F. Briggs for President. Mr. Briggs asked to be excused from serving longer, and the member from Piscataquis moved to excuse him and the motion prevailed. Whereupon F. S. Adams was elected President, and A. W. Gilman, Vice President.

Voted, That when the Board adjourns, it be until 10 o'clock, A. M., January 19.

Voted, The Secretary be empowered to cast the ballot of the Board, for executive committee. The ballot contained the names of F. S. Adams and A. W. Gilman, and they were declared elected. A. R. Smiley was appointed Messenger.

Voted, The Board wait upon the Governor at such time as he may be pleased to receive it, and Dr. Fernald was appointed a committee of one to notify the Governor of the action of the Board and report at 10 A. M. next day. A committee on pay roll was appointed by the chair, as per vote of Board, as follows: Porter of Houlton, Hunter of Strong, and Mooers of Pittston. Adjourned.

Thursday, January 19, 1893. Called to order by President Adams. Dr. Fernald reported that the Governor would be pleased to receive the members of the Board at any time when convenient to them. Board then waited upon the Governor in a body, was received with much cordiality, and warm words expressed for the future prosperity of the agriculture of Maine. On returning to office of Secretary, listened to report of that officer, as follows:

Members of the Board of Agriculture:

In presenting this, my first annual report of my labors as your secretary, I will say, that I trust I am not unmindful of the duties of the position, or of the accurate account of my stewardship which you have a right to expect of me.

Coming into the work as I did, I have found many difficulties to meet, that only experience will enable any one to overcome to advantage. As I found the office entirely lacking for records, except of some of the earlier years of the Board, from 1857 to 1863, I have been obliged to start from the foundation, and work from a standpoint of our own, as far as possible.

The Executive Committee was called together at this office February 18, at which time the work for the year was somewhat outlined, and it seemed to the committee to be expedient to hold as many institutes as possible, without lowering the standard of work, as it was thought that by so doing more farmers would be reached, particularly those who are most in need of the instruction of the meetings.

The committee also voted, at this time, instructing me to collect all laws relating to agriculture, and publish them in pamphlet form, and to incorporate them in the report. This has been done, there being 4,000 copies of the pamphlets, which have been mostly distributed, there being a great demand for them. They voted further, that the set of reports, purchased by Mr. Gilbert, should be bound in uniform size and library style, for permanent use in our library. This has been done, and the reports are now in position. The instructions of the Executive Committee, in regard to institute work, have been followed as far as possible, and as I believe, to good advantage. Two State meetings have been held, namely: The Dairy meeting at Brunswick, December 14-16, and the Union Winter meeting with the Pomological Society in Augusta, January 17 and 18. The attendance at the Dairy meeting was smaller than it ought to have been, from a series of unavoidable circumstances, but the exhibits of dairy products were large and of fine quality. We were fortunate in securing an expert who thoroughly understood his work, and the practical illustrations of separating the cream by the separator, and of churning and printing butter before the audience were successfully accomplished. The papers of our own and other states have reported the meetings and copied the lectures very fully, and, on the whole, I feel that the meeting was a success. The meeting of the Pomological Society was, perhaps, better attended than any similar meeting for some years, the hall being crowded at several of the sessions. The lectures were of a high order, the discussions interesting, and the display of fruit, plants and flowers excelled any former exhibit of the kind ever held in our State.

Monthly crop bulletins were issued during the growing season, and much information of value was obtained from the prompt and practical answers obtained from farmers in every county in the State. The addition of a summary of the weather was made, and, I believe, proved of much value. I wish to say that we have a large mailing list of newspapers both in and outside the State, and we mail to them short items relating to our general work, and they are very generally published.

Before going into any detailed account of the institute work, I wish to say that I have received much substantial aid in this work from your executive committee, as well as from the active co-operation of every member of the Board, and many citizens in every place where the meetings have been held, as well as from every member of the public press with whom I have been thrown in contact.

Early in the year a book was obtained in which to keep a permanent record of the work of the Board, the places of holding the institutes, the names of all speakers with their subjects, and the attendance at each meeting, together with any items which may be of interest. Also, one was prepared for a record of the expenses of the institutes, an itemized account of all expenditures, and a list of all names of persons for whom orders were drawn and the date and kind of service. In this book any one can see at a glance the cost of any meeting.

There seemed to be some question as to where to divide the work of 1891 from that of 1892; but as the Dairy meeting at Auburn, and the Pomological meeting at Cornish, had been fully planned before our last annual meeting, and were a part of last year's work, and as the institute at Augusta had been promised and partly planned and once postponed on account of sickness, it was decided to close the work there, and begin the work of 1892 with the institute at East Wilton. March 15. It may not be out of place to say here, that I close the work for 1892 at this time, as it is the time of closing our Board year, and all institutes held after this meeting will go into the work of 1893. So the time for holding those now reported, covers only ten months.

The Institutes held are as follows: East Wilton, March 5th, 1892, subjects, "Corn as a Fodder Crop," "Profits of the Dairy."

Bowdoinham, April 5th, subjects treated, "Corn Crop and How to Grow It," "Weather Signals and Their Relation to Agriculture."

Freeport, April 28th, subjects discussed, "What Shall we do with our Hay," "Advantages of the Creamery System."

Brewer, June 14th, subjects treated, "Value and Application of Farm Manures," "Equal Taxes."

Riverside, June 16th, subjects, "Value of Farm Manures and Their Application," "Hay Crop and Cost of Production," "Stock Breeding."

Penobscot, June 17th, subjects, "Orcharding for the Maine Farmer," "Modern Requirements for Successful Dairying."

Bucksport, June 18th, subjects, the same as at Penobscot.

Phillips, October 18th, subjects, "Advantages of the Creamery System," "Value of Corn and Mixed Grain for Maine Farmers," "Sheep Husbandry."

New Sharon, October 19th, subjects, the same as at Phillips.

Farmington, October 20th, subjects, "Best Roadways for Maine," "Agriculture in the Common Schools."

Fort Fairfield, October 24th, subjects, "Farm Economics," "General Principles of Stock Breeding," "Human Foods."

Mapleton, October 25th, subjects same as at Fort Fairfield.

Island Falls, October 27th, subjects same as at Fort Fairfield.

Cary, October 29th, subject same as at Fort Fairfield.

Charlotte, November 1st, subjects, "Farm Economics," "Sheep Husbandry," "Dairying."

Machias, November 2d, subjects same as at Charlotte.

Cherryfield, November 3d, subjects, same as at Charlotte, and "Human Foods."

Lamoine, November 5th, subjects, "Growing Farm Crops," "Dairying." Windsor, November 7th, same subjects.

East Poland, November 10th, subjects, "Rotation of Crops," "New Processes in Butter and Cheese Making," "Small Fruits for Home Consumption."

Stevens Mills, November 11th, subjects, "Best Roadways for Maine," "Agriculture in our Common Schools."

Phippsburg, November 12th, subjects, "Business Side of Dairying," "Sheep Husbandry," "Stock Breeding," "Farming as a Business."

Foxcroft, November 29th, subjects, "Future of Agricultural Societies," "Stock Husbandry," "Comparative Advantages of Associated Dairying," "Taxation."

South Sebec, November 30th, subjects, "Fairs," "Sweet Corn Industry," "Agricultural Education," "Taxation."

Clinton, December 3rd, subjects, "Dairying for Maine Farmers," "Hay Production," "Farm Economics."

Brunswick, Dairy Conference, December 14-16, subjects, "Breeding and Care of Animals," "Formation of the Dairy Herd," "How to Manage the Dairy," "Dairy Education," "Some Important Conditions of Dairy Progress," "General Principles of Stock Feeding," "Dairy Interests and Dairy Specialties."

Waldo Station, December 29th, subjects, "Rotation of Crops," "Sweet Corn as a Paying Crop," "Sheep Husbandry," "The Shop and the Farm."

Bingham, January 11th, 1893, subjects, "Orcharding for Maine Farmers," "Farm Economics," "Human Foods," "The Rural School of the Future."

St. Albans, January 13th, subjects, same as at Bingham.

The total number is 30; total cost, $1736.19; total attendance, 3,108; average cost, $57.87; average attendance, 103.

In addition to these institutes we have had a Farmers' meeting at Freeport at a cost of $15.80; Field day at Orono, at which every member of the Board was present, costing $115.78. I paid $28.45 for a Babcock milk tester with case and supplies; paid $7.88 for repairs on tester and milk tank; $40.00 for weather reports for bulletins; and $25.00 for paper on "The Resources and Future of Aroostook County;" $4.50 for sign at State Fair; sundries, $51.31; Executive Committee, $53.10; total expended, $2905.87, of which $867.86 were expended for the work of 1891, and $88.67 will come from appropriation for 1893. Receipted bills for all expenses are on file in the Secretary of State's office.

I have visited as many county fairs as were consistent with my other duties, and also both the Eastern Maine and Maine State Fairs, and wish to make public acknowledgment of the uniformly courteous treatment received at the hands of the officials. By vote of the Executive Committee, permanent headquarters have been secured for the use of the Board at Bangor and at Lewiston, and many farmers availed themselves of the opportunity to visit the rooms during both fairs.

March 9th, I went to Rumford Center by invitation of the directors of the Creamery Association, to make tests of milk, cream and buttermilk for the patrons of the factory.

March 21st, I went to Boston to investigate the condensed milk business for Maine farmers. After carefully looking into the matter, visiting jobbers and others interested in the business, the conclusion reached, was that time had better be given to establish the plants already begun and thus prove the worth of the business before increasing the number of factories.

March 29th, I attended a meeting of the Experiment Station Council, as a representative of the Board.

May 5th, attended meeting of the Secretaries of the New England Boards of Agriculture, and Directors of Experiment Stations, at Boston, for consultation as to means looking to the introduction of agricultural weather signals. An organization was formed, to be known as the "New England Association of Applied Meteorology."

The institute work has been carried along in about the same manner as formerly, with speakers mostly within our own State. It has been my purpose to employ as speakers only those who were familiar with their subjects from actual contact in the fields or laboratory, believing as I do, that it should be the purpose of this Board, and that the interests of our farmers demand that our teaching should be from a practical standpoint, and that no amount of theory or eloquence can take the place of actual, practical knowledge. I would like to acknowledge the great assistance I have received from the professors at our Agricultural College and the Director of our Experiment Station, who have freely given their efforts and their time to the work of the Board, without compensation, whenever called upon to do so.

I have taken up agriculture in our schools, road improvements, weather forecasts, frost signals for farmers, and human foods, as new subjects, believing that these questions are of vital importance to our farmers; and they have been very well received. I have also had a lecture on hay production, as that subject has not been discussed in former years as much as its importance would seem to demand.

The following is a list of the new speakers who have been employed during the year, with the subjects treated:

J. Warren Smith, Boston—"Weather Signals and Their Relations to Agriculture."

O. Gardner, Rockland—"General Principles of Stock Breeding."

Miss S. T. Goodspeed, Turner—"The Rural School of the Future."

G. H. Hamlin, Orono—"Best Road Ways for Maine."

W. W. Stetson, Auburn—"Agriculture in our Common Schools."

Hon. D. G. Bean, Wilton—"Taxation."

W. B. Kendall, Bowdoinham—"Hay Production."

W. S. Weeks, Vassalboro—"How I Manage my Dairy."

L. F. Abbott, Lewiston—"Some Important Conditions in Dairy Progress."

I. C. Libby, Waterville—"Dairy Interest of the State and Dairy Specialties."

D. A. Ballard, Fryeburg—"Sweet Corn as a Paying Crop."

I wish also to mention the class exercises of Miss Wilson, as I believe they have been of much value, in showing to the people the ease with which natural sciences can be taught in our rural, ungraded schools. The time of issuing our annual report has been allowed to get far along into the summer season, so much so that they have hardly been distributed in season for our fairs. Every effort is being made to issue the report for 1892 earlier than ever before. Much of the matter is in the hands of the printers and I expect they will take hold of it just as soon as the legislature adjourns. Next season, I am quite confident, they can be issued before farmers get about the labors of spring, thus enabling them to take advantage of whatever there may be of value in them the same year they are issued.

In arranging the institutes, the members have named the places; and as far as possible, their wishes have been followed when arranging dates, subjects and speakers. You will see that no institutes have been held in Lincoln, Cumberland, Oxford, York, Penobscot and Knox counties. The Penobscot institutes were arranged and advertised, but were cancelled in consequence of the death of the member. In the other counties the members wished them postponed until after the annual meeting.

In reviewing the work, I believe I can say that we have had a fair amount of success. There seems to be a great, and a growing demand for institutes, and the attendance and interest is such as to encourage us in the belief that we are accomplishing something at every place we hold our meetings. There is usually a fair proportion of ladies and young people present, and the general tendency seems to be to take advantage of every idea that is presented by the speakers, and often the discussions are very instructive.

In closing, I am happy to say that the year just passed has been one of fair success for our farmers. While the hay and potato crops were somewhat cut off in some sections, in most instances there has been an abundant harvest. Good prices have generally prevailed and most of the articles which farmers have to purchase have been quite low. So that there is a general feeling of encouragement every where we go. Our fruit, dairy products, and potatoes, are in good demand at paying prices. Horse raising is undergoing a transition which shall put the business on a sound basis, and when that takes place, we can compete with the world. The present outlook for hog products is very flattering and I am of the opinion that we shall do well to grow more swine than ever before, particularly as an adjunct to our dairying. Poultry raising, as carried on in some sections of our State, is proving very profitable, and can be increased to advantage. Some of our hillside farms are being stocked with sheep, and I look for a steady improvement along all the different lines of our varied agriculture.

Respectfully submitted,

B. WALKER McKEEN, Secretary.

Voted to accept the same. The President then introduced Mr. F. O. Beal, of Bangor, who addressed the Board upon the work of the cattle commission for the past year, followed by Mr. Daggett of Foxcroft, Dr. Fernald, Prof. Balentine, W. H. Vinton, A. W. Gilman and others.

Adjourned until 2 o'clock P. M.

Afternoon session, President Adams in the chair. Further discussion of the workings of the cattle commission, upon which Dr. Fernald introduced the following resolution:

"*Resolved*, That in view of the important relations which the health of our domestic animals sustains to the health of our people, and to the prosperity of the varied industries in the State, and in view of the inadequacy of the present appropriation to the magnitude of the work imposed upon the State Cattle Commission, this Board recommends such an increase of the appropriation for this commission as shall enable it to fully guard our domestic animals against the spread of contagious diseases, and thus to protect adequately, the large and valuable interests committed to its charge."

This resolution was adopted by the Board.

Next, listened to Report of Executive Committee, B. F. Briggs, chairman. Voted to accept the same. It was then moved by Mr. Vinton that the Board act in harmony with the State Pomological Society in the matter of an increased appropriation for that Society, and Mr. T. B. Hunter was nominated as a committee of one from the Board to so act. The motion was sustained and carried. Dr. Fernald called for information in regard to the vacancy from Hancock county. Answered by Secretary McKeen. Address by Prof. Walter Balentine. Subject, Agriculture at the State College. Next on the programme, was memorial exercises, conducted by the member from Penobscot county, Mr. Joel Richardson, upon the death of J. W. Green of Bangor as follows:

[redacted]

By the death of Mr. Green the circle of the Board has been again broken. Again are its members admonished that what we do must be done quickly, for death is ever near. And to those of us who have passed fifty years, the time for future labor is brief. But if we work with the zeal and energy of our deceased brother we may yet accomplish some good for the agriculture of our State which may benefit others when we shall rest from our labors.

Josiah Wesley Green was born at Wilton, Maine, July 15, 1837. At the age of ten, his parents moved to Farmington and the early part of his childhood and manhood was spent upon a farm in that town. He was educated at a district school, and afterward graduated at the Farmington Academy. In 1861 Mr. Green married Miss Eulalia Luce of Industry, who survives him. He also leaves one son and two daughters.

It was Mr. Green's ambition to educate and fit his children for usefulness in life.

Some twenty years ago he moved to Bangor and for some time he was in the insurance business; after a time however he moved to a large farm near the city where he carried on an extensive farming business, and also had a milk route. He usually kept about thirty cows, a number of horses, sheep and swine.

One of his greatest aims in life was to promote the agricultural interests; he being a member of the Maine Board of Agriculture; President of the Penobscot Agricultural Society, and Secretary of the Penobscot County Farmers' Club.

Mr. Green was an active member in the grange work, holding the office of Lecturer in the Penobscot Pomona Grange also Lecturer in the Queen City Grange, and deputy of Penobscot coun'y. In connection with these duties he was to introduce the subject of the "Listing bill," which work he accomplished with much zeal and ability. Mr. Green was much beloved and esteemed by all those with whom he came in contact, as he always manifested a deep interest in the welfare of his fellowmen. He departed this life November 22, 1892, after a brief illness.

Dr. Fernald made some feeling remarks and presented the following resolutions, which were adopted by the Board:

Resolved, That in the death of Mr. J. W. Green of Bangor, the Maine Board of Agriculture has lost a valued member, the cause of agriculture an earnest and able advocate, and the State a most worthy citizen.

Resolved, That these resolutions be placed upon the records, be published with the proceedings of the Board, and a copy sent to the widow of the deceased.

Voted, To refer the following resolution, offered by Mr. Moody of Liberty, to the Executive Committee and the Secretary:

Resolved, That it is the opinion of this Board, that the law providing for the election of members of the Board of Agriculture, be so changed, that in counties where there are more than one agricultural society, the members shall be chosen from the society which has been longest without representation.

Report of committee on pay roll presented and accepted.

Voted, That Secietary McKeen be continued upon the advisory council of the Experiment Station at Orono.

Voted to adjourn without date.

B. WALKER McKEEN, *Secretary*.

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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 Maine 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	C. E. Wheeler	Chesterville.
Aroostook County	S. W. Porter	Houlton	A. O. Jones	Houlton	George H. Gilman,	Houlton.
Aroostook, North	G. M. Park	Presque Isle	R. J. Smith	Presque Isle	James W. Bolton	Presque Isle.
Androscoggin County	D. P. Fields	Auburn	E. G. Woodside	Lewiston	J. G. Ham	Livermore Falls.
Cumberland County	W. H. Vinton	Gray	D. F. Whittier	Gorham	F. D. Scammon	Gorham.
Cumberland, North	Joseph Pitts	Edes Falls	A. Moulton	Harrison	Joseph S. Chaplin	Harrison.
Franklin County	Herman Corbett	Farmington	Reuben Hatch	Farmington	George M. Currier,	Farmington.
Franklin, North	P. B. Hunter	West Freeman	J. W. Butterfield	Phillips	M. C. Kelley	Phillips.
Hancock County	David J. Allen	North Sedgwick	Nathan Hinckley	Bluehill	N. P. Hinckley	Bluehill.
Hancock County Fair Ass'n	A. W. Ellis	Ellsworth	H. F. Whitcomb	Ellsworth	H. J. Joy	Ellsworth.
Kennebec County	F. H. Jacobs	Mt. Vernon	Geo. E. Coleman	Readfield	William A. Lord	Readfield.
Kennebec, North	S. C. Watson	Oakland	F. F. Graves	Waterville	C. G. Carlton	Waterville.
Kennebec, South	W. Johnson	Cooper's Mills	F. H. Mooers	Pittston	Jasper S. Grey	So. Windsor.
Knox, North	D. H. Merro	Union	F. E. Burkett	Union	F. H. Pratt	Union.
Lincoln County	J. M. Glidden	Newcastle	E. E. Dunbar	Damariscotta	George H. Weeks	Damariscotta.
Oxford County	A. F. Andrews	Norway	A. C. T. King	South Paris	A. C. T. King	So. Paris.
Oxford, West	C. H. Walker	Fryeburg	W. H. Abbott	Fryeburg	W. R. Tarbox	Fryeburg.
Oxford, Androscoggin Valley	T. B. W. Stetson	Canton	H. T. Tirrell	Canton	H. T. Tirrell	Canton.
Oxford, North	Geo. O. Huse	Andover	J. F. Talbot	Andover	E. E. Caldwell	Andover.
Penobscot County	J. S. Staples	East Bangor	Geo. N. Holland	Hampden	George N. Holland,	Hampden.
Penobscot, West	John Rogers	Stetson	T. P. Batchelder	Kenduskeag	T. P. Batchelder	Kendu keag.
Penobscot, North	A. H. Lindsey	Carroll	Nathan Averill	Lee	F. M. Johnson	Lee.
Penobscot and Aroostook	John Burnham	Sherman Mills	L. B. Rogers	Patten	John Scott	Patten.
Piscataquis, East	I. F. Hobbs	Milo	W. H. Snow	Milo	W. H. Snow	Milo.
Piscataquis, Central	C. S. Hayes	Foxcroft	E. A. Arnold	Foxcroft	E. A. Arnold	Foxcroft.
Piscataquis, West	W. F. Towne	Monson	E. R. Haynes	Monson	E. R. Haynes	Monson.
Sagadahoc County	E. Totman	Richmond	W. S. Rogers	Topsham	L. E. Smith	Brunswick.
Somerset, East	J. P. Longley	Palmyra	T. A. Linn	Hartland	Charles Rowell	Hartland.
Somerset, Central	A. R. Smiley	Skowhegan	R. T. Patten	Skowhegan	A. R. Bixby	Skowhegan.

Waldo County	S. T. Edgcomb	Belfast	G. G. Abbotts	Belfast	A. S. Redman	Belfast.
Waldo and Penobscot	M. C. Chapman	Newburg	C. H. Nealley	Monroe	F. L. Palmer	Monroe.
Waldo, North	Jesse Smart	West Troy	J. Libby	Unity	Ed. Hunt	Unity.
Waldo, West	L. C. Morse	Liberty	Wm. H. Moody	Liberty	S. T. Young	Liberty.
Washington County	Geo. W. Allen	West Pembroke,	H. F. Porter	Pembroke	N. S. Allen	Dennysville.
Washington, West	Jas. B. Bucknam	Columbia Falls	E. F. Allen	Columbia Falls	F. L. Allen	Columbia Falls.
Washington, Central	W. G. Means	Machias	W. H. Phinney	Machias	M. Gardner	Machias.
Washington, North	Oscar Pike	Princeton	W. R. Dresser	Princeton	S. G. Spooner	Princeton.
York County	Sam'l Haines	Saco	S. S. Andrews	Biddeford	Geo. H. Boothby	Saco.
York, Buxton and Hollis	A. L. Berry	Bar Mills	Ira W. Milliken	Hollis	J. W. Meserve	Barr Mills.
York, Ossipee Valley	Howard Brackett	Cornish	Jas. C. Ayer	Cornish	W. P. Perkins	Cornish.
York, Ramshackle Park	C. A. Goodwin	West Newfield	L. O. Straw	Newfield	C. E. Pinkham	West Newfield.
York, Shapleigh and Acton	B. J. Grant	Acton	Horace Bodwell	Acton.	H. A. Stanley.	Shapleigh.
York, Sanford Ag. and Mech	J. B. Stiles	Springvale	A. W. Low	Springvale	J. A. Butler	Springvale.

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR 1892.

Societies.	Amount received from State, 1892.	Amount received from State, 1893.	Receipts from membership.	Receipts from loans.	Receipts from entry fees for trotting purses.	Receipts from entry fees for other purposes.	Total receipts for the year.	Paid for improvements.	General expenses.	Total amount paid out.	Value of property.	Amount of liabilities.
Aroostook County	$94 40	$150 07	–	–	$93 00	$47 00	$816 30	$21 00	$219 11	$841 21	$380 00	$240 00
Aroostook, North	201 14	191 02	$51 00	–	271 50	12 00	2,252 78	684 29	384 75	2,350 84	2,500 00	1,000 00
Androscoggin County	440 60	345 63	62 00	–	735 00	15 00	2,217 50	323 31	451 30	2,782 36	1,000 00	1,450 30
Cumberland County	840 40	492 02	100 00	–	534 00	6 60	6,456 11	2,146 98	1,545 11	6,521 97	4,200 00	285 00
Cumberland, North	155 05	155 46	244 00	–	277 50	34 70	1,410 10	244 00	171 64	1,344 89	1,500 00	100 00
Franklin County	189 39	207 56	641 00	–	216 25	4 00	2,323 68	950 00	300 00	2,895 79	1,000 00	
Franklin, North	84 02	149 57	269 50	$1,800 00	230 75	469 55	2,853 82	1,800 00	65 00	2,827 71	2,500 00	1,987 49
Hancock County	–	224 22	–	1,000 00	240 00	5 00	1,245 00	500 00	40 00	1,680 25	5,000 00	800 00
Hancock County Fair Ass'n	–	228 86	–	–	356 50	10 25	3,850 28	–	943 38	2,211 38	10,378 90	
Kennebec County	205 51	221 71	–	–	253 50	–	1,878 28	219 30	783 32	2,321 87	1,800 00	
Kennebec, North												
Kennebec, South	–	71 59	10 00	–	70 75	–	805 54	200 00	341 16	972 53	1,200 00	
Knox, North	64 91	46 25	285 00	–	–	–	532 01	–	229 32	505 77	10 00	
Lincoln County	120 13	129 92	10 00	100 00	166 10	713 02	1,109 25	225 11	242 37	1,121 61	1,500 00	462 36
Oxford County	380 77	341 35	24 00	259 84	299 76	132 50	4,667 43	435 17	904 76	4,364 16	10,000 00	3,060 00
Oxford, West	208 04	221 63	93 00	–	333 75	37 90	2,537 35	66 98	342 74	2,377 20	6,000 00	1,500 00
Oxford, Androscoggin Valley	244 07	221 32	22 00	–	126 00	1,255 10	1,647 17	28 25	193 86	1,545 06	1,800 00	2,245 00
Oxford, North	83 24	75 98	9 23	–	107 50	766 84	876 81	115 00	337 48	906 68	1,600 00	
Penobscot County												
Penobscot, West	410 71	414 18	103 00	–	940 00	2 40	3,221 03	500 00	300 00	4,121 03	2,000 00	
Penobscot, North	176 33	125 04	5 00	–	177 50	35 40	394 23	–	40 96	790 71	225 00	
Penobscot and Aroostook	100 00	100 00	7 00	217 71	141 50	332 34	798 55	50 00	45 05	730 40	2,000 00	2,000 00

Piscataquis, East	8 00	5 73	12 00	-	-	-	20 00	-	11 00	-	5 00	
Piscataquis, Central	79 41	70 18	96 00	200 00	98 80	290 34	764 55	10 55	123 00	764 55	200 00	303 50
Piscataquis, West	13 68	13 35	38 70	28 00	-	42 95	126 44	-	51 56	-	-	41 65
Sagadahoc County	416 04	390 74	-	1,050 00	662 00	77 85	5,884 84	800 00	900 00	5,756 59	5,000 00	1,000 00
Somerset, East	163 74	97 61	96 00	-	79 00	-	875 55	54 75	161 01	907 11	2,173 96	4,700 00
Waldo County	118 21	87 24	-	-	132 75	-	418 71	-	58 93	-	3,500 00	
Waldo and Penobscot	250 00	250 00	20 00	7 17	445 30	2,009 14	2,731 61	1,027 85	600 37	3,050 32	3,500 00	
Waldo, North	82 70	102 78	20 00	-	129 50	299 88	532 08	-	161 65			
Waldo, West	88 7.	82 06	-	-	112 00	34 30	235 07	250 00	66 00	806 50	1,000 00	
Washington County	194 22	161 56	12 00	7 94	165 00	-	1,614 45	-	592 92	1,558 67	1,[illegible]00 00	
Washington, West	272 47	336 06	1 00	-	250 00	36 00	3,004 39	197 26	526 13	2,899 04	1,760 26	
Washington, Central	209 31	228 02	6 00	-	307 00	-	1,890 63	-	647 98	2,040 93	-	625 00
Washington, North	139 08	163 59	-	150 00	220 00	8 00	1,307 08	285 00	219 05	1,307 08	3,000 00	1,800 00
York County	337 53	263 65	5 00	325 66	481 00	37 76	2,157 24	-	449 54	2,150 00	-	625 00
York, Buxton and Hollis	166 03	141 26	3 00	20 00	303 00	1,216 85	1,708 88	-	-	466 76	3,000 00	1,447 65
York, Ossipee Valley	200 00	200 00	90 00	300 00	525 00	355 25	3,577 88	135 00	608 10	3,103 28	5,500 00	1,393 81
York, Ramshackle Park	81 42	111 15	20 00	-	170 50	45 38	1,080 17	75 00	70 00	918 18	4,500 00	
York, Shapleigh and Acton	170 36	158 83	200 00	109 22	231 00	-	710 58	-	25 00	-	3,000 00	
York, Sanford Ag. and Mech	159 37	186 93	-	-	298 75	-	1,917 80	213 90	407 11	1,790 86	6,000 00	

Financial Statement of Agricultural Societies—Continued.

Societies.	Amount awarded trotting bred stallions.	Amount awarded trotting bred brood mares.	Amount awarded draft stallions.	Amount awarded draft mares.	Amount awarded family horses.	Amount awarded gents' drivers.	Amount awarded matched carriage horses.	Amount awarded horses for all work.	Amount awarded colts.	Amount awarded horses for draft.	Amount awarded all horses, except those in races.	Amount awarded in trotting purses.	Total amount awarded horses and colts.
Aroostook County	$12 50	$ 4 50	$9 50	$4 50	-	$4 50	$5 00	$6 00	$33 50	$ 9 00	$ 89 00	$275 00	$364 00
Aroostook, North	9 00	12 00	6 00	6 00	-	3 00	3 00	-	48 75	19 00	106 75	768 00	874 75
Androscoggin County	31 00	8 00	-	-	$9 00	10 00	12 00	-	24 00	12 00	60 00	1,375 00	1,541 00
Cumberland County	49 00	12 00	3 00	12 00	-	-	12 00	-	14 20	25 10	86 00	2,032 19	2,245 49
Cumberland, North	1 00	1 50	1 00	-	-	-	-	1 00	2 00	20 00	-	695 00	721 50
Franklin County	28 00	11 00	5 00	-	-	6 00	3 50	-	24 00	-	2 00	574 00	653 50
Franklin, North	11 75	4 50	-	-	-	3 50	3 00	-	10 70	-	-	680 00	713 45
Hancock County	16 00	-	-	6 00	-	-	2 00	-	18 00	-	3 00	1,350 00	1,395 00
Hancock County Fair Association	40 00	37 00	10 00	-	29 00	-	-	-	70 00	-	186 00	855 00	1,041 00
Kennebec County	3 00	6 00	-	-	10 00	10 00	6 00	-	19 00	12 00	66 00	582 00	648 00
Kennebec, North													
Kennebec, South	6 75	3 50	-	-	2 25	2 25	-	3 50	1 75	-	-	273 75	293 75
Knox, North	15 00	8 00	-	2 00	3 50	2 50	3 00	3 00	34 00	-	13 00	-	84 00
Lincoln County	16 00	6 00	-	-	-	-	-	4 00	9 25	-	35 25	397 00	422 25
Oxford County	35 00	19 00	-	-	-	35 00	-	-	70 00	53 00	212 00	910 00	1,122 00
Oxford, West	18 00	6 00	-	-	-	25 00	10 00	7 00	18 00	16 00	100 00	793 00	893 00
Oxford, Androscoggin Valley	39 00	12 00	-	-	-	-	9 00	-	33 00	-	93 00	875 00	968 00
Oxford, North	3 00	3 50	-	-	-	-	-	-	6 40	-	-	295 00	307 90
Penobscot County													
Penobscot, West	10 50	6 00	5 00	6 00	18 00	10 00	8 00	5 00	20 50	8 00	97 00	1,927 00	2,024 00
Penobscot, North	3 50	-	7 00	6 00	-	4 00	-	5 00	8 50	5 00	-	580 00	619 00
Penobscot and Aroostook	5 00	6 00	5 00	6 00	-	.	-	-	19 00	-	-	381 50	422 50
Piscataquis, East	-	2 00	-	-	2 25	1 50	2 00	-	6 00	3 00	16 75	-	16 75

Piscataquis, Central.	8 00	6 00	8 00	6 00	3 00	3 00	5 00	2 00	9 00	8 00	14 50	234 00	306 50
Piscataquis, West	8 00	-	2 00	-	-	1 50	1 50	-	11 00	7 25	9 00	-	40 25
Sagadahoc County	22 00	7 00	-	-	-	15 00	. -	-	27 00	11 00	89 00	1,300 00	1,478 00
Somerset, East	19 00	9 00	-	-	-	3 75	5 00	-	18 50	6 00	59 25	350 00	
Waldo County........	4 50	4 50	4 50	-	-	-	5 00	-	24 00	-	10 00	380 00	432 50
Waldo and Penobscot..................	13 00	7 00	4 00	-	10 00	10 00	10 00	18 00	41 00	39 00	152 00	805 00	957 00
Waldo, North............................	25 50	6 00	10 50	6 00	6 00	6 00	4 50	-	14 25	10 50	-	355 00	444 25
Waldo, West	5 00	10 00	-	-	-	-	-	-	76 00	10 00	-	300 00	401 00
Washington County	11 00	12 00	7 00	12 00	-	-	-	-	-	48 00	90 00	516 25	606 25
Washington, West......................	45 00	12 00	75 00	9 00	-	-	5 00	11 00	75 00	48 00	-	710 00	960 00
Washington, Central.............	24 00	8 00	21 00	8 00	-	-	2 00	2 00	28 00	30 00	10 00	682 00	845 00
Washington, North.....................	5 00	6 00	5 00	6 00	-	3 00	-	-	20 00	25 00	-	480 00	550 00
York County............................	-	6 00	-	-	-	6 00	4 00	-	14 00	25 00	-	1,217 00	1,272 50
York, Buxton and Hollis......	5 00	5 00	-	-	-	-	-	-	9 00	5 00	-	630 00	654 00
York, Ossipee Valley...................	31 00	10 00	-	-	-	10 00	5 00	-	-	19 06	-	1,507 00	1,582 25
York, Ramshackle Park................	16 00	-	-	6 00	6 00	10 00	6 00	-	21 50	6 00	71 50	418 00	489 50
York, Shapleigh and Acton............	-	-	2 00	3 50	3 50	-	-	-	8 25	-	12 00	530 00	559 25
York, Sanford Ag. and Mech	-	6 00	-	-	7 00	4 00	10 00	-	15 00	-	-	700 00	742 00

Financial Statement of Agricultural Societies—Continued.

Societies.	Amount awarded thoroughbred bulls and bull calves.	Amount awarded thoroughbred cows, heifers and heifer calves.	Amount awarded grade bulls and bull calves.	Amount awarded grade cows, heifers and heifer calves.	Amount awarded herds.	Amount awarded working oxen and steers.	Amount awarded matched oxen and steers.	Amount awarded trained steers.	Amount awarded for beef.	Amount awarded town teams.	Amount awarded oxen and steers for draft.	Amount awarded sheep.	Total amount awarded neat stock.	Amount awarded swine.	Amount awarded poultry.	Total amount awarded live stock.
Aroostook County	$20 00	$40 00	$5 00	$21 00	$ 4 00	$6 00	–	–	–	–	$7 00	$34 50	$103 00	$12 50	$40 50	$554 50
Aroostook, North	13 00	27 00	5 25	11 25	11 00	2 00	–	–	–	–	–	12 50	69 50	–	4 25	193 00
Androscoggin County	30 50	42 00	4 00	48 00	18 00	16 00	$31 00	$2 00	$12 00	$36 00	70 00	39 00	309 50	4 00	25 50	919 00
Cumberland County	54 00	106 00	–	14 00	12 00	48 00	13 00	5 00	10 00	26 00	143 25	38 00	431 25	4 00	40 00	2,758 49
Cumberland, North	2 00	5 00	1 00	3 00	8 00	11 00	15 00	6 00	6 00	10 00	59 00	5 00	126 00	2 00	–	854 50
Franklin County	41 00	51 25	8 75	40 25	31 00	10 00	19 00	3 00	10 00	62 00	31 00	81 75	307 25	14 00	25 50	428 50
Franklin, North	7 25	10 65	4 50	8 00	3 00	9 25	9 75	1 00	4 50	39 00	3 00	22 50	99 90	75	6 10	842 70
Hancock County	15 00	8 00	–	–	–	32 00	5 00	–	7 00	–	13 00	14 00	80 00	4 00	2 00	100 00
Hancock County Fair Association	14 25	5 00	3 35	7 00	–	–	12 00	–	–	–	38 60	2 00	80 20	5 00	–	273 20
Kennebec County	18 00	37 50	–	31 50	23 00	34 00	18 00	5 00	7 50	60 00	–	30 00	234 50	11 00	16 00	939 50
Kennebec, South	–	–	3 00	7 90	8 00	21 40	15 20	–	3 00	15 00	7 50	2 50	81 00	1 00	50	378 75
Knox, North	5 00	9 50	4 50	7 50	6 00	10 50	6 50	2 00	5 00	6 00	16 50	8 00	79 00	4 00	7 50	182 50
Lincoln County	13 00	2 00	2 00	9 50	3 00	16 50	7 00	4 00	5 00	24 00	18 00	17 50	104 00	–	3 00	159 75
Oxford County	117 00	126 00	4 00	85 00	36 00	100 00	45 00	–	12 00	53 00	51 00	51 00	629 00	24 00	14 00	1,840 00
Oxford, West	13 00	15 50	5 00	10 00	20 00	33 00	17 00	7 00	9 00	48 00	31 00	–	208 50	14 00	4 00	326 50
Oxford, Androscoggin Valley	36 00	26 00	4 00	24 00	12 00	31 00	30 00	2 00	9 00	24 00	49 00	18 50	247 00	–	7 00	365 00
Oxford, North	1 00	2 00	7 50	5 00	5 80	8 00	4 50	7 15	2 00	2 00	6 00	11 50	50 55	–	5 50	
Penobscot County																
Penobscot, West	31 50	30 25	14 25	30 75	12 00	36 00	–	5 00	6 00	5 00	26 00	38 50	196 25	11 00	21 30	2,291 55
Penobscot, North	4 00	12 00	–	–	–	8 00	–	–	2 00	4 00	3 50	2 00	33 50	–	75	75 45
Penobscot and Aroostook	–	9 75	–	3 00	–	9 00	–	–	–	–	–	–	12 00	3 00	6 00	42 75
Piscataquis, East	–	–	–	4 25	–	–	–	–	–	–	–	1 50	4 25	2 00	50	25 50
Piscataquis, Central	6 00	6 00	5 00	11 00	7 00	6 00	5 00	4 50	–	–	8 00	12 00	59 00	2 00	6 00	385 00

Piscataquis, West	-	-	-	75	2 00	-	3 00	1 00	-	-	9 00	3 00	15 75	-	-	59 00
Sagadahoc County	64 25	65 50	-	65 75	37 00	23 00	14 00	3 00	9 00	39 00	65 00	28 50	385 50	17 00	102 50	2,011 50
Somerset, East	18 00	34 50	4 75	-	-	9 00	5 00	9 25	-	3 00	2 50	24 50	-	8 50	75	168 50
Waldo County	3 00	30 00	3 00	30 00	8 00	21 00	5 00	3 00	5 00	13 00	14 00	11 00	135 00	-	8 00	154 00
Waldo and Penobscot	23 00	54 00	6 00	18 00	14 00	21 00	12 00	2 00	23 00	-	40 00	29 00	213 00	7 00	21 00	270 00
Waldo, North	60 00	26 25	-	-	-	24 50	6 00	30 25	18 00	9 00	-	16 25	174 00	5 25	5 00	200 50
Waldo, West	-	-	3 00	17 50	12 00	-	25 50	-	-	-	20 00	11 50	78 00	-	-	490 50
Washington County	14 00	22 50	-	24 50	26 00	22 00	-	-	4 00	-	-	23 00	113 00	9 00	21 50	256 50
Washington, West	21 00	30 00	-	56 00	-	52 00	-	9 00	-	-	52 00	27 00	220 00	11 00	23 00	531 00
Washington, Central	25 00	37 00	-	27 00	-	18 00	-	-	-	7 00	20 00	18 00	134 00	16 00	16 50	1,029 50
Washington, North	7 00	16 00	14 00	42 00	-	20 00	-	-	-	-	10 00	15 00	109 00	15 00	9 00	698 00
York County	12 00	17 50	3 00	9 00	15 00	22 00	4 00	-	6 00	30 00	48 00	8 00	166 50	6 00	33 00	1,486 00
York, Buxton and Hollis	3 00	8 00	6 00	28 00	4 00	14 00	2 00	2 00	2 00	24 00	26 00	3 00	-	6 00	2 25	130 25
York, Ossipee Valley	20 00	45 00	6 00	24 00	15 00	41 50	26 00	-	10 00	64 00	36 00	9 00	287 50	5 00	6 50	383 00
York, Ramshackle Park	19 00	15 00	-	12 00	3 00	13 00	11 00	-	6 00	18 00	15 50	-	112 50	5 00	2 25	609 25
York, Shapleigh and Acton	7 00	19 50	-	-	-	12 00	12 00	15 50	6 00	70 00	18 00	5 25	160 00	13 50	14 75	193 50
York, Sanford Ag. and Mech.	8 00	38 00	8 00	12 00	-	34 50	6 00	5 00	6 00	44 00	30 00	9 00	191 50	18 00	20 00	280 00

Financial Statement of Agricultural Societies—Continued.

Societies.	Amount awarded grain and root crops.	Amount awarded fruits and flowers.	Amount awarded bread and dairy products.	Amount awarded honey, sugar, etc.	Amount awarded agricultural implements.	Amount awarded household manufactures and needle work.	Amount awarded all objects not named above.	Total amount of premiums, purses and gratuities awarded.	Per cent of discount in payment of same.
Aroostook County	$17 50	$29 30	$10 25	-	-	$10 50	-	$622 10	
Aroostook, North	69 10	29 25	24 75	$8 75	$5 00	27 55	$16 40	1,141 80	
Androscoggin County	29 90	44 15	21 50	7 50	-	39 90	4 00	2,065 95	
Cumberland County	66 00	37 25	29 00	11 00	-	11 00	122 01	3,034 75	
Cumberland, North	12 25	18 00	3 50	-	-	9 50	31 50	929 25	
Franklin County	2 80	44 80	14 75	1 60	50	49 50	47 00	1,443 45	
Franklin, North	9 15	15 95	2 45	45	1 75	18 90	2 70	894 05	
Hancock County	24 00	9 75	6 50	75	-	36 25	8 00	1,340 25	
Hancock County Fair Association	60 65	75 75	17 25	2 35	-	67 80	16 00	1,368 00	
Kennebec County	49 50	62 50	49 75	13 50	3 00	68 50	139 00	1,325 25	
Kennebec, South	8 95	11 15	11 55	-	-	8 75	-	427 95	
Knox, North	16 00	15 50	8 00	4 50	5 00	27 25	17 70	276 45	
Lincoln County	123 90	25 15	5 50	2 55	75	26 75	-	776 60	
Oxford County	41 00	63 00	26 50	14 50	6 00	30 40	19 00	2,040 40	
Oxford, West	16 00	12 00	29 00	4 00	12 40	60 00	71 75	1,324 75	
Oxford, Androscoggin Valley	7 25	25 00	12 00	2 75	4 00	15 45	16 50	1,322 95	
Oxford, North	11 75	8 40	6 00	2 65	3 00	24 75	22 20	454 20	
Penobscot County									
Penobscot, West	26 55	22 40	27 25	7 15	13 50	60 30	27 00	2,475 70	
Penobscot, North	7 25	7 00	4 75	2 50	3 00	18 35	10 15	749 75	
Penobscot and Aroostook	18 00	17 25	7 50	-	-	17 70	-	535 05	
Piscataquis, East	2 75	1 25	1 00	-	-	-	-	34 25	
Piscataquis, Central	3 50	9 75	8 00	2 00	-	11 05	-	419 50	
Piscataquis, West	1 45	3 00	4 00	65	1 00	2 25	8 50	79 85	

Sagadahoc County	118 75	79 00	24 25	2 00	3 00	58 00	39 12	2,335 62	
Somerset, East	–	2 20	24 25	5 50	–	20 30	7 75	578 50	
Waldo County	27 50	20 00	5 00	–	30 00	35 00	8 00	711 50	50% on purses
Waldo and Penobscot	43 00	26 00	6 50	–	–	90 60	9 00	1,402 10	
Waldo, North	35 75	13 00	10 50	9 00	–	36 75	11 50	760 50	$19\frac{4}{19}$%
Waldo, West						–	–	490 50	
Washington County	63 75	28 05	15 75	6 00	–	77 45	2 00	965 75	
Washington, West	104 25	88 35	29 70	9 15	–	83 22	435 13	2,000 20	
Washington, Central	98 75	30 10	8 25	2 90	–	114 70	108 75	1,392 95	
Washington, North	35 00	13 75	7 25	–	–	38 80	10 25	977 85	
York County	25 00	24 90	10 75	–	–	19 65	9 65	1,575 95	
York, Buxton and Hollis	7 00	–	4 00	–	–	41 20	7 95	819 40	
York, Ossipee Valley	8 00	2 00	4 35	25	–	34 85	–	1,939 70	
York, Ramshackle Park	7 50	6 25	8 00	1 25	–	25 40	6 75	664 40	
York, Shapleigh and Acton	50 25	10 00	10 50	–	–	30 75	95 15	949 40	
York, Sanford Ag. and Mech	48 00	12 50	6 25	–	–	49 45	20 65	1,117 35	

Agricultural Societies—Concluded. Number of Animals Exhibited.

Societies.	Number of horses and colts.	Number of thoroughbred bulls and bull calves	Number of thoroughbred cows, heifers and heifer calves.	Number of grade bulls and bull calves.	Number of grade cows, heifers and heifer calves.	Number of oxen and steers.	Number of sheep.	Total number of neat stock.	Number of swine.	Number of poultry (coops.)
Aroostook County	113	7	16	3	24	-	51	67	6	50
Aroostook, North	88	7	13	8	13	12	27	67	-	3
Androscoggin County	123	17	37	2	41	114	61	250	8	31
Cumberland County	147	18	47	10	91	12	51	151	10	80
Cumberland, North	46	3	7	1	4	84	14	123	1	
Franklin County	82	26	48	14	96	220	285	448	20	55
Franklin, North	70	6	16	5	17	141	78	191	1	14
Hancock County	84	-	3	6	38	-	17	171	8	2
Hancock County Fair Association	43	2	1	1	5	12	1	21	5	
Kennebec County	127	11	42	-	41	140	58	236	31	38
Kennebec, South										
Knox, North	47	3	8	4	19	36	17	130	10	6
Lincoln County	44	6	5	1	11	90	62	118	-	10
Oxford County	39	29	71	2	62	114	142	319	29	26
Oxford, West	53	8	5	2	8	112	-	214	12	4
Oxford, Androscoggin Valley	39	12	29	4	35	126	36	245	-	9
Oxford, North	28	1	6	3	14	38	39	80	-	6
Penobscot County										
Penobscot, West	152	10	16	9	51	96	116	204	17	27
Penobscot, North	49	-	3	14	27	-	6	44	-	1
Penobscot and Aroostook	34	17	2	-	14	-	59	67	-	3
Piscataquis, East	20	-	-	12	-	-	14	12	1	1
Piscataquis, Central	64	3	4	4	22	27	32	72	10	9

Piscataquis, West	32	3	–	10	10	–	31	52	6	
Sagadahoc County	60	18	54	57	–	96	69	281	33	124
Somerset, East	54	4	5	3	25	38	4	145	–	2
Waldo County	30	1	10	1	14	30	–	59	–	16
Waldo and Penobscot	82	14	38	6	13	45	58	275	19	40
Waldo, North	35	10	15	10	46	11	60	104	7	5
Waldo, West	51	–	2	8	18	–	25	28		
Washington County	46	5	31	–	25	22	43	147	35	26
Washington, West	46	3	10	24	50	–	32	87	13	17
Washington, Central	76	6	12	18	–	19	38	174	5	30
Washington, North	30	2	5	6	24	18	35	85	42	15
York County	33	4	7	3	21	80	11	162	12	21
York, Buxton and Hollis	32	2	5	–	85	68	10	192	3	6
York, Ossipee Valley	26	7	27	2	21	–	19	292	11	8
York, Ramshackle Park	75	6	6	8	25	65	–	230	15	3
York, Shapleigh and Acton	21	–	6	25	–	216	10	280	14	16
York, Sanford Agricultural and Mechanics	30	5	28	4	10	130	20	197	10	18

REPORT OF PROCEEDINGS

OF

STATE DAIRY MEETING

HELD AT BRUNSWICK, DEC. 15th and 16th, 1892.

Thursday A. M. 10 o'clock; meeting called to order by Mr. F. S. Adams, President of the Board of Agriculture.

ADDRESS OF WELCOME.

C. S. GILMAN, Brunswick.

Mr. President, Gentlemen; Members of the Sagadahoc Agricultural Society and State Board of Agriculture:

It seems proper that we should extend a warm, hearty welcome to the State Board of Agriculture. Their presence here, I have no doubt, will be the means of great good to the department of agriculture, especially in the dairy department.

The State Board of Agriculture is the organization through which the farmers are presumed to reach the legislature and the governor of the State of Maine; and in the past has been the instrument or lever of great usefulness.

Its functions and responsibility, it seems to me, will be much greater in the future than it has been in the past.

Maine has an area of 35,000 square miles. As large as all the rest of New England. Our population increasing, our railway system being extended; our manufacturing departments enlarging; it seems to me that there is a great duty for this organization to perform in this State in the future. While the legislature of the State of Maine has a large per cent of farmers,—still as you well know, the subjects that come under the consideration of the department of agriculture, are more thoroughly thought out, more thoroughly considered by the State Board of Agriculture, than by a committee of the legislature of the State. Therefore the State Board of Agriculture is the medium between the farmers' interests and the legislature of the State; and I think that the reports and the conclusions of the State Board of Agriculture in the past years will bear comparison with similar reports of like organizations of the other states of the Union; and it is my judgment, however poor it may be, that all the money expended by the State in the maintenance of this organization, is money well appropriated.

In its session, a year ago at Auburn, the Board of Agriculture I think, had to do, very much with the same questions that are under consideration to-day and to-morrow here.

I believe, and I think that a majority of the farmers of the State will agree with me, that while the horse is a most useful animal, very rapid in its movements, a most beautiful combination of muscle, yet at the same time it is about time to bring the cow to the front.

If you consider the value of the milk product in the State of Maine; of the butter and cheese product, I think it will compare favorably with the value of our horses While the State of Maine stands forward in bold relief in the culture and development of the horse; at the same time we can make many improvements in our dairy department, which is essential in the economy of life;—it is human sustenance. We can live without the horse; we cannot live without the dairy.

We welcome you here; and permit me to say to you that the Sagadahoc Agricultural Association commenced its career in 1834; and from the period of its birth to the present moment it has been active, and the public are satisfied and gratified with its mode of proceeding; and I think it would be very difficult to find an organization of a similar nature in the New England states, that has been maintained with more efficiency than this.

Now the members of this organization, the president, is here; and I hope and trust that the exhibition here to-day,—these combinations for milk and cream and butter, will so impress the officers of the Sagadahoc organization and the executive committee, that they will intensify their efforts in the dairy department to the benefit of the organization.

Mr. President, there have been great changes in dairy methods. I am not a very young man but I can distinctly remember when these appliances, these exhibitions of human genius, these chemical processes, these experiments, these results did not obtain. It was the old style. Now we are emerging into new light and I sincerely hope that the members of our organization, and others in the State, will see to it that the dairy department has its proper position in the public estimation.

I do not wish to detain you by further remarks, only to express my great gratification at your presence here to-day; and I hope that the papers read, the lectures given and the discussions that follow may be profitable to all concerned.

REPLY.

B. Walker McKeen, Secretary.

Mr. Chairman, Ladies and Gentlemen:

I assure you it affords me great pleasure to stand in this meeting and respond, as a representative of the Board of Agriculture, to the eloquent words of the honored gentleman who has given us such a cordial welcome. From the time I first thought to hold the meeting in this place, under the auspices of the Sagadahoc Agricultural Society, everything has moved along smoothly; I have received the most hearty co-operation from all the members of this society with whom I corresponded or met personally; and the success of this meeting is particularly through their efforts.

I wish to say gentlemen, that we heartily and sincerely thank you for these efforts and the kind words of welcome with which you have greeted us.

I think it is not best to occupy much of your time at present, because we have other things of more importance on our programme.

Explanations of the manner of using the separator and Babcock milk test were given while the audience were shown the practical working of the machines.

THURSDAY, P. M.

Meeting called to order at 1.30.

CONSTRUCTION OF THE DAIRY HERD.

By Dr. GEORGE AUSTIN BOWEN, President of the Connecticut Dairymen's Association, Woodstock, Conn.

Mr. Chairman, Ladies and Gentlemen:

I am very glad to come into Maine to meet the dairymen in this section of the State; because I believe that out of these dairy meetings a great deal of future good will grow.

I understand that dairying in this State, is, in many sections, in that old way that it has been carried on for many years, and that new ideas and new notions do not yet prevail to the extent that they should; but when we see dairymen meeting and find that year after year they are developing an interest; we always look for, and generally find a permanent organization following; and I think in the good State of Maine you will have, in addition to the State Board of Agriculture, a State Dairymen's Association, which will develop the dairy interests of this State and make them far greater and far better than they are to-day, and the pecuniary returns double what they now are. I believe it can be done; I believe it *will* be done.

Now, I did not come up here from Connecticut with any new ideas regarding the dairy, that are not known to all dairymen. I did not come with any new process of separating cream, any new breed of cattle to advertise; but I came simply to talk with you as one farmer would talk to another without any oratory at all; simply an interchange of views on the dairy subject

I come here as a radical. I am generally radical in everything I undertake. I do not mean by that something that is cranky, visionary; but radical means the *root*, and down in Connecticut the Yankees try to strike at the root of the matter. We have not got to it yet, bnt we are studying and studying it; and we believe we are getting closer and closer to it.

I shall probably make some pretty radical statements; and the first is,—that the dairy business in New England, is the best business carried on in its limits without an exception. It is better than preaching, it is better than politics; it is as good as railroad-ing when you consider all the money that is put into it. The railroad man, who has invested in railroad stocks looks for his six per cent dividend, or his ten per cent as many roads in New England are paying; but he is never sure of his stock. Some man like Jay Gould—thank the Lord he cannot wreck any more railroads;—wrecks his road and his stock is gone. The dairyman knows that no one has any greater power over his stock than he has, and if he goes on with the intelligence the business demands, he can increase his six per cent every day and every year. I believe that New England is best adapted to the dairy interests of any part of our country. It is better than the South, for there they have no good grasses. If they have, they have got to cultivate them as carefully as they cultivate their cotton and their corn. The West has its luscious grasses but its streams are alkaline; and without good, pure water we cannot have good, healthy stock; we cannot have good butter. The large cities are all in the East, so to speak.

Here will be the market of the future as it is to-day. We are near the markets; and there is another evidence of its being a good dairy region; because the market must be considered just as much as the development of the product itself. There have been a great many developments in the dairy within the last decade. We have seen the idea come forward that the old milk pan of our fathers could be superceded by a better process. You ali remember when in driving through the country, every farm house showed its row of bright milk pans set out in the sun, evidence of the thrift of the housewife and the great labor devolving upon her.

Now the whole condition has changed; the Cooley process has come in; the separator process is coming rapidly before the people and the housewife no long r makes the butter, but the farmer himself makes it unless he patronizes the creameries as all progressive dairymen should.

With the increase of the apparatus, a benefit has come also in the improved dairy cow. We find that it is no longer the old fashioned scrub cow, good to make butter in June; good to make a little cheese in July and August, and the rest of the year only good to consume fodder, unless in the spring she had dropped a bull calf, that would make a fair ox.

But we have no use for oxen on our farms now; the ox has gone, and the horse is taking his place. The progressive Yankee people find the ox too slow; if we want to get out of our own neighborhood into the next town, we must have a horse to take us there.

When we work on the farm we want to work at the same rate of speed we do in driving to our neighbors; so the ox has gone and the ox man has gone. I need not tell you here in Maine, that the horse man has taken his place; and that old cow has gone in many sections, and it is hard work to find the old native scrub stock. You will find them tinctured with Holstein or Jersey blood; and you will find the dairyman has gone to talking stock; he talks stock on all occasions; he is getting to have a good deal of knowledge of his subject and that knowledge is showing itself in his dairy.

We are getting knowledge of the dairy cow; we find we have departed from the old type and a new animal has taken its place. It is not built the same; does not look the same or act the same as th old cow of our fathers.

One of the most progressive ideas of the times, is this of the dairy interest because it is coming down to one of the practical points of life; it is one of the food supplies of the nation; it is going to be a greater food in the future than it has been in the past. It will develop in wonderful proportion I take it, in the next ten years. If we can read the history of the future by looking into the past we have the right to come to that conclusion. We find that a different class of men have come upon the farms. They are making a study of the animal; they have got to be intelligent men. The old fireside farmer who did the work by manual labor has passed away or is to pass away. We find it is the intelligence of our farmers, not muscular strength alone, that is needed. The man who intends to farm by muscle alone these days, nothing but brawn in his arm that is to bring him out and lift his mortgage, is a good deal like the Irishman, Ole Bull, found playing in a show. Ole Bull was the finest violinist in the country. He stepped up to him and said, "My friend, you play by note, I suppose?" "Divil a note, your honor." "Then you play by ear?" "Divil an ear, your honor." "If you don't play by note or by ear, how do you play?" "Be main strength, be jabbers."

We have got to learn to play by note; then we shall stop growling and have a good tune fit to march to at any time.

With the change in these farmers and in the type of the cow, we find a change in the farms. I believe that all good farming must depend upon some system of stock raising for its future. Otherwise, down goes the farm, year by year, it decreases in value, and the mortgage increases every day. But where we find stock-raising in some of its branches, raising horses, and better yet, the cow and sheep *There* we find the farm building up, growing richer year by year and the man who sells his cream, is selling the part that costs him least; that takes away less of value from his farm than the man who sells whole milk or the man who sells his hay; or simply grows stock, and sells that.

We find the dairy farms of other countries are increasing in value; we find that the buildings are improved; the stock is better cared for; the barns and out-houses are better; that with that increase in the barn comes a better homestead, better improvements there. And really, when you bring it down, that is all we have in this world; just our homes.

You can talk about views abroad, of the idols of other countries, all that goes to make up the general outside life, the farm home, I believe, is the truest home in this country. And there is where we get all our satisfaction, all our happiness. I am sure that to me, the happiest moment of my life is when I get into my street and see my own light twinkling in the distance. That is the most satisfactory, after all my jaunts through the State, to get home and get the welcome I find there.

We find a general improvement throughout the farm, beyond the farm buildings and the farm home. We find the intelligent dairyman is bringing up his mowing fields, making them better. He is getting rid of his division walls—you do not have many in this section; but in some sections of my state we have our walls. We find the dairyman wants long runs for his mowing machine and plough. He has taken these barriers away and sunk them, gotten rid of them in every way and improved his mowings, got them broader. Once having got them in good shape, he tackles the other job, the New England pasture. We find him draining wet places; cutting brush and burning it, killing stumps and working to better the condition of the land. And we find in a series of years that his farm is coming up, up, up; it is better year by year. In every instance where it is intelligently carried on, we find the mortgage burden decreasing—for I am sorry to say that there *is* a mortgage burden throughout our country. It is not New England homes alone; it is Western homes as well. I do not claim that farms are mortgaged more than other property; but *all* property throughout the country bears mortgage burdens. It is a shame and disgrace that we should be living under a system that will show in that way; but such is the fact.

With the improvement of the farm, comes the greatest improvement of all; the improvement of the dairy farmer himself. We find that he is more of a student; he is looking into the farm ledger more, that he is studying chemistry and physiology in order to understand the wants of his horses and cattle. And he is a pretty thoroughly informed man upon these points. The dairyman wants to be an educated man; it is doing away with the old idea, that as long as he knows enough to do a little sum in arithmetic, can keep his accounts on the margin of the almanac page, he is a good farmer. We find that will not do to-day. The dairyman opens an account book; he has got to do it. He learns after a while to figure out how much his crops cost him, how much his stock is bringing him in. We find it is making a pretty systematic business man, and when we have found a good business man on a farm, we find it paying just as much as it does a good business man in the factory. You will all agree with me that business carried out on business principles will always tell on the credit side, for if it tells on the other side, the man stops. No one continues in business at a loss. It is the *profit* he is looking after; it is the profit in this dairy system that we are individually to receive that we are looking after. We find that the dairy farmer is looked up to more than he was. There could not be this intellectual growth without it being recognized by the people at large; it tells in his favor.

I do not know whether you have had the same experience. It illustrates the point particularly well. I had a lady say to me—a very aristocratic lady—she looked me up and down and said "Dr. Bowen, I don't see how you can love your land as well as you do. And what there is about a cow to excite your admiration I cannot see." And her aristocratic nose went into the air. I told her I loved my land because it was generous to me; more so than my friends, for it supports me; and, "I admire my cows because they are exceptionally well bred, and I do admire good breeding whether in a cow or woman." Our friends wondered why there was such coldness after that, but it shows the recognition that many people have of the farm.

Now what is the type of the dairy cow? The dairy farmer has got to select a type and he must adhere to it when he has made that selection for therein is the whole success of his business. It will not do, simply to keep a herd of cows—good cows; you will say every cow is a good cow to its owner; we hear of few poor cows; but I think if we were to take the Babcock test and go through a majority of herds we would find a great many of the good cows were not even fair cows. Unknown to the farmer, he is keeping them at a loss instead of profit I know of but one way of building up a herd, making it better. That is, to have a clear understanding of what you are going to do, whether you are intending to make butter or sell milk; and get the cow that gives the greatest proportion of the milk product or cream product; and then keep in one line. That, you will say is as old as the hills. So it is. You have known it, I have known it; we have heard it time and again. Like the old darkey who said to me "Boss, we's got to have line upon line and postcript upon postcript; here a line and there a sermon." I shall not give you a sermon, but simply the line and the postscript to-day.

The type of the cow must depend entirely upon the business that you intend to carry on.

When we look at the dairy cow to-day, we find that there are two or three grand characteristics running through the whole of them. We will find a cow with great digestive capacity. That is the first thing to look at. We will find a cow of grand constitution, we will find one with firmness of the udder and mammary glands. You will say, that is all there is to the dairy cow. So it is; but let us look at the detail, let us study that, because in the detail of this animal are many essential facts that will aid us in selecting our herd

We see a grand good constitution. Where do we look for that? The first thing that attracts your eye would be the brightness of the cow, the look of her eye, the quality of her hair. The lustre of the hair and the general uprightness of her carriage all tell you at once that there is vigor. She should walk, not with a shambling gait, but with strength, carrying her head with courage, showing that she possesses the best of all temperaments, the nervous temperament. In looking her over, we shall find that every indication of her body shows constitution, great lung power, capacity to receive air, and there we know is the source of all life. It is the combustion of the oxygen; if there is a little furnace in the chest there cannot be great heat in the body, but with large lungs we know her digestive capacity for air will burn more oxygen than a narrow chested cow. We look for the deep chest, the good sloping shoulder, about like the trotting horse. You don't want a horse with a shoulder built straight up and down, for the long sloping shoulder indicates depth of lung, and you have a *stayer* on the road. The same is essential in the dairy animal.

Look down the cow a bit to see what there is there. You will find that great paunch not like those calves Dr. Bailey spoke of, but a good sized paunch that can carry a large amount of food, so when the cow lies down she has a store house and can chew her cud and get nutrition out of that. We find that the whole frame of the dairy cow indicates dairy characteristics. It is not a firm frame; I do not mean it is not a firm bone; but if you could see the skeleton of a good Jersey or Ayrshire cow, you would find a certain amount of ruggedness about the bone; the fine knit bone of the thoroughbred, and on it prominent lines and oppressions are particularly well developed, giving strength to the holes for the blood vessels. With a large hole in the bone, there is received a large nutriment vessel. So you will find the dairy cow has a rugged frame rather than finely drawn. I do not mean, a *coarse* frame; that is another matter; but you will find that the back bone is notched showing well the vertebra; a well developed tail piece set high; thigh bone of good size, but the thighs themselves smaller All these things have a reason for them. Let us take the reason for this notched condition of the back bone. You will find when nature builds a bone she carries out the rest of the characteristics to correspond with it. She does not build that strong, well developed bone without the corresponding parts being well developed. That is the cushion between them; for there is a cushion of cartilage between each vertebra. They give flexibility to the back, the thicker they are the more elastic and supple the animal, *vigor* again, you see the point? They show constitution, by their development. They separate the bones more. You can illustrate that yourselves by any of you, tall men standing up against the wall and measuring your height, making a mark thereon with a lead pencil. To-morrow morning, stand there again and you will be surprised to see that you measure half an inch more than to-night; simply because these cushions have carried your body during the day and have become compressed. By sleep, they are elongated and you are of your natural height. I have found individuals who measured one inch more in the morning than at night.

When one has selected the dairy cow of their idea; this large digestion; this large lung and heart power; an animal of good, vigorous circulation, good udder; he has then got simply a machine that is going to do his work. Now a machine would not do good work if it is quietly put aside and left alone. Here is a machine for separating cream, but it is of no value unless you put the milk in for the separation of the cream When you have got your dairy cow, she is of no use unless you take care of her, feed her; and there is the grand secret, beyond the breeding, in the feeding

We hear a great many people say, "I don't care anything about the *breed* of a cow, it is the feed that makes the difference." I think that it is the breeding that is first essential, and after that the feeding.

I believe that the dairy cow has been bred for an especial purpose. She has been bred for generation after generation and we have an animal that its type is fixed. You know how the type of different animals has become fixed in your own locality. How the type of certain horses has become fixed by inbreeding Some can tell a Knox horse as far as they can see him. We can tell a Jefferson horse by his conformation. So in the dairy animal; it has become fixed by systematic breeding. That is one of the strong points in the breeder's art, that he can fix the type. I think it is a strong point that nature established in the beginning, that there should be change. Nature is constantly changing. We can take individual animals and make them so we can produce changes; then take those changes and remake and carry out that change and establish new breeds of horses and new breeds of cattle We find that these attempts sometimes are not successful, because the individual does not understand the laws of breeding, the laws of change, the laws that take back to other generations, the law of heredity he is attempting to break up.

After selecting your type of cow, I would advise that you stick to it, and stick closely; not allowing any deviation from it. Like the old darkey out on the Mississippi river. He was fishing and kept catching cat fish and throwing them away. Some one on a little tug boat looking at him, said, "Why do you throw away all your cat fish?" He looked up and says, "Boss, up to the hotel they tell me they wanted eels. I is bobbing after eels, and when I be after eels I sticks to eels. When I goes catting I will stick to cats"

So when we are breeding for a certain purpose, stick to that one line.

What are you going to do with your present herds of cattle where they are made up of scrubs? You have to get out of them what you consider a good herd, about what you can handle on your farm. How can you change them? There are two ways. One is to go out and buy the best cattle you can find. You can always find good cattle for sale, but there are very few people who have a purse long enough to buy an excellent herd.

I know of no other way for farmers, but to build up their herds; and there is where the money is coming in. It is easy perhaps to buy a good animal here and there; but we are talking of the dairy business for profit; and wherein is the profit in buying an animal, and then find you have been sold instead of the cow. Now of the cows you own, you can make a selection,—take best animals of your herd and dispose of all others;—"cleaning them out," as the expression is, at the largest prices you can get for them. I believe that two cows, specially bred. are better than four cows that are not adapted to the purposes for which you are using cattle. The great principle of building up a herd, is to build it up of your own stock; selecting your best material, having your ideas as to what you are intending to have; then mate them. Send abroad for your sire of future stock. Get the best that comes to your ideal. The point wherein one blunders more than on any other is in the selection of the sire. A common animal will do, they say; but among the breeders there is a little saying, that "*The bull is half the herd.*" That is, if your herd is worth a hundred dollars, you can afford to pay fifty dollars for the sire of the future calves. If it is worth $1,000, you can well afford to go out and buy an animal for $500. Then by building up, you gradually bring up the herd. You can take these animals, the first cross and breed them back to their sire and you will get nearer to perfection. Now do not misunderstand me there, by saying that I advise in and in breeding. I do in the skillful breeder's hands. I think where you have your scrub stock, you can get a thoroughbred sire. It is not related, but of a different class of animals. The farmer who has ordinary knowledge can breed back the second generation to that sire and build it up and make it better. In the hands of a skillful breeder, who understands the physiology of the animal, the temperament, we find it can be carried on for three or four generations to the advantage of the animal, not to the detriment You will talk, perhaps, of incestuous breeding, but it is not so, because in animal nature it is not so, because in the animal nature that style of breeding has been carried on for generations and generations It seems to be the law of the lower animals, that the mating should be done among those related. You know about a covey of quail; they pair from the same source again and again and so it goes. It is the same with most wild animals. It is only in the higher animals that we have a different law established; and even in those higher animals, I think a great deal of investigation might be carried out successfully to establish the point that in and in breeding has brought out some of our strongest and best men. I had a little paper sent me a while ago on that point; I have it here. It is the pedigree of Moses, the most illustrious law-giver of the world. You will see there his tabulated pedigree traces twelve times back to Terah. You will see the point I would make in that.

I believe that a calf raised on the farm is of much greater value than one brought from abroad and brought into the herd. It is wonted to the place and wonted to the man.

We find that a great deal is said in the West about tying up animals; that they do not fatten as well as those fed in the fields. I have asked why that was so; in the East we believe that the animal that is housed takes on fat faster and is better for the shelter given it, than to shelter them as they do, on the lea side of a barbed wire fence. Intelligent breeders there have told me that they supposed the ill condition was caused by bringing an animal that has been in the open air into a strange place. It is irksome of the restraint. It is that point which makes it so nervous that it does not feed or fatten as readily as one that will roam. I believe that is the solution of the Western problem of fattening.

I think if we take the same idea with regard to cattle we buy and bring upon the farm, we shall get one of the reasons why the home bred animal is the best one. After we get our calves, what then? One or two generations are they any better than the others? Yes. You will see them improving; they have less scrub appearance; take on more and more the form of the sire; more symmetrical in shape. They show it in the udder, in the milk. They have developed a better hide; a better color to the hair; getting nearer and nearer to the dairy type. The flank is running up and developing behind.

I have in process of drawing a number of illustrations; but I did not suppose I should be obliged to speak on the subject until the latter part of January. The artist went away and I was not able to bring them.

Here is the picture of a cow, descendants of which I have; one of the most celebrated of the Jersey family, old Dandelion. You will see what I mean by the dairy type, with the high rump, high hip bone; the general appearance of the dairy cow, and you will find that you can somewhat develop that condition of things, that dairy quality, by feeding. Dr. Bailey spoke this morning of giving so much rough hay. I believe that a certain amount is favorable, it distends the paunch, it springs the ribs out; the ribs are broader by reason of that distention by the hay, but stay them there by the grain ration that follows it. I think that is the whole secret, beyond breeding, it is *feeding* of the animal, and the man who constructs the dairy herd can do very much by proper and systematic feeding.

If you take a heifer that has been ordinarily fed and give her a better ration, you will increase her milk output, and the calf from her after her milk is better established, will be better than her calf produced while she was illy fed. I think you can raise a dairy animal that will go ahead of its mother. You will do that more by feeding than by the coupling of the sire and the dam. It is a maxim, that "bad feeding will mar good breeding." We can see that in the human race as well as our cattle. It is said by physicians that we can take the strongest individual and feed him so that we can produce tubercular consumption in him within six months, so lower the tone of the system that the seeds of the disease will find lodgment there and the individual will show the condition. By good feeding the animal is kept up in tone and resists all these bad influences. It is not in a receptive condition and the health improves and with the improved health we find improved offspring that follows.

I have gone roughly through these points. I will show you one or two pictures of dairy cows.

I am often told by men that they wouldn't give a cent for the pedigree of an animal. I believe any good farmer will ackowledge, if he will give careful attention to the subject, that pedigree is the basis of all good breeding, that he would not buy an animal that did not have a good pedigree if he was buying for thoroughbred. Would you not have an animal traced two or three times to a cow such as these rather than a Shorthorn on one side and an Ayrshire on the other with scrub blood behind, mixed with different types? There is something wonderful in pedigree, when we carry it to a nicety and see the percentage of the blood of dairy animals in our herds. We find, that every time a good pedigree is duplicated in an animal that we get bet er milk quality. I will now leave the subject to your consideration and discussion.

HOW I MANAGE MY DAIRY.

By Wallace S. Weeks, Augusta.

Mr. Chairman, Ladies and Gentlemen:

Our secretary has asked me to tell you of my dairy and how I manage it I want you to forgive him this sin; it is his first offence and he did not know just what he was giving you. I will try to be brief and not oblige you to listen to that which I fear may interest only a few.

My farm is situated in Augusta and Vassalboro on the Kennebec river, about five miles from Augusta, and contains about 200 acres of mostly clay loam soil This is divided into tillage, pasturage and woodland about equally.

I decided, about seven years ago, to make the dairy business a specialty. I started in to make butter with the shallow pan. I sold my butter to private customers at Augusta for twenty-five cents a pound; started in with only four cows, but I made up my mind to increase my stock to twenty as fast as I was able, by raising my own stock, mostly. I followed this method and now I have sixteen cows, and two two-year-olds and two yearlings and a calf. Only four of these are thoroughbred, the rest are grade Jerseys. I have a thoroughbred Jersey bull.

I continued to make butter with the shallow pan for about two years; but I found that as I increased my stock, that it increased the work of taking care of the milk, and I needed more room.

From that I tried the d ep setting system, using Crocker's Creamery which is similar to the Cooley. This was a great improvement, for I could increase my cows without adding much to the labor of handling the milk.

My customers who had my butter, would ask me for sweet cream, which I furnished them. Soon others commenced to enquire for it, and I finally decided to start a cream route and build up a trade in this line. I had about five hundred call cards printed, like the show cards of grocers; stating on the card that I would furnish sweet cream Tuesdays, Thursdays and Saturdays for twenty-five cents a quart. These I circulated among the best families, and told them to place them in the window and I would call and deliver on those days. My trade the first season was small. It was a new thing; people were not used to having good, sweet cream on the table every day, and thought they couldn't afford it; but they soon found out it was good, and like many other things, the more they had the more they wanted. This is evident from the fact that now I am selling most of the cream from twenty cows, and two other parties follow the same business, and either of them are selling more than I did the first season. In addition to my cream, I sell a large portion of my skimmed milk for from six to ten cents a gallon. I also carry fresh vegetables, eggs, berries, etc. I do not raise them all myself. I buy some of them from my neighbors. All my farm produce in its season I carry in with the cream. I also leave my cream on sale at different grocery stores so my customers can get it days I do not go.

About two years ago I attended a Dairymen's Conference at Winthrop. I saw the separator used there and had quite a talk with Governor Hoard about it. I decided I wanted one, and ordered it from Kendall & Whitney. I have used it two years, every day, and have never paid out anything for repairs. It runs better to-day than when I first got it. I separate my cream as soon as it is milked; then cool the cream down to about forty-five degrees and put it up in glass cans.

I use the quart, pint and half pint sizes. These are sold for thirty cents a quart, fifteen cents a pint and nine cents a half pint. Since using the separator I have raised the price of my cream, for the reason that it contains thirty per cent of butter fat against twenty per cent with the creamery, and gives much better satisfaction. Now this is the way I dispose of the product of my dairy. Perhaps a few words would be of interest as to the cost and care, and how I manage it. This I will give you and you can pick it to pieces.

How to care for the cow so that she will give me the largest net profit is what I consider the secret of dairying.

A good, No. 1, dairy product, whether milk, cream, butter or cheese, is sure to find a ready market if put up in a first class manner. So the main question is, how to reduce the cost of it. To do this, we have got to feed economically; we have got to understand the cow and her wants and know what she is doing. We have got to study her, and every cow is a puzzle. She is not just like a common puzzle, that when you have found it once you can do it all right forever after, because she will change, and you have got to study her right along, and know when she leaves off doing well. I did not understand this when I begun and I have not received the profit I ought. But I have been studying and am getting some light. Last winter I made up my mind I was keeping some cows that didn't pay and I must find out which ones they were and dispose of them To do this I must have a Babcock milk tester, a set of scales and some record blanks on which to keep the record of the cow so I can tell what she is doing. I found these blanks were furnished by different publishers in different forms, but I had some printed to suit myself.

In the first column is the name and number of the cow. Across the top are the days of the week; under each day are two columns. In the first I record the morning's milk in pounds; in the second, the night's milk and so on through. In the next column will be added the total of each cow for the week. In another column you will find the total for the herd for the week. In another column is found the amount of butter fat for each cow for the week; and the average for each cow for the week. They are in this form.

ACCOUNT OF MILK

Produced on Meadowdale Farm for the week beginning.........189 .

Number.	Name.	Sunday.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Total number of pounds.	Average per cent of butter fat.
1	Daisy.................									
2	Jennie.................									
3	Rosa..................									
4	Pansy									
5	Cenny									
6	Geneva................									
7	Pug...................									
8	Hulda									
9	Buttercup									
10	Clover................									
11	Mollie									
12	Sooky									
13	Dona									
14	Topsy									
15	Dora..................									
16	Blanch									
17	Lillie									
18	Brownie									
19	Betty............									
	Total amount of each milking...............									

Average number of pounds per day for all cows milked..............	
Total per week	
Average per cent of butter fat	

I have these blocked together and hung over the milk table, close to the scales and as soon as the milker milks a cow he hangs the pail on scales and sets the amount down in the column opposite the name of the cow and the work is done and it has taken him only from six to ten seconds to do it. At the end of the week this is torn off and filed away and you have one ready for the next week without any waste of time. The footings can be taken at any time, you needn't do it for three months if you don't want to. If I want to make a test for butter fat, I take this case of bottles. Each one is numbered on the stopper, and on the lead around the neck to avoid mistakes. These set on the table by the scales, and as soon as the milk is weighed and recorded it is turned into another pail and stirred with this dipper, and a dipper full taken out and turned into the bottle, the number of which corresponds to the number of the cow. This I repeat for six milkings. The case containing the bottles is kept in a cool place. Each one of these samples is then thoroughly mixed together and a pipette sample is taken from that for the tester. If I don't have time then to work the sample through I set it away; because it won't injure if it sours; because the fat is all in there and you can find out any other time how much there is of it. By this method I can find out just what each cow is doing and know just how much she is paying me. I find that my cows, according to the scales and Babcock milk test, —if I had made their product into butter for the past year, that nine of them which I have kept right through, would have paid me $25.50 net profit. This I get by reckoning cream enough to make a pound of butter, at the door, worth twenty-one cents and skimmed milk worth twenty cents per 100 pounds. I have allowed the cost of keeping the cow from $45 to $50. In making this estimate I have allowed six dollars for pasturage; I have allowed from fifteen to eighteen pounds of hay a day for six months at twelve dollars a ton. I have allowed one dollar for green corn fodder fed in the pasture; two dollars for fodder fed in the barn; twenty dollars for grain. That would give me from six to eight pounds of equal parts cotton seed meal and shorts per day, for eight months. This, I think, would keep a cow in good shape for a year. I also allowed two dollars for salt, saltpetre, sulphur, and other necessary expenses that come along. I called it one dollar for green corn fed in the pasture; my pasture is old and does not yield what it ought.

Last spring I plowed up an acre and planted to fodder corn and used superphosphate in the drill and fed it green in the pasture. That worked so well, I intend to put in two or three acres in the same way and feed it the same, another year, seeding down the old piece every second year. When I cultivate the corn the last time, I sow the grass seed on with a little winter rye. I believe in this way I can increase the flow of milk and improve my pasture without expense, because the corn will pay for all the work. I reckoned the cost of the acre of corn fed this year and found for the sixteen cows it would cost me seventy-three cents each. I did not reckon the cost of cutting and feeding. I am also intending to put in a silo next spring, because I think corn fodder is the cheapest feed for dairy cows.

I keep my cows in a good, warm tieup, and they are not turned out doors from November till May. They are watered in the stable by being turned loose twice each day. The water is pumped into the stable from a well, some 200 feet distant, by a Buckeye pump. The water is not warmed and never freezes.

I think this is better than turning them out in the cold to drink ice water.

I have followed this way for two years and my cows are contented and have done well.

I will not trespass any longer upon your time.

If there are any questions that I can answer, I shall be pleased to do so.

Ques. How long does it take to separate the cream?

Ans. My separator runs through about two quarts a minute. It runs through from 280 to 300 pounds of milk an hour. The separator here yesterday run 200 pounds in 42 minutes.

Ques. Do you seed your ground to grass?

Ans. That is my intention. In marketing my cream I am obliged to use ice. I market my cream for the table, and it is necessary that it should be kept sweet. I cool it to forty-five degrees and put it up in glass cans which seal perfectly tight. There is a little paper cover that comes with them, which shuts on and seals up so the bottle can be carried in any position. I pack them in ice as soon as I seal them. It will keep three or four days.

Ques. Have you weeded out your cows?

Ans. I have. The standard I am aiming at, is to keep cows that will yield 300 pounds of butter a year. I have cows now that will do it. I know for I have the figures. I have one cow that has given me, since last March, or in ten months, 6,000 pounds of milk which tested four and two-tenths per cent of butter fat on an average of eight or ten tests. That cow will do better than 300 pounds of butter a year. I have another cow that has given me 5,000 pounds of milk in the same time, that tests 5 1-10 per cent. She will make more butter than the one giving 6,000 pounds; but I consider the one that gives 6,000 the best cow. I have a cow that only gave me in a little less time, 3,586 pounds; which tested on an average for the time, five and nine-tenths per cent, almost six per cent. She was giving a small mess of milk, but it makes almost as much butter in a year as the others that give almost double.

Ques. Do we lose forty per cent of our cream by setting in shallow pans or in creamers?

Ans. No. I do not think you do.

Ques. I understood you to say that the cream that yields you thirty now only yielded you twenty per cent when you used the creamer?

Ans. I said I had raised my price for cream, for the reason that the cream I have now, contains thirty per cent of butter fat, when the cream I took by the creamer only contained twenty per cent. I presume that you can get cream from pan setting that will average thirty per cent. The Cooley raises more milk with the cream; you have more skimmed milk in it.

Ques. What is the difference in the amount of cream by the Cooley creamer and the separator?

Ans. As I separate my cream, I separate nearly one pound of cream from seven pounds of milk. Take the average for the last nine months, take the whole of my milk, would give me just about one pound of cream from six pounds of milk; but I have sold some milk whole. When I run the creamer I used to get one quart of cream from four quarts of milk. This from the separator to-day, was one quart of cream from five quarts of milk, but by turning that screw in the machine, you get better cream.

The trade demands better cream. People prefer to pay five cents more and get it. If I was creaming milk for any purpose, I should prefer the separator. I think the separator is the best method I have ever seen. It takes time; you must turn the crank. After you become accustomed to it, it is done more easily than you would think.

I have a hired girl sixteen years old, who separates my milk wholly, I do not have to attend to it. I do not think it takes any more time with the separator than in using the creamer, and when the skimmed milk comes from the separator it is just right for the calves.

Mr. Blaisdell speaking about the gravity process and separator process, I believe there is no one thing that the farmers are so ignorant of as the ability of getting the cream out of milk. I will tell you my experience; getting out of ice, with a herd of twenty cows, in one month.

Now this gentleman spoke about losing forty per cent of butter fat by the deep setting process. I say you can lose forty or fifty per cent if you don't understand the process. I can take a can of milk and set it in water at a temperature of fifty or sixty degrees and get two inches on the can, although it may be richer in butter fat. Set that can into a temperature of forty-five degrees you get four inches of cream. I got out of ice and sent a team to Bangor, fourteen or fifteen miles, after a ton of ice to last me a month. It cost me four dollars and inside of twenty-four hours I raised my cream up fourteen inches a day which paid me $1.40 a day or $42 a month. The great secret of making the dairy a success is for you to find out if you have good cows.

IMPORTANT CONDITIONS IN DAIRY PROGRESS.

By L. F. Abbott.

The production of choice dairy goods, the kind we are talking about, presupposes the one great factor of pure milk behind them. And pure, and good milk, in the main, is dependent upon the three requisites of good cows, good feed, and a regenerated dairyman. With most any kind of cows, fed upon ordinary kinds of feed, it is possible to produce good butter, but when you add to the combination a dairyman yet in the depths of unregeneracy; unenlightened by the grace of the gospel of the new dispensation which has dawned upon us in the last years of the nineteenth century, the product is a shock to æsthetic tastes, a libel on human nature, and an insult to the cow.

Butter or cheese, to be of the highest quality, must be manufactured from pure milk. Milk off in flavor, from whatever cause, is always off. No mode of handling after it leaves the producer's hands, can eliminate one jot or tittle of barn flavor, or neutralize the faults of filthy dairymen. Barn flavor, like the man on the town, once there is there to stay.

In the evolution of systematic and ideal progress, dairying has come to be a fine art. The business no longer rests upon the primitive base of a cow, a stack of hay, a small boy with a big dog and a pump. Skipping the dairyman we have jumped to high ideals in stock, in feed and fixtures; dropped the dog and consigned the pump to the commercial milk man.

Then, we say, educate the dairyman. So if I was going to use a text it would be: More education and enlightened practice at the barn. As we glance over the dairy field we have to admit that there has been a creditable advance in dairy progress within the past decade. We have better dairy stock, and have adopted better dairy methods, so far as handling the milk or cream is concerned after it reaches the factory or milk room, at least. The butter maker has been duly instructed in the arts of manufacture, but while there has been a great deal of instruction in the line of handling the milk after it comes from the cow, comparatively little has been said concerning the production of a clean, wholesome milk, free from taint from the barn, and how to attain that desirable end.

Hence, the crying need is for educated dairymen and cow owners; men skilled in the art of milk production and the most cleanly methods of drawing it from the cow, and caring for it until the cream is deposited in the cream gatherer's can, or at the factory, for it is this factor behind the butter and cheese factory which has a far greater potency in determining quality in dairy goods.

New York, Massachusetts, Vermont, Maine and other states, have their dairy schools. Professors of agriculture and directors of experiment stations explain to large audiences of farmers and dairymen the workings of the Babcock tester and other improved machinery, and these are all admirable factors at that end of the process, but it leaves the dairyman yet in the bonds of iniquity. For all the art and instruction of dairy philosophy and acumen, are not equal to the task of eradicating an iota of the barn flavor from the cream that comes to their hands through the careless, shiftless, or lazy dairyman, whose filth-bedraggled cows produced the tainted cream.

The case is even worse with the thousands of small dairies distributed throughout the country, for it is in these small dairies that probably three-fourths of the butter produced is made. And also to their credit largely must be placed the millions of pounds of inferior quality of dairy goods which are thrown upon the market and sold at pauper prices, dragging down the prices of good butter, this making possible the prosperity of the oleo trade. It is among these thousands of dairymen, missionary work needs to be done; that the gospel of this new dispensation that seeks to educate the dairyman to the possibilities which affect his own best interest, may reach his heart and shine through the work of his hands.

The rank and file of cow owners on the farms of Maine and New England, have not yet become educated up to the great and fundamental truth, that it lies almost entirely with themselves whether the butter or cheese they produce at home, or that which the creamery produces with which they may be connected, takes rank among the elect when the product reaches city markets.

The rudiments in the dairy art are learned at the stable, if learned at all, and how well these primary lessons are learned has a tremendous bearing upon the subsequent work which the student absorbs at the dairy schools; because, if the first have been disregarded the latter cannot amend the delinquency.

The agricultural mind is apt to run in grooves. The traditions of ancestors are too often held sacred—not so much in honor to a sentiment as for a lack of individuality and force to break away from obsolete customs. The barn of our forefather's time was constructed to feed the stock from a wide, open crib, directly from the central floor, and generally with no partition between the floor and tie-up. And too often there were no shingles or battens on the walls to screen the stock from the searching wintry winds. Ten or eleven feet was considered sufficient width for the tie-up, and the one caring for the stock was obliged to walk upon the sill behind the oxen and other animals, or do worse.

Feeding from a wide open crib, with a standing invitation to reach as far as bow or stanchion would admit into the open floor, stock by spring were simply filthy monuments of unskilled care and keep.

But how much is the situation bettered to-day? We have better barns in many respects; they are warm; we have widened out the leanto and made it light, but nine-tenths of our farmers retain the same old method of feeding from the wide low crib, and so milk dirty cows with all the filthy accompaniments.

The uncivilized cow, generally speaking, is naturally of cleanly habits. She makes mistakes sometimes like other people, but not so many as her civilized owner. Under our artificial conditions she has no choice left her but to make the most of her circumstances, and farmers too often accept the situation, and make no effort to amend a faulty practice handed down from their fathers.

When we begin to talk about pure milk, we have a big subject on our hands. The modifications arising from various practices incident to modern ways, call for ways and methods to counteract influences which have a harmful effect, both upon the cow and her product.

The barn cellar introduces a knotty problem not easily solved; how to avoid the contaminating influences of decomposing ordure. The modern barn, as generally constructed, carries danger in its close and unventilated tie-up. These are points of most vital importance in the production of pure milk. I venture to say that it is an impossibility to produce milk even approaching pureness from cows housed in winter over an unventilated barn cellar which retains the droppings of the stock through the six months of winter, to say nothing of a close unventilated tie-up which, when opened in the morning will be rank with the fumes of ammonia and filthy scent of the droppings of the stock.

Then the question comes up: what shall be done to overcome these difficulties?

The only way while we must have the tie-up over the barn cellar is to afford proper and ample ventilation. This I have seen done to seeming perfection by the use of flues leading from the cellar up in front of the tie-up, thence to the roof, terminating at the ornamental cupolas. Two of these in a 75-foot barn, situated one-fourth the distance from either end, with connecting flues over the heads of the stock from the tie-up, seeming to afford complete immunity from deleterious effects of animals standing over the cellar, and also largely from the fumes of ammonia in a close tie-up.

The dairyman of the future we expect to see educated up to an ideal where his cows will stand over a floor near the ground, and thrice daily in winter the ordure, rendered odorless by the use of plaster or other deodorizer, will be wheeled to a distant point and disposed of in such a way that no suspicion of taint shall adhere to the pure lacteal fluid.

Now we have so much for the general arrangement of the premises. Let us go a little into detail in arranging our tie-up for the comfort and neatness of the stock, and the peace of mind of the fastidious dairyman as well; for to have pure milk we must have clean cows; but with the average feeding arrangements as we find them among the farmers, neither can be accomplished. The main reason is, faulty construction of crib and feeding arrangements. The whole secret lies in properly restricting the animal in its movement in front, but affording ample freedom otherwise.

The cow, like some individuals of the *genus homo*, given an inch advantage will take a foot or all she can get, and seem to feel hurt in her feelings that she can't have more. The cow is a fastidious feeder. Ever so hungry she doesn't devour her food indiscriminately, but the best and sweetest bits are eaten first, going through the whole amount time and again till the whole is consumed. It is mince pie first and plain bread and butter last, with your well bred cow. Hence, if there is a wide crib and unrestricted room to the front, the animal in reaching forward to discover something a little better than she fancies that lying next to her—distance lends enchantment you know, with a higher order of beings—she will befoul the platform on which she stands with consequences at once apparent.

To particularize. First a platform on which the cow stands, inclined a couple of inches to the rear, terminating at a drop of four inches. For the average eight or nine hundred-pound cow, five feet four inches is the right length of platform ; this will enable the animal to lie down comfortably with none of the dangers of the short platform, while the same ends will be conserved. Partitions three feet high running across the crib and extending three feet upon the standing floor should separate the animals. Three feet and a half space will afford fairly good quarters for the average sized cow, but three to six inches added are better. The partitions should be long enough back to prevent injuries from neighboring animals stepping upon the teats or udder while one is lying down. Most severe injuries have sometimes occurred from the sharp hoof of an animal standing in an adjoining stall with faulty partitions.

I wouldn't have these partitions too high giving the lonesome look of horse stalls. Cows, in keeping with a higher developed female instinct are social creatures, although not so much given to exercise of the tongue, yet, they like to scan their neighbor's toilet if no remarks are made. But each crib should be entirely independent of its neighbor. Let the crib drop two to four inches below the barn floor and yet have the bottom raised four inches higher than the platform on which the fore feet rest. Twenty-four inches is sufficient width for the crib with a plank next the platform rising twelve inches. Attached to this plank may be fitted the means of fastening the animal. Thus may a ring screwed into the centre, or an iron rod or short wooden stanchion arranged at an angle upon which the tie-chain or ring of halter may play.

In front of the cow, twenty inches from the bottom of the crib place a rack with six inch meshes, slanting towards the cow, and high enough to hold a fair foddering of hay, the foot receding to within six inches of the partition on the floor side.

Most farmers nowadays like to have a close partition between the leanto and the barn floor. This is right if proper means are used to afford ventilation. The arrangements for feeding we are discussing calls for this. Let this bottom board, say one foot in width, be hinged to turn up and fasten. This affords means to slip in the feed box when provender is given. Nail fast the boards on the next foot of space, beveling the edge next to the crib of the upper board, then have a panel two feet wide hinged to the beveled board, this panel to be adjusted at any desired angle or closed altogether at will. Over this panel against the rack is pitched the hay. The barn floor is kept clean of chaff and fine materials by pushing into the crib through the lower opening which is kept closed only when open to feed. The rack keeps the animals back, the closed crib gives no incentives to reach forward, and the result is, clean cows, clean milk and, with a dairyman alive to his interests, satisfaction and peace of mind because he has a clean conscience. A side issue comes in here. Two important considerations demand attention—a pure atmosphere in the cow stable, and the fertility of the farm. Securing the first the latter follows as a necessary sequence. The provision and use of some material as an absorbent secures both. Plaster-sulphate of lime is an excellent material for this purpose, but for general use in the large dairy, something less expensive is required. No material is so generally available as muck. Properly prepared, submitted to the action of frost, air and heat, it is admirably fitted for the purpose. Of the inherent value of muck there is a difference in samples, and not a high value attaches to any. Its main value is as a vehicle to absorb and carry elements that are liable to run to waste. The bright and shining dairy genius will devise ways for its use.

But one may well ask, what is the use of all this talk? Who of all the hundreds of dairymen and farmers throughout the State give a passing thought to the preaching and teaching, the thoughts and suggestions that are continually dinned into their ears through the agricultural press, the farmers institutes and dairymen's conferences and conventions?

Well, once in the while there is a convert, and then I suppose we ought to give up to great rejoicing, and still hustle around after the ninety and nine unregenerate ones.

This factor behind the churn is one of the most important in the whole catechism of dairying. It devolves upon the average dairymen largely, whether success and reputation in line with financial growth, shall crown the work of associated effort in dairying. He is the primary factor on which hinges the success of organized effort in this line of farm work, and he ought to be willing to open his heart to conviction, especially, when the exercise of faith promotes his own interest in working out his financial salvation. Selfishness may sometimes masquerade as a virtue if one isn't too particular to analyze motives. The average farmer is willing to be taught if the outlook includes the shekels in a not too far distant horizon. But the man you have to compel to be honest or decent because he fancies his obliquity won't be found out, is better left till he squares matters with his conscience.

It is these fundamental principles carried out at the barn, every day in the week, and every week in the year, which tallies for success in dairying, whether carried on with a few cows on the farm, or by the associated plan. Hence, we reiterate the text: More education and practice at the barn, is the crying need in dairy progress.

PROF. WALTER BALENTINE.

Mr. PRESIDENT:—The Secretary has asked me to say a few words with regard to the efficacy of the different methods of creaming; by the deep setting process and centrifugal process. The question was asked in the first place, what would be the loss with the deep setting process, compared with the centrifugal process?

Now the creaming of the milk by centrifugal process does not depend upon the cow at all. We all know that the Jersey cow is noted for her rich milk. We get a very complete separation of the cream from the skimmed milk. There is a small quantity of butter fat left in the skimmed milk. Once in a while with a lone cow the milk does not cream readily. I have seen in the milk of some cows one per cent of butter fat in the skimmed milk by the deep setting process. I have also seen cows by the deep setting process, Jersey cows, leave only one-tenth of one per cent. Now it is claimed that by this process, after the machine is once in hand, and you understand how to use it, it can, about every time, be run so that there will not be left over one-tenth of one per cent. By that process to-day, there was left only one-half of one-tenth or five-one hundredths of one per cent of butter fat in the skimmed milk. It is claimed that this machine will separate any milk as well as it has to-day; that the milk of a cow that leaves one per cent, will be creamed so that only one-tenth of one per cent will be left by a well run centrifugal machine. Not all run as low as that; but it is a question if they cannot be run by careful management, so they will not leave over one-tenth of one per cent of butter fat in the skimmed milk. Gov. Hoard said last winter, that in his factory one separator man left over one-tenth of one per cent in the skimmed milk and there was a row made right off. There is the difference between the gravity process and the centrifugal process. The centrifugal process is sure, effective.

Mr. McKEEN—About the different sizes of herds. You have shown certain advantages from using the centrifugal machine. There are certain reasons why the gravity process will be in use a great many years, if not for all time.

Prof. BALENTINE—Against the machine for small dairies is the cost. It costs more than it does for the Cooley apparatus; and the Cooley apparatus, with good cows, is very effective.

Now Prof. Cooke, who will speak to-morrow, said last winter, that it will pay a man to purchase one of these small separators, with a herd of twenty or twenty-five cows; but he questioned whether it was advisable to purchase a separator with a smaller herd. It is considered by many that it is no more work to take care of one separator, than to take care of the milk by the process of deep setting, taking into the account the washing of the dairy apparatus, getting in ice, etc.

Ques. Will it pay the interest on the cost of the machine?

Ans. If you have a good herd of dairy cows, you don't leave one per cent of butter fat in the skimmed milk. I have said that I have seen Jersey cows, that by the Cooley system of setting milk, left only one-tenth of one per cent. If you are going to use the Cooley system, you want to breed your cows with that point in view, of complete separation of the butter fat by the deep setting process.

If you have got a cow that will produce 300 pounds of butter a year, and you have only one-tenth of one per cent of butter fat in the skimmed milk by the deep setting process and the cow is in every other way good, that is the line you want to breed from. If on the other hand you find one that leaves one per cent of butter fat in the skimmed milk, you want to discard her. If you use the deep setting process, you must breed with that point in view.

If I had a small herd of five or six good cows, that all of them creamed their milk so they left only one-tenth of one per cent of butter fat in the skimmed milk, and I was well fixed up with a Cooley creamer, I should hesitate about purchasing a separator unless I wanted to make thirty per cent cream for the market. If I was going to make butter I should hesitate before putting money into a separator.

DAIRY EDUCATION.

WALTER BALENTINE, Professor of Agriculture, Orono.

MR. PRESIDENT, LADIES AND GENTLEMEN—Some years ago when the mechanical course was first introduced at the Maine State College, a prominent manufacturer took a schedule of the work and handed it to the foreman of his shop and asked, "Of what use is the training given at the Maine State College in mechanics to a young man about to enter these works?" The foreman answered, "I would not have such a man around."

A wealthy man in this State who contemplated starting a butter factory in his native town, was approached upon the subject of the desirability of having a man in charge of the factory who had received a thorough technical training in the Dairy School at the State College. His reply was, "I would rather take a man out of the stone quarry to do that work."

This illustrates the esteem in which technical education has been and is held by some practical people.

There are, I am sorry to say, too many people who seem to believe that nothing good and practical can come from a thorough, systematic study in schools, of the principles on which our industries are built.

But, as a matter of fact, the graduates of our technical schools have learned that the time spent in professional study in the schools serves them better in the long run than spending all of their time in the practical work of their profession.

The engineer in charge of one of the large New England railroads was recently asked, "Which would you prefer for your work, a man educated in an engineering school or one who had gained his knowledge of engineering in practical railroad work?" His reply was, "The man who has received his training on a railroad would be more immediately useful to me, but in the end the one trained in the school makes the better man."

It is not the school alone that gives the best training for industrial life, neither is it the shop alone. It is the combination of the mental discipline and knowledge of facts that others have acquired, which can best be obtained in the schools, and the personal experience gained in practical work.

Dairying is an industry that forms no exception to the general rule. To meet and overcome all of the difficulties that arise in the path of the dairyman requires as severe discipline and as wide a knowledge of facts relating to it, as that of any industry in the land.

The dairyman must grow crops to provide food for his stock. In order to do this with the greatest economy, he must gain a thorough knowledge of the various fodder plants, of the physical and chemical characteristics of the soil of his farm, of the best methods of cultivation, of the best tools and machinery to accomplish the objects of cultivation, and of the best methods of harvesting and storing the crops after they have arrived at maturity.

When the crops are grown and harvested only one phase of the business has been covered.

The crops must be fed to the stock. The machinery must be selected for manufacturing the crops into milk. The dairyman should make his selection of cows on the same principle that governs the manufacturer in the selection of a steam boiler or a water wheel, i. e., on the ground of efficiency. In these days of close competition no dairymen can afford to keep a cow that will produce only 250 pounds of butter per year, when a cow is available that will produce three hundred pounds out of the same feed, if butter is the objective point.

The dairyman should therefore be able to form a judgment of the efficiency of a cow before purchasing and to test the correctness of his judgment in actual work.

Dr. Bowen has to-day given us a word picture of the dairy cow and every dairyman should train himself to recognize the cow which that picture represents. Mr. Weeks has given his method of determining in actual work whether the cow is actually doing what her form and general characteristics led him to expect, and he further informs us that his tests have induced him to dispose of some of his animals which were not satisfactory and to place others in his herd that are satisfactory.

Every manufacturer using steam as a source of power, recognizes that there are some firemen that with the same boiler and same coal will make more steam than others, or in other words some firemen will use their coal to better advantage than others.

A manufacturer of sulphuric acid once told me that he was obliged on one occasion to employ a new sulphur burner and when he had been paying the old hand only two dollars per day the new hand demanded five dollars per day and as he was the only man available he got what he asked. It proved a profitable change for the manufacturer, however, because the new man, through his superior knowledge of the art of sulphur burning, was able, and actually did, get more sulphuric acid out of the same amount of raw material.

Thus we see that the greatest success does not lie in the machine alone, or in the raw material alone. Much depends on how the machine is fed and cared for. This fact is equally true in the care and feeding of dairy stock. Certain conditions must be observed by the dairyman in order to obtain the best results in yield of milk, butter or cheese.

The successful manufacture of milk into first class butter and cheese, is perhaps even more exacting in its requirements than the production of crops or milk. We have but to examine the products of our butter and cheese factories and the dairy butter and cheese in our markets, to become convinced that there is room for dairy education in this and every other state.

Now where is the best place to get the education necessary for a successful dairyman? My answer is, in part in our agricultural colleges. It is there that the principles of plant and animal nutrition, of milk production, of the manufacture of butter and cheese, of the care of animals, and stock breeding can best be illustrated and learned. The remainder must be learned in actual practice on the farm and in the dairy. The training that our agricultural schools are giving in agriculture, cannot be too highly estimated as a foundation on which to build. This training is just as valuable for the farmer as the training given in the engineering schools is for the engineer. The time has come now, that the Maine State College does not turn out young men fast enough from the engineering courses to fill the demand. This shows that the value of technical training is being recognized in other industries. Why should not our farmers and dairymen also recognize the value of technical training for them?

We have some grand exhibitions of confidence in the educational work of our agricultural schools. The most marked is that of the Wisconsin cheese and butter factory managers, who will not employ a cheese or butter maker who does not hold a certificate from the University of Wisconsin.

I wish to say here that the Maine State College has been doing for the farmers of this State all that our farmers would allow it to do. It has educated and sent back to the farm all the young men that have been sent them for that purpose. That the number is small is not the fault of the institution, but the fault of the farmers, who having little confidence in the business of farming have directed their sons to take courses of training to fit them for some other employment.

In the past the complaint has been made that the course was too expensive, and that four years was more time than a young man who intended to devote his life to farming could afford to spend on his education after having covered the ground necessary for admission to college.

I hold that there has never been a time when the necessary expenses at the college were so great as to place a four years' course beyond the reach of a bright, energetic young man. But whatever may have been said of the past, does not hold for the present. Tuition and room rent are now free, and about the only expenses are board, fuel, lights, books, clothes and nominal charges for breakages and laboratory fees.

In agriculture, four courses are offered:

1st. The regular course of four years.

2nd. A special course of two years which includes all of the technical studies of the full course.

3rd. A special course of one year in which the most important of the technical studies are taken up.

4th. A special winter course of three months which will prove very valuable to anyone who is unable to get away from his business for a longer time.

No entrance examinations are required for any of the special courses, the only requirement being that the candidate shall satisfy the professor in charge that he will be able to profit by the instruction given.

The three months' course is being patronized by young farmers already engaged in business.

In establishing these short courses the college has sought to remove every obstacle possible to its usefulness to farmers who desire to gain a better knowledge of their business.

MR. STETSON OF LINCOLN COUNTY.

MR. PRESIDENT AND GENTLEMEN:—I am here at the sacrifice of comfort and perhaps at the risk of my health, which is precarious; but impelled by an intense desire to aid my constituency in the attempt recently made to create an interest in the dairy business, I am here to hear just that which I have listened to to-day; but I did not come to follow the professor of agriculture from the Maine State College, nor the agricultural editor of the *Lewiston Journal* in a talk on dairying. But since I am *here*, Mr. President, I will stand up to be counted, if no more.

I want to say, however, before I attempt to say anything about agricultural interests, that I am pleased, when I consider the condition of the weather, to meet so many of the farmers of this county as we meet here to-day. I did not expect to see so many. But I am *astonished* when I contemplate the intelligence that is so plainly and indelibly written on the countenances of those in attendance here.

I have attended a great many Farmers' Institutes and other meetings held in the interest of agriculture; but I have never before looked upon such an audience assembled for any of these purposes, and I do not hesitate to say that I never yet, in the experience of a great many years, looked upon the assembled salons of the State who had written upon their countenances more intelligence, than those in attendance here to-day. Of dairying, I know practically nothing. As might be inferred from something I said, I came here to learn something; not to put in practice so much myself, as to teach my constituents, who are almost altogether in the dark. I reside in Lincoln county, some of you know that we are a commercial people; but few of us are interested in anything but building and sailing and fishing. The bottom has gone from the whole concern and we are left standing upon the soil without knowing how to dig our own potatoes after some one has raised them for us. There is no section of the State better than Lincoln county. It is traversed by three salt rivers giving an inexhaustible resource of fertilization, simply by hauling it home; good for crops as anything you can find in the world. Some of you know of the practical value of what we call rock weed and mussels; all of which we have an abundance, an inexhaustible supply of; but we have made no use of them.

Almost every man in the county, if he wasn't a shipbuilder, worked in some department of the shipbuilding as a mechanic, a painter or ship carpenter. A great many of them had farms, yet all the attention they gave them was to plant a garden in the spring, put in half an acre of potatoes and go to the shipyard. No attention was paid to them. Then they would go and rake the land over and get in a few tons of hay and go back to the shipyard as fast as they could. Such employments occupied a large portion of the county.

Now a depression has come upon us which I presume many of you understand. We hoped for improvement, but everything grew worse. The ships were growing old and needed repairs, and the time came when we could not insure because we had no money to pay the premiums. All our money and credit was put in, and the whole thing is gone and we are left, as I said, standing on the soil. It is with great reluctance that our people come back to the soil.

I think Ex-Secretary Gilbert and Secretary McKeen will say that for two or three years we have made some improvements. We hope to get alongside of some of these counties if we don't starve to death which won't be a long time unless we do improve.

WARREN H. VINTON OF CUMBERLAND COUNTY.

Mr. President:—I did not think of being called upon to-night, and if I should attempt to say anything I should hardly know what selection to make of a subject. But, as Brother Stetson says, I am willing to stand up and be counted.

Sometime, Mr. President, when there is opportunity at some of our institutes, I am willing that you should give me half or three-quarters of an hour to talk upon this single topic: "Farming as a Business." Because I am reminded everywhere I live and move among my neighbors, of the importance of considering farming as a *business*; as is not now done. The general impression is, as we have heard to-day, that farming is *not* a business that our boys and young men should be encouraged to go into; and as has been said here to-night, fathers who have been farmers—called themselves

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farmers—had rather their boys would go into almost anything than submit to the drudgery of farming. There has been an idea prevalent, that if, out of a dozen boys raised upon the farm, there is one dull boy, that that boy will answer for a farmer. But if there is another boy a little smarter, who shows a little aptitude for anything, that boy must go to college; must go into commercial or professional life, because he is not adapted to the farm. Mr. President, if there is a spot or place on God's green earth in which capacity and brains and shrewdness are called for and adapted to, it is upon the farm. What does he deal with? See what questions we discuss! The heavens above and the earth beneath us! How much does *anybody* know of them?

This whole question of plant and animal growth, a hidden mystery, spread on the right hand and on the left; yet they say, if a boy has good sense he is not adapted to the farm. Why, they say, "farming cannot be made profitable; there is no profit upon the farm." We should fight this idea,—sit up nights to fight it. And we should encourage the boys to go upon the farms simply because there *is* profit there; a surer way to affluence, wealth, ease and comfort in middle life and old age, than anywhere else in Maine. I know farmers in my vicinity who are keeping cows. They tell me they sell milk, that their returns for milk are not less than $100 a month. Isn't *there* an income? We are intoxicated as a people, with the idea of being suddenly rich. Farmers want their boys to go into something where they can get rich quick, farming is too slow. The whole process of accumulating riches and not fail in business, is to take a business where there is a slow, continual gain; where a man comes out at the end of the year better than he was at the beginning; that man is getting rich, if he can lay up a little each year.

One of my near neighbors came from Oxford county and bought a farm twenty years ago close to me. He has been a careful, thrifty farmer.

He told me what he wanted to do. He wanted to carry on his farm, pay all his bills and raise a large hog to sell in the fall; have that in addition to salting down one every year. That man has never failed to raise one of the best hogs, sometimes two, but he never calculates on but one; and when pork was worth eight or ten cents a pound he was never satisfied unless it would dress 500 pounds. He has paid his expenses and lays aside $50 each year.

That goes on interest at six per cent. That is $53 at the end of the year; then he adds $50 more. So he goes on and up; and that man to-day is rich. He has hundreds of dollars at interest, while multitudes, with the idea that there is no profit in farming, are on the road to ruin. There are as good profits for farmers in Maine, if a man conducts the business upon business principles; putting in the same thought and energy that others do in commercial and manufacturing lines; there is a good opening for young men in the State of Maine.

Another idea. The farmer should enlarge his business from year to year. What other business is there that is successful, that proves to be a good business, that is not enlarged?

I remember when Ara Cushman, the great shoe manufacturer of Auburn, was at work in a seven by nine shop. It is within my memory when John B. Browne, once the richest man in Maine, was doing business in a small store in Portland. But the business that these men were in was a profitable business; and because it was profitable, it was enlarged. They added to it; and almost any merchant to-day of any success, began with small means and added to and enlarged their business.

Well, now, the farmer who is conducting his farming upon business principles, will do the same thing. We have here and there a man who does it. Mr. Weeks is a noble illustration of it; he has got sixteen cows and is going to have twenty. Mr. Blaisdell is another; he is going to have a hundred. These men are going to be a success in business. They enlarge as their business is enlarged.

Is not the manufacturer looking out for improved methods of work; all the time on the alert; inviting every one to talk with him when he can get information? Therein is his success. Do farmers do that? Once in a while, here and there, because he is a progressive man; but as a general proposition, the great body of farmers sit down and boast that their fathers and grandfathers before them did so and so, therefore if they can do as their fathers did, and especially if they can get hold of the coat tails of their *grandfathers*, they can do well enough.

Farming as a business! I want to hear it discussed; I want to hear every farmer raising his voice and speaking,—not in the cry that farming does not pay; that it is a business that young men should be cautioned against going into. Pertinent to this matter of farming as a business, is the matter of dairying. That is the great hidden mine of wealth to the farmers of Maine.

I maintain, Mr. Chairman, that this question of butter which we discuss in the dairy meetings, is *not* a luxury. It is as important for the poor to have it as the rich. It is an article used in our families. We are asked, high, low, rich and poor alike to say that anybody, however poor they may be, can get along without butter. We may as well say they can get along without flour. The whole world is calling for it. Farmers want to get the idea that butter making is for the whole world.

MR. ATWOOD, OF WALDO COUNTY.

Mr. President, Ladies and Gentlemen:—I did not come here to speak; I have not been educated as a speaker, but I will say that I am glad to be here. I have listened to many good points to day and if I make a few remarks I will touch upon points already presented.

Perhaps the first one would be the ox. We have passed him by. I for one, regret it. I like the ox, like his work, his beef. I like him from the time he comes to the time he passes away; and I believe to-day, that if five per cent, at least, of the horses in Maine were annihilated and we had the ox in his place, that Maine would stand much better than she does to-day. Then there is one point in the dairy question that has been a little neglected: and that is the skimmed milk; that we do not think much of.

Now, gentlemen, I raise the point in feeding colts. I like to raise them, I like to see what I can do, I don't like to overdo, but make them what nature designed them; help to make them that as far as I can; and I know I can do that with skimmed milk; a light food such as nature would produce for them. After they go to grass they do better than by high feed, make more valuable, profitable horses. Speaking of skimmed milk; I once had an old grade Hereford cow that brought a pair of twin heifer calves. I said I would try and make something of them. I took them from the cow as soon as the milk was good and took care of them myself. I commenced to feed the skimmed milk to these calves.

A short time after that I met a gentleman in the store, a neighbor who pays the highest tax of any man in town. He says, "I am raising a pair of steer calves. They were brought to the slaughter house and I looked over the pen and they looked so much alike I made up my mind I would buy them of the man who brought them in. I have taken one and put on the best cow I have and bought a cow and paid $50 and am going to put the other on that and I am going to raise a pair worth raising." I said, "I am going to raise two heifer calves by hand, and I am going to *beat* you with skimmed milk." He went on with the steers and I with the heifers. His turned out to be nothing but beef. I kept mine till they were twenty-two months old and they weighed 2,200 pounds. I sold them for $150. A man took them and exhibited them for me in Bangor, Bar Harbor, and to the Lewiston fair and took the first premium as the best and first and second premiums as the fattest. Then they came to the Lewiston fair the year after and were sold there *he* said for $1000. Those were the calves I raised.

Now about colts. I heard of a pair of colts that came from Boston; little neglected fellows. A man brought them to Searsport and when he went to the boat he didn't want them. I took them and paid $25. One of them weighed 175 and the other 207. In six weeks time I doubled their weight with skimmed milk. When they were two years old one weighed 1000 and the other was lost. Now, gentlemen, if we pay the attention we ought and feed our colts, calves and pigs with skimmed milk, we will find as good results as from any product of the farm.

MR. GILMAN OF PISCATAQUIS COUNTY.

Mr. CHAIRMAN:—When you said you would call upon some members of the board, it did not occur to me that you would call upon me, when I knew that *you* knew that there was not a man on the board who had not had more experience in farming, *much* more in farmers' institutes than I have; and I do not propose to entertain these gentlemen, for I have seen indications already upon every face before me that they want to go.

I want to say that I was pleased with the first remarks that I heard when I came in; the gentleman from Connecticut when he said that farming was better than preaching and better than politics and as good as railroad stock. I now believe, gentlemen, that if a man will give his personal, undivided attention to farming, it can be made to pay a fair, reasonable, steady, sure yearly income.

I agree with Mr. Vinton but I want to add a different thought in a different line from him. What is the cause of this depression? It is true, although we may not want to own it, it is a fact, that farming, for the last decade has had a hard row, compared with other industries. Manufacture, certainly in almost any line has had an advantage over agricultural produce. I believe, however, now that the tide is turning the other way, from the fact that we are loaded down with manufactured articles.

The question of dairying and the new methods; the methods of feeding; the large amount of labor that is saved by these new methods, is largely attracting the attention of the dairymen of the country. I have been very much interested in the description of Prof. Balentine of Orono College in his remarks with regard to the Dairy School and I will say that I believe, if the dairymen of the State will give this matter the attention that is due, there will be a large amount of good grow out of that school that they have recently established in our agricultural college. The State and the people are putting their money in there to educate our young men. If I wasn't too gray, I would like to go down there and study for myself; but he said it was intended for *young* men and I suppose I am out of his class. But, gentlemen, there is an opportunity that we did not have years ago, that we now have for educating the youth of this land. He did not say so in his remarks to-night, but he said before that it was open to both sexes, and that women were giving the matter some attention.

When Brother Vinton spoke of farming as a business, I was thinking that more than half of the farmers in the State of Maine to-day, farm as a sort of secondary business.

When they can earn a dollar at anything else, they leave the farm and go after the dollar outside of their legitimate business.

This young man who addressed us this afternoon; I watched him carefully from the four cows to the sixteen cows, and when I get home and get through this job I am going to see if I cannot give it my personal attention and not leave it to the man, and so make something out of the business by my own hands.

When Brother Vinton's discussion occurs, I would like to be there and touch upon it after he gets through.

FRIDAY MORNING.

Separator, Tester and Churn at work from 9 to 10.30.

GENERAL PRINCIPLES OF STOCK FEEDING, FORAGE CROPS AND ENSILAGE.

By Prof. W. W. COOKE, Director of Vermont Experiment Station.

MR. PRESIDENT, LADIES AND GENTLEMEN:—My subject is the general principles of stock feeding; and we will pass over lightly, what you may call the mechanical part of stock feeding, whether you shall feed once or twice or more times a day; how many times you shall water the stock and whether you shall warm the water.

Our own practice, which we have adopted as the result of experience, is to feed twice a day, morning and night. But the morning and night feeds are given in two parts; so you might call it, feeding four times a day; yet it is all crowded into a comparatively short time. We feed the grain and a part of the coarse fodder, then the rest of the coarse fodder we feed to them about nine o'clock; then they have nothing more until we begin to feed in the afternoon about four o'clock. They are fed about three hours in the morning and three hours at night, but nothing through the middle of the day. When we used to take them out to water, we watered but once a day. We are always feeding succulent food and under these conditions, cows will not drink but once a day.

Now we have a much better system than anything we have had before, a stationary water system in front of the cows. It is the Buckley Watering Service; I do not know whether it has been introduced in this State; I think ours was the first in New England and after using it a little over a year, we are very much pleased with it.

The water is in front of the cows all the time, is always fresh. No matter how much they drink, it is always there.

As to giving water warm or cold, we finally concluded that this is a matter, not so much of warm or cold water as of warm or cold barns.

If in a warm barn they will like cold water as well; but if in a barn full of cracks, if turned out to water and left out in the yard to shiver afterwards, every particle of heat a man can give them is an advantage. Under these conditions, it might pay to warm the water. This you might call the mechanical side of feeding.

As to the general principles of stock feeding, it is easier to lay down general principles, than to lay down the practice which shall govern in every pa ticular case

In the first place, *feed must be healthful.* Not only must each particular feed you give the cows be healthful, but the combinations in which they are given, must also be healthy. For instance, corn meal is a good food, cotton seed meal is a good food; yet you would not think of feeding nothing but corn meal and cotton seed. You would know that would be an unhealthy feed; it would be feeding good feeds to excess, and that would throw the system of the cow into a feverish state.

We have finally come to the conclusion that in feeding grain, it is best to feed one-half by weight, of what you would call light grain; that is, bran, middlings or ground oats, and the other half of heavy grains, corn meal, cotton-seed meal, glu en meal or linseed meal.

We have made a practice of feeding at least one-half of the grain of a light grade, no matter what the coarse fodder was.

So it is well enough in feeding, to have part of the ration of green feed, part green and part dry. If the cows like the feed they do better; it keeps the system of the cow in better condition.

A most important part of the principles of feed, is that the cow shall be *comfortable in all her surroundings.* This is best not only from the humane side; but it pays to have the cow perfectly comfortable. She will not do her best under any other conditions. Our present dairy cow is an artificial animal. Man has taken her from a wild state and by feed and selection, brought her up to be a different animal from the original cow.

She is an exceedingly artificial animal; and anything that makes her uncomfortable will show in that particular part which is most artificial; that is, in the milk production. Now when a cow shrinks in her milk from anything outside which makes her uncomfortable, whether a dog chases her or the hired man makes a racket or hits her, anything that acts upon the system or mind of that cow, to make her uncomfortable, will have a double effect upon the milk production. It will lessen the *quantity*; it also lowers the *quality.* You have a double loss,—in quantity and quality. It is the general rule, that as quantity *decreases*, quality *increases.* This is true of the natural milk flow; as the cow gets further along in lactation, the richer the milk becomes; but it never becomes rich enough to make up for the decrease in the flow; though it increases somewhat. But if you get a decrease from unnatural reasons, instead of compensation, you get a further decrease in the richness; thus it is a double loss.

It is a little queer, though it may be merely a coincidence, that those feeds the cow likes best are the easiest digested. Fresh grass, ensilage and roots, that cows are exceedingly fond of, are highly digestible; and those feeds that cows do not like very well, such as poor hay and straw, are only a small part of them digested.

It may be, that the larger returns which come from feeding those feeds which the cow likes, come from her eating more total food. A cow takes a certain amount of food to keep herself going. About two-thirds of the feed is used, just for keeping the cow alive. It is what she eats beyond that, that gives you a return. If a cow has fine feed, she will eat an amount beyond what she needs to keep the system going; an amount large enough to leave a good surplus for returns. So the relish of the food by the cow, in that it makes her eat more, is likely to give you a larger return.

The fodder must not be too *bulky*. A cow will not make two pounds of butter a day on hay alone. She cannot eat enough to produce that large amount; and the more you crowd the system of the cow, the more you desire to get out of her, the larger proportion of the fodder, you must give in concentrated form.

If the fodder is bought instead of raised on the farm, it is cheaper to buy food in the concentrated forms. When we can sell hay at $15 per ton, and the bran we feed costs from $16 to $17 at the barn, the bran is the cheaper feed and it would be a profitable exchange if we could sell all the hay and feed nothing but bran. But we cannot do that. We are feeding a small amount of hay with a larger amount of grain.

The fodder must also be in the *right proportions*. Now when a person begins to talk about the proportions of fodder, about the carbohydrates and the albuminoids, the audience almost always goes to sleep.

This is really an important part, one of the most important parts of the principles of stock feeding. There are two general parts of the food to be considered in stock feeding, the heat producing and the flesh producing. The animal needs to keep the body warm; it needs something to take the place of the waste flesh; and the fodders can be divided into the parts which tend to make heat and the parts which tend to produce flesh.

An ox just standing in the stall, neither gaining or losing in weight would need more heat producing material and needs but little flesh or muscle producing material. It would, however, want some of the latter to carry on the action of the heart and lungs; to carry on the mere processes of life.

But put the ox to work and he immediately requires a larger proportion of the flesh producing materials and also as much of the heat producing as before.

So with a dry cow; she needs a large amount of heat producing food, with comparatively little of the flesh producing. But when she commences to give milk, she requires much more of the flesh producing. Milk is first made as flesh in the animal, then made into milk. It is the same constituents of the food that make flesh and make milk.

If then, you were feeding an animal just what it wanted, you would feed it such proportions of the heat producing and the flesh producing foods as to just equal the wants of the system. You will see at once that this would vary according to the animal you were feeding, and according to what that animal was doing. The heat producing part of the food is the starch and sugar and those parts that are nearest like starch and sugar. The flesh producing parts are those which are like the gluten of the corn or wheat and the casein of the milk. They are all chemically like albumen or the white of an egg; so the chemist calls them albuminoids. We mean by a wide ration, one that contains a large amount of heat producing food, as compared with the flesh producing. A narrow ration is one which has a large part of the albuminoids or flesh producing, as compared with the heat producing.

Farmers understand that there is a difference in the feeding value of different feeds, though they may not understand the scientific difference. For instance, you know you would not think of feeding a milch cow with nothing but straw. When the chemist analyzes it, he says it does not contain enough of the flesh producing food. It has enough of the heat producing, but only one part of the flesh producing to thirty of the heat producing. You would not feed on linseed meal alone; it has too large a proportion of the flesh producing and not enough of the heat.

Now there must be somewhere between these two parts of the feed, between the heat producing and the flesh producing, there must be somewhere a proper proportion that shall be best for the animal under consideration. If a milch cow, there must be some proportion between these two which shall be best for the milch cow.

I want to make one pretty sweeping statement; that *whatever that best proportion is, it is the same, whether you are using that cow to get the most milk out of her; or whether you use her to make the most and the best butter*. That is, the cow uses the same food, in the same way, to make a large quantity of milk or a large quantity of butter. She needs the same constituents in the food to produce milk, as she does to produce butter.

I know that farmers have a variety of notions as to the influence of the feed on the character of the milk. You will find a general belief among farmers that there are certain foods from which you can make a larger quantity of milk, therefore of a poor quality; and other feeds which have an influence to give richer milk and of less quantity. Farmers in general, believe that green feed makes watery milk; that sloppy feed makes much milk, but not rich milk, that bran and middlings have a tendency toward producing a large quantity of milk.

But if feeding for butter, they would feed heavy grains, corn meal and ground oats being in special favor; cotton and linseed meal are also sometimes fed. There is that general belief among farmers; that there are these two kinds of effects from the feeding.

Now I have the highest respect for what might be called a *general belief*. These general beliefs are the result of an immense amount of experience. It scarcely seems possible, that where so many farmers have tried it under so many different conditions, with so many cows, for so long a period, that they can be mistaken. It would seem almost certain that there must be some foundation for the belief in the different effect of these different feeds. Yet when you come to put it to the test of accurate experiment, you cannot find anything to indicate that there is the effect. You cannot find that one set of these feeds makes any more or thinner milk or that the other set makes any richer milk. You will find that the *quality* of the milk depends more upon the *individuality of the cow* than *all* else; and that the *quantity* of milk depends upon the amount of good digestible feed that the cow eats. It makes but little difference what the source of this food is, as long as the feed is in good proportion and the cow relishes it. It makes very little difference whether that food comes from cotton seed meal, bran or corn ensilage. So far as the most accurate experiments go, the source of the food seems to have but a small influence, if any, on the actual quality of the milk.

Now what is this proper proportion between the heat producing and the flesh producing? The German experimenters say it should be about one to five and a half. I do not believe it is possible to adopt any invariable rule as to a nutritive ratio which will apply to all cases.

There is quite a tendency to say that the German standard is best. But if there are certain conditions in which we get more profit by feeding less of these expensive flesh producing materials and more of the cheaper heat producing, it is the part of economy and good sense to feed with that from which we get the most profit. If a man buys his feed,—as for instance a milkman in the city,—there is no doubt that he should adhere closely to that standard of one part of the flesh producing for five and a half parts of the heat producing. But the further you get from the railroad, the further from the market and the smaller prices you receive for the products, the larger proportion you should raise on the farm. If you get back in the hills, it might be that the best ration that could be fed, would be dry hay and corn stalks, which would have a nutritive ratio of about one to ten. The larger part of our farmers can get better results from a ratio of one to seven, rather than one to five and a half. But any one who is selling milk and feeding his cows heavily, had better keep very close to the German standard. Nearly all the fodders we raise in quantity on the farm, are deficient in the flesh producing part of the feed, and that is the side which we want to build up as much as possible. It is those forage crops which contain a large amount of the muscle or flesh producing part of feed, which we should raise in as large quantity as possible on the farm. Clover is the best of all.

Where clover can be grown it is one of the best dairy feeds. You can certainly grow peas and oats, and these are about as good. We grow peas and oats and get two crops a year from the same land. We have had good success and like that first rate. We plow the land in the fall and put on the oats as soon as we can get upon the land in the spring. You cannot get the land too rich. We take off a crop about the first of July, as a green crop; and sometimes feed directly from the field to the cow; sometimes it is put in the silo. Then we can put on a crop of barley for a fodder crop. We have never found any green crop that would force out milk so largely as green barley. It seems to be a fact not very well understood by farmers, that this green barley is not hurt by the frost in the fall. Sow from the first to the twentieth of July. Let it head but not ripen. It is not injured by the frost; we have fed it from the field in October and until December. It is just as good and the cow relishes it just as well late in November even after the first light snows. They seem to eat it as greedily and we get just as good returns late, as in the early part of the fall. It is the only crop I know of that you can feed from the field so late. We can get two full crops from a given piece of land in one year, by combining peas and oats first and barley for the second crop.

Then we have for two or three years, used another combination, viz.: corn and rye. Plant the corn at the ordinary time, in hills and cultivate both ways. Just before the last cultivation, go through and scatter rye, throwing it broadcast over the field, then go through and cultivate, using the cultivator, not with the plow teeth but a little cultivator with spike teeth like a harrow. It is a good kind of cultivator for general use, but especially good for this last part. We have one that you can throw the teeth backward or have them straight. Either of these will cover the rye nicely if you can run both ways, covering the entire field. The corn shades the rye and it does not make much growth through the fall. This year, ours was perhaps six inches high when the snow covered it. We had a thick, heavy growth of that rye this last summer, which we cut about the first of June. Usually, we can cut from the 15th to the 20th of May. We feed rye directly to the cows so far as we can, the rest we put in the silo and it comes out excellent ensilage. The making of good ensilage from rye is not easy. We have failed about as many times as we have succeeded. We have only succeeded when we have cut the rye short and weighted it heavily. We have put it in in different ways but we have not had good success except when the rye was cut green, as soon as it showed the head. If you plant it as an extra crop with corn, harvest it as late as you can let it stand before putting on the corn, then cut it short and put it into the silo, weighting it heavily.

Ensilage. There is some dispute about this forage crop.

No one has determined just where the ensilage crop shall have its place on the farm. It is about as undetermined as anything in

American agriculture. First, *negatively*, what ensilage will *not* do. You may think when I get through the negative part, that there is nothing left to be said on the other side; so I will say at the outset that I do believe thoroughly in ensilage and we feed it 365 days in the year. Negatively,—ensilage is *not* more digestible than fresh corn. Siloing it, does not make it more digestible,—you may remember that is one of the claims made for ensilage,—that putting it into the silo makes it more digestible. You can lay it down as a certainty that there is nothing you can do to any fodder that will make it more digestible.

The corn plant is most digestible the moment that the knife cuts it. Nothing you can do after that will increase its digestibility. Everything you do to it makes it less. Ensilage is less digestible than when the corn was cut. Ensilage heats in the silo. The parts most digestible are the parts that heat first. The part last in heating is the part that is least digestible. Ensilage is therefore a little less digestible than the corn was the moment it was cut. Ensilage has not more feeding value than the corn, as it is put into the silo. That was another thing that was claimed for ensilage. It was said, if you put in a certain amount of corn, you got more feeding value out of it than it had when you put it in. No. There is no such thing as manufacturing feeding value. You cannot get out of the bank any more than you put in; you cannot get any more out of the silo than you put in. There must be some loss in feeding value in the heating.

Ensilage is *not* a perfect ration. The opponents of the silo always hold up as one of the things against it, that the owner always has a big grain bin when he feeds ensilage. He ought to have. It is not a well balanced ration; and the man who undertakes to carry a lot of cows through the winter without something else to balance it up, is not feeding wisely. It is not a perfect ration. I am talking of the ensilage of corn, with ears or without ears; the proportion of the parts is practically the same whether the ears are on or not. Corn meal is about as unbalanced a ration as stalks would be; so that although there is more feeding value, it is not in better proportion with the ears than without. If you use peas and oats, or young rye or barley or clover ration; if you use them for ensilage you would have a well balanced ration; but you cannot feed entirely of bulky feed; a cow cannot eat enough ensilage to do good work on that alone. We have fed as high as 120 pounds a day to an animal; but it did not do the animal any good;

we found a fever was setting in. It was unnatural for a cow to take so large a quantity of bulky food.

Ensilage is *not* more valuable, pound for pound of dry matter, than dry stacked corn fodder. I believe there has been as much discussion over that point as over any other.

After you take out the water, a pound of dry matter of the ensilage, is not worth any more than a pound of dry matter of the stacked corn. Putting it in the silo does not make it contain any larger amount of food or make it any more digestible. Ensilage will *not* make any richer milk. It will not have any influence at all, practically on the quality of the milk. It will not make it cream any more easily; it will not make the cream churn more easily or thoroughly. It probably will not have any effect upon the churnability of the milk.

I will say also, that the silo as an institution is not for the summer dairy. The great bulk of summer dairymen cannot use the silo to any advantage. It is of practical advantage in winter dairying.

Now what are the good points of ensilage? In the first place it is *healthy*; I mean healthy in the wide sense of the word. It is healthy for the cow, it is healthy for the calf, for the sheep, the hog and horse. We have fed it to all these animals and they have all done well on it. It is a healthy feed. You need not be afraid of the acid eating the teeth of the cow and making them loose.

Ensilage is a good, healthy food. Moreover, ensilage by itself will not have any bad effect upon the milk, cream or butter. There is no person whose taste is acute enough to take ten samples, five made from ensilage milk and five without, providing the cows have been kept clean and the milk handled in a cleanly manner, and tell which is which. It is just a chance if he gets it right; for there is no such thing, as a moderate feed of ensilage having any influence upon milk, cream or butter, that is, influence *through the system of the cow.* You must make a sharp distinction between the effect upon milk that comes naturally through the cow and that which is artificial, or that comes from outside of the cow.

If a man handles the ensilage in feeding the cows and then milks without washing his hands, you will get the flavor in the milk; but you do not want to lay that up against the cow. If the barn is unventilated; if the ensilage is heating strongly so the air is saturated, so that the hair of the cow is saturated, and the man is not cleanly in milking, you will get the odor of the ensilage in the milk and the effect in the milk ; but don't blame the cows or the ensilage. There is such a thing as feeding so much ensilage as to throw the cow into an unhealthy condition.

A few years ago we undertook to feed ensilage that was very heavily eared. I suppose the corn would have run seventy-five or eighty bushels to the acre. We undertook to feed forty pounds of the ensilage a day. It was altogether too much ; it threw them into a highly feverish condition, and the milk began to have a bad odor and we had to cut down on the ensilage to about twenty pounds. Then we began to raise a different variety of corn, with larger stalks and not so much grain. So you needn't be afraid of the ensilage hurting the milk through the cow, if you are perfectly cleanly and the barn is in good condition.

Ensilage is certainly relished. The cow says it is good, and will leave almost any feed for the ensilage ; consequently they are likely to eat enough to have plenty of material in their bodies to give you good results of milk

On an average, there is *less loss in putting corn into the silo than in stacking it.* One man may cure the corn in the stack and do it well, another man is careless with the silo and the ensilage is poor ; but on an average under fairly good conditions, it is easier to keep corn in good shape in the silo, than stacked. Ordinarily, good ensilage will have more net feeding value than ordinary stacked fodder ; so on an average, a man will get more food value out of his crop, put into the silo than stacked and fed dry. Ensilage is just as good at the last end of the winter as at the first. That is the great trouble in trying to keep dry corn fodder. It is all right in October, November and December, the cows will do just about as well ; there is practically no more loss during the early part of the season in the stack than in the silo ; but it is exceedingly difficult to carry that fodder over to spring and have it keep well. In the silo it keeps perfectly. We feed ensilage the whole year, and had some of last year's still on hand when we filled the silos this fall. We think we have enough now to last till next fall.

But the real benefit of ensilage, the real advantage that ensilage has been to the nation as a whole, the real advantage which ensilage is to be in the future, is two fold.

First it enables you to raise a much larger amount of food value per acre. That is one of the strongest points of the corn plant ;

you can employ a small number of acres to carry your usual amount of stock or you can conduct larger operations on the same number of acres as used to be used for the small business. It gives you a much larger supply of fertilizer to put back on the soil, so as to increase the fertility of the land.

That has been found by all who have run the silo for a series of years, that the farm was increasing in fertility; that the crops were increasing in size. It enables you to increase the size of your operations, or carry on the same operations on a much smaller acreage.

Second, it is an education to the dairyman himself. I think that is one of the largest benefits.

A man cuts the corn and stacks it in the field; he does not seem to consider that as being of much value. He does not act as though he thought there was much feeding value there. If a stack tumbles off the cart he lets it lie, and if the cows do not eat the stalks, he throws them in the barnyard. The farmer does not think he has much feed value there. If he puts the crop in the silo, he is more careful in feeding it out. He says, "I have been to a good deal of expense to get the corn in there and I have got to be equally at pains not to waste it and I have got to have good cows to use it."

The missionary result has been one of the largest benefits of the system of ensilage.

So to review in brief, we may say, that the fodder must be healthful, must not be too bulky, must be properly proportioned; it must be raised as largely as possible on the farm, and if you possibly can, run a winter dairy and so use ensilage and use it largely.

FRIDAY AFTERNOON.

Meeting called to order at 1.30.

"THE DAIRY INTERESTS OF THE UNITED STATES AND OF MAINE." ALSO, "DAIRY SPECIALTIES AND CONDENSED MILK."

By Hon. I. C. Libbey.

Ladies and Gentlemen:—I am glad to meet you on this occasion in the interests of agriculture. While I need not tell you that speaking is rather out of my line I shall only attempt to give you a few of the ideas I have gained from travelling over the country. My introduction to a Maine audience is hardly necessary, as you all know me and my business for a quarter of a century. Twenty-five years ago, in connection with my business life as a farmer, I found in coming in contact with farmers, that they were all prosperous and happy. We had a good cattle industry. Our fields and pastures were good and our methods of producing beef were such that we could produce it with profit. But we soon began to see that the prices of this commodity, which was the real revenue from which we derived the cash, began to decrease and the production of beef was a losing operation.

We who were in the business and knew the cattle deal, began to watch the situation to find out what was the trouble. We saw that that great section of country, that Peter Parley called the "Great American Desert" was being opened up by Yankees, who built railroads into the far West. We soon saw that as the Indian is drifting towards the setting sun, as the buffalo were slaughtered for their pelts, that the domestic animals would follow in their place, that that country was soon to be a competitor, and would drive out the business here. Being connected with the Maine Farmer at that time, you may recollect that I advised to keep to beef and thought we would weather the cape after a while. That the great prairie country would be cut up into farms, that the emigration would build up cities and villages and towns and they would use their own beef and give us the New England markets.

These prophecies have proved fallacious; and six years ago I visited that great country myself to see what was the trouble. In leaving Chicago over the Great Northern road I came to Dakota.

When traversing over that country I opened my eyes. I began to see a little. There, hidden in these vast plains was productive farming land that Yankee skill and ingenuity would come and utilize, and we must contend with it. I went up to Montana; I penetrated to the very heart, that great mountain country, the high bench land covered with thick herbage and trees away up in the mountains. That state is 4,000 or 5,000 feet above the level of the sea. To give you a little more graphic idea of that great country, I will give you an experience of a trip across the bench lands. I went a hundred miles to the Judith Basin and in travelling that hundred miles, I didn't pass a half a mile without seeing a band of cattle. Sometimes ten, sometimes fifty and sometimes 100. When you take into consideration the fact that Montana contains twice as many square miles as the whole of New England and is only one of those ten great subdivisions of land in the western country that used to be known as the American Desert.

We have 40,000,000 of cattle in the United States and 30,000,000 are on these plains west of the Mississippi river, which must give the whole world all the beef it will need. This country has a climate peculiar to itself, dry, no trees or shrubbery, everything is burned up; they have two months rain; May and June is the rainy season; the thick herbage is withered up and the hay that grows a foot or two high, the first of July it comes dry and you see the animals running till the next spring. This grass stands there and changes into hay for all the year and affords nutriment for cattle that don't have to be housed. The climate is cold; there is once in a while a high wind and a big snow storm. There is a peculiar wind from the Pacific coast, called the "chinook" which carries off the snow and leaves the cattle feed the year round. In March these cattle were rolling fat. Let me remind you of one fact; that between the Mississippi and the Rocky Mountains there is three-fourths of the extent of the United States, yet with the exception of Iowa and Wisconsin, there are no dairy states. They never can produce dairy products; their water is insufficient; the alkali soil makes the dairy product inferior. We are not afraid of that competition, while we know that that country will always be a great consumer of our dairy products.

I went below Mason's and Dixon's line. I found the milk inferior there and worth ten cents a quart. I found northern butter and cheese and northern condensed milk. These are encouraging facts to the people of the State of Maine, because we have a market for our products after they are produced in the great West and the great South. They are buyers of our dairy products. The milk products are higher on the other side of the ocean than here. Our dairy products go across the ocean in steamers. We have another field for condensed milk; it is the Australian Islands. They buy their butter and cheese and condensed milk in Europe and America. In the Chinese empire there are 65,000,000 of people. They never make butter, they never milk cows, and there is a large demand for butter I have no doubt. I have had an application to load a cargo of condensed milk for the Chinese empire. Now to leave this subject.

I saw in the West that we must do something besides producing beef to sell. I studied the question of dairying. Years ago it was forcibly brought to my mind that the idea of condensing milk would be a good industry to start in the State of Maine, and following that idea, I visited New York; I wish I had time to picture to you some of the farm pictures which I saw in the valley of the Mohawk and Hudson rivers. I found those farmers had started large dairies. The state of New York has thirty or thirty-five cows to the square mile. They are prosperous and happy; their farms and buildings show it. You can hardly buy a farm for less than a $100 an acre. Another picture to show these facts; the young people, instead of leaving home to go West, go and start in on the farm that their fathers lived on; the father has got rich and has become a gentleman of leisure. The young people marry and cut up and divide the farm and stay at home. It is an unusual thing for young people to move out of the beautiful valleys.

After going through Vermont and New York I will say that the first indications of what dairying will do was in going up the Champlain valley to St. Albans; that gained its whole importance from being a dairy centre. It has the power to price the dairy products of New England. The price of cheese and butter is controlled by St. Albans, Vermont.

Now we come up to Maine, and I will say, after looking over all these farm pictures and mingling with the farmers, seeing their situations and comparing them with the State of Maine, nature has been no more bountiful to them than to us. The valley of the Kennebec beats theirs. We have every advantage; we have as fertile soil, and one of the vital questions is a good water supply, and no state in the Union, no section of the globe is better favored with water than the State of Maine, and that is essential to the dairy interest, and we will say right here, that the dairy interest is waking up; we are bringing it to the front.

You have been running to the savings bank to deposit your money and going out of farming; the bushes grow up in your pastures and your young people go to the West or to Massachusetts. But you have seen it about long enough; you are getting over the dark spot.

We very soon must have a butter centre in the State of Maine. It will be essential in order to get fair prices for the dairy product; and the board of trade that starts in and secures the position of a butter centre in the State of Maine are going to be lucky fellows. In Boston at a first class hotel I had the honor of eating Elgin, Ill., butter. It has become a great butter centre; and the price of butter in Elgin is quoted all over the world. There is hardly an island in the ocean but knows what Elgin butter is. But they don't make a pound of butter in Elgin, Ill. The fact is, the board of trade of Elgin, being smart, went to work and established a grade of butter; buying the butter from all over the country; and the Wisconsin butter that comes to Boston, comes as Elgin butter because it comes through Elgin and gets their grade. It is a great industry and has the distribution of a large amount of money. When you get to a butter centre, there will be another plant erected. This may be new to some of you. A freezer may be made; I will show you one in Boston on North street, a large building where they can put the temperature in July, August and September, to any degree you wish. It can be twisted down to twenty degrees below zero or placed at thirty-six degrees above. Now let us see the force of such a thing as that. If we in Maine had a butter centre and a large amount of butter on hand, and butter drops in the market. We take it there in July and put it in the freezer where it is ten degrees below. That butter will not change a bit for ten years; it holds right there.

To-day in Boston, every two and one-half months old lamb that dresses thirty pounds, that is dressed neatly, is dropped into little boxes where the thermometer is below zero and is frozen up in five minutes and remains there till the Quincy House people want a spring lamb. The freezer is a great institution. They have taken a hundred barrels of potatoes and put them in the freezer when the thermometer was thirty-five above and held them there a year, and the potatoes were as fair and hard as when put in. They could be kept there ten straight years and then you could not tell but they were just dug from the ground. The same holds true of eggs. These things are coming and we farmers of the country must learn what is going on around us and catch on to these new ideas. That freezer goes with the milk implements.

Now, as some of my friends are going away, I will get around to condensed milk. Thirty years ago there was a peculiar kind of a man named Wood, who undertook to preserve milk with sugar. He saw there was a large amount of the milk supply that was being fed to the hogs. He knew that that food product was the most complete food. He went to work and studied up the work of condensing milk. But the industry was a slow thing and the war came on, but it was a necessity to the army; and that brought condensed milk before the public. What has given it the greatest boom, is the fact that in this broad country, animals are subject to the same ills that the human race is. Cattle are liable to be sick and there is no better generator of disease than the milk of diseased cattle; and scientific men have brought the fact to the surface, that the condensation of milk, by raising it to a high temperature, kills all the germs. That idea has brought it forcibly before the public and made it desirable in many cases. In the start we explained to you a little of our position on condensed milk. I did not intend to start into a new business life, having followed the cattle business a quarter of a century. I did not intend to go into dairying, but I was interested in the subject and looked the business up and come to the conclusion that it was an industry that ought to come into the State of Maine. It has been kept lately, since the business became profitable, very secret. If you were to go to New York and attempt to go into their factories, they won't let you go through. As I did not start into this as a life business or to make a dollar out of, I am here to tell you this fact, that I am willing to give all the secrets. I do not care if there are ten condensed milk factories in the State. But there are some difficulties. If you want to start one, you can get all the secrets through us; but our New York friends say it is fool-hardiness. In this great world there are thirty condensing factories; fifteen in the old world and fifteen in America. This is a trifling percentage of the entire milk product. There is a great demand for it; there is no trouble in selling all the condensed milk that the State of Maine can make. Now again we compete with New York. I have told you that in New York their farms are worth $100 an acre. Their farms are no more fertile than ours; but they are nearer the big centre. We pay seven cents a case to get our milk from Newport to New York. Our facilities for carrying our produce to New York, almost places us there. Our land is worth $10 an acre. Another great advantage in the State of Maine is the fact that our live stock is particularly healthy. We are the only State that has a real true bill of health. We have hardly any sick cattle among us. One of the reasons for that is this: our cattle are not closely herded, they run in our pastures in small herds; they are not fed on any decayed foods. This gives our milk at the present time a good send off in the market. When we can say to these people that we have healthy cattle, our neighbors in New York are finding fault with us, but we try to say a good word for the State of Maine when we can.

Now with regard to the operation. We have a factory at Newport 100 feet long and 40 feet wide and three stories high. We have another at Winthrop, nearly 300 feet long, all of brick. All have the best machinery; everything put there to last half a century. These two factories have the capacity to condense 100,000 cans of milk a day. We can use the product of 10,000 cows. We shall distribute at those two factories, when fully equipped one and a half million dollars per year. We do not send money to Boston as they do for the woolen mills; we buy the milk of the farmers, and hire the farmers' sons and daughters to manufacture it. After it is a known fact that these industries have come to stay, that they are bona fide; I would be pleased to see other factories spring up. The two plants, to condense the milk of 10,000 cows, will cost $300,000. It takes money, but nevertheless they are not enemies to the butter factories nor cheese factories,—the two go hand in hand.

It has been said that we have injured the butter folks, that we have paid higher for milk. Do you catch on to that idea, that if we use the product of 10,000 cows, butter will not be any more plenty? But the point I urge on the farmers is this;—that we must have good butter and have a butter centre, so we can get as much for the Maine butter as they do for the Elgin butter. If that comes around, you can pay as much for milk as we can. It is a science; we need intelligence and education. The young farmers are catching hold of it and coming to the front. There is not the slightest doubt that in ten years from to-day there will be more than two condensed milk factories in the State of Maine. I think there will be a great many butter factories.

I will give you another point that may be worth considering. It is said by some of the experts that have been in the factory lately from Illinois, that they can condense the skimmed milk. If so, we shall be buyers of the skimmed milk after your separator has taken out the butter, and so utilize the whole thing. I intended to have here some cases of milk. We make four brands. This I hold in my hand is a specialty; we have the copyright; this is a new thing. We have first this "Baby Brand." In this can are sixteen ounces of milk. That is preserved in sugar; thirty-five per cent is sugar. I will give you the figures so you can all figure it out. When you inquire for a can of condensed milk, you buy a pound; you buy a square quart of milk. It takes just a quart of milk to make that can.

Now, the condensation of milk consists of this: We have a large hopper, weighing over five tons; we have strong vacuum pumps, and as the milk is brought in from the farms, (later on we shall buy milk according to quality, and the man who produces the best milk will get the most for it. Now we pay the same price for it), the first process of condensing milk, after the milk is strained and run into the vat, we mix the proper amount of sugar with it, then it is heated up to form a syrup. Then it is pumped into the big pan; we can manufacture several hogsheads at once; this pan is formed so we can take the air out, then put force pumps on and force out the air and form a vacuum. Then heat is communicated to the pan by copper coils that circulate through the milk; being free from atmospheric pressure the milk assumes the form of spray. It is a beautiful sight to see the spray flowing off and the water in the form of steam rises up going into a long copper arm that has a lip and as it goes in, it cools and drops off. At one end you see nothing but pure cow's milk, at the other end you see the steam and clear water running out.

In this particular can which I hold in my hand, we take out seventy-five per cent; this is the best. The next brand is the "Maine Jersey." That is condensed down to twenty-seven per cent. The next "Dirigo" is condensed down to thirty per cent. The other, the "Newport," is thirty-six per cent. I will give you a point on this later on.

At Newport and Winthrop you will see as fine a band of cattle in the vicinity of these two factories as you ever saw. There will be about a hundred head in each barn, and that milk will be kept for the infants; so people can see what we are feeding them on. We intend very soon to have our cattle inspected and so give people pure milk.

The sale of our milk has been very flattering, although it is an effort to put it before the public. I will give you an experience. I sold in the first place a hundred cases of milk to go to Boston. The next week when I arrived there, they had left word there that they wanted to see Libby. I got down and they said the thing was all bad; and it was strange that a man whom we call sharp should go to work and doctor his milk and put it upon the market.

They brought forward some New York milk. This New York milk was as white as lard and ours was colored. I noticed that the cattle in New York were Holstein. They get the cows that give the largest number of quarts, while our cows are grade Jersey and Ayrshire breeds for dairy and butter purposes, giving a fine quality of milk.

I went out to an assayer and asked him how long before he could tell me whether there was anything except pure cow's milk in that milk. He asked me twenty dollars. I called twenty-five of those grocers together and brought the assayer in. I said "I was raised in the State of Maine and am a cattle man, and here is a man to tell you whether we have a mixture; here is the State assayer." Then I explained to them why ours was yellow. I sold them a car load of milk, more than 400 cases. Then I went to the "Globe" office and they charged me a dollar a line to tell the people to buy nothing but tinted milk, and I have kept it going. They really like tinted milk.

I must give you a point about Mr. Page, the man who wrote up the article in the Maine Farmer when we were starting this industry. It was a blood curdling article and the result of it was, we almost came to a standstill. That same fellow I have met in New York. In the first place, he started in with a little industry with $60,000. Now he is reported to be worth $3,000,000. I told him he ought to let us have something in Maine. I told him we proposed to do it, and I proposed to sell to his neighbors. I went to New York, to the four biggest grocery houses and there, after working hard and long, I made a deal to sell them a little stock for more than

$100,000. I made four deals with them. I got up a new label, a new brand; each one has his brand Each case says "Made and manufactured by the Aroostook Condensed Milk Factory of Maine." Each controls his own brand. The first cargo of milk I shipped them, they wrote right back that the milk was very satisfactory.

I want to remark one thing here, that is very encouraging, I have touched on it before, but I want to say it again because I believe it is important that we study the dairy question. We cannot produce beef to sell, but we can go into the dairy with a strong hand. Instead of having five cows to the square mile in the State of Maine, to New York thirty and Vermont twenty to twenty-five, the State of Maine with greater privileges having only five to the square mile and $50,000,000 in the savings banks. We want a change; we want to take $25,000,000 out of the savings banks and put it into dairying. The State of Maine wants fifteen or twenty cows to every square mile. Then you will have fertile farms; you will have an income. You are going to injure the mail service of the United States. You won't have so many letters to write to your sons and daughters in the West; you will have them right here. I have four sons in Montana. It is a wild country. I can take more comfort in a year here, than in a lifetime there. It is wild, barren, hard; every part of it rough, but profitable, if one understands how to make it so. But how nice it is to see a family picture of that kind; to see the farmer increasing his cows from twenty to forty and eighty. Think of the great West that will always buy our dairy products. We, in New England and in the northern states, hold the key to the situation.

In New York, when they first began to keep eighty or a hundred cows, they found it necessary to have milkers. It was difficult to hire men to do the milking. They started and went to the Old World, to Switzerland, Denmark, Sweden and Holland and hired several car loads of beautiful young girls and shipped them to New York, and they were hired as milk maids. Splendid looking girls, red cheeks, brown hair, young and healthy. The farmers told me that as soon as the milk maids came there was no trouble in getting boys to milk and even some of the old fellows would come out to help milk. Now if there is any question with regard to condensed milk that you would like to ask, I would be more than pleased to inform you.

Ques. How many cows are necessary to start the business?

Ans At the present time we are condensing only between 5000 or 6000 quarts. We have the capacity for 4000 cows at Newport and 6000 at Winthrop. The cows will ordinarily have to be within ten or twelve miles of those industries. In New York, those factories that I visited are about of the same capacity. They reach out ten or twelve miles. The milk is hauled in by the farmers. They find it convenient to haul ten or twelve miles. The farmers deliver all the milk.

Ques. Would there be any trouble in shipping milk over the railroads?

Ans. Not in the least, except from freezing. It has to maintain a certain degree of temperature and be kept cool in hot weather by surrounding it with ice.

Ques. Why do companies refuse to receive milk when cows are fed on ensilage?

Ans. I am glad this is called up. I know very little about ensilage, but in learning what I could in New York, about condensing milk, the foremen at two places told me we would have to exclude all milk when ensilage or turnips or any such feed was used. Mr. Seagraves has been foreman in a factory for seven years. He told me that milk was the most sensitive thing to preserve in the world; that there was an acid in the milk of ensilage fed cows that caused fermentation. That the can of milk would swell very soon after being put up. We have never had a "swell head," but we have never received milk taken from herds fed with ensilage.

I understood Prof. Cooke to say there was no perceptible difference between the milk of cows fed on ensilage or any other feed. I have found no trouble or difference between the milk of cows fed on ensilage or anything else.

Mr. Libby. That is only giving you the New York side of it. I will say right here that it will be experimented on; we shall experiment because our milk is all different from New York milk. After we manufactured milk a hundred days, I thought there was a difference in the milk; so I sent off and had an analysis of the milk, which I have before me. Then I went to a finer chemist and had him subject it to a different analysis. I carried one can of the "Jersey" condensed milk that we manufacture at Newport and this is the report of the State assayer.

CERTIFICATE OF ANALYSIS.

Cane sugar	41.60
Milk sugar	13.23
Fat	4.30
Caseine	13.17
Ash	1.45
Moisture	26.25
	100.00

This was the sample of the Jersey condensed milk.

Now the Eagle brand made by the Condensed Milk Company, New York, sells $1.35 higher than we sell here.

Let me remark with regard to the milk, because I have been studying these ideas and it is an encouragement to our Maine dairymen, we found we had no swell heads

I was very much encouraged. I went to another chemist. I took two cans and stripped the labels off and marked them. One was the Eagle brand and the other our condensed milk. I told him we had two factories; that we were going to enlarge either one or the other and I wanted him to tell me which factory to enlarge, if there was any difference. I told him I was willing to pay him and I wanted it done fine.

When I went to his office he told me I ought to leave and destroy one of those factories and put the whole steam on the other. He says, "One of these factories is granite soil and shows a large percentage of lime. While that factory stands, you will have swell heads. The other is different." That can was made in New York. He said that was made where cows fed on soil that contained iron ore and alkali and that will injure now and then a can.

He remarked to me with regard to butter; said it was a fine section to make butter in this granite soil; that we would have no trouble in keeping butter. He don't know to-day anything about the two cans of milk.

Ques. Is it necessary that the milk should be sealed in the cans?

Ans. It has been understood that it would keep better kept from the air; but we have been experimenting. We have had one can of milk open a hundred days and it has never changed one mite. Although it is sealed, I think it is safe to put anywhere; we have never had any milk change a particle.

Ques. Will it not call for improvements and enlargement of barns on farms through this range of twelve miles, in order that the cows may have more room?

Ans. In the town of Newport, there is a young man named Furbush. His attention was called to this. He had eight or ten cows. He had a large sheep barn and other outbuildings, and he went to work and bought cows till he has got sixty. He has simply changed the buildings from sheep houses into cow barns. Every man who sells milk, signs a contract that he will keep his cows in such and such shape; the barns have to be whitewashed and the cows fed on food not in any way decayed. These are the conditions that parties have to sign who bring milk to the factory. Our foreman attends to it.

Ques. Do you take any fat from the milk?

Ans. No. It is whole milk.

Ques. How rich milk can you use? How large a per cent of fat can you evaporate for condensing milk?

Ans. I think we could condense *cream*. Good cream could be condensed; but there would not be but a small percentage taken out by the heating process, and the sugar would keep it. But we have learned recently that skimmed milk taken from the separator the modern way, to make butter, can be utilized and is salable; that there is full as large demand for it as for the higher class of milk. The idea we shall adopt, to condense skimmed milk if we could ship skim milk to our factory from this factory at Walnut Hill, we are going to use up the product of the cows in the State of Maine. If the New York people can make money, we can. The only dairy product that is shipped to this country from the Old World is a class of cheese made in Italy that brings thirty-five cents a pound. I have talked with intelligent Italians. They say that the people keep the cows right up in the barn and keep them on select food and make the cheese and bring it here. We can do the same thing. In France they are making a large industry, manufacturing butter which is put in glass cases holding five pounds and send it to Australia and that butter is worth fifty cents a pound. All those things are before us and we have got to study the questions and use the knowledge and get up and be catching on and not be away behind; strike in where the other fellow left off.

Ques. Is condensed milk generally used in families!

Ans. It is a recent thing to be used in families. Since I have been identified with it, I don't use any other kind. I have that put upon the table. Just a teaspoonful of that milk put in coffee is better than any cream and sugar I ever put in my coffee. I am arrang'ng so that that can be put upon the table of the Quincy House and Tauny's Hotel in Boston.

Steam ships and vessels use nothing but condensed milk. The islands of the Indian ocean are great buyers; there is no end to the demand; all the mining companies use it. We have shipped to Helena, Montana. We have on file an order for a car load to go to Butte, Montana. It is a peculiar city, containing 25,000 people, a high atmosphere, the fumes of a hundred smelters thrown out to contaminate the air, so they cannot keep animals there; the highest prices are paid for help on account of the death dealing atmosphere. They think this condensed milk is a Godsend to them. If we were prepared to do it, we have a very advantageous offer to load a cargo of that condensed milk. If we can make it in the month of April and load at Belfast and ship to Australia the cargo would amount to $109,000.

Now if we can make it profitable at Newport and Winthrop, other sections of the country can go to work and build factories. You must understand that the hard side is the *cash* to do it. It is $110,000 and our two factories are only partially equipped. When I pay stock holders good dividends on their stock, I think we can go on. It has cost me considerable to get this up to where it is to-day. It has come to the State of Maine to stay. We can make butter and cheese and condense milk as cheaply as they can near big centres. Those condensed milk factories are near big centres, but they can never make it cheaply.

Ques. Is it used for cooking purposes?

Ans. Yes, and for ice cream.

PROF. W. W. COOKE.

GENTLEMEN :–There is one point which I want to bring up, that I omitted to speak on this morning, that was with regard to the loss of quality of milk from unkindness. I touched on that a little, but I neglected to make the further statement, that when a cow shrinks in her milk at one milking, she usually makes it up the next. That is the general rule; if a cow gives less one milking she gives an increased quantity the next, and so makes up for it. But where that shrinkage comes from exposure or unkindness or worry, anything outside of the cow, that shrinkage is a loss, she does not make it up in the following milking or any milking. She may get back but does not increase. So looking at the matter, at the bare dollars and cents side, it pays to treat cows kindly and humanely.

Ques. There has been talk about cows making milk. Whether a cow carries a large quantity of milk in her bag, or whether it is the matter of a few minutes' time at the time of milking. I have a case in hand at my place that convinced me that the milk is made by the cow in a few minutes when the cow is milked.

Ans. Well, I think any one could convince themselves very easily. Take a cow that is giving a large flow of milk, twenty pounds at a milking. At the usual time of milking, instead of milking her, kill her. You would be doing well if you get two quarts of milk out of the udder. If instead of killing, you would milk her, you would get ten quarts.

Ques. How much rye would you save with the corn?

Ans. From one and one-half to two bushels to the acre, scattering it broadcast.

Ques. Would that do for fall feed to turn cows on?

Ans. We put it in the ensilage corn. It does not grow in the summer; there would not be feeding value enough to use then.

Ques. Do you raise peas and oats to thresh?

Ans. No, we get more feeding value out of it cut green.

Ques. What time of year do you sow the rye?

Ans. We throw it on broadcast on the ensilage corn, just before the last cultivating.

Ques. Can you sow as late as the middle of July?

Ans. Usually not earlier than that; from the middle of July to the first of August, when the corn is nearly two feet high.

Ques. What is the cost of raising corn for the silo as compared with drying it?

Ans. It costs less to bring it to the barn and put it through the cutter and into the silo, than to run it through the cutter after it is dry, and bring it to the barn. The difference would depend somewhat upon the man's individual situation Where a farmer has one hundred and thirty-five acres put in the silo, everything on a large scale, they handle it with very small expense; about sixty cents a ton from the field to the manger of the cows.

Ques. Why does the silo heat?

Ans. There is the temperature of the season of the year when the ensilage is put in; the amount of weighting and the tightness of the silo. If the silo was absolutely tight and was heavily weighted, it would cool right down; but if there are cracks through which the air enters and it is not heavily weighted, you will get heat.

Ques. What do you call a heavy weight?

Ans Fifty pounds to the square foot is an ordinary weight; 100 pounds to the square foot is heavy.

Ques. What is the best method of building the silo?

Ans What I consider the best is made of two by ten, set up edgewise and covered on the inside with two thicknesses of boards, with building paper between, with gas tar slightly thinned with gasoline, so it is put on with a brush; the inner lining is painted with that before the building paper is put on; then the inside of the silo painted after the silo is all made, the outside being just the thickness of the sheathing. The two by ten, sixteen inches apart, gives s rength enough.

Ques. Will they not spread out?

Ans. The two by ten set over six inches has a good deal of strength to resist pressure.

Ques. How do you tie it together at the corners?

Ans. It is done by binding it back and forth. The two by tens at the corners are lopped over and spiked through and the outside boards lengthwise. Then we spike a piece inside. Our silo is twenty-six and one-half feet deep, fifteen feet wide and thirty-three feet long, divided into three silos.

Ques. How long a time do you dare to wait before you weight it?

Ans. I should want it weighted in four days after the ensilage was put in.

Ques. How long a time would you allow to fill it; could you take a week?

Ans. I would just as lief fill in one day; let it wait three days, then another day. I shouldn't want more than four days between the filling. We have three silos, and go back and forth, and let them all heat and settle.

Ques. Do you consider ensilage as good, put in whole?

Ans. That depends on conditions. If a man puts in a couple of acres of ensilage corn, has a little silo, he can put it in cheaper to put it in whole, than to buy a cutter and pay $125 or $200 for it.

Ques. What is the best fodder corn to raise?

Ans. I should not be qualified to speak for you. I know what is best for us. We use the Sanford and Redtop. We begin to feed from one silo as soon as we fill it. One, we do not open till May or June. That is weighted 100 pounds to the square foot. First we cover with rough hay run through the cutter and as it comes out, men stand with hose and cover it with water, so the water runs off, the hay being saturated with water. It was then carried up and dropped on top of the silo and spread over it making a thick coating. Then we put a few loose boards across and put on stones enough to make that weight. The hay matted together under the stone.

Ques. Is ensilage as good as good English hay?

Ans. Good judges think that one and one-half to three tons is worth as much as a ton of good English hay. We consider ten pounds of hay ample feed with ensilage. Ten pounds of hay and all the ensilage the cow can eat. We give eight pounds of grain.

Ques. Regarding the rye sown among the ensilage corn, I understood you to say that was winter rye to cut the following season, in June?

Ans. Cut just before you need to turn the land over to use for corn. We use the same land for corn.

Ques. Is that rye fed green?

Ans. Some of it was cut and fed green, but mostly it was cut up fine and put into the silo.

Ques. About barley?

Ans. Barley was fed green from the field without cutting. The cows ate every bit. The barley was sowed from the middle of July to the first of August. Barley is as good, if not the best feed we have ever got hold of.

HON. WARREN H. VINTON:—I move that the thanks of the Board of Agriculture are due, and hereby tender to the Maine Central Railroad for reduced fare, to the hotels for reduced rates, to the citizens of Brunswick for their kind and cordial reception of all during the meeting.

SECRETARY MCKEEN:—I wish to make a little statement with regard to the operations carried on yesterday and to-day. You have witnessed the operation of the churn and separator from the stage. You have been told that the churning has been done from cream raised by the deep setting or Cooley process and butter was also churned from cream separated by the separator. The testing of skimmed milk and of whole milk before it was set, you have also seen. The idea has arisen in the minds of some, that that would make competition among the different processes of raising cream. Such is not the case. It would be unfair for us to make these comparisons of the two distinct processes of separating cream from milk.

In the first place the separation of cream from milk is simply a mechanical process; as much as for oil to rise on water. It depends wholly upon the movements of the liquid. These movements while cooling are just the reverse of water when it is boiled. As it cools the heavier particles are thrown to the outside of the can and their places are taken by the lighter particles rising to the centre, the cooler particles going outside. During this action, the cream is separated and remains upon the top of the can. We brought this milk a long distance, and for that reason we were unable to get that perfect separation which we were able to do with the Cooley or deep setting process under fair conditions.

I trust no one of you will go away with the idea that it was of a competitive nature; because the Board of Agriculture had no intention to make it so. We only designed to show you the different ways to raise cream and the making of butter from them. The quantity of butter which we got in both cases was so nearly alike, that the difference would be hardly worth reckoning.

The speakers of the meeting have been very fortunate in their choice of subjects and in their manner of treating them, and I hope this meeting will be productive of good; that the farmers have been benefited by these two days we have spent together. There has been a great deal of labor on the part of citizens and members of the board and the janitor of the building. I feel that we have been amply repaid by the interest you have taken and the attention you have paid the speakers. We shall leave the building to-night with the idea that we have done good work here and we hope to meet you all again at no distant day.

Meeting adjourned.

PAPERS PRESENTED AT INSTITUTES.

IMPROVED ROADS FOR MAINE.

G. H. HAMLIN, Professor of Civil Engineering, State College, Orono,
Delivered at Auburn, November 11, 1892.

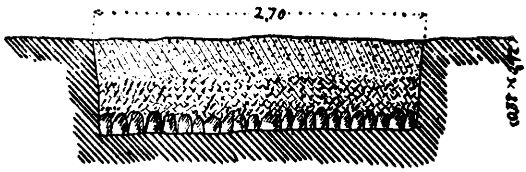
The best road for Maine is, the one which has been shown to be the best for all parts of the world, by the usage of a hundred years—the Modified Telford Macadam road. The foundation principles of road making apply everywhere alike, the frost even, having but slight effect upon the best artificial road. Stone roads were built by the Carthagenians, the Romans, and the Ancient Peruvians. Prescott tells of great military roads in Peru, the broken remains of which are still in sufficient preservation to attest their former magnificence. He says "there were many of these roads traversing different parts of the kingdom. These roads passed through long tunnels, under mountains of solid rock, and over ravines of hideous depth, by means of embankments of solid masonry. Stone pillars in the manner of European mile stones were erected at stated intervals of somewhat more than a league all along the route. Their breadth was about twenty feet. They were covered with heavy flags of free stone and, in some parts at least, covered with bituminous cement, which time has made harder than the stone itself. One of their great roads which lay through the level country from the Andes to the ocean, was constructed in a different manner, as demanded by the nature of the ground, which was for the most part low, and much of it sandy. The roadway was raised on a high embankment of earth, and defended on either side by a parapet or wall of clay, and trees and odoriferous shrubs were planted along the margin." Between 1500 and 2000 miles of these roads are still distinguishable in South America.

The roads built by the Romans were as enduring as the very hills. In places, they are in a good state of preservation to day, after the lapse of 2000 years, and are noble monuments to the skill of these builders.

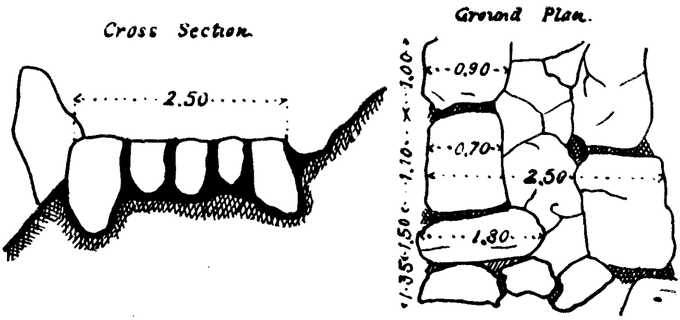
The Romans built roads by digging a trench of the required width and depth and depositing a layer of large stones in it at first, and then another of smaller, on top of the first. These were

Roman Roads. Sections.

Roman road below Kallnach between Grenches and Soleure



Roman road on the Septimer



Roman road above Mett in the Jura.

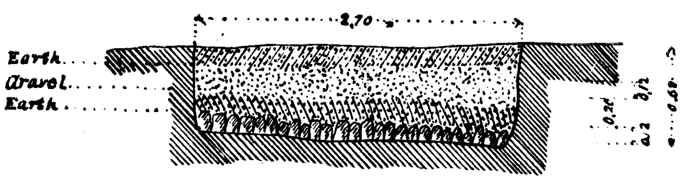


PLATE I.

carefully and compactly laid, often in mortar, to form what was called the sub-road, over which the road material proper was placed, which consisted of prepared slabs, or blocks of stone, or gravel and sand, the total thickness of the whole often being four or four and one-half feet. They always went in the most direct line from place to place. The hills were cut down and the valleys filled up. They built, however, solely for military purposes. They placed the construction and care of these roads in the hands of those of known ability and high in authority. Julius Cæsar at one time had charge of the roads of the Roman Empire. The roads of Rome were a part of the machinery by which she governed the world, but they were constructed at an enormous expense, if we give to human labor in those days anything like its value of to-day.

Good roads are of no less importance in maintaining and strengthening our present progress and civilization, than they were to Rome in maintaining her mastery over the world. But during the decadence of the Roman Empire, the magnificent system of military roads, which lead in all directions from Rome even into England, France and Switzerland, and which had been constructed at such a great expense, were neglected and fell into disuse. And during all those years of the Dark and Middle Ages their value and importance were unknown and the methods of their construction forgotten. (See plate I.)

When in the sixteenth and seventeenth centuries, the necessity for some system of road construction and repairs was felt, the governments did not assume their direct care as was the case in the days of Roman roads, but adopted that indirect method by statute labor, from which we derive our own present pernicious and inefficient system; and which in England resulted in a system of roads which, if possible, were worse than the roads which the same system has produced for us. In the words of the historian Macaulay, I will describe to you the roads of England in the last of the seventeenth and first of the eighteenth centuries. Macaulay says: "On the best lines of communication the ruts were deep, the decents precipitous. Often the mud lay deep on the right and the left, and only a narrow tract of firm ground rose above the quag mire. It happened, almost every day, that coaches stuck fast, until a team of cattle could be procured from some neighboring farm to tug them out of the slough." Thorsby, who was in the habit of traveling between Leeds and the capital, has recorded, in his Diary, such a series of perils and disasters as might suffice for a journey to the Frozen Ocean, or the Desert of Sahara.

On the roads of Derbyshire, travelers were in constant fear for their necks, and were frequently compelled to alight and lead their beasts. The great route through Wales to Holyhead was in such a state that, in 1685, a viceroy on his road to Ireland, was five hours in traveling fourteen miles in the neighborhood of Conway. Between Conway and Beaumaris he was forced to walk a great part of the way, and his lady was carried on a liter. His coach was with great difficulty, and by the help of many hands, brought after him entire. In general, carriages were taken to pieces at Conway and borne on the shoulders of stout Welsh peasants to the Menai straits. In some parts of Kent and Sussex none but the strongest horses could, in winter, get through the bog, in which, at every step, they sank deep. The markets were often inaccessible during several months. It is said that the fruits of the earth were sometimes suffered to rot in one place, while in another place, distant only a few miles, the supply fell far short of the demand.

The wheeled carriages, were in this district, generally pulled by oxen. When Prince George of Denmark visited the stately mansion of Petworth, in wet weather, he was six hours in going nine miles; and it was necessary that a body of sturdy hands should be on each side of his coach, in order to prop it. Of the carriages which conveyed his retinue, several were upset and injured. A letter from one of his gentlemen in waiting has been preserved, in which the unfortunate courtier complains that during fourteen hours, he never once alighted, except when his coach was overturned, or stuck fast in the mud. He says that one of the chief causes of the badness of the roads seems to have been the defective state of the law. Every parish was bound to repair the highways which passed through it. The peasantry were forced to give gratuitous labor six days in the year. If this was not sufficient, hired labor was employed, and the expense was met by a parochial rate. That a route connecting two great towns, which have a large and thriving trade with each other, should be maintained at the cost of the rural population scattered between them, is obviously unjust. It is a remnant of feudal times when the peasants held their land only on condition that they would keep the roads in a suitable condition for the passage of the troops of their lord.

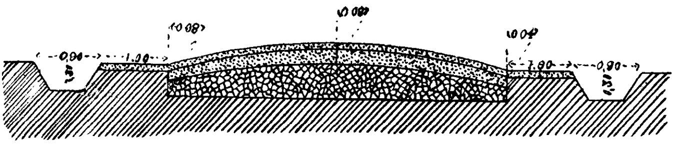
Soon after the restoration, this grievance attracted the notice of Parliament, and an act, the first of our many turnpike acts, was passed imposing a small toll on travelers and goods for the purpose of keeping some parts of this important line of communication in good repair. This innovation, however. excited many murmurs and the other great avenues to the capital were long left under the old system. A change was at length effected, but not without great difficulty; for unjust and absurd taxation to which men are accustomed is often borne far more willingly than the most reasonable import which is new. It was not till many toll bars had been violently pulled down, till the troops had in many districts been forced to act against the people, and till much blood had been shed, that a good system was introduced. By slow degrees reason triumphed over prejudice, and our island is now crossed in every direction by nearly thirty thousand miles of turnpike road. At first these turnpikes were constructed by trustees, into whose keeping Parliament gave the roads with the power to collect toll with which to make repairs and to pay the interest on the cost of construction. In this way the best roads became, as it were, the property of private corporations like our railroads. But the builders of these roads copied after the ancient roads and went very deep for the foundation and consequently the roads were so expensive that toll gates had to be erected every four or five miles with toll rates varying from six to thirty cents for each distance.

This state of things continued until about the commencement of the present century, when John Lowdan Macadam and Thomas Telford revolutionized the whole system of road construction. The plan of these great road makers differed radically from the old method and produced an equally good road at such a reduced cost, as to admit of the wonderful extension of roads all through Europe, which took place at about this time. The roads built by these men were often constructed for less per mile than it required for annual repairs on the old ones. A writer in St. James Gazette compares the two systems in the following language: Instead of going deep for a foundation, the new method was to work on the surface. Instead of producing a peaked, roof-like mass of rough surface, a flat, smooth and solid surface was produced. In place of a road four feet deep, a road of a thickness oftentimes not more than ten inches, was produced; and for large rocks and boulders were substituted stone, broken small and to uniform size. The leading principles which were to guide in the new method of construction were,—first, that a road ought to be considered as an artificial flooring, so strong and even as to let the heaviest vehicle pass over it without impediment; and second, to serve as a rcof to shed the water which fell upon it, and thus always to keep the foundation dry and consequently unaffected by the frost.

In the old method of construction the foundation was made heavy and deep in order, as it was supposed, to be able safely to carry the load. The new method recognized the fact, that almost any soil when dry, possesses sufficient bearing strength to carry any load, and that the effort should be to keep the subsoil always dry, first by excluding the water that fell upon the road surface from percolating down through, and secondly by a system of thorough drainage to keep out and carry off the moisture that entered the subsoil from contiguous soil and from above.

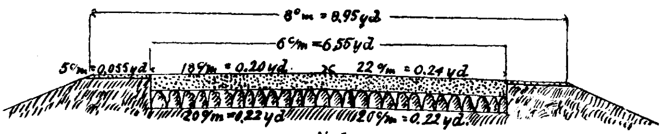
Macadam discovered the fact, that stone broken small and shaken or pressed together, as by the traffic on a road, rapidly settled down face to face and angle with angle and formed so close a mass that it soon became practically impervious to water. The bearing ability of the road, he secured by a thorough drainage of the subsoil, and the thickness of the road material proper, he regulated solely by its imperviousness, and not at all with reference to its bearing weights; the native soil being fully equal to this, when drained properly. It was found that a road bed, formed and drained after this fashion, and covered with from four to eight inches of good broken stone, thoroughly compacted by heavy rollers and one season's traffic, would pass through the most severe winters without breaking up. Upon these principles, as applied by these great road makers, thousands of miles of road were constructed in various European counties, and with some slight modifications, to suit time and place, thousands of miles have since their day been constructed. The system has been thoroughly tested in nearly all parts of this country, and found to give good results, whenever it has been applied by men thoroughly instructed in all the details of its application to construction and repairs. (See plate II.)

Now, without going into these details any more fully, I would say that such are the best roads for Maine, but they are very expensive, costing all the way from $2,000 to $10,000 per mile, according to circumstances, such as the character of the soil and the cost of labor and materials.



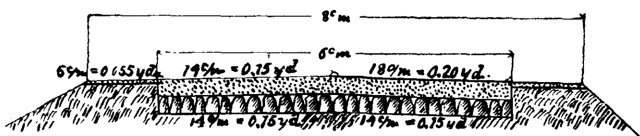
Plan of a cross-section of the road from Denia to Ondara

SPAIN.



No. 1.

German Roads.
Heavy Construction.



No. 2.

German Roads.
Light Construction.

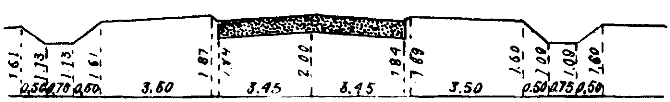


PLATE II.

There are places in Maine to-day where the population is dense enough and the traffic sufficient to amply justify the construction of a first-class system of macadam roads; but before the construction of such is undertaken and the expense justified, careful study should be given the locality by men thoroughly qualified to judge of such matters. The builders of country roads should be as well educated as the railroad engineer. There would be just as much sense in intrusting the construction of railroads to the inexperienced and uneducated man, as there is in leaving the construction of the country roads to him. He has done the best he could with the means at his command, but he has not been sufficiently well grounded in the principles involved to enable him to cope successfully with the destructive elements with which he has been obliged to contend.

Maine is a large State containing 30,000 square miles with a population of only 700,000 people and a valuation of $290,000,000 and the road problem with us is a very different one from the one with which the people of most European countries have had to contend.

The problem, however, is being solved with marked success in parts of British America where all the conditions would seem to be more difficult than in our own State as will appear from the following extract from the report of Consul Levi W. Myers, concerning the roads in the province of British Columbia.

He says, "Considering the recent date of settlement, the rough and uneven character of the surface of the country, and the limited finances at command, this province is remarkable, in the older portions especially, for its excellent roadways, and in all parts of it, for the interest taken in them and for the amount of money expended in their construction. In the first place and chiefly, the provincial government has entire charge of all road work. I emphasize this point because, in my judgment, it is the key to the success of the system that prevails here. Road work is not left to local caprice, nor is it placed in the hands of incompetent or inexperienced persons. The department of lands and works determines where a road is needed, and then it is laid out by a competent engineer, and thus the roads of the entire province are related to one another.

The government not only determines where the road shall be, but how it is to be made, who is to make it and what the cost is to be; and then it pays the bills out of the public treasury.

There is no special tax or special road appropriation. The work of construction is under the supervision of competent civil engineers and foremen, who have what may be regarded as liberal salaries. The latter receive from $100 to $150 per month. All work is done thoroughly and with great system, and the work of one year is the foundation for the work of the following year, according to the general plan of improvements."

This last sentence is the key to the whole subject, and the problem of improving the roads of Maine should be undertaken in this same spirit, so that while time and money shall not be thrown away upon them, they will be kept in a passable condition in all localities as cheaply as possibly, while in the localities where the traffic is heaviest; there, permanent improvement may be undertaken in such a way that every dollar laid out upon them will ultimately tell in the final development of a first-class macadam road.

The first effort in the line of permanent improvement of the road should be to correct the alignment, wherever that is possible so as to avoid steep hills and deep valleys. Where change of location can not be effected, the hills should be cut down and the valleys filled up, as much as possible.

The expense of heavy grades in wagon roads is not appreciated by those who are most inconvenienced by them. To illustrate this point we will suppose that a horse can haul 2000 pounds on a certain kind of level road, then if the road rises

1 foot	in	100	he could	haul up	it only	1800	pounds.
1	"	50	"	"	"	1620	"
1	"	30	"	"	"	1200	"
1	"	10	"	"	"	500	"

A horse can exert a tractive force of 120 pounds, steadily and continuously at a walk, through the day. On a good gravel road the tractive force, necessary to move a ton, is about 140 pounds. Now a horse can exert a tractive force of two or three times 120 pounds, for a short time, so that any hill which does not involve more ascent than is required to trebble the resistance of the load, if it is not too long, or does not occur too often, will not materially lessen the value of the day's work of the horse, but when the rise becomes so steep that the horse can not, even by trebbling his effort, haul the load up it, then, if only one such grade occurs in a distance of ten miles, it will necessitate the hauling of a lighter load over the whole distance on account of this one hill, and consequently the value of the day's work will be lessened in that same proportion. If, for instance, on a ten mile trip, such a hill occurs that the load will have to be reduced by one quarter, then if a man is driving a team of two horses which should be worth four dollars per day to him, we can readily see that this hill is costing him one dollar every day he makes the trip. It can easily be shown that, in such a case, a very liberal expense could be incurred in order to reduce this grade so that the horse could haul his full load over it, by a short spurt of effort. The resistance of grades is found by multiplying the gross load by the rise and dividing the product by the length of the grade, thus the resistance to be overcome, to haul a given load up a grade of one foot in a hundred, would be one-hundredth of the load, and the resistance on a grade of one in ten, would be one-tenth of the load. Telford estimated the average resistance of carriages, on a level part of a good broken stone road, at one-thirtieth of the gross load and as he desired no grades on his roads which would require the horse to more than double his effort, he assigned one foot in thirty as the ruling gradient which ought, as far as possible, to be adopted on good stone roads; occasionally, however, he found it necessary it introduce steeper grades for short distances, such as one in twenty or one in fifteen.

Now, the resistance to traction on a common dirt road is about 200 pounds to the ton, or one-tenth of the load, so that the resistance due to a grade of one in ten has been shown to be one-tenth of the load. It is evident that to haul a given load up a dirt road having a grade of one in ten, would require that the horse should double his effort to overcome the grade. As it required only a grade of one in thirty to double the resistance on a good stone road, but requires a grade of only one in ten to double the resistance on a dirt road, it appears that in scientific road construction, steeper hills may be allowed on poor roads than on the best ones. This fact, however, is not a count in favor of dirt roads; for while a horse can haul 4035 pounds on a good stone road, he can haul only 1350 on an average dirt road. Reference is not made here to a hard clay road in a dry condition. A horse could haul as much on such a road as on a stone road. As a further illustration, take this road colored blue on Plate III as an example. On this map are shown the contour lines for every five feet in elevation. The road as shown by the blue lines, as measured on the map is thirty-three hundred feet long. There are also two hills over which the load must be drawn and this is only another expression for saying that the load must be raised to that height. The difference in elevation between the villages A and B is only five feet, hence for every foot which the load is unnecessarily raised, there is a corresponding waste of power.

To show the effect of grades in this case, take a loaded vehicle weighing six tons; the tractive force required to draw it on a well made macadamized road would be 264 pounds, provided the road was a level one, but if we take the same load over the road from A to B, it will require an additional force of 800 pounds to draw it over the steepest grade, which is one to fifteen. These figures are based on results taken from well-built, hard roads, and of course the force required to haul the same load over a muddy or sandy road would be much greater.

Suppose on the same map a second road be located and be represented by the *black line*, here the length of the *new* road as measured on the map is four hundred feet in excess of the *old* road, but to compensate for this, the load does not have to be raised so high by at least fifteen feet and the additional power required to draw the load up the steepest grade, of which there is but a short stretch of one to thirty, and so only one-half as much would be required to draw the load as on the *old* road. Steep grades also add to the expense of repairs as such hills are likely to become gullied by deep ruts along which the water will run with such force as to cut up the surface of the road and render it unfit for travel. If the improvement be avoiding a hill Gillespie gives the following demonstration: The resistance of gravity to be compared with that of friction. Suppose a certain road ascends a hill which is a mile long, and has an inclination of one in ten, and descends on the other side with the same slope, and that a level route can be obtained by making the road a mile longer. It is demanded how much may be expended for this purpose. Take the average power of draught of a horse at three miles an hour for ten hours a day at 100 pounds. Suppose that the friction on this road is $\frac{1}{40}$, and that 50,000 tons is to pass over it annually. On the original road of two miles, the force or draught required to overcome the friction of 50,000 tons hauled over thirty miles, where the resistance is as above stated, $\frac{1}{40}$ of the load, would be $\frac{50000}{40} \times \frac{2000}{100} = 25,000$ horse-power exerted one hour. The working day is to be ten hours, or in other words, it would require 250,000 horses to do the work in one hour.

If they were to haul the load over one mile, instead of thirty, of course it would require only $\frac{1}{30}$ the number of horses. To haul it over two miles, the length of the hill under consideration, would consequently require 166,666 horses working one hour, or 1,666 horses working all day. To overcome the gravity of the loads on an incline of one in ten, thirty miles long would require $\frac{50000}{10} \times \frac{2000}{100} = 100,000$ horse-power exerted one day, or for one mile $\frac{100000}{30} = 3,333$ horse-power would be required for one day, or 3,333 days' work for one horse.

The descent of a mile on the other side of the hill is not a compensation, for a horse will have no more to take down the descent than he had dragged up the ascent. The total annual labor to overcome both friction and gravity on these two miles is therefore $1,667 + 3,333 = 5,000$ days' work of a horse.

Upon the new road proposed there is no inclination to overcome, but an extra mile of length. The force of draught upon it due to friction is $\frac{50000}{40} \times 2,000 = 25,000,000$ pounds for three miles, 250,000 pounds for thirty miles, 2,500 days' work of a horse. The saving of labor is therefore $5,000 - 2,500 = 2,500$ days' work of a horse $1,875, reckoning the wages of a horse seventy-five cents per day, interest of $31,250, which amount (deducting cost of repairs of the extra mile) may be expended in making the new road.

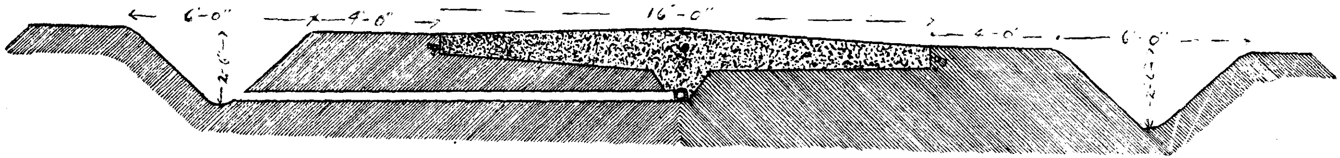
The first law in road making is drainage. Of all the principles, however, which should guide the road maker, this is the least respected by those who have charge of the roads of Maine. No attempt whatever is made to enforce this law, other than to provide such culverts and ditches as will suffice to carry off the greater part of the water which falls upon the surface during a heavy shower or long storm. This is the only use of the ditches as ordinarily constructed and left by the sides of our roads. Water is the greatest enemy to our roads. The problem of drainage is then, the problem of removing this water from the road as quickly as possible and with as little injury to the roads as possible. The easiest way to dispose of this water is by so constructing and keeping the road bed that it will at all shed, like a roof, the greater part of it as soon as it falls upon it. The coating of stone on a macadam road is put there for two purposes; first to furnish a smooth, hard and unyielding surface for the wheels, and second to furnish an almost impervious roof to the road bed. But through the very best and thickest stone road some water will soak, and unless it is at once removed, it will destroy the best road that ever was made. Hence in the construction of the very best stone roads the greatest care has to be taken to provide drains for the immediate removal of this water, so that whether we are to build a stone road, or a clay, or a gravel road, the formation of the road bed, and its proper drainage, must first be correctly attended to. The importance of the smoothness of the road surface is well illustrated by the following table from General Gilmore's work on road construction. He says: "If we assume that the amount of traffic between two towns ten miles apart requires the constant service of fifty horses with carts weighing two and a half tons inclusive of load, upon a very dry and smooth road of broken stone, then the additional horses required upon other kinds and conditions of roads, will be as shown in the following table, calculated from the results of M. Morin's experiments:

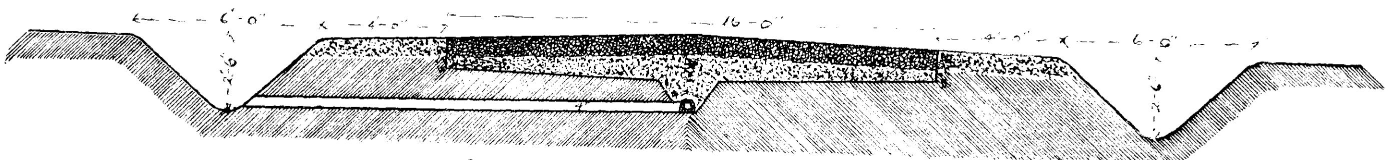
Broken stone road, very dry and smooth,	50	horses.
" " " moist and dusty,	71	"
Dirt road in good, hard condition,	93	"
Broken stone road, with ruts and mud,	112	"
" " " with deep ruts and thick mud,	192	"
Dirt road covered with one and one-half inches of gravel,	245	"

Profit of improving the surface can be shown in the following example taken from Gillespie work on roads. The cost of conveying this amount of traffic is next to be calculated. To simplify the question we will neglect the gain in speed, and consider only the saving in heavy transportation. Assume that over the road, thirty miles in length, 50,000 tons of freight are annually carried, and that the average friction of its surface (as determined by a dynamometer) is one-twentieth the weight. The annual force of draught required is therefore 2500 tons, or 5,000,000 pounds. If the average power of draught of a horse at three miles an hour for ten hours a day be taken at 100 pounds, there would be required $\frac{5000000}{100}=50{,}000$ horses working at three miles per hour. At this rate they would traverse the road in ten hours, or a working day and the total amount of labor would equal 50,000 days work of a horse, or $375.00, taking seventy-five cents for the value of one day's work. Suppose now that the road is to be macadamized or planked, or in any way to have the friction of its surface reduced to $\frac{1}{50}$. The total force of draft will then be $\frac{50000}{50} \times \frac{2000}{100}=20{,}000$ horse power, at three miles per hour, for thirty miles or ten hours, 20,000 days work of a horse. This is a saving from the former amount of 30,000. Tak-

PLAVE IV.

CROSS SECTION
OF
GRAVEL ROAD
FOR
MAINE





GRAVEL REPLACED WITH BROKEN STONE

ing the value of the day's work of a horse at seventy-five cents, $22,500 would be the actual saving of labor in each year, by the improvement proposed, which amount the carriers could afford to pay, (either in tolls, or in making the improvement themselves) for their diminished expenditure on horses. If money were borrowed at six per cent, $375,000 would be the amount which could be expended in making the improvement, supposing the data to have been correctly assumed. If the improvement can be made for any amount less than this, the difference will be so much clear gain.

Now the cost on an average, of a mile of macadam road, of proper width and depth of metal, would be about $7000 per mile in most parts of this State, and several of the older states are borrowing money and building many miles of such road, even at a greater expense than this. The proper formation and drainage of the road bed, and covering a strip in the centre sixteen feet wide with gravel one foot deep, would not cost on an average, over $1200 per mile, and, would with proper care, form an excellent road in itself, and one which would always be ready to be transformed into a first-class macadam road, simply by removing about four inches in depth of the gravel, and spreading it out on the wings or sides of the road, as indicated by the accompanying figures, (See plate IV) and replacing it with six inches of broken stone. If the alignment and grades have been properly corrected as a preliminary to the formation of the road bed, I should say that in this way we shall construct the best roads for Maine in the most economical and only practical way. This method of road construction is very nearly followed, according to the report of Consul Damuel D. Pace of Port Ontario. He says: "The country roads of Ontario and especially in the older settled portions of the province are really very excellent roads. In localities remote from stone quarries and where cobblestones are not easily obtained, ordinary sand and gravel is the sole material used, whether broken stone or cobblestone, with sand and gravel combined, or sand and gravel without the foundation named, it is essential that the roadway should be properly constructed with reference to grading and ditching or drainage.

In many instances very durable and substantial roads are constructed without the use of broken stone or cobblestone, and these roads are built in the easiest and simplest manner possible. No excavation is made in the centre of the road to receive the material; the sand and gravel are applied to the surface of the road without preparation precisely as they leave the gravel pit. The gravel is strewn over the surface to the depth of from four to six inches. The ditches and culverts and even the grading should be as carefully constructed in this method as the other; but it will be clearly seen that this process of road building is much cheaper, both in material and labor, than if cobblestone or broken stone are used as a foundation. The loose sand and gravel thus spread over the surface of the road soon becomes hardened and smooth by the tramp of horses feet and the continued passing of vehicles; a new coating of gravel each year for a few years, and thus the hollow places become filled and the road bed itself becomes more solidified. In fact, roads built after this method and properly cared for soon become practically indestructible. During the first two or three years after the gravel is applied, hollow places will appear here and there, in the roadway, or occasioned perhaps by the more yielding quality of the earth in some spots than in others.

The hollow places are filled with a fresh supply of gravel, perhaps once each year until the whole roadway assumes an unyielding surface, as firm and as smooth as the neighboring rocks. Whilst driving over these magnificent country roads, observing their solidity and comparative cheapness of construction, I have often thought our city street pavers might learn useful lessons in the art of road building from the unpretentious tillers of the soil."

The first work that must be done, in the direction of improving the roads of Maine, must be the bringing about of a radical change in our road laws. And before this change can be brought about in a country like ours, governed by the will of the people, a campaign of education must first be instituted. The people must be educated to understand the value of the changes to be made. They must be taught to see that improved roads will increase the value of their farms; that their products will thereby be increased; that the cost of the goods they consume will thereby be diminished; and finally, that their social condition will thereby be greatly improved. Unless the tax payers can be brought to see these things, there will come a powerful opposition from the country, especially to any change in the road laws looking toward the abolishment of the present pernicious system of working out road taxes and certainly to their increase. Theoretically, these changed conditions can be shown to follow improved roads by a statement of this kind. The census for 1880 gives the hay crop of Maine for the season of 1879, 1,279,300 tons, for the cereals 4,543,000 bushels; taking sixty pounds per bushel as the average weight of this, we should have 136,300 tons. The potato crop is given as 8,000,000 bushels.

The apple crop is given as worth $1,112,000. On the assumption that these sold for fifty cents per bushel and that their weight was fifty pounds per bushel, their total weight would be 55,600 tons. This gives a total of 1,711,200 tons. We will assume that one-half of this is sold and carted five miles. A double team could make two trips a day over such a route which at $4.50 per day for team would be $2.25 per trip. Now on the average road of Maine a two horse load would be about 2300 pounds net or to haul 855,600 tons to market would require 744,000 loads. A load for two horses on a good macadam road would be about 5824 pounds or 293,818 loads would carry it to market over a macadam road, so that at $2.25 per load, a saving of 450,182 loads would be effected and this would represent a saving in money of $1,012,909 every year.

Practically in the following manner, the people of Union county, New Jersey, which contains about 150 square miles, a population of about 50,000 and a valuation of about 25,000,000 in the year 1889, obtained permission from the Legislature of the state to issue bonds to the amount of $300,000 and to assess a direct tax of $25,000 for the construction of a system of county roads. Since that time forty miles of road at a cost of $350,000 have been constructed, and Mr. Charles C. McBride, a citizen of that county said, last February, when some of their roads had not been completed a year, that, "the property in Union county had actually appreciated in value far more than the cost of the roads," and this not only in cases of sale or exchange, but upon the tax levy. In other words notwithstanding the fact that $300.000 worth of bonds have been issued to build these roads, and the interest must be met annually, the tax rate has not been increased in the county, or in any city of the county in consequence of the extra expense, and it is but fair to say that the actual appreciation of property due to the increased values of lands benefited by the improved roads, meet their increased tax already.

Mr. John C. Tanner, who made a report to the National Government upon roads of foreign countries which attracted considerable attention at the time and was reproduced and commented upon by nearly all of our leading journals, in a later report says: "I firmly believe that the great hinderance in the prosperity of the farmers of the United States to-day, is the lack of good and substantial national, state and county roads. Wherever such roads have been constructed, they have enhanced the value of the farmer's land and have given increased value to all the products of his labor.

It is a common mistake that the farmer reaps all the benefits from good roads. While it is unquestionably true that the farmer is benefited in a hundred and fifty ways by good roads, it must be borne in mind that anything which benefits the farmer, benefits the entire community. Our farmers have to compete with farmers who have the very best facilities for hauling their product to the market (at a minimum of labor and cost) and to the railways.

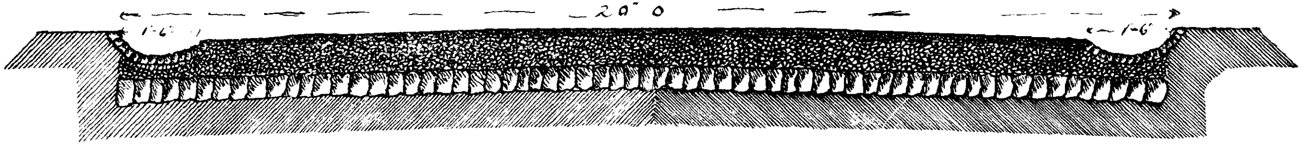
Highways in Europe enable the farmer to carry immense loads to the markets with one horse, which our farmers cannot do in some instances at all, because the road is simply impassable. Our farmers can perceive the odds against them, when a dog in Europe can draw a load to the market which a horse can not do in the United States.

This is a day of close competition in everything, and the farmers of our country are realizing this. They have an immense advantage over the European farmers, and have reduced the latter to the practice of the very strictest economy in order to live at all. With economy and with the advantage of the excellent highways, the European farmers eke out an existence, but they have learned by stern necessity that which our farmers must learn for protection. If a highway can be provided by which a farmer can haul an increased load to the market with one horse that at the present time requires two, with a larger and stronger wagon, and if this can be done in one day instead of three or four, it is as palpable as a proposition can be that he is benefited just in that proportion. There is nothing more rational to my mind than the movement of the farmers toward bettering the condition that environs them.

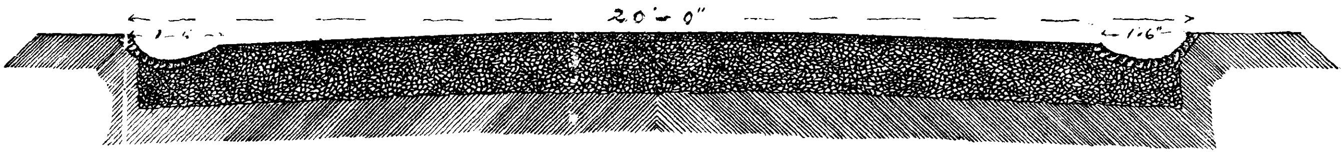
If they are given good roadways, depend upon it half of what they complain of will be removed. If the railroads may be compared to the arteries of a living body, then wagon roads are the veins and each are equally necessary in quickening and in communicating life to the parts to which they lead.

Our system of raising the money is not right. Our roads are common property. They are for the benefit of all, and all should help pay for them. As it is now, the people of a given town or district are assessed to pay for the construction and maintenance of their own roads, while the people of the whole state should be

PLATE V.



TELFORD ROAD



MACADAM ROAD

assessed for the expense of construction and maintenance of all the roads.

To those who live in the cities and towns, the road tax falls particularly light, while in most cases they are directly benefited by good country roads. Every town and city in this State could well afford to construct many miles of the best macadam road into the richest and most productive of its out lying towns. For the increased traffic, caused by the improved facilities for getting into town, and the increase in population attracted to the neighborhood of such improved roads, would increase the volume of business to such an extent as to amply repay them for their outlay. A writer in Good Roads has well said "The merchant, the banker, the manufacturer, the lawyer, the doctor and more or less directly, everybody in the towns, is interested in county roads."

The state as such is also interested and I believe that certain of the more important roads should be constructed and constantly maintained by the State; and the convicts, paupers and tramps should be made to work for their living on the roads where their labor would benefit all who contribute to their support.

I believe also that the National Government has a sufficient interest in good roads to take a hand in the construction of those which could be shown to have a national importance.

Mr. Studebaker, in Good Roads, says: "If there had been as good a government road as the old national post road leading from Fortress Monroe through Yorktown and Williamsburg, to Richmond, McLellen might have ended the war in 1862. As it was, his army had not only to struggle against a gallant opposing force in its advance on the Confederate capital, but to contend as well, foot, horse and artillery for every rod of the way through unfathomable mud." Some now present can doubtless testify to the truth of this part of this, at least.

The system of choosing the road surveyors, which consists simply in the tax payers of a road district taking the office in turn without reference to fitness for the work, if any preference is given to any one it is on account of his ability to reckon the least possible amount of labor for a day's work. Such a system tends to perpetuate itself and render any progress in the principles of road construction or any real improvement in the condition of the roads impossible.

Finally, statute labor, except by convicts, should be abolished. It is a relic of barbarism and can be rendered efficient only under the lash of the master. The road laws should be so amended as to allow of a more equitable distribution of the road tax, and also in such a way as to allow of the purchase of the greatest amount of labor for the least amount of money, and further in such a way that the greatest amount of permanent accumulative benefit may be received for the labor exerted. Then, and then only, will the roads of Maine begin to pay liberal interest on the money invested in them, and show a steady improvement from year to year.

THE SHOP AND THE FARM.

By J. W. Ricker, read at Institute at Waldo Station.

The shop and the farm are two of the most important factors in the industrial world. Their interests are so interwoven as to make separation next to impossible. Each thrives the better when the other is the more prosperous; the one relies upon the workers of the other to buy its products, therefore each is benefited by being located near the other. The faithful workers of shop and farm have rightly been called the "true nobility of the world."

To the shop, we look for most of our wearing apparel, household goods, instruments of music, and works of art; for machinery and tools which have revolutionized the business of the farm and factory, and furnish the motive power for the transportation of freight on land and sea; for those appliances which enable us to have in our daily papers, reports of what has happened the same day across the Atlantic; which makes it possible to talk with and recognize the voice of a friend many miles away. To enumerate the products of the shop would be beyond my power. No thinking person can contemplate the wonders which have been turned out in them, without a feeling of pride that we, not only belong to a race, but to a family whose Divine leader has made it possible to attain such marvelous results. To this large army of workers should be given only words of encouragement Be it far from me to do or say anything to make their lot less endurable than it is now.

But to an assemblage of farmers it may do no harm to speak of some of the real blessings of life which are denied our shop friends, but which we possess, frequently unappreciated. It has fallen to my lot to have had experience in both places. I have noticed in the shop and on the farm a feeling of unrest, a desire to change from one to the other; but my observation has taught me that more dissatisfaction exists in the shop than on the farm and with better reasons therefor. The labor of the shop has been divided, and subdivided, until now a shoe, boxed and ready for shipment, has passed through nearly, or quite, as many hands as it has pegs or stitches in its sole ; each doing his or her particular part to hundreds of shoes. This lessens the cost of the shoe, but at a sacrifice of variety of labor, which to the operative is rest. Then confinement in doors to limited space soon becomes tiresome. Of course different people endure this differently, while some seem to hold their own, others who came fresh from the farm full of vigor, health and strength, immediately begin to show evil effects from the changed and unnatural conditions to which they must submit. They soon loose their red cheeks, the muscle becomes flabby, the food for some reason does not taste as well as it did on the farm, and if given to finding fault, they are liable to blame the cook, when in reality, by the confinement in close quarters, without proper ventilation and exercise, their digestive organs have become impaired and the food cannot be taken with the relish of one who has a plenty of out door exercise which the farmer gets.

When the mechanic leaves his work to go to his family generally the objection of close quarters still confronts him, and if he is fortunate enough to have his tenement on the south side of the house, he is liable to have another house so near as to obstruct his view, and in the short, cold days of winter the sunshine is shut out from the same cause. Those who find themselves thus unfavorably situated are continually looking forward to the time when they can occupy a more roomy lot. As John Quincy Adams says in his

"THE WANTS OF MAN."

"I want a garden and a park
  My dwelling to surround,
A thousand acres (bless the mark!)
  With walls encompassed round;
Where flocks may range and herds may low,
  And kids and lambkins play,
And flowers and fruit commingled grow,
  All Eden to display.

I want, when Summer's foliage falls,
  And Autumn strips the trees,
A house within the city's walls
  For comfort and for ease—
But here, as space is somewhat scant,
  And acres rather rare,
My house in town, I only want
  To occupy a square."

But the lofty hopes are too often blasted. Dull business, low wages, and lost time to the average worker brings the income so low that the expense for rent, fuel, dairy products, fruit, vegetables and other necessaries of life, have quite used up, we will say, the $500 earned. Yet it may be said that he has made $500 at his trade, for his hands and skill are his stock in trade, and the expense for tools, if anything, is slight. But not so with the farmer; he must be able to show an increase of money or its equivalent and unless he can, he has made nothing, is the usual verdict; although he has had many real comforts of life, which the mechanic has not had, to say nothing of the monotony and confinement of shop life. This I know something about, having been connected with the shop twenty-three years of my life. I stood by the side of the same man and performed the same kind of labor for seven years. Imagine yourselves confined to some particular indoor duty for that length of time, and you will be in condition to better appreciate the almost endless variety of labor on the farm. Few realize how indispensable variety is to our happiness. The fields, clothed in their most beautiful green, were they to remain so, would become tiresome to the eye, and a change would be desired.

And so the most luscious article of food if placed before us as an exclusive diet, would soon appear stale and unsatisfactory. God, in his infinite wisdom and goodness, has given us in nature the greatest variety possible, not only do we find no two trees alike, but each leaf has a peculiarity of its own, and this diversity extends through all his creation.

There is no other occupation which affords such a variety of labor as farming.

"When Henry Ward Beecher first visited 'Hillside Rest' (his farm home at Peekskill) after it came into his possession," says Mrs. Beecher, "as soon as he could, he slipped out, and with bowed head he walked across the grounds to the highest hill and there, shielded from observation by the trees, I knew he felt alone with his Maker. He told me afterward that to own such a place had been so long a dream with him, that when his realizations had come true, he was so deeply moved that he wanted to be alone where he could better control his feelings. 'It overwhelmed me,' he said, 'to think it was mine, and I wanted to go somewhere unseen where I could weep, pray and give thanks.' Surely," says Mrs. Beecher, "never did any earthly possession give such *true comfort* and *enjoyment* as Mr. Beecher realized in this blessed spot, where for nearly thirty years he spent most of his time during vacations, and where through the whole year he went if only for a few hours rest and change."

Mr. Beecher had a large salary and it was not the need of what the farm might produce that led him to make the purchase, for he said that "it was the remarkable aptitude of the place for eye crops that caught my fancy. It was not so much what might be made to grow on the place, as what could be seen on it that won me. If a man can grow rich by looking, I am on the royal road to wealth." Mr. Beecher was only one of thousands who sought a home in the country because it has attractions not found in a city.

With a lover of nature the truest and best home is on the farm where the mysterious and wonderful work is carried on from the germination of the seed, through all the stages of growth to the ripened product and can be seen and enjoyed. To him who has planted the tree and vine, and cared for them, and with his own hands has gathered the ripened product, is given a keener sense of appreciation than to him who simply buys of the producer.

The farmer *may* have the best farm products, and they are many, fresh and at their best on his table, a thing not always to be had in a city. He need not have his milk watered unless he prefers it, and if he raises his own meat he knows what he is eating.

He has independence in a greater degree than a man can, who is connected with the shop. If he wants to go away for a day to the Grange or elsewhere, the only boss he is obliged to consult is his own good sense; but he who occupies a position in the shop can not do this. He is as a link to a chain and cannot step out without the loss being felt through every department.

The chances for mental improvement are very much better on the farm, if we but improve our opportunities. In the shop there is a continual clatter, much of it is necessary to the business but much is not. I refer to the clatter of tongues which run too much on gossip or other unprofitable subjects, which, while they occupy the mind, do not improve it. We are told that it is not good for man to be alone. I think it is not, long at a time; but if I express a good thought in this paper it came to me when alone. Continual hearing or reading without reflection is like continual eating without digestion. A business which is unhealthy for the body is also unhealthy for the mind.

The narrowing of the channels of labor and action, also narrows and weakens the mind. There are other advantages on the side of the farm. Among these generally is the difference between employe and employer. The most of us rather work for ourselves even if we don't get quite so much money, than be under any other man's control. Then mechanics are not always paid according to merit. In dealing with the farm, Dame Nature keeps a strict account with the husbandman, and the account is the measure of his reward. It is of no use to try to palm off ignorance, faithlessness and deceit, for intelligence, faithfulness and honesty on her, because she is sure to detect it, and as sure to pay accordingly. The farm was the early home of at least twenty of our twenty-three Presidents, and a very large majority of our leading men and women. And why? simply because the conditions there are more favorable to the development of such, than in a city. The habits of labor and self reliance are early formed. If one gets very high in this life there must be a vast amount of climbing, and it is necessary that he commence young, for life is short and obstacles are many to be overcome. Not only do the boys from the farm go to the White House, but not less than eleven ex-Presidents re urned to the farm. From our cities hundreds of thousands of people representing almost every vocation, when they were ready to make their ideal home have chosen the country for that purpose. Farmers have trials and disappointments, I will admit, no vocation is without them, though they may appear so at a distance. These are among the Great Master's agencies for strengthening and perfecting mankind. Remove these opposing elements to life in Maine and we should soon lose the reputation of producing the ablest men to be found in this country. Then without the darkness, we should be unable to appreciate the light.

The great objection to farming offered is, that it does not pay. The same objection applies to almost every vocation when expenses connected therewith are considered.

I claim that there is no other business that can be run so loosely and wastefully as farming is, without bankrupting owners. And while it is not a business at which one becomes speedily rich, yet with the intelligence, skill and industry applied, which are required to insure success in the shop, the farm *will* pay. Illustrations of the truth of this statement are to be seen on every hand.

Therefore the comparison stands, for the shop hand, a life of servitude, frequently in bad air and close quarters, unhealthy, monotonous, the farm products on his table often stale and store-sick.

For the farmer, a life of independence, pure air, health, the freedom of broad acres, the owner of his own improvements, a large variety of labor, and of the best and most wholesome food, and last but not least, the right conditions for the building of a most noble manhood and womanhood.

GENERAL PRINCIPLES OF STOCK BREEDING.

By O. GARDNER of Rockland,

Member of Board of Agriculture from Knox County. Delivered at Institutes in Aroostook, Washington and Kennebec Counties.

I presume that no matter how much we may differ in our ideas, or how varied may be our methods and practices, in the reproductions of our farm animals—we are all agreed, in that we desire to obtain the very best specimens possible, being governed only by our surrounding circumstances and conditions. In presenting this paper we shall be governed by our own experience and observation. And if in treating this important subject we refer more especially to dairy breeds it is not with any desire to prejudice in favor of any particular breed; but on account of a greater practical knowledge of some breeds than others, we can better illustrate our position; for we believe that the same underlying principles apply to the successful reproduction of all breeds. The art and practice of stock breeding is prehistoric. The science is a thing of the future, through long years of practice and observation, facts accumulate, and in time science comes to organize these facts. Science is but organized facts. But the facts must first be observed and collected, and this is the work of what are known as practical men. Little by little they accumulate knowledge by experience—each generation inherits something of the experience of its parents and may be adds a grain or two to the store—and it is only by a concert of action in discussion and interchanging ideas that we can hope to receive the benefits of the past for future use.

Breeding is a fine art. The really good breeder must be a man of genius; must have great powers of observation, a knowledge of the laws of physiology, excellent judgment, an accurate eye and a fine touch; he must set up his ideal in his mind and work towards that ideal with all the means at his command as a sculptor works out his ideal conception from the rough marble little by little.

Every animal not calculated to further his purpose must be mercilessly sacrificed, so that he will breed only from the best or those in the line of improvement. You cannot get more good qualities in the produce than are possessed by the sire and dam or their ancestry.

A stream cannot rise higher than its source. Nutritious food furnished from birth with good kindly care will, however, modify, vary, and improve animals; and such improvement may then be made permanent by careful breeding. Hence the laws of variation are as important as the laws of hereditary transmission, for without variations, improvement would be impossible. What is needed in dairying is a system of testing that is practical for all and at the same time carry with the test confidence in the honesty and correctness of the system.

When some fifteen years ago we commenced breeding in a small way the Jersey cow there was among breeders of trotting horses much enthusiasm and a great desire to outstrip each other in breeding for speed. There was then much in the surrounding situation; the want of knowledge of records and blood and their relation to each other (that now very largely exists among breeders of butter cows) but crude as was the knowledge at that time the breeders of trotting horses possessed one element of information to guide and enlighten them in their methods of breeding, which breeders of butter cows do not at present possess in anything like as reliable and comprehensive form. Trotting as a sport had become systematized and the records were consequently reliable. It was practically out of the question for a false impression to be circulated in regard to the trotting speed of a great number of animals of a family or strain of blood. (There were trotting tracks in every section of the country.) The owner of a fast horse was a skeptic of the speed of everybody's horse except his own until convinced by experience that he was on the wrong track. He was generally confident enough to try conclusions if his neighbor thought he had a faster one.

There is at present, and always has been, similar doubt among breeders of butter cows; but the latter possess no method of testing sufficiently complete and removed from possible fraud to fully dissipate it. Even what are called official tests are systematically decried in private circles by rival interests. No sooner is a test announced that promises to make a cow conspicuous, than insinuating rumors are in circulation against the character of the test. They are generally traceable to nobody that knows anything about the test; yet they are very effective in hurting public confidence in the exceptional merits not only of special cows but of the entire class of cows for which exceptional superiority is claimed. It is not at all strange that this state of affairs should exist. The breeding interest in butter cattle is growing There is a more general demand for breeding stock at this time than ever before, not so largely among wealthy fanciers perhaps as formerly, but the common farmer is taking more interest and more pains to possess improved blood than at any former time. This tends to a temptation to catch public attention by exaggeration or deception in order to sell to advantage and there is no check upon false pretences.

Trotting horse breeders used to practice the same methods and to some extent do now. Breeders who never trotted their horses in public claim a great deal of speed in private for animals that were near in blood to young stock of which there were plenty to sell. The press was full of descriptions of stock farms whereon everything was absolutely perfect—of young trotters by thousands, each with a brilliant future, destined to raise the name of its sire from obscurity to fame. This sort of advertising frequently had a great effect, for the value of special blood was at that time little understood by breeders of trotters and by most of them was not at all believed in. There was more buying done at random than for any consistent reason that the buyer could give, beyond the fact that he liked the appearance of the animal and its action in the field or in harness. He seldom stopped to consider what its immediate family had done in the way of trotting. Indeed he could not give much consideration to the subject for the want of knowing how to inform himself. The point that we are leading to is the great value according to our own experience of special blood lines. We know among breeders of butter cows there are strong opponents to this theory. We are not believers in any whole breed as the best means of elevating the butter capacity of butter stock but have great faith in the value of special animals of any breed to elevate the standard of the breed.

A modern writer has said that there is no special intrinsic value attached to strains of blood. He believes in the whole breed, and maintains that while there is a difference in individuals there is none pertaining to families or strains that warrants paying enhanced prices, and that they will do as well to buy poorer animals of the same breed, or as he terms, animals of non-fashionable blood. We in principle entirely disagree with this theory, yet we know that there are good cows developed from lines of blood, where they are the exception of the family; but cows like these while they are as good butter cows in a breeding sense (whatever they may be in a dairy sense) they will not hand down their superior qualities with equal certainty to their descendants.

Now let us turn back to the trotting field of fifteen or twenty years ago. Up to that time the trotter was more the product of the trainer's skill than of the breeder's art. Nevertheless (by chance as far as human agency was concerned) by heredity in obedience to the laws of nature, several families of trotters have developed, not because they were sought out by trainers, but because in the multitude of material that was tried haphazard they proved to be the best for the object sought. Not one trainer in fifty would admit that special blood had anything to do with success; now nine-tenths of the profession have exactly the opposite opinion. They not only want the good gaited one with good legs and feet but they want him to be of a trotting family before they are sanguine of success; while there exists to-day difference of opinion among breeders of trotting horses as to their superiority, their differences are confined to well established trotting families and most breeding establishments, rise so far as practicable combining all the leading families in their catalogue. From the lessons in trotting horse breeding it would seem that we should profit in regard to these things and if we expect to attain the highest standard with our dairy animals we must seek the best lines of blood of the breeds we are interested in. Breeding for the highest standard necessarily implies the use of thoroughbred blood. Not that it is practicable or perhaps desirable among all farmers, but the breeders must depend much for future results, upon the blood lines of the present; therefore in order to act and direct with intelligence he must have a knowledge of the material he attempts to utilize, the present time for the future. And right here let me say just a word in regard to the value of registered pedigree; it is of value to the breeder as an evidence of pure blood but unfortunately too many seem to think this is its full and only value; this idea is an erroneous one and to our mind is the cause of a great amount of disappointment in stock breeding. Some one has said "that an ill bred thoroughbred is the worst of all breeds," to which apt saying we fully concur. We think the greatest value of a pedigree is that it enables the breeder 'o study blood lines to ascertain the per cent of meritorious also the amount of inferior blood that their breeding animals contain.

Once let a cow of a certain family make a high record in her specialty and immediately every breeder who has an animal that contains five per cent of that blood rushes into print, advertising that blood for sale and most buyers, without stopping to inquire what per cent of that special blood the animal contains, hastens to secure the prize in advance of some one else.

We have frequently written to parties who had animals of a certain family of Jerseys advertised for sale; but when we got their tabulated pedigree we could only find from five to twelve per cent of the blood we sought. Every other blood line had been obscured by the small per cent of relation to the great performer. And in all such cases the really good animal is sacrificed to make a sale of inferior ones—an animal of the blood of any given (first class) animal that a man would breed from if it were in his reach. That is, the fourth remove from the animal desired (provided it has come down in every cross through first class animals) is worth very many times as much as the son of the preferred animal that has an average animal for its dam. One bad out-cross close up kills for many generations. No *really* first class breeder could be hired to use a bull *knowing* that a really *inferior* animal was close up to him, though he was the son of the best animal living. Very many breeders who are very intelligent on most other subjects cannot bring themselves to believe that there is so much difference in breeding animals that are so nearly alike as individuals; no amount of reasoning or even any number of examples seem to make any impression upon their minds.

The small breeder, to be successful, must confine himself to a very few lines of blood to enable him to concentrate the desired characteristics in any one animal; for by continual out crossing the blood lines that we desire shall predominate become so scattered that in a very few generations we have entirely changed the individual and general good points that we most wished to retain. In making out crosses, other things being equal, the chances of perpetuating and increasing the excellences sought for are increased many fold by not making the out cross absolute, but by using an animal some of the best of whose ancestors are in the pedigree of the animals for which an out cross is sought. We believe that every family of all breeds has its congenial out cross, without which it is only partially successful.

Among horses the blood of Abdallah only accomplished great things when combined with Bellfounder blood in Rysdyk's Hambletonian. Among Jerseys the Alphea family of cows when combined with the blood of Rioter 2nd and the St. Lambert Jerseys became famous the world over, only by crossing the blood of Victor Hugo, Pauline and Pride of Winsor, combined with that of Stoke Pogis 3rd. All these great families have furnished plenty of evidence that because any given blood produces great things in combination with one family that it will not in all combinations be a great success.

An examination of the records of some of the leading butter families discloses the fact, that while the general distribution of the butter capacity is prominently brought out by the tests, the inspection also shows that there is a marked difference between families. Now the force and value of heredity is the sheet anchor of all stock breeding. Without it no breed could ever have been established, none could be improved and no improvement preserved. But while this is true, it is equally true, that no breed was ever established independent of its surroundings. No breed was ever improved without continued and careful selection in breeding and an uninterrupted course of generous feeding from generation to generation. And it will invariably be found that cows that have made big records have been generously and judiciously fed. This is another fact that stands out clear and unmistakable. And it is therefore a question open for debate as to how much of the manifest superiority of certain families is due to inherited prepotency and how much to judicious feeding, (into this question I do not go.)

In a paper like this there is not time to go minutely into details, yet in looking around us there is no lack of prominent instances of the success of careful and judicious mating of sire and dam and intelligent management in rearing of the best specimens of all species of farm stock. And although it is a fact that the best specimens are most sure to produce satisfactory results, other things being equal, there are many things not recognized by all, which are liable to materially change the hereditary influence of good qualities of the parents in the progeny. No country has made more rapid progress in systematic breeding than this in the last twenty-five years; as shown by the superiority of nearly all stock bred from imported parents over the best specimens of the same bred in the countries from which they came. And it is a source of encouragement to the Maine farmers to know that many of the most remarkable animals have been produced in our severe northern climate, on food which would be considered quite inadequate in other countries.

While we would encourage all in the practice of breeding from the most perfect specimens I would venture the caution to those who need it, that it requires more than that to succeed in reproducing most perfect specimens. American breeders of all kinds of farm animals have proven to the world that blood will tell; but intelligent breeding wins. Fine spun theories are sometimes pleasant to contemplate but natural results are sure to follow natural causes.

There are many natural influences which combine to produce variations in the character of the lower as well as the higher animals. One of the most common is that of association; thus it is no uncommon occurrence in a mixed herd to see the young of thoroughbred stock resemble scrubs in form and color (and why not as likely in natural qualities?) very much to the annoyance of their owner. A case of this kind came to my notice within a year from this writing. A Jersey cow standing in the stable between two others marked very differently from herself in color and differently from each other and of very different forms, gave birth to twin calves, one marked precisely like the cow on one side of her and the other calf like the cow on the other side of her. In my own herd this season one of my cows gave birth to a calf marked just like a cow that was sold three years ago, of a distinct and separate strain of blood. These are no new freaks of nature, but only confirm the story of the striped sticks in the watering trough, at the same time pointing to possible results of an unpleasant character, and as strangely to means of producing desired results, by favorable associations and impressions. Prof. Agassiz stated that "children are not only the children of their father and mother but they are the children of their grandfather's and grandmother's." They are the children of the generations preceding them, so much so, that it is a well established fact that often children resemble their grandparents more than they do their parents, and the same law governs other animals; hence the value of a good pedigree and the necessity of pure bred ancestry in the production of a good stock; for it is an old and true saying that "like produces like" or the likeness of same ancestry.

SHEEP HUSBANDRY.

By Secretary B. WALKER McKEEN.

Read at Institutes in Franklin, Sagadahoc, Washington and Waldo Counties.

I approach this subject with quite a good deal of delicacy, not because of its lack of importance, or of any want of valuable matter that may be gleaned from a close study of the laws governing a successful venture in this very profitable and valuable branch of farming in our State, or of any lack of interest on my part; but from a knowledge of my want of any very extended observation in the different departments of the business. I promise, however, not to weary you with any very lengthy lecture, and to confine myself to what I have learned from reliable sources and from practical experience on my own farm. Although my later years of farm labor have been more closely connected with dairy work, and a study of the characteristics and requirements of dairy stock, my early recollections of life and of the farm are very closely connected with the care of sheep, and, if I mistake not, the first money that ever came to my hand was from the sale of the products of the sheep-fold. Until the somewhat peculiar conditions of our farm rendered the longer keeping of sheep extremely troublesome, the flock was a permanent fixture, and a constant source of profit.

I may, perhaps, be pardoned if I indulge in a little personal reminiscence. My early life was hedged about by many difficulties, and all the sources for a possible revenue had to be utilized; so no boughten cloth ever found its way into the household, unless it was an absolute necessity.

The clothes I wore, up to the time of leaving the academy, came from the backs of our flock and were spun, colored, woven, cut and made by my mother's hands. I well remember the last suit I wore, and the first time I stood among the scholars of my class with it on. So you will, perhaps, pardon me if I show a peculiar sensitiveness of feeling in favor of sheep raising.

HISTORY.

The history of sheep husbandry, dates back to a period almost as remote as that of the human race; and, all along the line of human history, up to the present time sheep have been regarded as necessary to man's comfort and welfare, whether among the semi-barbarous and nomadic tribes of the East, or among the highly civilized people of the western countries.

Abel, the brother of the first born of the human race, is recorded as a keeper of sheep, and when a writer, as long ago as the year 1534 said, "Sheep is the most profitablest cattle a man can keep," he expressed what may be called a truism, which holds good to the present day. In fact, its truth must be brought out more fully by the present perfected breeds of sheep. Their flesh is a valuable food and should be appreciated by all classes ; it is highly nutritious, is free from many of the most serious objections that are made to the meat of other animals, as it seldom or never carries any disease germs with it, and is very much more available for the table of the average farmer than that of the ox or the hog. Their wool furnishes one of the most valuable materials for clothing, and its production upon our farms tends to increase the products of our manufactories, and thus bring a new source of revenue into our homes. And last, but not least, they furnish a very valuable means for maintaining the fertility of our farms.

Sheep are found in every latitude, from the equator to the Arctic regions, on the bleak shores of Greenland's icy mountains, and the burning sands of Sahara's desert. No animal is more widely distributed among the different zones, or subsists upon such a variety of grasses. In fact they seem to thrive on shrubs, weeds, grains, barks, roots, leaves, etc , many of which no other animal would touch unless reduced to the verge of starvation.

The uses to which these animals are put, appear to partake of the great diversity of their characteristics. Their meat, which for ease of digestion and delicacy of flavor has no equal, is one of the standard dishes of the world. Their milk is made into cheese by some nations, and it is said, that in some cases even the wool is used for food, by being first scorched to a crisp brownness.

IMPORTANCE.

The income from sheep husbandry in this country adds much to our national wealth now, but when we take into account our facilities for the business, and compare our output of the products of our flocks, with that of England and some other countries, it seems as though the business must be in its infancy. Many thousands of dollars go annually for importations of wools and woolen goods ;

and if this money could be kept at home by producing our own wool and manufacturing it, it would add much to our national wealth and prosperity.

Not only are the extensive tracts of land in the West and South available for this task, but the eastern states, and particularly Maine, can compete quite successfully, by good care, choice breeding, and judicious selection of animals. I believe there are many flocks of sheep in Maine to-day, paying a far better per cent of profit on their cost and the labor required in the handling, than any other class of animals on our farms. And I trust that the time is not far distant when we shall not only produce wool enough for our own manufactories, and thus save importations, but shall have an amount for exportation, as the amount of wool now exported is small when compared with some other articles of export.

Hon. John L. Hayes, Secretary of the National Wool Growers Association, says: "Of all the products of agriculture wool is the most capable of transportation; or, in other words, the greatest value can be placed in the smallest bulk, in the form liable to receive the least injury in the friction of transportation. When the freight of wheat from Chicago to the seaboard costs eighty per cent of its value, of pork, thirty per cent, that of wool is but four per cent; wool, therefore, may be grown with profit in the districts of the remotest interior, favorable to its production." This fact alone, it seems to me, makes a strong argument in its favor in many sections of our State.

There are many other arguments in its favor, some of which may be summed up as follows: A farm may be stocked with sheep with far less money than it would take to stock it with cattle, horses or swine; and they will come nearer to eating everything that grows on it than any other animal; besides, the labor necessary to convert the fodders into the products of the stock, will be much less, and if any of you have suffered from poor help, as I sometimes have in my dairy, you will appreciate this advantage. Then the profits will come sooner than with any other stock, except swine; thus enabling the farmer to turn his capital over oftener, thereby gaining an advantage; then again, a fine income can be obtained without the necessity of selling stock, as I believe the sale of wool alone makes the business desirable.

BREEDS OF SHEEP.

I am aware that the distinct breeds and sub-varieties of sheep are very numerous, but it is not necessary for us to consider or describe them all. I will, therefore, confine myself to such breeds as in my judgment, may be especially valuable to our farmers generally. And it may be well to class them under three distinct heads, namely, the heavy breeds, such as the Cotswolds, Lincolns, Leicesters and Teeswaters, known as the "long wools;" those adapted to downs or similar localities, such as the Oxford Downs, South Downs, Shropshires and Dorsets, known as the "middle wools," and the Merino and their crosses, known as the "fine wools." In this way we have the breeds before us in three distinct classes and can consider each one separately. It must be borne in mind, however, that there are, aside from these distinct breeds, many crosses combining their essential qualities, and that grades from these crosses, coupled with a thoroughbred male make very valuable sheep. Therefore we must not be discouraged because we do not own a thoroughbred flock, but seek to improve upon what we do possess by good care and the use of pure bred males, always having a distinct object in view and a true picture of what we wish to produce in our minds.

I believe, from what I noted in my own and neighbors flocks, that the valuable qualities of a male will be sooner seen and more certainly reproduced in the sheep than in any other animal.

Having sketched the history of sheep husbandry, its importance and some of the breeds, it may be of interest to look for a moment at each of the breeds in turn, as by so doing we may arrive at some conclusions that shall be of interest and value. I will first call your attention to the Merino. It is generally supposed that this is the most ancient breed of sheep known, and the most widely diffused. They were imported into this country from Spain in 1802, by Chancellor Livingston. The first importation consisted of two choice bucks and ewes, and they were sent to the country seat on the Hudson. Other importations followed, but it was quite a number of years before confidence in the breed had become sufficiently strong as to result in their general dissemination.

About the year 1811, the fabulous sum of $1,000 was paid for the average Merino bucks, and many were reported as being sold at a still higher price. The improvement of Merino sheep has been very marked for the past twenty-five years. In fact, distinct types of the breed have arisen as a direct result of this care and skill in breeding. Some of these types are known as the American, French, Saxony and Spanish. Now, perhaps a few words in regard to the cause of the founding of such a breed as the Merino, will be of interest and then we will pass on to consider some of the other breeds.

A well known authority says: "The ancient Greeks, having no cotton or silk, and hardly any linen, sheep's wool was, necessarily, the principal material from which their cloths were made. This necessity led them to take special care to cultivate such breeds as produced the finest wool. To render the wool still more fine, they covered the sheep with cloths in winter. This covering in winter led to the production of a breed with delicacy of make up and exceedingly fine wool. This Greek industry was transmitted to the Romans, and they were finally crossed by them, with bucks imported from Africa. When the barbarians invaded Italy, these sheep were all destroyed. But in the less accessible mountains of Spain the Moors preserved the breed, and it is to this cross of Greek and African ancestry, that modern Spain owes the Merino of to-day.

Of the peculiarity of the wool it is, perhaps, unnecessary to speak, as no doubt you are all familiar with it. The breed is noted for its longevity, many of them producing young even at twelve years of age. They are healthy and hardy, and will thrive where many of the larger breeds will not. They are not impatient of restriction, and will run quietly and in contentment without any efforts to get over even very low fences. They must be considered as a wool producing breed, not being especially valuable for mutton on account of their smallness of frame, and the slowness with which they mature. Their wool is said to shrink by scouring sixty-six per cent, while coarse wool shrinks but fifty-four per cent, still they produce 4.02 pounds of scoured wool per 100 pounds of carcass, this being about double that produced by the Dorsets, Leicesters, or Cotswolds.

DOWN, OR MIDDLE WOOLS.

We will next consider the Downs or middle wools, and first of all will take the Oxford Downs. This is a comparatively new, and very valuable breed of sheep; it was produced by a cross between the Cotswolds and the Hampshire Downs, with a sprinkling of South Down occasionally; now, by cross breeding I mean a system of breeding for many years, with a definite object in view, with a fixed determination to produce certain results, and by using thoroughbred animals on both sides; not a haphazard venture, without end or aim. This steady course of breeding, in this case, has produced a breed that can hardly be beaten, or even equalled for both wool and mutton. They originated about sixty years ago in the county of Oxford, England, from which they take their name. Though they have been introduced into this country but a few years, they are destined to gain favor rapidly and become widely disseminated. The aim of their originators seems to have been to unite the weight of the long wools with the valuable wool producing qualities of the middle wools, and they succeeded admirably. An English authority says that the Oxford Downs should have a nice dark color, the poll well covered with wool, adorned with a top knot on the forehead, a good fleece of wool, thick on the skin, but not too curly; a well formed barrel, on short, dark legs (not gray or spotted), with good, firm mutton.

The average clip of wool from a good flock of Oxford Downs is about seven pounds, although the bucks have been known to shear as high as twenty pounds. They are the largest of the Down breeds, weighing 120 pounds, dressed weight. They are hardy, and will bear confinement well. I believe they present many valuable qualities for the average farmer of this State, who wishes to produce wool in fairly large quantities, and at the same time, lambs for our early city markets, either in their purity, or for the purpose of improving the native breeds.

The South Downs are, perhaps, the best known of any of the Downs in this country and being a very valuable breed, are worthy of special notice. They have existed for a long time in England among a range of chalky hills or downs commonly known as South Downs, from which the breed derives its name. More than one hundred years ago, Mr. John Ellman of Glynd, Scotland, begun to improve this breed of sheep. Keeping patiently at it until he had succeeded in producing a breed that has since become famous for their symmetry of form, large size and adaptability for fattening. The best blood of this breed has since come almost entirely from his flock.

An English writer thus describes the South Downs: "They have a close set fleece of fine wool, weighing, when the animals are well fed, about four pounds; their faces and legs are of a dusky brown color, their necks slightly arched, their limbs short, body broad and compact, offal light, and the buttock very thick and square behind.

They are less impatient of folding, and suffer less from a pasture being thickly stocked than almost any other breed." They mature early, are hardy and prolific, surpassing the Merino in the production of twins. The lambs are large, hardy, and mature for market early, taking on fat very evenly over the carcass. They are not so long lived as the Merinos, and, I believe, should not drop their first lambs until they are two years of age.

The Hampshire Downs resemble the South Downs in general characteristics and appearance. They are a native of England, and are an old and well established breed.

The Shropshire is another Down breed, partaking of the characteristics of the South Down. They are some larger, however, and are said to be the most prolific of all breeds, as well as more robust than many. In some cases the increase of pure bred Shropshires has been reported as high as 100 per cent, and when pure males are used on grade long wool ewes, as high as 200 per cent. They are of recent origin, comparatively, and I think their merits for the average sheep farms of Maine are not fully appreciated. They have been proved to be peculiarly adapted to crossing with long wools and readily stamp their peculiarities on their offspring. A pure bred Shropshire, used in my own flock, produced lambs that would sell, at three months readily, for four dollars, and that with only grass feed.

Of the long wools, the Cotswolds, Leicester and Lincoln, the Cotswolds are, I believe, regarded with the most favor in this country. They all originated in England. The long wools are the largest sheep known, and produce combing wool, admirably adapted for manufacturing worsteds, blankets, carpets, and anything requiring length of staple in the wool. They are, also, valuable for mutton. I have considered them too large and too sensitive to cold for our climate, but learn with much satisfaction that they are thriving finely in Aroostook county, and are considered by the farmers there a very valuable breed. A peculiarity of the long wools is, that they all have white faces and legs.

Mr. Joseph Harris says that a cross produced by a Cotswold buck on his Merino ewes, has produced very satisfactory results. Lawes and Gilbert have shown, by experiment, that the Cotswolds gain more rapidly in proportion to the food consumed than any other breed. The breed takes its name from the fact that they were sheltered in sheds in their homes on the hills of Glostershire, England; that is: "Cotswold," or camp of sheep sheds. Of the Leicesters and the Lincolns it is unnecessary to speak, as they are quite rare in this country, and closely resemble the Cotswolds.

The Dorset is a very ancient breed of sheep found in Dorset, England, and are now gaining favor in this country. They resemble the Merinos in form, but in no other way. They are chiefly famous for producing lambs twice each year.

Now it may be asked which breed is the best. This question, every one who engages in the business, must answer for himself to a certain extent; all breeds will have their favorites, but each is valuable in proportion to the abundance of the desired qualities it possesses. Generally speaking, I should say that the middle wools would come nearer our requirements than any other, as we must aim to produce mutton and lambs, as well as wool. Perhaps the Cotswold should be added to the list, but don't forget the good care necessary. In breeding, every one must remember that the prepotency of the male, of whatever breed, must depend upon its claim to being thoroughbred. In no case should grades be used, as the result will surely be disastrous. Choose a buck in accordance with your ideal of the animal you wish to produce in the offspring. Don't breed too young, or to too large a lot of ewes if you would secure healthy, vigorous lambs. Select the best of your ewes for breeders, and aim to establish uniformity in the flock by a careful selection of the best lambs each year.

Liberal feeding of the ewes during the period of gestation will help to produce vigorous lambs. As the period for the young lambs approaches, the ewes should be separated and watched carefully, to avoid accidents. They should be kept in a clean, dry place, free from all annoyances. Much of the success of the breeder depends on the condition of the mother; if she is in good flesh, the lamb will be valuable, if other things are favorable.

MANAGEMENT OF LAMBS.

Constant care must be exercised by the breeder during the lambing season, more particularly if the lambs are dropped early in the year. If a lamb can be induced to take some milk from the mother the trouble is over, for a little nourishment will, almost always, put him in good form for taking care of himself. But if the sheep refuses to lick him dry and has not sufficient milk for him, it will be necessary to rub him dry with flannels and procure milk for him from a new milch cow. The trouble of sheep disowning their lambs is usually caused by a lack of milk. It is very seldom that a fat, tame sheep will refuse to care for her lamb. Sometimes this may be the case when there are twins; if this happens it will often affect a cure to hold the sheep for a few times and place her in a dark pen. It is claimed that rubbing a little of the milk of the ewe on the lamb, or placing a little meal on it and allowing her to lap it off, will often cause her to own it, but the safer way is to avoid the necessity for this by good care and liberal feeding.

It is considerable trouble to rear lambs by hand, but it can be done by learning them to take the teat of a new milch cow, or a bottle for a short time, when they will usually learn to drink the milk from a dish. They should be fed often, and it takes great care to feed them enough and not overfeed. If the milk from a fresh cow cannot be obtained, a little molasses will make farrow cow's milk suitable for them. Some of the best sheep we ever owned were brought up by hand, but it is best not to start in with the work unless we are sure of our patience and skill. Sometimes, if lambs get chilled, it may be found necessary to carry them to the house to resuscitate them. I have usually had a tub of water of about ninety degrees ready, and placed them in it except their heads, this applies the warmth evenly all over the body; with one hand I hold the lamb's head out of the water and with the other gently rub its legs and body; more hot water can be added from time to time to maintain the temperature, if necessary. It should be kept in this until it begins to move its legs, when it can be taken out and immediately rubbed dry, being very careful not to expose it to the chilly air again until it is thoroughly dry; it can soon be carried to the mother and will readily take some milk. I can recommend this to all as being safe and effectual.

DOCKING LAMBS.

This seemingly cruel practice becomes a necessity, but should be made as humane as possible. My method has always been as follows: Let one man catch the lamb, holding its head toward him with one hand; with the other, grasp the tail and pull the flesh on it as much toward the body of the lamb as possible. The tail is then placed on a block, and another man, with a mallet and chisel rapidly severs the bone; being very careful to place the chisel on between the joints about two inches from the body. The loose skin will at once drop over the wound and it will soon heal.

FEEDING LAMBS.

Whether designing them for the butcher or the farm, lambs should be liberally fed. It is surprising how young they will learn to eat grain, if they are provided with it in places where the sheep cannot get at it. Bran, oat meal, whole oats, corn meal, and linseed meal are excellent, and good results can be obtained by mixing these grains together. If the lambs do not come along until the sheep are in good pasturage, they will usually thrive well without grain, if the feed is good.

FEED FOR SHEEP.

It has always seemed to me that many farmers make a failure in sheep raising, because they fail to feed liberally enough. No animal is more sensitive to ill treatment than the sheep; or less inclined to eat food that has become foul, or injured in any way.

Much hay of an inferior quality can be used in the sheep fold if care is taken in feeding, and the lack of nutriment in it made up by feeding a liberal ration of grain. Clover hay is especially valuable, beans, of which they are very fond, make a good grain feed, as they are nutritious and promote the growth of wool. Bean, pea, oat, and, in fact, all kinds of straw can be fed to advantage, as also roots of all kinds.

GRAIN-FEED.

Oats and corn, mixed in equal weight, make an excellent ration, one and a half or two pounds of this grain, fed with any fair quality of hay will produce good results, and may be increased for fattening purposes. Bran, oats, and corn, mixed in the same way by weight, might be better for us, as bran is cheaper and has a larger proportion of nitrogen than oats. Three pounds per head of this mixture, fed with straw has produced good results with me, and it may be reduced one-half if good hay is fed. Oil meal is valuable, fed in small quantities. Plenty of salt and water must be furnished at all times.

PASTURES.

I believe in changing sheep occasionally, from one pasture to another. If the pastures be divided by a fence, this can be done very easily. By so doing, fresh feed is obtained, and more stock can be carried per acre. Pastures must be supplied with plenty of shade and water; and the flock can often be renewed as it were, by ploughing the pasture and seeding it; although it is thought by many that sheep will ruin clover by cropping it too closely, I do not think that such will be the case, unless the pasture is overstocked. Pastures should always be made up of mixed grasses, as in this way, a variety of food is secured.

SHEARING.

This calls for much care, skill and patience; generally speaking, it should be done as early in the season as possible, without endangering the lives of the sheep. My practice has been to shear while still in the barn, keeping the sheep well housed, until they are accustomed to the change; if the lambs come along a little later, the wool will be out of the way, the energy of the mother will go more to the production of milk, and the lambs will be more hardy. For some years I sheared our own sheep; and considered it safer than to trust it to any hired help that we could obtain.

METHODS OF HANDLING AND SHEARING SHEEP.

I would never take a wet day for shearing, better pay double for labor than to expose the sheep to such a sudden change in a cold, wet day. Take the brightest day possible, and you will be amply repaid in the increased thrift and comfort of the animals.

CLASSES OF WOOL.

Wool is divided into three classes, according to its length and fineness: the clothing wool, the combing wool, and the carpet wool; each one divided into subdivisions. The value of any wool, in its class, is increased by its strength, lustre and working qualities, and these are made up, largely, by the care the animal receives; poor, ill fed, and poorly cared for sheep always producing the wool of the poorest quality. So you see we have, right here, another incentive to feed well, and give good care.

DISEASES.

The maggot fly is very troublesome to sheep in summer, and every precaution should be taken to prevent their annoyance. I have thought that a cool, shady place of retreat often prevented them from doing very much damage, and would, certainly, advise the free use of tar, in and about the salt troughs, with a frequent application of some carbolated mixture, if they have affected the animal very badly. Poison, either from laurel or meadow poke, can be relieved and the animal often cured, by giving a dose of castor oil or lard, and new milk. This has always been our remedy. It neutralizes the poison and tends to drive it from the system.

Scab is one of the most insidious and dangerous diseases that the sheep raiser will have to contend with; it is particularly dangerous, because it cannot, always, be detected until it is pretty well advanced. Many times it will be in the flock, in the fall of the year, and the most rigid scrutiny will fail to detect it. It is caused by a minute insect, the constant burrowing of which, causes intense itching and pain. It is readily communicated from one animal to another and no flock is safe, for a moment, if allowed to come in contact with an infected sheep.

Prevention is better than cure, and a liberal diet, supplemented with good care, will do much to prevent it. But if once it gets into the flock, active measures must be adopted. Tobacco decoction is an excellent remedy, but I have used a carbolated sheep dip, which is sold in the State with good results, using as soon as possible after shearing and repeating after eight or ten days. Ticks and lice become great nuisances, but may be entirely removed by the use of this dip soon after shearing, washing all the sheep and lambs. We have carried a flock for several years without any ticks, and only had them return by our sheep running with others.

Now I may be asked, what particular branch of sheep raising I would advise: I would answer, that each farmer and breeder must answer this question for himself, in a great measure; there is money in *any* branch if intelligently followed. But I would say, that, generally, the aim should be both wool and mutton. The market is always open for good lambs at paying prices, and while I do not believe in hot house lambs for the average farmer, I do think they should put that amount of skill and labor and care into their work that shall produce the best results. We often hear of almost fabulous prices being obtained for a few early lambs in our city markets, but we must all remember that each one so sold represents a large amount of labor, feed, skill and care, and that the market is constantly narrowing on this article by reason of its being shipped from farms farther south of us where they can be raised much more cheaply than here. Our best market for our early lambs is, and must always be, our sea shore and mountain summer resorts, and none of us are so unfavorably situated as to be unable to produce lambs for them at a profit.

I believe there is ample room for quite a large increase in the business in our State, and that no one can make a mistake who goes into it intelligently and with a determination to succeed.

I have hardly touched upon one quite important item connected with the business of sheep husbandry, and that is the improvement that will surely come to our worn soils, and this is an item well worthy of consideration. How shall I restore the fertility of my land? is a question that is often asked, and it is one that calls for a careful study from every farmer in our State. If it can be done as a part of the business, become incorporated in the work of the day, much of the difficulty has been passed. I believe this can be done, in a large degree, by engaging in the business of sheep husbandry. Sheep readily eat many varieties of weed, shrub and bushes that other animals refuse to touch. They distribute their droppings over the ground so evenly, that they become readily incorporated with the soil and are made available, and they will not take so much phosphate from the soil as cows in milk, or young, growing stock. The products sold remove but little plant food. Some of the most successful experiments in renewing the fertility of worn fields have been conducted with sheep. I therefore believe that sheep husbandry must come in as a very important factor in the renovation of our worn soils and the repopulation of our so-called abandoned farms.

In recapitulation, I will say that, to engage in this business successfully we must choose good animals, feed them well, protect them from the chills and storms of spring and fall, remembering that there is no animal that we can so poorly afford to let lay out, exposed to storms of rain and sleet, as the sheep, use full-blood males, put our products of wool and lambs into the market in the most attractive shape and at a time when we can get the most net returns for them. In this way we shall find our incomes increasing, our fields becoming more productive, our homes more attractive, our young people better satisfied with farm life, and the general prosperity of the State, increasing in no small degree.

RELATIONS OF THE WORK OF THE WEATHER BUREAU TO AGRICULTURE.

J. WARREN SMITH,

Director New England Weather Service, delivered at Bowdoinham, April 5, 1892.

Ladies and Gentlemen: This subject of the weather is a well worn one and one that we always turn to whether traveling with acquaintances or strangers. But it is particularly interesting in New England where such a thing as settled weather is never known, and where weather changes follow each other with a rapidity and violence equalled in no other part of the world. It is shown in the story of the old lady, who on her return from a visit to New England was asked what she thought of New England climate. "Climate," said she, "they have nothing but climate there and have weather only two or three days in the month."

The subject of my remarks this afternoon is the relation of the work of the weather bureau to agriculture. It naturally divides itself into two divisions; first, the origin and early history of the service with its methods and systems for carrying on the work, and second, the plans for the future extension of the work.

The National Weather Bureau was established by an act of Congress approved February 9, 1870. By this act the secretary of war was required to cause meteorological observations to be taken and notice given by flags and the electric telegraph of the approach and force of storms. Its care and supervision was placed in the hands of the chief signal officer of the army; hence its name until recently, "Signal Service." It was strictly military in its organization, the employes all being officers and enlisted men in the army. A school of instruction was established at Fort Whipple, Va., afterward changed to Fort Myer in honor of the first chief. At this school the men were all trained in the care and use of the meteorological instruments, as well as in the system of sending messages by the small flags and by the telegraph, and also the drill with the musket. This act was the first government legislation looking to a national weather service. Its first work the beginning of official effort to solve the problem of American weather.

On November 1st the actual work begun with the 7.35 A. M. observation. This system embraced twenty-four stations, well scattered over the United States. The elements of observation then, and which remain the same at the present time, are on the pressure and temperature of the air, the amount of moisture, the temperature of the dew point, the direction and force of the wind, the amount, kind and direction of the clouds, the character of the sky and state of the weather; and the observer has to keep on the lookout all the time for any special phenomena, such as thunder storms, tornadoes, hail storms, auroras, halos, earthquakes, etc.

These data were telegraphed to Washington immediately after the observations were taken, and from there transmitted in the same manner to the stations situated at the commercial centres in the form of bulletins and charts. The observer disseminated the information thus received through the means of the daily papers and other methods.

The foundation was now laid and it proved to be on a rock and ready for the building of what is now the finest weather service in the world. We are behind none of the European services in the study of the weather, and some of its special phenomena, but far ahead in the systems of observation, in the manner of collecting the data, and in putting the information before the public.

The people, however, were not long contented with tabulated reports of observations and bulletins of thermal ranges and barometric pressure. The attention of scientists and learned people of the country was attracted, and their interest aroused, and they soon demanded deductions, looking to the benefit of commerce, marine and agricultural interests. The pre-announcement of future weather conditions and changes, warnings of the approach and force of storms, cold waves, early and destructive frosts and floods was expected.

In order to fulfill these requirements, the Chief of the Service called to his aid learned meteorologists and scientists, and on the 19th of February, 1871, began the issue of the probabilities and a synopsis of the weather conditions. These probabilities, afterward known as indications and now as forecasts, were indirectly in the interests of agriculture.

The matter to receive consideration was the display of wind signals along the sea-board and the Great Lakes. This display was made at twenty stations on the lakes and the Atlantic and Gulf coasts. It has been found to be of such importance that we now have a line of stations extending from the mouth of the Rio Grande to Eastport and throughout the Great Lakes. So, step by step this service has advanced, the observer stations have increased to 150, nearly all provided with continuous self-recording instruments, and all reporting to Washington twice daily, by telegraph. We have over 2,200 voluntary observers who take daily records of the temperature and precipitation and report the same monthly. We have a special department for the study of the cold waves that sweep down over our country from the northwest, and can now herald their approach from twelve to thirty-six hours in advance; and we have a system for distributing these warnings, as well as the daily forecast, throughout the agricultural districts.

The great territory of the United States has been divided into districts and the special interests of each looked after, and as the issue of the probabilities was indirectly in the interests of agriculture it was with this division into districts and the special study of each, that began the direct co-operation with the farmer, the bone and sinew of our great country. In the cotton belt a special system of rainfall stations for the benefit of the planter and dealer has been begun, and it is remarkable how a heavy rain in that section or a local frost will sometimes vary the price of cotton in Boston. In the early strawberry season, the report of a heavy rain in New Jersey will quickly increase the price of the fruit in Boston.

The great flood warnings throughout the great valley of the Mississippi are of incalculable value; thousands of acres of the most productive land that the sun shines on is subject to the overflow of the "Father of Waters," and for years, the service has been successful in giving timely warnings of the approach of these floods.

Through the observations of the weather bureau it has become known that many square miles in the western states have seasonable rains and are therefore valuable for cultivation.

I might go on to tell you how the observations are utilized for the study of our climate in relation to health; how the daily forecasts are depended upon by almost every branch of industry, or how scientists are studying the vast amount of data collected to ascertain if possible whether our climate is changing; but it is not necessary, you are all familiar with it.

This matter of change of climate is very important. Has our climate changed? Do we have warmer winters now than fifty or sixty years ago? Do we have a less amount of snow than used to fall here? All are very important questions, not only scientifically, but practically, and they can only be answered by a large number of observations at many stations.

Perhaps some of you read what Prof. Davis of Harvard University said recently with regard to the change of climate. He said, "We speak of old fashioned winters or an old fashioned storm as if such storms and such winters had gone out of the fashion now." He says, "This habit of referring to severe winters in the past may be caused by some such state of mind as that produced by the arrangement of telegraph poles along a road. Those near to us seem to be far apart, while as we look back they seem to be much nearer together.

So it is, in relation to storms of years ago. Strong impressions made by heavy storms remain, and the space of pleasant weather between the storms is forgotten, until we remember the storms as though they were crowded together. As a matter of fact, severe storms occur about as frequently now as in earlier times.

The observers at all the weather bureau stations, scattered over the country, take two observations each day,—at 8 A. M. and 8 P. M.—and telegraph the information directly and promptly to the chief officer at Washington. As fast as the reports are received, maps or charts are made. On these maps is expressed, by figures and symbols, the exact weather conditions at each station, and then by drawing a system of lines we indicate areas of good or bad weather. Then by knowing something of the laws of storms, one can tell by just a glance over the map the probable weather for twelve to thirty-six hours in advance. The issue of these maps is one of the most important duties of the large stations. At Boston we issue about 850 maps a day, sending them to postmasters, exchanges and schools.

Our air is constantly in motion, not only by surface winds, but by an elaborate system of great air currents. In our latitude there is a great current of air flowing towards the northeast; and in this great current there is constantly springing up, small whirls, or areas of different weather conditions from the general current, but which are still moving easterly. How these whirls are caused does not interest us now, but we know that we have them indicated on the map as areas of low barometric pressure or storms.

A storm does not necessarily mean rain or snow, but it means a decided or violent disturbance of the atmosphere which moves from place to place. Now let us note the distinction between a cyclone and a tornado. We often read in the newspapers of the terrible effects of a cyclone in some of the western states; these are not cyclones, but tornadoes. A tornado is one of these small, narrow storms that cut a track not but a few yards or rods wide and not many rods long, but which destroys everything in its path. They are whirls of air blowing with terrific violence.

A cyclone, on the contrary, is a large storm, covering an area from one hundred to six hundred miles in diameter and moving slowly across the country at an average rate of 400 or 500 miles per day. The winds blow inward in a cyclone and specially around the centre in the same manner as a tornado, but it covers so large an area the winds seem to be straight. The cyclone has entirely different weather conditions in different parts of it.

One of the most important laws of storms is, that in our latitude they almost invariably move from the west toward the east. Another important law is, that the wind blows toward the storm and not from it. When we are having a storm with heavy northeast winds and rain or snow, we usually say that the storm is coming toward us from the ocean, but that is not so; the storm is approaching from the west or southwest and the wind is really blowing toward the direction from which the storm is coming.

Cyclones pass across the United States near New England in three general classes. The first class come from the northwest, down across the Great Lakes and pass to the north of New England down the St. Lawrence valley. As the storm passes by to the north of us, the wind goes to the south, then to the west as the storm gets by, with clear weather. Areas of bad, and areas of good weather are continually moving over the country from the west toward the east.

The second class of storms form somewhere in the Mississippi valley and pass eastward off the coast to the north of New England. These give us north winds, and generally, heavy rain or snow storms.

The third class of storms come from the West Indies and move up our coast.

Our maps or charts are made twice a day: the observations taken at 8 P. M. and sent to Washington. The men at the Boston office were using them in making maps at half-past nine. Within twenty minutes after, the observations are taken and sent directly, without any stop, to Washington; they are returned for making these charts.

A large number of these maps are sent out, so every one can be a forecaster; they can forecast for themselves.

By these three classes, the cyclones, one passing just to the north of New England and the two others just to the south, you can see how it is we have such changeable weather.

The storm of January 6th to 10th, 1886, was a very severe storm, followed by a remarkably cold wave, temperature below freezing far down over the gulf. At 7 A. M., January 7th, the storm had just formed in Indian Territory and was moving toward the south. A wave of cold weather was moving down behind the storm from the far northwest. Twenty-four hours later the storm has moved over toward the eastern part of the gulf, increasing in area. And twenty-four hours later the storm had moved to our middle coast. Twenty-four hours later it had moved across New England to the St. Lawrence valley, and the anti-cyclone, clear weather had spread over all the United States. More than eighty per cent of all the storms that occur in the United States pass near enough to New England to give us some of their weather.

A cyclone is a storm area; anti-cyclones are areas of clear, cooler weather and follow behind the cyclones. They all move at an average velocity of 600 miles in twenty-four hours. When we get within one, two or three days of a storm we hardly ever have clear weather; the storm hardly ever lasts over three days. It is much different in New England than it is in the Southern states. They have clear weather for two or three weeks; we, almost never have more than three days of clear weather.

As the grammar school is here, I will say that if you do not get weather charts in your school you can get them. They are of the greatest importance to the scholars, as, from them they can learn many of the laws of storms and many meteorological truths that will be found of great value.

Ques. Do all these large storms take a rotary form?

Ans. Yes; the wind does not blow toward the centre, but a little bit to the right of it. When it is over such a large territory, to one observer the wind motion seems straight, but it is spiral, always.

Ques. Does observation show that there may be any regularity in successions?

Ans. Some have tried to find that succession of storms; but there are so many other things that come in, if there are any such periods they have not been found.

Now, in addition to the regular stations of the National Weather Bureau, the several states have branch weather services with voluntary observers reporting to them. They are called State Weather Services. In New England we have the New England Meteorological Society, which has been doing the state weather service work for the six states. This society was organized about six years ago to promote the study of New England climate and special weather characteristics, and has done a valuable work. This local work has now been transferred from the society to the National Weather Bureau, and a New England weather service established.

Last year, on June 30th, the weather bureau was transferred from the war to the agricultural department as you all probably know. The express purpose of Congress in making the change, was, to extend the benefits of the weather bureau in the interest of the farmer. And that is what we are now trying to do. The State weather services have been established to facilitate this work. They are supplements of the larger National Bureau, and carry the local work more into detail. There are four lines of work which the State weather services are extending at the present time.

First, in the establishment of stations for making daily records of temperature and precipitation, systematizing the work of any who have voluntarily taken it up and in printing the data in practical form. There are now forty State weather services and over 2,200 voluntary observers connected with them, who are taking daily records. In New England we have about 160 of these voluntary observers, in addition to the half dozen regular weather bureau stations. Most of them own their own instruments and report to us once a month, on blanks furnished them for that purpose. The instruments are a maximum and minimum thermometer. The maximum records the highest temperature and the minimum the lowest. The cost of the instruments—a set of thermometers—is from six dollars to eight dollars, and the cost of the rain gauge is about the same. In places where we have no reporting stations, arrangements can be made for the loan of instruments to reliable men, who can report to us once a month.

One speaks of the climate of a *country* or state; but it is known, that not only does the climate of each state differ from the adjoining one, but the climate of each *town* and man's *farm* is different from his neighbor's. We cannot hope to establish these stations on each man's farm; although each farmer would be benefited if he would pay more attention to the study of climate in relation to crops. But we do hope to have one in each town; showing the influence of climate and weather upon crops. The successful growth of crops depends upon climatic conditions; and when we say that our crops fail because it is too dry or too wet, or too cold or too warm, we usually take no notice of how dry, or how wet it is; or how early the frost comes; and we do not know just what conditions of heat or moisture are necessary to insure the most perfect crop.

The importance of this, being more fully realized, is becoming apparent, agriculturists are taking up the subject to a great extent, both abroad and in the United States. Last year the apple crop was very variable. In one orchard or town, there would be a big crop; in the adjoining one, none at all.

What was the reason? Some orchards were thought to be more exposed to the late frost than others; and again, some were set in more favorable conditions, thus making them more advanced than others. We frequently hear it remarked that July or August determines the corn crop. But last year, we saw that September has something to do with it.

The second matter of work which is being extended, is the securing of crop information. The work calls for the service of a large number who shall report to us the weekly condition of the several crops and the effect of the weather upon them. These reports are condensed and sent to Washington and issued in weekly crop bulletins. They give departures from the normal. in both temperature and precipitation over the United States, as well as a synopsis of the condition of each crop.

You can see, that by following these reports from week to week, you can know about the crops in any town or county or state. This is considered the most important work which the state services are doing. We are anxious to secure a large number of correspondents throughout New England, and especially in the fruit sections of Maine, and if there are any here who will report, for the information that we can give him through the crop bulletin, I should be glad of his name.

We publish a bulletin weekly and send to all voluntary observers, farmers' clubs and newspapers. With the transfer of the work to the agricultural department, twenty local forecast officials were appointed, and the United States was divided into districts, each district to be especially looked after. The officials in Boston will try to make special forecasts for the special crops during the coming season. If in haying time, they will pay attention to showers for the next day. In Western Maine, when they begin to pick their corn for canning, they will make a special forecast for frost or no frost; whatever information is specially desired in any section they will make special forecasts for. In the South, they cure their tobacco in barns and sheds. They can shut them up when they have wet weather. Muggy weather spoils it by causing stem rot, and other diseases. By forecasting these waves, the growers can shut up their barns and thus control the air inside them.

Beginning with the first of the year, the forecasts have been made for a longer time in advance than ever before, being now made for twenty-eight and thirty-six hours ahead, and sometimes forty-eight hours. One forecast is sent out during the night and is received by the display men early in the morning. These indicate the weather until midnight. Another is made out in the forenoon and is received about noon. These indicate the weather until 8 P. M. the next day. It seems to me that the latter are more beneficial, especially during the haying and harvesting seasons.

The different methods for disseminating are important. The method which has been used is by flags. I have charts which show these flags. They are five in number and should not be less than six feet square.

The fair weather flag is entirely white; the rain flag, blue; the flag indicating cloudy weather and showers, half white and half blue; and the temperature flag is black and is triangular in shape. Then we have the white flag with the black center for cold waves. We have eighty or eighty-five stations in New England; but we are sending out these telegrams as fast as villages and neighborhoods desire, and will provide flags for display. We furnish flags to some, but not in many cases. Another method is by mill whistles. We telegraph the daily weather forecast also, where mills will blow a system of whistles and where large agricultural districts will be benefited.

The Old Colony Railroad, the New York, New Haven and others have taken up the matter and sent weather forecasts through all their roads. People get a set of flags and ask some man to display those flags; every day they disseminate information at different points.

There is a plan which has originated in this Bowdoinham Grange. I have heard of nothing similar in any other section. It is one of the most practical that I have heard of. This is, to display the information by means of balls.

When you put up the flags, if there is no wind they hang close down beside the pole; if the wind is blowing straight toward you, or from you, you cannot read the signals; but by having the balls put up instead of flags, they can be seen, no matter what the wind is. I will explain that method a little. They propose to put on their highest hill a large pole, about seventy feet high. On that pole they will haul up large balls from eight to twelve feet in diameter. Whatever the forecast is, the ball indicating it is pulled to the top of the pole, which can be seen five or six miles away. If it is going to be cloudy with local rains haul up two balls. If it is going to rain, haul up three balls, the third ball an average distance from the others, to indicate the distance that the storm is away. If it is coming soon, haul it close; if in thirty-six hours, lower down. I hope this will be a benefit and I hope it will have a fair trial in this town; and I assure you the weather bureau will aid as much as possible in testing the scheme. I think it is the most practical way that it can be done.

I remember receiving a letter from a gentleman who said he wanted a weather instrument that would make accurate forecasts. He did not mind the cost as long as it would make accurate forecasts. Occasionally now, a man comes into the Boston office and looks carefully around as if in search of something; and on being questioned, he will say he is looking for the weather machine; and he will act as if he expected to see a large machine and a man with a crank, grinding out the weather. A great many people do not know the difference between the regular weather bureau officials and some astronomical meteorologists. The regular officials forecast from the maps, for from one to three days in advance and try to tell you the exact weather for the time, and at any place, or just where the temperature will begin to rise or fall; while the astronomical meteorologist pretends to tell from the position of the planets or something of the kind, the weather for months or weeks in advance. They will say, "About such a date, look out for a storm," or a frost is liable to occur between September 25th and October 5th.

Here in New England, I have shown you how we have so *much* weather, that a man cannot help hitting it, as he predicts a part of the time ; and some of these so called weather prophets have a great reputation which is due to nothing but co-incidence.

Possibly the sun and planets have something to do with the weather; but science has not advanced to that stage yet, where it can be determined from them just when we are to have a storm, or over what section of the country it will traverse.

Ques. Give us your idea of the accuracy of the barometer?

Ans. A barometer will give the difference in pressure at one station; but with all the instruments he may have, *one man* alone at *one* point cannot accurately forecast the weather. It is by knowing what the weather is all around that this can be done. A low barometer generally indicates stormy weather; but not always. So the barometer will sometimes go way down low, other things being equal, and you may still have good weather. It is only by knowing what weather is coming toward you, that you can know what weather to expect. The barometer is good as far as it goes. Low pressure almost always means a storm; while high pressure means generally, fair weather. The small, cheap barometer indicates the pressure changes very quickly, but not so accurately as the large one. Thirty inches, as indicated by the barometer on the attached scale is normal pressure; when *below*, it indicates stormy weather; when *above*, it is almost always clear weather. If your barometer is changing slowly, do not anticipate very bad weather; but if the barometer is changing quickly, it indicates a great difference in pressure; and you must have high wind from somewhere to equalize that difference.

Now, taking up the fourth work which is being extended, that is, the study of the cold waves and sending out frost warnings. It is found that these cold waves originate in the far northwest over British America, and then sweep down over our country in great waves. The first class comes from Manitoba, over the Lakes and New England, coming very quickly and passing away quickly, not lasting more than twenty-four or thirty-six hours.

The second class comes from the northwest and sweeps well down over the Southern states, moving slowly and lasting sometimes five or six days. The third class is intermediate between the two.

In the West they have cold "Northers" or blizzards; the air is filled with fine particles of ice that cause extreme suffering and even death. But if you will take notice, the lowest temperature is not with these high winds. It comes with the clear, still atmosphere after the windy front of the anti-cyclone has passed over. During a cool time in summer you do not feel troubled about the frost while the wind is up; but after the wind goes down then you worry about crops.

The first warnings of frost were telegraphed to New Orleans during the season of 1879; these were for the benefit of the sugar interests of Louisiana. It was doubtful if the people would pay attention to them, but it was found that they were benefited. Strong resolutions were sent out by the New Orleans Board of Trade and it was decided to organize a complete system of frost warnings. It was by these reports that the great blizzard of 1886 was heralded far in advance of this, never to be forgotten, cold wave. The cold wave came behind the storm; and during it, Galveston bay was frozen over, and several men frozen to death. It spread over the "Land of Flowers," and the much disputed frost line was something of the past. The Boston observer was in charge of the station in Jacksonville, Fla., at that time; and at that station the mercury stood below freezing for three days. Everything out of doors was frozen; oranges picked from the trees would fly to pieces if thrown upon the ground, like a stick of sealing wax. Those who took notice of the warnings were profited by them.

Large orange groves were saved. On the noted Harris farm, which contained a large grove, the owner built fires all around and among the trees. He had to keep the fires burning three days; but to do that he tore down his fences and outbuilding, and everything but his dwelling house, to feed the fires. But he saved his oranges and his groves.

During the cold wave, Mr. Smith tells a laughable incident that occurred during the cold wave. After the cold wave flag was put out to give warning of its approach, a man came into the office and related a remark made by a countryman on the street. The man of the farm cast his weather eye toward the flag and said: "That weather man must be dead drunk, for there has been his white rag out and not wind or cold enough to take the wrinkles out of it."

Last fall, in November, a man from New Hampshire came into the Boston office and said that the announcement of the first cold wave on the daily weather maps saved him over $300.

We are often asked why we have a frost when the thermometer indicates a temperature of forty degrees or forty-five degrees even. Plants radiate heat very fast, and as they radiate heat into space, they become cool, and as the air is a poor conductor of heat, the air directly in contact with the plant becomes very much colder than where the thermometer is; so you may have thirty degrees down there when the thermometer may indicate thirty-eight or forty degrees.

Mr. T. S. Gold, Secretary of Connecticut Board of Agriculture, relates that he remembers a time when the line between the cold lower air and the warmer upper air was so sharply marked that the buds were killed on the lower half of some fruit trees standing on a plain, and the upper half were not injured, but bore abundant fruit.

Ques. Do plants get a good deal of dew, more than the surrounding ground?

Ans. Yes more dew is condensed on them.

Ques. I should judge that on a piece of ground that is bare of plant growth, there would be no dew.

Ans. Not necessarily no dew; but not as much as if there were plants there. Plants radiate heat rapidly and become cool very fast and so more dew is deposited on them. Radiation is going on all the time, but is most noticeable in the night. But one important question comes in here. That is, will plants become colder and colder until morning? Now, they will keep growing colder and colder during the night up to a certain point. That degree is called the dew point. The air is like a sponge; you can squeeze a sponge partly saturated, until if you squeeze it one bit more the water will come; so with the temperature of the air; as you cool it, you reduce its power to hold moisture. So as it cools during the night it goes down to that point of complete saturation or when dew will be deposited. As dew is deposited it gives out heat and so lowers the temperature of the air up to that point or nearly so, so the temperature during the night will fall until the dew point is reached and not much below that. Then if you can find out in the afternoon what the dew point is, you will know how low the temperature will go during the night. That is done by the hydrometer.

The simplest of these is the wet and dry bulb. Take two common thermometers and cover one of the bulbs with a thin piece of muslin and connect the muslin with a cup of water by a wicking. This will keep the muslin saturated and water will evaporate from it. As it evaporates it takes up heat and so lowers the mercury in the thermometer below the temperature of the air as indicated by the other or dry bulb thermometer.

By taking the difference between these two thermometers, you can determine the dew point, or in other words, the minimum temperature for the night and thus, whether a frost will occur. This method is good where you cannot receive the report; but of course the best method is by warnings sent out by the weather bureau, indicating these cold waves.

We are establishing in the cranberry and strawberry sections a system of central stations where we can telegraph frost warnings from twelve to thirty-six hours in advance and have this information sent to surrounding farms and villages. This is usually done by putting up cold wave flags. They cost about $1.50. We will telegraph these warnings to those sections wherever the pole and flag will be provided, and the information sent to the surrounding farms and villages. One correspondent suggests that the coaches carry a flag, another the steam cars whistle, and another the church bells rung. I think the last is a good suggestion. There are few sections in New England where they could not hear some church bell. Down in Connecticut, they propose to fire a cannon to indicate the frost. Any method will do by which you can send these warnings to the surrounding neighborhood after receiving information, and you can protect the crops by whatever means is in use. A great many bogs of cranberries can be flooded, and in bogs where they cannot be flooded they build fires. For other crops, the only way is to cover them.

Radiation goes on in straight lines; if you cover the plants in any way you will stop radiation as surely as you stop the rays of the sun if you put an umbrella over your head. You go out and cover your cucumbers with newspapers; but if it is cloudy you do not fear frost. Then if a cloud a mile or more above the plants will stop radiation and prevent frost, so a very light artificial covering will do it just as quickly. A muslin cloth will protect them, but covering with cloth can be done only on a small scale. So covering by smokes or smudges is practical in the fields of the West and the orange groves of the South. They have a stove arrangement and burn tar and keep up a thick smudge all night; by putting it on the windward side it prevents frost.

In Germany they are using a compound of tar and sawdust. Farmers have told me that, on still nights, the smoke goes straight up into the air and does no good. It is a question in my mind however, if this smoke will not spread out at some height, and if it does spread out over the plants it will do as much good as if lower down. I should like to ask Prof. Fernald his opinion.

Prof. FERNALD of the State College, Orono: I can see no reason why it would not do as much good. Just as smoke rises over a village, rises into the atmosphere and spreads over the entire region. I have seen that frequently, especially on cold mornings. I see no reason why the smoke does not diffuse itself and so make a protective covering at a certain height of the atmosphere.

Mr. SMITH: There are currents of air after you get a certain distance above the earth and above the fire that might carry it the other way. I think that can be tested by little balloons of fire. I think the smoke spreads out and prevents radiation and freezing just as much as if near the ground.

The Connecticut Pomological Society have taken the matter up and asked the State Agricultural Experiment Station to make some experiments on the value of smudges, and they intend to do it this summer. They intend to build fires and test the matter thoroughly. I believe we shall get good information from it. I have told you of these four lines of work which the weather bureau is extending, taking daily observations of temperature and of precipitation, giving crop information, disseminating daily forecasts and frost warnings. And I have told you also, that you must meet the weather bureau half way. We cannot say you *must* have all this information, but you *can* have it. Tell us just what you want and the weather bureau will try to give it to you.

Before closing, I would like to say that I was particularly interested in what was said about the Agricultural school in this State. Nearly all my life has been spent on a farm in New Hampshire, and I am interested in such matters. Since I have been in Boston I have met a great many graduates of the Maine State College, and I have found them men standing right along side of men graduating from other colleges. It has sent out some of our strongest and most upright men.

A good many times, young people from my own town, ask what they had better do for a living. My advice always is, "Boys, stick to the old farm," and to the girls "stick to the farmer's boys."

Ques. As to how this matter of the weather forecast is to be given. Is the agricultural board to look it up and see that a method is devised? What methods have been presented to you; has anybody suggested anything?

Mr. Smith: No, the flags and whistles are the only methods in use that I know of. This ball system is all the one I have heard of.

Ques. If such a point should be established here would you be authorized to give us a special forecast for this special place?

Mr. Smith: You would not need that for this special place. The forecasting officials in Boston divide the states into districts, eastern and central Maine, western Massachusetts and Connecticut valley. They could make a special forecast for this place, but you would want your regular telegrams. If you should get three or four telegrams a day after the system was put in operation and we could not keep it up, you would be disappointed. I think you can get telegrams twice a day if you wish; early in the morning and at noon for the next day.

Ques. We cannot have it for thirty-six hours, early in the morning?

Mr. Smith: No. The forecast which you get early in the morning was made last night and covers until midnight. The forecast you get about noon to-day was made from the eight o'clock this morning observation. This covers the probable weather for all day to-morrow, till eight P. M. This last is the most important, or is generally considered to be the best. If you get thirty-six hours in advance, it is not so accurate as for twenty-four hours. For forty-eight hours it is a little less accurate still.

Ques. If the farmers should desire it through haying time would not the weather bureau give such forecasts?

Ans. I cannot say in regard to that. Through the newspapers they do sometimes forecast two or three days in advance. It was thought by localizing the forecast, the official in Boston could make a better forcast there for New England than at Washington.

TAXATION.

Delivered at Foxcroft by Hon. D. G. BEAN, of East Wilton.

The subject of taxation is old and familiar to man, and it has been endured, paid, or evaded through all time. The only way to levy a satisfactory tax is to put it equally upon all, and that should be the aim of the legislators and the officials who carry into effect the laws. Many look upon their tax as a demand without an equivalent, made legal by law. But a just tax, assessed upon the property of our State equally should be paid cheerfully, for the benefits received from this expenditure are a better return for the sum paid, than any money expended.

The point which I am to discuss is the inequality of the tax. The farmer from necessity is obliged to spread his property out thin, covering a large portion of our State with highways and streets running in all directions, so the public can see it all. He cannot if he would, hide it. It is all inventoried and taxed.

The business man keeps his property more privately, and if he will, can hide it and evade taxation. I am sorry to admit it is a fact, that too many of our taxpayers *hide* their property from the assessors with the same skill and zeal that they would hide it from the *highwayman*, thinking his financial success depends upon his succeeding in evading both.

While I have made use of these two characters, the highwayman and tax gatherer, have made their acts to appear somewhat similar, as looked upon by many, they are not in the least alike. The former takes your money and gives nothing in return, while the latter takes your money in payment of value received, and my first effort will be to prove to the man who looks upon taxes as a burden, that he is mistaken, and that he receives larger dividends from this money than from any like sum expended by him, especially if he be a poor man, and the sooner he corrects this error the sooner he will become content with his lot.

Taxes are as essential as the blessings for which the tax is paid. As soon as we own a blessing in common, that costs money, just then should we begin to pay tax. The gifts of God, *light*, *heat*, *air* and *water* are not the products of man, and are not taxed, they are ours by inheritance. Tax is not tribute paid to a sovereign, but a sum paid for something received. And all of these common blessings furnished by the laws of our State cost money, and must be paid for by some one. And the wise men of the State, when the Constitution was formed said in article IX, section 8, "All taxes upon real and personal estate assessed by authority of the state, shall be apportioned and assessed equally according to the just value thereof."

Open the Revised Statutes of Maine, the foundation of its government, and you find: 1st. The Declaration of Independence; 2nd. Constitution of the United States; 3rd. Constitution of Maine; 4th. Rules of construction; 5th. State government; 6th. Towns, their meetings, powers and duties; 7th. Elections; 8th. Lands; 9th. Taxes. And fifty-seven pages are devoted to taxes, and there we find that all real and personal property within the limits of the State is taxable, except that which is exempt, by section 6, chapter 6, and I think no one objects to these exemptions. There is no doubt in the meaning of the law, and the assessor who enters upon his duty is commanded to stay. And the failure to follow the statutes is the one great cause of the injustice in taxation. I will admit that some changes could be made to aid the assessors in their duty, and at the same time I would suggest that the law be more imperative, compelling the assessor to do his duty. We too often complain of the amount of our taxes, and speak of them as unjust, unequal.

The State tax is levied by our Representatives, our town tax by ourselves. One vote is as potent as another, and every man in town should interest himself in his town affairs. But a large proportion of the men in all towns are much more interested in getting certain men into office than they are in adjusting the taxes.

The money matters of your town should be of the most importance, and men of good judgment and moral courage to do their duty, regardless of the criticism or favor of their townsmen, are the men to elect assessors. Many men may be good selectmen, good officers in any other capacity, but fail to do their duty as assessors.

It is an easy matter to count the sheep and swine of the poor man, and fix the value. The widow's cow cannot be passed by, for the law compels them to enter it upon the books. The musical instrument, of more value than $15.00, must be noticed; but the *money*, *stocks*, *bonds* and *securities*, which slumber in the dark, are suffered to go unnoticed.

Taxes bear heavily upon those whose property is all in sight. If all the property in the state was enumerated on the assessors' books and its just value placed thereon, as the law directs, I honestly believe that three-fourths of one per cent would be the average tax of the State.

Education being the foundation on which our government rests, and by reason of this, we are the light of the world, it is wise that the laws of the State demand the tax of one mill on the property of State, together with the school fund, to be expended in our common schools. We have 384,159 acres of reserved land, set apart for the support of schools. These lands are located in the counties of Aroostook, Penobscot, Piscataquis, Somerset, Franklin, Oxford, Hancock and Washington. The income and sale of these go into the school fund to educate the children of the State.

This tax is raised on the property of the State (I mean the mill tax). The poor man pays on his dollar one mill, the rich man pays the same per dollar, all the difference, the rich man has *more* dollars to pay on. Is this not a wise law? Around this school fund are placed protective laws, so that it shall not be misappropriated. The law says each city, town and plantation shall raise eighty cents for each inhabitant within its limits, to be expended for town schools, and when the municipality pays their State tax into the State treasury, they may draw from the State their school money.

How much shall each city, town and plantation draw? How shall it be, so that all shall be fairly dealt with? According to the number of scholars. What is this fund for? For the education of the children of the State, it matters not where they live. If the plantation of Wallagrass is poor in estate, and rich in children, should her portion of school money be withheld? They pay their tax as the law directs, now let them have the school money as the law provides. There is no State law, thank God, which regulates the number of children in a town or in a family. And the stigma of "*pauper town*," is misapplied, when put on any town, city or plantation because its school fund exceeds its State tax.

If the citizens of any city or town think it of more importance to raise their *bank account* than to raise children, then let them cheerfully comply with the law, and help educate the children in other portions of the State.

Many of the errors that now exist in the cities and towns of the State relating to valuation could be remedied under the present laws.

For example, the assessors of a prosperous city sent their copy of their valuation of 1889 to the valuation commission, properly sworn to according to law. In that city was a water company supplying the city and families with water, with a profitable margin for profits. No mention of this on the inventory, consequently it was not taxed. The valuation commission in making up the valuation for that city in 1890, added to the assessors' returns $75,000 for the value of the water plant. Within twelve months the city, by virtue of the water company's charter, wanted to buy the water plant, and the supreme court appointed referees, to ascertain the value of said plant and report. Said report to be the price to be paid by the city. A more able body of men never entered upon a like duty. They said the city should pay to this company $250,000, and the water company thought it was not enough, and did not want to sell. Yet that city pays a State tax on $75,000 as the value of this property, omitting to pay any State tax, on $175,000 of value. There are 213 towns and plantations in the State, that each has a valuation to-day less than this sum. Don't need any new law to correct *such* errors.

A city with a valuation of more than $10,000,000 with 5,019 polls returned their books, under oath to the valuation commission with $8,000 as money at interest in that thriving city. While an agricultural town with only 391 voters, made their return with $237,200 money at interest. The new city of the Kennebec valley, where the fastest horses of the State are found, and where the white-faced Herefords abound, the total value of live stock as returned to the valuation commission was $56,306, not the value of one horse owned there. Don't need additional law to correct this, for the property can all be seen. The money invested in lumber pays tax in some towns, but in many is not taxed. All the lumber,logs and bark in all the towns on the Penobscot river, including Kingman on the Mattawamkeag,and this should include lumber and logs at the mills,and logs in the river, in the woods,on the landings or in the streams in transit to these mills; bark at the tanneries and in the woods, on the 1st day of April, amounted to the sum of $105,753; or, if valued at the lowest price possible would be about 13,000,000 feet. Yet, there is run down the river each year more than 200,000,000 feet.

ICE.

Our State is noted for its superior water and climate for producing ice. She stands without an equal; yet but a small portion of the ice harvested pays any tax. One assessor, when asked why he did not tax ice, answered: "He could not, because it was only frozen water, and water was free and it cost nothing to freeze it."

Any commodity that represents money, takes money to produce, gather and market it, is property; and all property should be taxed according to the value thereof. In January you often see statements of the amount of ice put up on the Kennebec, on the Penobscot, and elsewhere, but by the 1st of April it has been lost sight of, not taxed.

WILD LANDS.

I suppose in the minds of many it would be a defective discussion of taxation, if I did not speak of the wild lands, and by some it would be a mistake if I did. But I cannot omit so large a portion of our State for forty-two per cent of its acreage is wild land. Aroostook has 2,824,548 acres; Franklin, 539,962; Hancock, 362,893; Oxford, 353.654; Penobscot, 824,674; Piscataquis, 1,995,142; Somerset, 1,735,838; Washington, 624,125; total, 9,260,836. Valued in 1890 at $19,146,458 or $2 07 per acre.

That there are errors in the valuation of wild land I have no doubt. Some townships are too high, some are too low. Some acres are *burned*, some *hard cut*, some beyond drivable waters, some had *blow downs*, some eaten by worms, a little not worth operating. I will give you the testimony of one of the best experts in the lumber business during the last half century on a certain township in a county not far from here: "23,083 acres valued in 1880 $50,000 or $2.16 per acre. Cut thirty-seven operations in ten years, 1880 to 1890. Gross receipts for stumpage, $70,962.18. Worth to-day ninety cents. This is a very good settling town."

Thirty-six per cent of the area of Maine is farms; forty-two per cent, wild lands. Twenty-two per cent, the balance, must be cities, villages waste and land not included in farms. We cut 600,000,000 feet annually of lumber from our forests. We have granite on the coast and in the interior, a sample of which can be found in nearly all of the large cities of the Union. We have lime of superior quality. It is manufactured successfully. We build the finest modern ships in the world and they are known in every port. We raise the best apples on earth, and I wish the young farmers would set more trees—and take care of them.

The number of polls in the State in 1890, 172,799; number of polls in the cities, including Brunswick and Skowhegan, 51,817;

in the rural portions of the State, 120,982; and yet I sometimes hear that the cities have too much of a controling influence in the government of the State. If this is true, it seems to me that you and the rest of us who live in agricultural portions of the State, are stupid, for we certainly outnumber them.

Valuation of the State as fixed by the valuation commission in 1890, was $309,096,041.

Valuation of the cities...	$130,819,080 00
Valuation of wild land..........................	19,562,050 00
	$150,381,130 00

Three hundred and nine million ninety-six thousand and forty-one dollars, minus one hundred and fifty million three hundred and eighty-one thousand one hundred and thirty dollars equal to one hundred and fifty-eight million seven hundred and fourteen thousand nine hundred and eleven dollars, the rural or agricultural valuation.

It seems that you pay a State tax on $8,000,000 more valuation than do the cities and wild land combined. You have more votes, you have a larger valuation, and consequently you pay more tax. Now, please tell me why you don't legislate more as you desire.

It is because the agricultural portion of the State do not interest themselves in the affairs of their town, county and State. It is because you do not put importance enough upon united action. The valuation commission of 1890 considered carefully every property interest in the State, and by facts and figures, evidence for, and evidence against, they reached the result as shown in their report. The result was that 114 towns and plantations of the State were reduced in valuation, and 385 advanced during the decade from 1880 to 1890. In conclusion of this subject, you will ask, how can a just valuation be obtained? I will answer, it never can be. Fill the books full of laws relating to valuation and taxation, and errors and inequalities will exist. You may ask what I would recommend in addition, or in place of the present law. I will answer, that I believe there can be some improvement in the laws regulating valuation, and I trust we have in our State wise men able to meet the demand, but we sometimes fail by having too much law, a change is not always an improvement.

To correct the errors that exist outside of wild lands, much can be done by selecting men for assessors in cities and towns, who know their duty and dare to do it, and take time to hunt up and examine all property, until they know its value; and every town should list all property at its full value, exempting none, except that so exempted by law.

If any political party desires to win at any important election, they rally at the polls, and they succeed, if they *outvote* their opponent. If any corporation, or body of men, desire any aid from the Legislature, they first elect men to that office that will favor their project; and when those that think alike act together, they usually succeed. In union there is strength. It is old, but true.

The errors in valuation are most common in cities and large towns, and always will be. It is more difficult to find property. The property in the country can readily be seen and the value ascertained.

In view of the facts as they now exist, what shall we do? Send men to the Legislature that will demand such laws that will compel the assessor and the assessed to do their duty.

THE RESOURCES AND FUTURE OF AROOSTOOK COUNTY.

By Hon. EDWARD WIGGIN.

Delivered at Fryeburg, on "Board of Agriculture Day," of Maine Chautauqua Union.

Although Aroostook has commanded so large a share of the attention of the public for the past few years, and although so much has been written and spoken about it, yet it is a fact, that the "Garden County" of Maine is still comparatively but little known to the residents of the older portions of the State. It is thought by many to be a semi-Arctic region, away up in the frozen north, with its year divided, as some wag has expressed it, into but two seasons, "nine months winter and three months mighty late in the fall." Another has avered that "it would be a grand country to live in if it wasn't for the two or three months of bare ground." Again, many suppose it to be wholly a wilderness, where the settlers, located in log houses at wide distances apart, can just see the smoke of each others cabins over the intervening tree tops of the primeval forest, while any approach to the culture and refinement of good society, as seen in the older portions of the State, is thought to be wholly out of the question. This may have been true of Aroostook a half century ago, but it is far from the truth as regards many sections of the county to-day. Yet the apparent wonder of those who visit the more thickly settled portions of the county for the first time, and their expressions of surprise at finding it not all woods, and the inhabitants not wholly uncouth and uncultivated, indicate that the general impression is about as we have described it.

That we are not wholly in the hyperborean region may be seen from the fact, probably not thought of by many, that the parallel of latitude that runs near the town of Houlton also runs through the city of Lyons in Southern France and crosses the northern part of vine-clad Italy, and the head of the beautiful Adriatic sea. The line which marks the extreme northern limit of Aroostook county, runs very nearly through the city of Paris, the heaven of good Americans, while away to the north of this line lies Belgium and the Ne herlands, the larger part of the German Empire and the whole of the territory included in the British Isles. The Swedish colonists of Aroostook, who in a few years have converted a forest township into a succession of finely cultivated farms and comfortable homes, and who by their honesty, industry and frugality have come to be regarded as among the most valuable citizens of the county, were obliged to migrate fully thirteen degrees southward from Stockholm, the capital of their fatherland, in order to reach the northern boundary of the township which was to be their new home. The mouth of the beautiful blue Danube, is but a few miles south of the equally beautiful Aroostook, while the Seine and the Rhine mingle their waters with the ocean far to the north of the junction of the Aroostook river with the magnificent St. John. It will thus be seen that, although we occupy the northern portion of the State of Maine, yet, when the question of latitude is considered, we are "in the swim" with the most fertile sections of the habitable earth.

Some idea of the extent of this great county may be formed when we remember that it embraces more than one-fifth of the entire area of the State of Maine, is nearly as large as Massachusetts, almost a third larger than Connecticut, while Rhode Island could be snugly tucked away in its northern forests and have a good broad fringe of woodland on every side.

The principal river system of Aroostook county is the St. John and its branches, though the southwestern portion of the county is drained by tributaries of the Penobscot, and the southeastern portion by affluents of the St. Croix. The St. John is indeed a magnificent river, and runs through Aroostook for many miles, before it becomes the boundary. Some of its branches are a'so noble rivers. The chief of these is the Aroostook, a broad and smoothly flowing river, which rises in the northern part of Piscataquis county and flows in a most tortuous course, often doubling upon itself and forming many "ox-bows" but holding a general northeasterly direction across the county, leaving it in the town of Fort Fairfield and emptying into the St. John a few miles beyond the boundary. The beautiful valley through which the Aroostook flows is one of the most fertile sections of this fertile county and already well fulfils the prophecy of Gov. Lincoln who said of it in 1827, when the rapacious hand of England was stretching out to rob us of this fairest portion of our State, that it was "destined to be occupied by a numerous population, engaged in all the pursuits which sustain human life and adorn human nature."

Fish river, which empties into the St. John at Fort Kent, is also a river of considerable volume and has upon its waters one of the finest chains of lakes in the world.

The Allegash is a river of much importance, as it drains a vast and valuable lumber region, and finds its way into the St. John some twenty-five miles above Fort Kent. The Meduxnekeag, upon the south branch of which the beautiful village of Houlton is situated, is also an important stream. Its north branch runs down through the town of Monticello and, crossing the border, unites with the south branch and enters the St. John at Woodstock.

In the southeastern portion of the county are the streams forming the St. Croix and the grand chain of lakes there forming the eastern boundary. Farther west in the southern part of the county are the branches of the Mattawamkeag, some of them being streams of no small dimensions. All of these rivers have numerous branches and abound in lakes of greater or less dimensions, which make Aroostook one of the best watered sections of New England. The scenery around these woodland lakes and streams, is most picturesque and beautiful, and as their waters are well stocked with fish, and the forests abound in game, the wilderness portion of the county is a veritable sportsman's paradise.

The settled portion of Aroostook is mainly included in the five tiers of towns which form the entire breadth of the county in its southern part and which extend northward to the river St. John.

The towns along the upper St. John, as far west as the mouth of the St. Francis, are also thickly settled and there are numerous little hamlets and detached openings containing good farms, along the shores of the upper St. John above the mouth of the St. Francis as far up as Seven Islands, where, nearly eighty miles above Fort Kent is one of the finest farms in the State. There are also several settlers on the Allegash, who have comfortable homes and good farms, finding a ready market for all their surplus products in the lumber camps near by. From Ashland, in the fifth tier, the mail route from Patten continues on through portions of the sixth and seventh ranges, fifty miles to Fort Kent at the mouth of Fish river. The country along this road is quite thickly settled for a greater part of the way and there is much good farming land. This road passes through Portage Lake plantation, which has many good farms and contains the magnificent sheet of water from which the township takes its name. It also passes in sight of Long lake with its picturesque landscape scenery, and skirts the pebbly shores of Eagle lake, which is one of the most beautiful lakes in any land. On its placid bosom a "field" of contesting oarsmen might start and row straight away for fully ten miles without obstruction, and the race could be witnessed by admiring thousands from the gently sloping banks on either side.

With the exception of the portions named (which include more than one-half the county) and remote openings here and there in out of the way places, the remainder of the county, comprising the great northwest, is almost an unbroken wilderness, and is one of the finest timber producing regions in the eastern portion of our country. Here Nature may be seen in her virgin loveliness and in all the grandeur of her original beauty. Here is the home of the moose, the deer, the bear and the caribou, together with many different species of smaller game. Here are rivers and streams where the finny tribe sport in wanton freedom and in blissful ignorance of bait or fly. Here is the boundless forest "where flows the Allegash and hears no sound save its own allegations." Here the mighty Wallastook, monarch of rivers, the deep and sluggish Mattawaakwamsis, the swift-flowing Chemquasabamticook, the noisy Musquacook, the lake fed Chimmenticook, and many other streams of equally euphonious names, flow peacefully along, unvexed by the busy mill wheel, and the deep solitude of their forest shades undisturbed by the shrill whistle of the noisy factory. Remote and wild as this region is and uninhabited in summer save by the native denizens of the forest, it is during the winter season the theatre of a busy industry.

Now above the lofty tree tops of the "forest primeval" rises at frequent intervals the curling smoke of the woodman's camp, while the frequent ring of the sturdy chopper's axe and the crash of the mighty monarch of the forest as it lays its cumbrous length along the snow-clad ground, are heard on every hand.

On the banks of all the streams resound the shouts of the strong-voiced teamsters and the merry clanking of chains, as the big loads of logs are hauled from out the fragrant green wood, and the high, wharflike "brow" is built up along the steep bank, to be rolled into the freshet swelled waters in the opening spring, and floated away to the distant mills.

Formerly the only lumber cut in this great wilderness was the pine, which grew in great abundance, and was of excellent quality. Then the pine was all hewn into square timber in the woods and, as only absolutely perfect trees were taken, much valuable lumber was sacrificed. The chopper sounded the tree by striking upon it with the poll of his axe, and if it gave evidence of being sound, it was cut down. It was then chopped into, for a short distance at frequent intervals and, if found perfect, it was sided up as far as the first limb and hauled to the landing. If, however, the slightest evidence of rot or shake was discovered at any point, the whole tree was condemned and left to rot upon the ground. This proved to be a most wasteful business, and a quarter of a century ago the pine, suitable for square timber was practically exhausted and round logs made up the principal part of the drives. Indeed whole winter's operations have since been made upon old "timber works," hauling the condemned logs and the tops of timber trees which, however knotty, were sawed into boards for box making. A pine growth once cut off does not renew itself, and the extensive operations carried on each winter eventually stripped the land of this valuable timber. In the old pine timber days, the spruce was looked upon with something like contempt by the lumberman, as a tree of an inferior race and one wholly unworthy of his steel. It was thought in those days that a spruce township was utterly worthless, and it was hardly deemed possible that the cutting and driving of this variety of lumber from these distant lands would ever be carried on with profit. As early as 1870, however, a stray spruce log was occasionally seen among the pines in the St. John river drives and, steadily increasing from that time, they now form the bulk of the drives, the pine logs being conspicuous by their extreme rarity. The spruce towns are now the most valuable of all the lands in this timber producing section, as the wood grows rapidly and the same ground can be cut over at a profit as often as once in every twelve or fifteen years.

A glance at the geological characteristics of Aroostook county may here be in order, as the rock formation has much to do with the value of this interesting section of our State in an agricultural and industrial point of view. The testimony of the fossils found in the rocks of Aroostook determines them to belong either to the Devonian or Silurian age, in which latter period those portions of the earth now habitable are supposed to have been beneath the water. No land productions are found in this formation, the fossils being those of the most primitive productions of the sea, shells and various species of trilobites being frequently discovered, but no fish. The limestone around Ashland is largely composed of encrinites, resembling our water lilies. These fossils, appearing both in the limestone and in the slate formations, show that they belong to a quite primitive condition of the earth, more generally known as the "old red sandstone." Dr. Jackson, who made a cursory geological survey of the county, conjectured from the evidence of some of the fossils found, that beds of coal might exist in Aroostook, but in this opinion Rev. Marcus R. Keep of Ashland, who has made the geology of the county a special study, does not agree. He has found no distinct traces of the coal period, or of chalk, or of the new red sandstone (more modern than the coal formations), and therefore thinks it useless to look for coal in Aroostook. The most extensive underlying bed rock, reaching from the region of Houlton northward to the river St. John and westward to Ashland, is seamed with a white calcareous spar, or crystalized lime, coming from the rock as it cooled and filling the open spaces made by such cooling, which condition shows that our rocks are only a little more modern than the molten condition of the Azoic period.

In the limestone, which reaches from the Fish river waters near Fort Kent southward for eighty miles, there are at Square lake, immense deposits of trilobites. At Ashland these fossils mostly disappear, and thirty miles farther south the same limestone, or of the same age, becomes marble, or crystalized lime, which underlies Townships No. 7 and 8 in Range 6. This deposit is rendered of small value for the common purposes of marble work as it is rifted, or seamed, but it is particularly valuable for building purposes. As the seams are perpendicular and the rock stands in high bluffs, it can be easily quarried and is the only available stone for bridge work in that locality. From Island Falls to Linneus is a granite region, the formation being particularly noticeable in the town of Oakfield With less expensive means of transportation this granite would be exceedingly valuable for building purposes.

In the lime soils of lower Aroostook are many deposits of marl or bog lime. Caribou lake, near Island Falls, which is fed wholly by hard-water springs, is filled nearly to the surface with a deposit of bog lime. From the region of Fort Kent westward and southwestward the formation is clay slate, and in the town of St. Francis, quarries of good roofing slate can be opened very cheaply. Fine roofing slate is also plentifully found on the west branch of the Mattawamkeag, near Island Falls, and metamorphic and silicious slate, said to be excellent material for grindstones, is found in great abundance at Portage lake. In the first three tiers of towns, west from the east line of the State, the soil is mainly composed of the disintegrating limestone, mixed with a rich vegetable deposit, which makes it most fertile. The porous limestone beneath, furnishes an almost perfect natural drainage which adds much to the value of this land.

In the southeastern part of Wade plantation, on the Aroostook river, adjoining the town of Washburn, is a valuable deposit of iron ore, of the variety known as red hemetite, or, as Prof. Hitchcock denominates it, limonite. This deposit was first described by Dr. Jackson in 1837, and his analysis showed it to contain more than fifty per cent of pure iron.

Mr. Keep has also studied this deposit quite thoroughly and agrees with Dr. Jackson and Prof. Hitchcock in the opinion that it is a bed of great value. The quality of iron there found is peculiarly adapted to the construction of plating for war vessels, and may be of considerable industrial value to the county when the railroad reaches it. Copper oar is thought by scientific observers to exist in the wilderness region of the upper St. John, as deposits of wonderful extent and richness are found in Canada in the same geological formation.

The character of the forest growth of Aroostook differs according to locality. A line starting at the point where the western boundary strikes the northwest branch of the St. John and continued in a northeasterly direction across the county, terminating in Hamlin plantation, may be said to mark the southern limit of the distinctively coniferous or "soft wood" growing section of the county.

North of this line the growth is principally the pine, spruce, fir and kindred trees, though occasional hard wood tracts of small extent are found. To the southward of this line, broad stretches of hard wood growth appear, this being mixed with soft wood in the lower lying localities. In this section the original growth upon the ridges is principally maple and birch, with an occasional beech, and even on these hard wood ridges a big cedar is sometimes found growing side by side with a towering rock maple.

In the lower lands, or mixed growth, are hemlock, spruce, fir and cedar, with elm, hornbeam and black or brown ash. This kind of land, though harder to clear than the hard wood ridges, is much the stronger and will stand more cropping, besides being the very best land for grass. The soil in this low, mixed growth is deep and black, not generally muck, but a deep, rich turf, or vegetable mold, which is easy of cultivation and produces abundantly. On the higher ridges the soil is of a somewhat lighter character, but is better adapted to wheat culture than the black soils.

In speaking of the "Resources and future of Aroostook county" a glance at the history of its early settlement and of its growth and development up to the present day may not be out of place. Some wise writer has asserted that the most important part of the history of any country is the history of its wars. Though this is not wholly true as regards Aroostook, yet the early history of the county is intimately connected with military operations, and in many portions of its territory the hurried march of martial hosts, preceded the peaceful invasion of the pioneers, who went thither to make for themselves homes in what was then the almost trackless wilderness of Northern Maine.

Though war may be termed a relic of barbarism, yet it has ever been an important factor in the advancement of civilization, and in colonization and development of new countries. To this rule Aroostook county forms no exception. It was war, most cruel war, that drove the peaceful Acadians from their homes "on the shores of the Basin of Minas" and sent a scattered remnant of this unfortunate people away up the beautiful St. John river to find new homes upon its fertile banks, and to become the first settlers of Aroostook county. It was the ominous war cloud that hovered for years over the north-eastern border of the Nation, that induced the establishment of a military post at Houlton in 1828, an event which not only gave strength and permanence to that struggling border settlement, but, in the consequent opening of the military roads, aided much in the development of large portions of the county. It was the famous Aroostook War, now only remembered as a farce and known to this generation chiefly from a few incidents bordering on the ridiculous, but which was in fact the one manly, heroic, patriotic protest against the insolence of British greed and British injustice in all the course of the long controversy which ended in the shameful loss of a fair portion of the heritage won for us by our revolutionary forefathers—it was this bloodless war that directed attention emphatically to the rich lands of Aroostook and gave an impetus to the settlement of this most fertile section of New England. Previous to that time Houlton, and a few other towns in the southern part of the county, had been partially settled, and along the banks of the Aroostook river a few settlers here and there, had made their homes; a majority of them having come up the river from New Brunswick. These with the Acadian settlers upon the St. John, formed the population of the county, which at the time of the conclusion of the boundary controversy by the treaty of 1842 amounted to less than 10,000 souls. The country was practically a wilderness, in most portions of which the rivers were the only highways, and communication with the outside world was difficult in the extreme. That it was a region possessed of grand agricultural rescurces was apparent to all, and little by little settlers began to come in and commence the task of clearing away the forest and making homes for themselves and their families. The extensive lumber operations then carried on upon nearly all the rivers and streams throughout the county contributed to a large extent toward rendering its settlement possible, as the almost total lack of communication with the outside markets in the early days was compensated by the market for all kinds of farm produce afforded by these operations. They also furnished the means by which the settler could earn a few dollars to bridge over until a crop could be raised. Most of the early settlers of the county were men whose entire wealth consisted of a strong arm, a stout heart, a narrow axe and, in most cases, a wife and little ones. By the time the pioneer had got his first small clearing made and his log house made comfortable, the few dollars he might have brought with him were gone, and that most practical of all problems, the bread and butter question, began to demand an immediate solution. No crop could be raised the first year, and a long, cold winter was approaching, during which his family must be provided for. Two resources were now open to him, both made possible by the lumber industry. If so situated that he could leave his family during the winter months, he could shoulder his axe and hire out by the month with some one of the numerous operators, and thus provide bread for his wife and little ones. If he could not be spared from home, the other alternative was to fell the cedar that grew by the brook-sides near his own dwelling, rive and shave it into shingles and, somehow, get them to the place where they could be exchanged for the necessaries of life.

Many a prosperous and independent farmer who now looks with pride over his broad and fertile acres, who rides to church on Sundays in his covered carriage and on week days hauls many barrels of high priced potatoes to his nearest railroad station, has, in his pioneer days on that same farm, kept bread in the home by means of the cedar shingles shaved by the big open fire in the old log house, and hauled many miles, sometimes on a handsled through the woods, and at others with a team hired from some neighbor, and paid for in labor. It would be hard indeed for these men now to return to that way of working and of living, but they tell us that at the time, the toil did not seem so very burdensome, that those days of their early struggles were happy days and that the hardship was not so apparent to them then, but is only magnified by the retrospect and by comparison with their present manner of living and with the larger measure of comforts and conveniences by which they are now surrounded. Many a time and oft, in my journeyings throughout Aroostook during the past few years, in which I have made the county an especial study, while looking over the many beautiful farms with their broad, smooth fields of fifty, sixty or a hundred acres, to be found in nearly every settled township in the county, have I listened to the story of the early struggles of the owner and of the evolution of the farm from its wilderness state, to its present attractive and productive condition. Though there were times during this transition state when things looked a little hard, and when the question of bread and butter became a pretty serious one for a time, yet some how they managed to pull through and now they love to look back upon those early struggles which made them sturdy, self-reliant men.

Said Eneas to his band of wandering Trojans when the prospect began to look dark and rations were scarce, "It will delight you hereafter to remember your gnawed trenchers." So these independent farmers, the pioneers of twenty, thirty or more years ago, now the foremost citizens of their several towns, love to look back upon their "burnt land days" and to tell the story of their tustle with the wilderness. Not many months ago I visited one of the many beautiful farms in one of the newer towns of the Aroostook valley. A broad, smooth and well kept road ran by a set of neatly painted and commodious farm buildings; the barn, capacious and well finished, stocked with a fine herd of dairy cows; the house furnished in the manner that a family of taste and culture would enjoy. Back from the buildings stretched one continuous field of sixty acres, without stump or stone to mar its surface, which was as smooth and level as a lawn. Along side the field was an ample pasture of a later vintage, in which the maple stumps still stood, but where the grass grew in such rich abundance as would make the heart of a dairyman in old Oxford leap with joy. In the rear of field and pasture was a grand growth of rock maple of many acres, which is now cleared only as the wood is taken from it for needed fuel. While walking over this broad field in company with its owner, now one of the foremost men of this thriving town, he related the story of his pioneer experience. When he came upon the lot a year or two after the war there was not a tree cut upon it. He came in the fall, made a chopping, and the next spring moved his family to their forest home. He had just money enough to purchase sufficient provision to last himself and his little family until he could make his first clearing and get in a crop. When his crop was in the ground in June, his provision was nearly exhausted and he had no money to buy more. Hts farm was his only resource and upon this bank he drew. Going into the woods by the brook-side he felled the cedar trees and shaved out a small load of shingles. He then hired a neighbor who had been in the country longer than he, to take his oxen and haul these shingles to a distant store and exchange them for provisions, taking his pay for hauling, out of the proceeds of the load. Early in the morning he saw his load start from the door of his humble log cabin and on the evening of the same day he and his family ate for their supper the last morsel of food the house contained. Their breakfast must come from the proceeds of that load. Darkness came on and he knew that in the bad condition of the primitive wood roads his messenger could get no farther that night than the little settlement at the mill, some three miles away. Without fear or misgiving he went to bed and slept soundly till three o'clock, when he arose, took a bag and went through the woods by a "short cut" to the mill. There he found his load and, taking a small quantity of provisions in his bag, he returned by his forest path as the morning birds were waking and flitting about in search of food for the hungry mouths dependent upon them. The good wife went quickly to work and by the time the little ones were up a good, warm breakfast was spread upon the table. "It was a close shave," said he, "but I filled the gap." Other loads of shingles procured supplies for the family until the crop ripened and, said he, "since I harvested my first crop I have never been without sufficient provision in the house for my family, and enough to spare for a guest, and everything you see here has come from the products of this farm and I had the land to pay for and the farm to clear in the mean time."

Where, we ask, could the average man, without means, make for himself so good a home in so short a time, or surround himself with more of the comforts of life as the product of his own honest toil. This is by no means an isolated or exceptional case, but similar ones can be counted by hundreds and thousands throughout this county, and what has been done can be done again, and the circumstances and surroundings are now far more favorable. On one of the many fine roads in my own good town of Presque Isle, is one of the finest farms in the State. Hundreds of acres of fertile land are enclosed in fields so smooth and level that a sheep could be seen from the road on any foot of them. A handsome dwelling long since replaced the old log house; big, roomy barns and granaries, well finished and painted, receive the ample crops; a windmill draws the water for a large stock of cattle and horses, and around are all the conveniencies of a well-kept farmstead. Upon this farm lived and, but a year or two since died, Mr. Freeman Hayden, one of the early settlers of the town. It was the pride of the old man's heart, and he delighted in nothing more than in taking strangers who were visiting the county to see his beautiful farm, and as he showed them over his broad domain he would tell, with pardonable pride, of how he came to the forest lot with hardly a dollar of capital and, with the help of his sons, made the farm what it is to-day.

Those sons still live upon the farm, and it is an estate worth many thousands. Instances like those named might be multiplied, and it is an evidence of the fertility and productive value of the soil of Aroostook and of the grand agricultural resources of the Garden County that these fair farms have in most cases furnished the means for their own improvement as well as for the payment for the land. In numberless instances, all through the county, broad fields have been cleared and smoothed, good buildings have been erected in place of the primitive log structures, stock has been placed upon the farm and many articles of comfort and convenience, and not a few of the so-called luxuries, placed in and about the home, and all, or nearly all, have been paid for from the products of the farm.

Before speaking farther of the agriculture of Aroostook we will again notice for a moment the vast extent and importance of its lumber industry and the practically inexhaustible resources of the county as a timber producing section. In order to give some idea of the magnitude of this industry the following figures from the records of the Houlton Custom House are here given. These figures are for the cut of 1890, and they will represent very nearly the average amount of lumber cut yearly in the county upon the St. John river and its Aroostook tributaries and driven down the St. John to be manufactured in mills located in New Brunswick. In that year there were driven out of the Aroostook river 31,430,331 feet of spruce, cedar and pine. From the Meduxnekeag river, 13,481,649 feet. From Three Brooks, so called, a stream flowing through the town of Bridgewater, 2,169,014 feet. From the St. John and its Aroostook tributaries above the mouth of the Aroostook river, 59,230,155 feet, making a total of 106,311,150 feet. We are safe in saying that fully one hundred million feet of lumber are cut yearly in the forests of Aroostook and floated down the St. John river to be manufactured. By a special law this lumber is allowed to be manufactured in New Brunswick and returned free of duty to the ports of the United States. Could this large amount of lumber be manufactured in the county, and shipped by rail over a direct line to outside markets, an immense business would thus be built up which would aid immeasurably in developing the resources of the county, and add largely to the wealth of the good State of Maine. In the "future of Aroostook" we look to see mills established on our own soil for the manufacture of a large part of this important product to be shipped to market over the line of railroad already commenced and to be pushed we hope to a speedy completion. But the figures given show but one branch of the great lumber industry of Aroostook, exhibiting only the amount floated in the log to the mills of New Brunswick.

In addition to this we have to take into account the immense amount of lumber manufactured in the county for local consumption, the amount of long lumber shipped by rail, the large amount cut in the southeastern part of the county, on the St. Croix waters, and the large drives of logs cut in western Aroostook upon tributaries of the Penobscot and floated down that river to the mills at Bangor and vicinity. In this account, however, we have spoken only of logs and long lumber, but there is another branch of the lumber industry of nearly equal importance. At all points upon the rivers and streams within convenient reach of the railroad are mills for the manufacture of cedar shingles for home and outside markets, and hundreds of millions of shingles are annually exported from the county. Add to this the vast amount of hemlock bark cut in the county every year and the great number of railroad ties, telegraph poles, etc., shipped from every station, and some conception may be had of the immense resources of Aroostook as a timber producing county. Still there is growing in the forests an untold wealth of timber, of varieties unavailable for exportation with the present railroad facilities of the county. Timber for the manufacture of wood pulp can be furnished in almost unlimited quantities, and with the building of the great trunk line of railroad through the heart of Aroostook, with branches extending into these vast forest tracts, many varieties of timber now practically worthless can be cut and shipped with profit, and new manufacturing industries will be established at points now almost inaccessible. All these added industries will induce increased immigration to the county, and by thus developing its resources, will add to the population and the wealth of the State. In this direction, then, we may be assured that the prospect for the future of Aroostook is most promising. But vast as are its capabilities in the lines named, the real wealth of Aroostook consists in its grand agricultural resources and its exceptionally fertile soil, which renders it capable of becoming, to a far greater extent than at present, a land of comfortable homes. The most permanent and beneficial addition to the wealth of any state or locality consists not in the concentration of vast hoards in the hands of a few, while the many are dependent and needy, but in the multiplication of pleasant homes, tenanted by a happy, independent, law-abiding people. It is under such conditions that true manhood and womanhood are developed and good citizens are nurtured.

The agriculture of Aroostook may be said at present to be passing through its transition state and to be advancing to something like system in its operations. In early years, during the pioneer period of those portions of the county now settled, there was very little method in its agriculture either in the southern portion or in the valley of the Aroostook. Remote as they were from the big world, and with imperfect means of communication with outside markets, the farmers of the county were obliged to be in a large measure dependent on their own resources for most of the necessaries of life. Their chief market was found in the lumber woods and their principal crops were oats and hay for consumption in the winter's operations. Many of them were themselves lumbermen on a small scale, working their farms during the farming season, and in the winter either conducting a small operation hauling lumber "by the thousand," or hiring out by the month for some larger operator.

As the country began to be developed, and roads were made connecting with older settlements and with the great highway to Bangor, known as the "old military road," the farmers of Aroostook began to devote themselves to the raising of other products than those especially demanded for the lumber woods. The raising of sheep and cattle came to be an important industry and buyers came to the county and gathered large droves, which at that time were driven "all the way to Brighton." In the years before, the business was practically monopolized by the great cattle ranges of the West. Much money was left in Aroostook in the hands of farmers who had land enough cleared to enable them to engage in a partial stock husbandry.

Another product which was found profitable was the clover seed and grass seed, which could be raised in great quantities on the new farms. Dairying also began to be engaged in to some extent, and it became the custom of many farmers who had got "upon their feet" to make up a load of clover seed, a few tubs of butter and perhaps a side or two of beef, and haul it over the winter road away to Bangor, where the money received was expended in groceries and other necessary articles and hauled back to the farm. Large quantities of cedar shingles were also hauled by teams to

Bangor, even from Northern Aroostook, for shingles were at one time the recognized currency of the county, as was tobacco in Virginia in the olden time. I have seen upon the records of one of the most prosperous towns in the county, the vote of the town empowering the collector to accept cedar shingles at the market price in payment of taxes, and appointing a place for their delivery. In those times farming in Aroostook was a far different industry from what it is to-day, in all sections within reach of the railroad stations. Mixed husbandry was then the rule and it was so completely mixed that each one raised a little of all the necessaries of life possible of production in this latitude. Farm machinery was then unknown, to any extent, and most of the work upon the farm was done by hand. We are not now speaking of very ancient times, but of times which men who would resent being called old, can remember as the days of their early manhood.

Up to the time of the war, and indeed for some years afterwards, the clothing of the Aroostook farmer was made from the wool of his own sheep, spun and woven in most instances by the women of his own household, and also cut and made at home. We have heard men assert with pride that the first suit of clothes they ever had that was not spun and woven, cut and made by their own mothers, was the suit of blue furnished them by Uncle Sam when they enlisted in their country's service and marched away to fight for the old flag. Not only were the farmers clad in homespun, but their wives and daughters also wore dresses of the same stout and honest fabric. Much pride was taken in its coloring and design, and many a web of handsome dress goods was wound around the slowly turning beam of the old hand loom. In many households too, the table and bed linen was of home manufacture, and from the flax grown upon the farm and manipulated through the many soul harrowing processes required to fit it for the wheel. Where the patient housewife sat for hours at a time working the treadle of the "little wheel" with her foot, and drawing out the slender thread which was afterwards woven into webs of linen and bleached to snowy whiteness. Specialties in farming were little known in those days, but each made a specialty of raising all he possibly could, of the various articles needed for food and clothing. Strict economy was then the order of the day and, though the farmer's table might be bountifully furnished, yet very few articles not actually needed for comfort found their way into his frugal household. Very little money was then handled, but most of the trading was done by barter and in too many instances the entire salable crop of the year was "taken up" at the store before it was harvested. Such was farming in Aroostook not many years ago, and in this school of economy and industry were many of the independent farmers of the county reared. During these years many new farms were cleared and large forest areas gave place to cultivated fields. Men from other sections of the State and from other states came here with hardly a dollar in money and in a comparatively few years found themselves possessed of comfortable homes and of farms which yielded a sure support for themselves and their families.

But while the country was being gradually developed, an entire change took place in the system of Aroostook agriculture, or in other words something like system was introduced in many sections where none had previously been known. It became possible after the opening of the railroad for our farmers within reach of its stations to raise special crops which could be sold for cash, and with cash many necessary articles could be purchased much cheaper than they could be raised and manufactured upon the farm. The spinning wheel and the loom are objects of curiosity to the young people of to-day, while the implements for the manufacture of flax would look to them like a collection of instruments of torture from the old Spanish Inquisition, where, indeed, they would have done very good service. Clothing is now all bought at the stores and a suit of homespun is rarely seen. In the farmer's house are many articles formerly unknown, and, indeed, unattainable, but now so common as hardly to attract notice. In the corner where the old hand loom clanked and clattered is a handsome organ, and members of the household are able to call forth sweet music from its reeds. Carpets are upon the floors, pictures upon the walls, and upon the tables and shelves are books and newspapers. The list of crops has been reduced and more intelligence and care are expended upon those now cultivated. The farmers of Aroostook dress better, live better, have better houses with more abundant furniture, have better schools and more cash than they did even twenty years ago, and are in every respect more prosperous and independent. This change has been brought about, mainly by the introduction of labor saving machinery, and by the extension to the county of partial though wholly inadequate railway facilities. In the first named respect the change is marked and the present generation of boys upon the farms would hardly be able to name the implements their fathers used, were they to see them. At first the farmers of Aroostook were quite conservative and somewhat prejudiced against the use of these "new fangled machines," but latterly this has been almost wholly removed and they are now fully abreast of the most progressive ideas in this respect. I think the first self-binding reaper operated in Maine was put to work in an Aroostook wheat field, and now many of these wonders of inventive skill are owned in the county. The advent of the railroad, even with its circuitous route and inadequate facilities, gave a new impetus to Aroostook agriculture, as it directed the attention of starch manufacturers to this fertile region, and it was found that the soil was particularly adapted to the raising of potatoes of fine quality and in almost unlimited quantity. The introduction of the starch factories, worked almost a complete revolution in the farming operations of the county. The first factory was built at Caribou some twenty years ago and was soon followed by others, until there are now more than forty factories in the county. The increased culture of potatoes led to the cleaning up and smoothing of large tracts of rough, stumpy land, formerly used only for pasturage, and thus many broad and beautiful fields took the place of these unsightly old "mortgages." As the fine quality of Aroostook potatoes came to be known, buyers for the outside market appeared at all the shipping points, and thus our farmers were encouraged to extend their operations, an immense industry was built up, and Aroostook has become the great potato producing section of New England. In the olden time our farmers handled but little money and, as we have said, did most of their trading on the credit system. The new order of things brought them ready cash and enabled them to put their business upon a more systematic basis. It also enabled many of them to get out from under the crushing, soul-wearing weight of the mortgage and to step forth free and independent, the undisputed lords of their own fair acres. The result was also seen in better buildings, an increased attention to home adornments, the introduction of the musical instrument into almost every household, and all these things necessarily brought an increase in culture and in the refinement of social intercourse. Farming became less a continual round of dreary drudgery, and more time was allowed for mental culture and social enjoyment. In this connection we must not fail to mention the grange as one of the most important influences for improvement in this direction. Its effect has been to bring farmers and their families together at frequent intervals, to break up the old-time tendency to isolation, which kept every man on his own side of the line fence, and to bring about a community of feeling and of interest never before known. Since the introduction of the grange, our farmers and their wives, sons and daughters not only dress better and appear better, but think more of themselves, of each other and of their calling, and are really better farmers, better neighbors and better citizens.

The potato crop is now the leading cultivated crop of Aroostook, and the one upon which our farmers mainly depend for their cash income. In 1890 fully 3,500,000 bushels were raised in the county. One million bushels of this vast crop were made into starch, leaving more than 2.000,000 bushels which were shipped to the hungry toilers of other localities, after reserving a liberal quantity for seed and home consumption. Nearly if not quite $1,500,000 in cash were received by the farmers of the county for the potato crop of two years ago. Twenty years ago, hardly a dollar was received from this source and this vast sum is but a portion of the measure of benefit received from the partial development of the resources of the county by the present railroad facilities, which consist merely of spurs running up from a foreign system to four towns on and near the border. As an evidence of the fertility of Aroostook soil it may be stated that in the great contest for the American Agriculturalist prize of 1889, for the best acre of potatoes, open to all America, three of the five largest yields were raised in Aroostook county, and, as it happened, all in the town of Presque Isle. The yield on these acres were as follows: First prize, Charles B. Coy, Presque Isle, 738 bushels; third prize, Fred S. Wiggin, Presque Isle, 537 bushels; fifth prize, Delano Moore, Presque Isle, 523 bushels. In the contest of 1890, also open to all America, of the best twenty acres, thirteen were raised in Aroostook. The yield on these acres ranged from 745 bushels, 25 pounds, which was the third largest yield reported on the continent, down to 461 bushels, 57 pounds, which was the twentieth. These thirteen Aroostook acres produced an aggregate of 7,000 bushels and 33 pounds, or an average yield per acre of a little more than 538 bushels. That these yields were produced at a profit may be seen from the following figures. Mr. Philo H. Reed of Fort

Fairfield raised on his prize acre 745 25-60 bushels. His net profit on his crop, exclusive of prizes was $230. He received $300 in prizes, giving in all the snug sum of $530 clear of all expenses for the crop raised on a single acre. Mr. A. M. Dubley of Castle Hill raised 605 27-60 bushels. His net profit on the crop as sold was $123 which added to his prize of $275 gave him $398 clear money on his acre. Albert L. Haines of Fort Fairfield raised 547 49-60 bushels. His profit on crop was $126, his prize $175 making $301 over all expenses. Thomas T. Brooks, Presque Isle, raised 542 54-60. Net profit, $217; prize $125, making $342. J. W. Dudley of Castle Hill raised 529 44-60 bushels. Net profit, $149; prize, $75, making a total profit on his acre of $224. Two of the thirteen did not report their profit on the crop. On the other eleven acres the aggregate profit (exclusive of prizes) after paying all expenses was $1,472, or an average net of $133.82 per acre. These are certainly most flattering figures and show the capability of Aroostook soil when encouraged with a little extra stimulant and careful cultivation.

Years ago many predicted that the production of such large quantities of potatoes would soon exhaust the fertility of the soil to such an extent that the industry would have to be abandoned. On the contrary, after more than twenty years of potato raising, during which the business has increased with each succeeding year, while the aggregate crop last year was the largest ever raised, the average crop per acre was also the largest of any year since the farmers of the county began to engage in the business extensively. This may be accounted for from the more careful cultivation bestowed upon the crop and from the experience gained in planting and cultivating during all these years.

Not only have the farmers of Aroostook demonstrated that this large and profitable potato industry has not been carried on at the expense of the fertility of their soil, but the facts show that it has not interfered with the production of the various crops formerly raised in the county. The production of hay and grain has very largely increased during the last twenty years and the amount of dairy products of the county were larger last year than ever before. The business of stock raising, it must be admitted, is not yet carried on with very much system. Each farmer appreciates the necessity of producing as plentiful a supply of fertilizing material as possible and of returning it to the soil. They know that they are prospering in their farming operations and that their farms are not running out, but a special debt and credit account with the stock and hay mow, is something that is as yet attempted by but very few. The business of producing beef to any extent, at a profit, is regarded as out of the question; as the great cattle ranges of the West have an apparent monopoly, but should the time ever come when beef producing can be carried on profitably, upon a large scale in the East, it will be proved that Aroostook is especially adapted to that branch of stock husbandry.

Dairying is a business which can be carried on with especial advantage in Aroostook, and is one from which many farmers are now realizing handsome profits.

The rich and abundant grasses and plentiful supply of pure water, together with the ease and cheapness with which hay, grain and roots can be raised for winter feeding, afford ample means for the successful prosecution of this industry, and dairy products can be produced as cheaply as anywhere in the land.

The question of extending the business of dairying has been much discussed in the county, and some attempts at associated work have been made, and in most instances have been successful. Some seven or eight cheese factories have been established, and these have generally been well patronized and have given satisfactory returns. The natural conditions for successful dairying on an extensive scale are here afforded, and it is only necessary for our farmers to take hold of the business with the energy and intelligence which they have so successfully applied to the culture of potatoes. It would seem, however, that this very success which has attended the potato raising industry has had a tendency to discourage the introduction of dairying as a general business. The constant and careful attention to details and the necessary confinement required in successful dairying are irksome and distasteful to many farmers who are not obliged to flee to the business for a subsistence. Indeed, we often hear some such remark as this made by farmers who are peculiarly well situated for undertaking the business: "As long as I can raise a hundred barrels of potatoes on an acre, and sell them for from $1 to $2 a barrel, I'm not going to tie myself down to milking cows."

For this reason many farmers devote but little attention to their cows, using them for the most part as machines for converting their hay and straw into manure and getting whatever return may happen to result from them. Of course there are many notable exceptions to this rule and many neighborhoods in which dairying is made a business and systematically conducted. The rule holds, however, and it is safe to predict that Aroostook will not make any great advance in the direction of systematic dairying so long as the business of raising potatoes continues as profitable as it is at present. Still the fact remains as an encouraging outlook for Aroostook farmers and for those who may be thinking of establishing their homes in the county, that all the conditions for successful dairying are here present to be taken advantage of whenever necessity or inclination shall influence them to go into the business. Sheep raising has always been found profitable by those of our farmers who have devoted themselves to it to any extent, though whatever has been done in this branch has been merely as an auxiliary to the general line of farm operations, and few have made anything of a specialty of the business. It is, however, one of the resources which is capable of being utilized and developed whenever desired. Increased attention is being paid in all sections of the county to the raising of good horses, and the exhibitions at our county fairs show that much improvement is being made in this branch of stock husbandry. The results already reached prove that the county is naturally adapted to the production of first class horses, and that the business can be made profitable.

Fruit culture has finally become firmly established as one of the profitable branches of Aroostook industry, and the business is rapidly increasing every year. While it is true that certain portions of the county are more particularly adapted to fruit raising than others, still there are few localities where the business cannot be made profitable except upon the intervales and river terraces of the upper St. John. The mistakes made in the past, by those who attempted to raise varieties not adapted to the climate resulted in failure, and often in discouragement, but since experience has taught our farmers to discard all trees not perfectly hardy, success has attended their efforts and the outlook for the future in this respect is very encouraging. Already in Northern Aroostook, we have a list that carries us well into the spring, while in the southern and southwestern portion, especially in the town of Sherman and vicinity, which is an exceptionally fine fruit growing section, still other varieties are successfully produced. In this list we may mention especially the Yellow Transparent, Tetofsky, Duchess, Fameuse, Alexander, Wealthy, and Dudley's Winter as among the proved standard varieties, while others are raised with good success in various portions of the county. Apples have already been shipped by the carload, with satisfactory results. One shipment made by Mr. J. W. Dudley of Castle Hill, a year ago last fall, netted him four dollars per barrel, and his factor advised him that had they reached Boston a week earlier the returns would have shown still better. Apples have also been shipped at a profit from Sherman, despite the long haul to the railroad station.

Plum culture is also receiving much attention at present, and the raising of plums for shipment promises to be a profitable business. Mooer's Arctic is a variety for which there is a large demand and it appears from experiments already made, that it can be successfully raised in large quantities in the county. It is a heavy bearer, well adapted for shipping, and when laid down in the fall, comes safely through the coldest winter. Mr. J. B. Long, a neighbor of mine, has between two and three thousand of these trees, and in the space between them he raises thousands of cabbages which he disposes of at a profit. Much more might be said concerning the resources of the Garden County, but I fear I have already wearied you. A word, however, in regard to climate may be permitted. The climate of Aroostook has been much criticised and maligned, but I do not hesitate to affirm that in many important respects it is preferable to that of any other agricultural section of our country. It is a fact that the snow often appears here earlier and remains somewhat later than in some other sections of the State, but even that is no serious detriment to agricultural operations. In fact, the warm covering of snow is a great advantage to our fields, as, coming before the ground is frozen to a great depth, it protects the meadows from the wintry cold, and when it has disappeared the frost is usually all out of the ground, the soil dries off quickly and farming operations may at once be commenced. Indeed, the transformation in spring time, from the thick, wintry covering of snow, to the rich green carpet upon our fields, is sometimes wonderful, and it often seems as if some magic wand had been waved over the bosom of Mother Earth and caused the change.

Late in April the forest trees may be stretching out their bare and leafless branches to the winds, when ere we are aware, the poplars at the edge of the woods are beginning to bud and, almost in a day, the leaves burst forth and they are covered with a wealth of verdure. Winter, here, seldom lingers long in the lap of Spring, for Spring is a busy maiden in Aroostook, and when seed time comes old Winter must take up his white blanket and depart, for Spring has no time to dally with him. He sometimes lingers in the woods and fence corners and watches operations as though loth to depart; for often the spring sown wheat has sent up its strong, broad spires and is even beginning to tinge the soil with green and to wave a little in the breeze, while on the north sides of fences and in the edge of the adjacent woods may still be found the remains of the winter's drift. By this fortunate peculiarity of our climate, we are not subjected in spring and fall to the long and tedious interim of deep mud or frozen ruts. The soil having a perfect natural drainage, the roads dry quickly after the snow leaves, and soon become smooth and even for carriage driving. Another advantage of our climate is its even and reliable character and the absence of the terrible meteorological disturbances with which other sections are visited. The long continued droughts which are so often injurious to portions even of our own State, are practically unknown in Aroostook, and on the other hand devastating floods never bring wide spread havoc and dire and fatal disaster to fields and villages, or sweep away in an hour the product of a season's faithful toil. We confess to some fairly cold winter weather and at times the mercury may seem disposed to leave the tube and go down an inch or two on the clapboards, but even in times of our extreme temperature, the cold is not so penetrating or so noticeable to one on the road as it is in places nearer the coast, where the mercury is many degrees higher. Pneumonia, that dread scourge of damper atmospheres, is of comparatively rare occurrence and lung troubles are by no means frequent.

But what of the future of Aroostook? We have shown that the agricultural resources of the county are unparalleled, that its timber supply is practically inexhaustible and that it is rich in mineral wealth and in the possibilities for industrial development. We have seen what progress has already been made, and how this favored section of our State has grown within the memory of living men from an almost trackless and uninhabited wilderness to a population of 50,000 and a valuation of estates of more than $10,000,000. We see townships which at the close of the War of the Rebellion were in their original forest state now covered all over with fertile farms, with neat and commodious buildings and cultured homes. In Northern Aroostook are the three thriving towns of Presque

Isle, Caribou and Fort Fairfield, with an average population of about 4000 each and an average valuation crowding well up toward a million dollars. Each one of these towns is well supplied with handsome mercantile blocks, with banks, electric lights, water systems equal to the best, and sewerage systems well under way. Each village has a plentiful supply of church edifices, and a high grade educational institution at which pupils are fitted for any college in the land. And yet there are men now living in each one of these villages who can remember when their sites were covered with the original forest growth, when the river was the only highway and the spotted line the only guide through the wilderness. If all this growth and development has been made in these few years with no special aids, and in fact in spite of an unfavorable State policy, what may we not look for in the future with the impetus to be given to the development of the county by the great trunk line of railroad now in process of construction? As we have seen, the railroad facilities of Aroostook consist at present of spurs running up from a foreign system to the four border towns of Houlton, Fort Fairfield, Caribou and Presque Isle. A glance at the map will show how small a portion of the county can with profit export agricultural products from these four stations, and yet the volume of Aroostook's railroad business (that is the amount paid the railroad companies for the transportation of Aroostook freight and passengers) amounts to the large sum of one and a half million dollars yearly.

The large amount of potatoes annually shipped, comes from a comparatively few towns in the immediate vicinity of the four railroad stations, while many towns with a soil as productive and a population as industrious, are from lack of means of transportation, practically debarred from engaging in this profitable industry. In the eastern portion of the county the towns of Mars Hill, Westfield, Blaine, Bridgewater and portions of Monticello, all splendid agricultural towns, are thus situated. On the upper Aroostook, the grand agricultural region comprising Ashland, Portage Lake, Masardis, Oxbow, &c., is still almost wholly dependent upon the lumber operations for a market. In the western portion of the county is a large section covered all over with fine farming towns and with a population of enterprising and industrious farmers, who are laboring under the same great disadvantage. The towns of Benedicta, Silver Ridge, Sherman, Crystal, Hersey, Moro, Merrill, Dyer Brook, Island

Falls, Oakfield and Smyrna, are now practically isolated, so far as railroad facilities are concerned, and yet in the towns named the agricultural products now exported could easily be raised to double their present volume. All these towns will be provided with ample means of transportation by the building of the Bangor and Aroostook railroad, the construction of which is now being rapidly pushed.

Not only will the agricultural resources of the county be thus greatly developed, but many industrial enterprises will spring up along the line of the new road, which will add much to the wealth and population of the county. In the future prosperity of Aroostook the people of the whole State are interested. Too many of our young men have already emigrated to the West, some to meet with success, but too many, we fear, to encounter failure. This steady drain of the stalwart sons of Maine has told heavily upon the State, and but for the increase in population in Aroostook the census figures of 1890 would have shown but a meagre growth in the last decade. If in the future more of her sons can be induced to remain at home, and opportunities be afforded them to build up and develop the resources of our own good State, the figures of the next census will show a generous increase in the wealth and population of Maine.

To no man would we hold out the inducement that Aroostook affords opportunities for the speedy amassing of great wealth, or that a competence can here be acquired without the exercise of faithful labor, either of hand or brain. But with the prosperous future now dawning upon the county, we do not hesitate to say to any man who desires a comfortable home in the midst of an enterprising, industrious, peaceable and law-abiding people, in a county possessed of a fertile soil and healthful climate, that he can find it in Aroostook, if he is willing to work for it; and find it, too, without being subjected to the hardships and privations encountered by many who undertake to build up a home in the far West.

Citizens of Maine, let us take pride in our own good State and let us have unbounded faith in her resources and possibilities. Just now we are receiving large sums from the wealthy residents of other states for the very air with which our rock bound coast and our inland lakes and mountains is so richly blessed. With the advent of winter an icy hand will be laid upon our noble rivers and thus a crop representing much wealth afforded, which can be gathered yearly without fertilization and without exhaustion. The very air of heaven and the waters which are chained in our rivers and streams by wintry fetters, are thus adding to our wealth. In addition to this, the grand water powers in all sections of the State afford almost unlimited opportunities for the establishment of industrial enterprises when our capitalists shall learn to have faith in their own State, and invest their money within her borders instead of risking it elsewhere in doubtful ventures which often promise well but result disastrously. The present state of our agricultural interests is most encouraging, and despite the dismal cry of a few croakers the farmers of Maine as a whole are prospering. Above all, the assured success of the grand enterprise so long looked for and so ardently worked for, the opening of a grand railroad system through the heart of the Garden County of the State, is to afford new opportunities for the investment of capital, for the establishment of prosperous industries, and for the building up of comfortable homes for the sons and daughters of Maine.

OBJECT LESSON IN "AGRICULTURE IN OUR SCHOOLS," GIVEN AT STEVENS' MILLS AND AUGUSTA.

The following object lesson, was given by Miss M. L Wilson, a teacher in an ungraded school at East Auburn, with a class of sixteen, boys and girls ranging from eight to sixteen years of age.

The objects discussed were placed in the hands of the pupils and when necessary were dissected by them. The work was still further illustrated by drawings and diagrams made by the teacher or pupils.

SAND.

In presenting a jar of sand to the pupils the following questions were asked and answered:

T. What have I in this jar?

P. It is sand.

T. What is sand?

P. Sand is pulverized rock.

T. How are rocks pulverized or ground?

P. Rocks that are exposed to the atmosphere undergo a chemical change which causes them to crumble.

P. Rocks in the course of glaciers are torn up and borne along, grinding upon other rocks and through solid beds of rocks.

P. Running water wears them off.

P. Every shower and rain helps to grind them.

P. Melting snows in spring time help to grind them.

P. The ebb and flow of the tides, and the breaking of the waves on the beach grind rocks into sand.

P. Ice forming in the cracks and crevices of rocks year after year, tends by expansion to burst or break the rocks letting in the atmosphere and hastening the work of crumbling.

P. Particles are detached from rocks by the freezing and thawing of moisture on their surface.

P. The wind blows sand against rocks and grinds them.

P. Boys throwing stones against rocks wear them off. (This is the original answer of Harry Vickery, six years old.)

T. Can you tell me some of the uses of sand?

P Sand is used in making mortar.

P. Sand is used in making sand-paper.

P. Sand is used in making sand soap.

P. Sand is used in making plaster.

P. Sand is used for making glass.

P. Sand is used in making bricks.

P. Sand is used for scouring purposes.

P. Sand is used for grinding glass.

T. Explain the process.

P. The part of the glass to be kept smooth is covered with wax and then sand is forced against the uncovered surface until it is ground.

T. Of what is pure sand composed?

P. Pulverized quartz rock.

T. Of what is quartz rock composed?

P. It is composed of silica.

SOIL.

T. How many classes of substances are there in the soil?

P. Four.

T. Name them.

P. Ground rock.

P. Decomposed animal matter.

P. Decomposed vegetable matter.

P. Substances formed by a chemical action of these three substances.

T. How many elements are in soil, plants and animals?

P. Fourteen.

T. Name them.

P. Oxygen, nitrogen, hydrogen, carbon, silicon, sulphur, phosphorus, chlorine, potassium, sodium, calcium, magnesium, aluminium, iron.

T. What name is given to ordinary soil?

P. Loam.

T. If soil is quite sandy, what is it called?

P. Sandy loam.

T. If quite clayey?

P. Clayey loam.

T. If quite mucky or peaty?

P. Peaty or mucky loam.

T. Which soil is most valuable for agricultural purposes?

P. A peaty or mucky loam.

T. What is meant by cultivating the soil?

P. Handling and stirring it.

T. For what purposes is the soil cultivated?

P. To make it mellow.

P. To admit the air.

P. To hasten decomposition of the soil.

P. To mix fertilizers with the soil.

P. To kill the weeds.

T. Name some of the advantages of deep ploughing.

P. In wet seasons it affords drainage, by providing more space for the surface water to pass into the porous soil beneath.

P. In a time of drought, the roots of plants are able to extend more deeply into the soil, and thus obtain moisture.

T. Why will soil, well harrowed, yield better crops than soil poorly harrowed?

P. Because it is better pulverized.

P. It prepares it for the roots.

P. It admits the air and thoroughly mixes the fertilizers.

T. How may surplus water be drained from a field?

P. By surface drains and under drains.

T. What are some of the disadvantages of surface drains.

P. They are unsightly.

P. They are inconvenient.

P. Some of the richer portions of the soil are washed away.

T. What are some of the advantages of under drains?

P. They are buried out of sight.

P. They waste no land and accomplish the purpose better.

T. What is the object of drainage?

P. By it, wet land can be prepared for tillage.

P. It makes the soil warm.

P. It admits air to the lower soil.

P. It secures the benefits of rain.

GRANITE.

T. Of what is granite composed?

P. Quartz, mica, and feldspar.

T. Describe each mineral.

P. The quartz is the glassy looking mineral. This is smoky quartz and will scratch glass, so the quartz is harder than glass.

P. The milky white mineral is the feldspar, this will also scratch glass but is not as hard as the quartz.

P. The black mineral is mica.

T Name some of the uses of granite.

P. Granite is used for making gravestones.

P. Granite is used for making watering troughs.

P. Granite is used for making hitching posts.

P. Granite is used for making buildings.

P. Granite is used for making curbings.

P. Granite is used for paving streets.

P. Granite is used for making milestones.

QUARTZ ROCK.

T. What kind of a rock have I in my hand?

P. Quartz rock.

T. What kind of quartz rock?

P. Rose quartz.

T. What other kinds have we?

P. Smoky quartz and quartz crystals.

T. For what are quartz crystals used?

P. They are used in making spectacles.

T. Because objects can be seen through them, they are called what?

P. Transparent.

T. How can we tell quartz rock?

P. It has a glassy lustre, does not break smoothly, and will scratch glass.

MICA.

How many kinds of mica have I in my hand?

P. Two, white and black.

T. How is this formed?

P. It is formed in layers and it takes many of these layers to make an inch in thickness.

T. For what is mica used?

P. It is used for windows in houses, in China and Siberia.

P. It is used in stove doors, because the heat would break common glass.

P. It is used for making windows in men-of-war vessels, as the jar of the guns would break glass.

P. It is used for covering compass boxes.

P. It is used fcr frost work on cards.

FELDSPAR.

T. How can we tell feldspar?

P. It has a pearly lustre and has a cleavage in two directions.

T. What kinds have we?

P. Flesh, red, pink, creamy white and green.

CLAY.

T. What is clay?

P. Clay is decomposed feldspar.

T. For what is clay used?

P. Clay is used in making bricks.

P. It is used for making vases.

P. It is used for making marbles.

P. It is used for making drain pipes.

P. Sculptors use it for making models.

CLAM SHELLS.

T. What is this?

P. A fresh water clam or muscle shell.

T. Where did you get these shells?

P. On the shore of Lake Auburn.

T. What animal feeds upon the soft part of the clam?

P. The muskrat.

T. Because it has two shells, what is it called?

P. A bivalve.

T. What is the edge of the shell called?

P. Its margin.

T. What is the margin called where the two shells are connected?

P. The hinge margin.

T. Why is it called hinge margin?

P. Because it opens and shuts as a door does on its hinges.

T. What is the brown substance called that connects these valves?

P. Ligaments.

T. What do we see on the outside of these shells?

P. Lines of growth.

T. Where do these start?

P. From a point at the back called the umbone or starting point.

T. Holding the shell with the ligament uppermost and the umbone from you, what is the end next to you called?

P. The anterior, and the end from me is called the posterior.

T. What are the short ridges on the inside of the shell near the umbone called?

P. The cardinal teeth.

T. What are the long ridges called?

P. The lateral teeth.

T. What are the depressions on the inside of the shell called?

P. Muscle scars.

T. What are the larger scars?

P. They are where the muscles were attached which open and close the valves.

P. The smaller scars are where the muscles were attached which move the foot.

T. What is this line running from the larger scars called?

P. It is called the mantle line and it is where the mantle was attached.

T. What gives the pearly lustre to the inside of the shell?

P. Secretions from the mantle, and the edge of the mantle, also deposits the successive layers which increase the size of the shell.

T. How are pearls formed?

P. A grain of sand gets between the mantle and the shell and secretions form on this in successive layers and in time a pearl is formed.

A HOUSE-FLY.

T. Why is the fly a true insect or an insect proper?

P. Because it has three pairs of legs and two wings.

P. Because its body is divided into three parts.

T. What are these parts called?

P. The head, thorax and abdomen.

T. Of what does the head consist?

P. Simple eyes, compound eyes, feelers, and mouth parts.

T. Describe the compound eyes.

P. The compound eyes are made up of many small eyes.

T. Describe the mouth.

P. The mouth is a probosis, which is bent up when not in use; when feeding it unbends and the food is lapped up with it.

T. What do the lines running across the thorax and abdomen divide them into?

P. They divide them into segments.

T. Into how many segments is the thorax divided?

P. Into three parts.

T. What is attached to the first segment?

P. The head and the first pair of legs.

P. To the second segment the second pair of legs and the wings.

P. To the third segment the third pair of legs and the abdomen.

T. Describe the fly's wing.

P. The fly's wing is transparent and is stiffened by a network of veins which can be plainly seen.

T. How is a fly able to walk on the wall and ceiling of a room?

P. The feet are glued to whatever it walks on.

T. Describe the fly's foot.

P. The fly's foot is made up of two little pads.

P. On each pad are about a thousand tiny hairs which are hollow and trumpet-shaped.

P. Back of these pads is a little bag filled with liquid glue.

P. When the fly steps the pads are pressed against the bag of glue, which comes out through the hollow hairs, and hardens as soon as it reaches the air.

P. When the fly takes its foot up it does it, as you would pull a moist postage stamp from a letter, in a slanting direction.

BEANS.

T. What do you see on the side of this bean?

P. A scar where the bean was attached to the pod.

T. What can be seen near the scar?

P. A tiny hole called the micropole.

T. With what is the bean covered?

P. A tough shiny skin.

T. On removing the skin what can be seen?

P. That the bean is divided into two parts.

T. What are these parts called?

P. The seed leaves or catyledons.

T. What is between the catyledons?

P. A tiny plant called a plantlet.

T. What are the two leaves called?

P. The plumule, which comes up from the ground.

T. What is the other part called?

P. The radicle which grows down into the earth and from which the roots grow.

T. Of what use are the seed-leaves or catyledons?

P. They furnish food for the plant until it is large enough to obtain its food from the soil.

P. When the food which is stored up in the catyledons is exhausted they wither and fall off.

T. Plants then are made up of how many parts?

P. Three, the roots, stem, and leaves.

T. Of what use are the roots?

P. They hold the plant firmly in position and take nourishment from the soil.

T. Of what use are the stems?

P. The stems lift the foliage into the light and air.

T. What is the stem of a tree called?

P. Its trunk, and the juice in the trunk is called sap.

T. What are simple stems?

P. They are stems which do not branch, like the stems of corn.

T. In how many ways are leaves placed on stems.

P. In three ways, opposite, alternate and whorled.

P. The maple leaves are opposite.

P. The oak and willow leaves are alternate.

P. Some honey sackle leaves are whorled, which means growing around the stem.

T. Where will the branches start next year?

P. Where the footstalk of the leaf is joined to the branches.

T. What is that called?

P. The axil of the leaf; axil means armpit.

T. Name the parts of this oak leaf.

P. The blade, edge or margin, footstalk, midrib, veins or veinlets.

T. What can you say of its margin?

P. Its margin is jagged.

T. What kind of a veined leaf is it?

P. It is a netted veined leaf.

T. Describe the maple leaf.

P. The margin is jagged and it is netted veined; but it is also radiate veined, because it has three midribs starting from the base of the footstalk.

T. Describe the leaves of corn and grass.

P. These leaves are linear-shaped; linear means a line.

P. Their margins are entire.

P. They are parallel veined because they have veins starting from the base of the footstalk and running parallel to the midrib.

T. What can we learn then from noticing the veins of the leaves?

P. That all plants whose seeds have but one seed-leaf, have parallel veined leaves, while all plants whose seeds have two seed-leaves have netted veined leaves.

T. Of what use are leaves to a plant?

P. They are the stomach of the plant, and digest the food.

T. When do they digest the food?

P. Only in the sunlight.

T. Through what does the plant breath?

P. Each leaf is covered with pores, through these it takes in carbonic acid gas, by separating the oxygen from the carbon, and giving back the oxygen to the air.

T. Name the parts of this pansy.

P. The calyx, which means a cup.

P. Each leaf of the calyx is called a sepal.

P. This pansy has five sepals.

P. The corolla, which means a crown, has five leaves, which are called petals.

P. Removing the petals we see the pistil and stamens.

P. The pistil has three parts, the knob on the end, called the stigma, the slender part called the style, and the part in which the seeds are formed called the ovary.

P. The little things around the pistil are called the stamens.

P. The stamens are made up of three parts, the slender part called the filament, the knob called the anthers, and the powdery stuff on the anthers called pollen.

P. The pollen falls on the pistil and fertilizes the seeds.

T. Describe the apple blossom?

P. The parts are the same as the pansy blossom except that it has a compound pistil, composed of five little pistils, therefore there are five cells for the seeds, these cells can be seen by cutting an apple.

T. Name some of the uses of plants?

P. Plants furnish us fuel.

P. Plants furnish us much of our food.

P. Plants furnish timber and building material.

P. Plants furnish us much of our clothing.

P. Plants purify the air.

P. We could not live without them.

The following flowers and fruits were used in object lessons and the answers below were given by the pupils.

P. The calla and Indian Turnip belong to the Arum family.

P. The long, fleshy head is called a spadix.

P. The flowers are placed around the spadix or spike.

P. The leaf or hood which surrounds the spadix is called a spathe.

P. The leaves of the calla are arrow-shaped and parallel veined.

P. The leaves of the Indian Turnip are compound.

P. We usually call the Indian Turnip, "Jack in the Pulpit."

ROSE FAMILY.

P. To the rose family belong plants which have alternate leaves with stipules and regular flowers.

P. The flowers of plants belonging to the rose family generally have five petals and usually more than ten stamens growing from a persistent calyx.

P. Their kernal or seed has two seed-leaves or cotyledons.

P. The rose family furnishes us with some of our most esteemed fruits, such as the apple, quince, peach, strawberry and pear.

P. The rose is an erect climbing shrub.

P. The thorns are to help sustain itself and to protect it, that is, to keep boys from destroying it.

P. It has prickly hairs to keep off insects which would harm it.

P. The fragrance and color of its blossom are to attract those insects which are a help to it.

P. The flower stalk expands into a vase which grows fleshy and has inside, the carpels or fruits.

P. This is bright colored to attract the birds who devour the fruit and scatter the seeds.

P. This branch of the wild rose was picked near our schoolhouse.

P. Roses are beautiful and give us much enjoyment.

P. In some places they are raised for the purpose of making rose water from them.

PANSY.

P. The pansy is sometimes called the "Heart's Ease."

P. It belongs to the violet family.

P. It has five sepals.

P. It has five petals.

P. It is not a regular flower, because the petals are not alike in shape and size.

P. The lower petal has a sac or spur at the base.

P. It has five, short stamens.

P. It has a simple pistil.

P. Atter of roses, which is a very expensive perfume, is obtained from roses.

P. From one variety, the hip of the rose is used as a medicine.

STRAWBERRY.

P. A strawberry is the receptacle of the flower, much enlarged and pulpy.

P. The seeds are on the surface.

P. It is like the rose hip, turned inside out, as you would turn the finger of a kid glove.

P. The calyx is beneath.

P. The leaves are compound, palmate, oblong and ovate.

P. The roots are fibrous.

P. It has long branches, which have no leaves, and which, after running their full length, strike root from the tip, and then a bud forms, which develops into leaves, and forms a new plant.

P. These long, slender branches are called runners.

The branch from an apple tree was described by the pupils, the leaves and flowers analyzed, and the following was told about the apple:

P. The apple is the calyx, grown large and fleshy.

P. On cutting an apple we see some green lines around the core.

P. Inside these lines is the flesh of the core, which is the receptacle of the flower, grown fleshy around the ovary.

P. Outside the green lines is the calyx grown around the receptacle of the flower.

P. Apples are used as food for men and animals.

OUR HAY CROP.

By W. B. KENDALL, Delivered at Clinton.

IMPORTANCE.

On July 4th of each year our State of Maine celebrates its agricultural independence, by presenting its farmers with a constant, and never-failing million ton crop of grasses, the great basis of our agricultural life and wealth, in this northern clime.

So constantly do we gather this king of all crops into our barns, that, while almost every year, some of our cultivated crops, through drought, flood, insect blight or "season" are failures, the great hay crop, because ever present, is not given the gravity of consideration it demands. The hay crop of Maine has averaged, for the past ten years, one and one quarter million tons. At $7 per ton in the field $8,750,000 and at $10 per ton in the barn, $12,250,000,or more than the value of all others combined. We hear much of Maine's great lumber crop, and industry, but even this does not, in primal value, nor in the capital invested in its manufacture, nor in value after it is manufactured, amount to as much as the value of the hay crop in the field, the labor, machinery and barns for its storage and the cash value of the same delivered in Boston market, or consumed on the farm.

Our hay crop, the basis of our dairy industry, supports through our northern winters 1,100,000 head of cattle, horses and sheep.

In fact, a total failure of our hay crop for three years would practically depopulate our State, farm, town and city.

CONDITION.

Though we have had favorable seasons for the past five or ten years, the tonnage of our hay crop has, probably, hardly held its own, and the quality of the grasses produced, for feeding or shipping purposes, are certainly retrograding. While it must be justly said that, in point of better quality produced, there remains not a single item or factor, as regards native or cultivated agricultural products, in our State, which have not been greatly improved except this, our hay crop. Take our dairy interests, think of the new Jersey, the quality of her surroundings, and the great quality of her product, of the quality of the horse, the sheep and the fowl. Again, what variety or quality of seed are we using to-day that is not superior to that of ten years since, of all varieties of fruit, of farm machinery, what an improvement in quality, of fertilization and cultivation, and of the farm home.

It cannot be said that the solid progress we have made in these directions is because of our natural or climatic aptitude for such progress; but all has been fought against great odds, and only by the earnest work of the agricultural board, agricultural press, State College, State Grange, stock raisers, seed growers, fertilizer and implement makers, with intelligent co-operation on the part of farmers, has the result been obtained.

Why these combined forces, that have evolved so much toward real agricultural progress among us, have neglected to attach to our improvement, but perpetually passed by our great staple crop, is a question that it is high time we were considering; for the condition of the area on which the Maine hay crop is grown is bad, the crop in point of yield per acre is bad, and the quality of grasses produced is bad.

It is a mistaken idea that we are a good hay producing State. Of forty-six states and territories to the west and south of us, we stand almost at the foot of the list. Forty-three of the forty-six states yield more hay per acre than Maine, our yield averaging only the inconsiderate amount of 1960 pounds of poor quality. This is a dark picture. With an average of 1960 pounds per acre, what must be the yield of run down or exhausted hay lands? And just here comes in our abandoned farm question, for who ever knew a good hay producing farm to be really abandoned?

Our forefathers cleared this stony hearted land of the Red man and the forest. They had the physical power to do it, but down to this day we have failed to improve on our inheritance. In that large agricultural and manufacturing centre of Maine the Penobscot, Kennebec, Androscoggin and Saco Valleys, intersected by rivers and crossed by railroads, much of it in touch with ocean traffic, there are probably 1,000,000 acres of worn hay lands of stony constitution that have been cropped constantly for from twenty to forty years. These lands are either in outlying tracts, part of home or abandoned farms producing, perhaps, 600 pounds per acre at $10 per ton in barns, is worth $3,000,000, which could and should be made to produce one and one-half tons per acre, if not two tons, or a value of $15,000,000 yearly, which represents a gain of $12,000,000 yearly, or the value of our entire crop at the present time.

Such a result as this is certainly surely coming when the forces of the 19th century are properly set at work, to accomplish the purpose. But that it has not been done before is not surprising when one considers the apathy with which the whole question of our hay crop has been looked upon by agricultural forces in our State before mentioned, that having concentrated their energies, in other agricultural departures have accomplished such grand results

Let us see whether this is true. The work of the Board of Agriculture is embodied in the agricultural reports, yet, although these reports for the past seven years comprise about 1,800 pages of agricultural matter, besides 1,000 pages given strictly to the pomological society and reports, yet, of these nearly 3,000 pages, there is *less* than 100 pages relating directly to the question of hay, hay lands or worn soil.

As to the agricultural press, what proportion of interesting or instructive articles in its columns are devoted to the topic under discussion. The State College has its own record, while the State Grange, with its 250 subordinate organizations, spread throughout the entire area of our State, holding with such membership and organization the greatest opportunity for experiment, and useful data, has done simply nothing.

Our two large State fairs followed by forty-three agricultural societies, subsidized by the State, for the furtherance of all matters pertaining to agricultural property and life have, during the same past seven years awarded in premiums the following:

Total for live stock, $40,720 ; grain, $6,148 ; fruit, $6,405 ; butter and cheese, $2,630 ; bread and honey, $1,033 ; with a total for premiums,$200,435 ; but not one dollar for hay,upon which most all other premiums really rest. Millions for defense, but not one cent for tribute, if we are down to the 43d in the line of 47.

A native takes his western or southern friend to our State fair and upon entering the hall on the ground floor you will probably find yourself surrounded by a small sea of farm implements, among which are a great variety of plows and harrows, mowing machines, hay forks, hay tedders, hay rakes and hay seed, and outside the building hundreds of head of cattle, oxen, sheep and horses, all dependent on the great staple which carries all, through our northern winter—a thousand manifestations of the crop, but no crop itself. Your friend may ask what is your great State product and you tell him, but he says, "I see no display of it except at the stalls. As well think of attending an agricultural fair in Georgia and see no cotton, or in Colorado and see no minerals, or no corn or wheat at a fair in Illinois.

I have never seen but one bale of hay on exhibition at any agricultural fair in Maine.

The State Pomological Society draws $1,000 annually from our State treasury. Pomology about us has forged ahead wonderfully, under this, while hay quality has gradually declined. Why?

REMEDY.

Ours is a day of business system. There is a general impression that we are suffering severely on account of western competition, and we are; but to put it another way, it is nearer the truth that we are suffering severely because our Western friends, through large areas, fertile lands and railroad competition, have reduced all their movements to a system.

Our dairy interest rests entirely upon system and is successful. Our sweet corn industry is the most intricate agricultural system we have in the State, and is successful. The distribution of western feeds in our State is reduced to a system, and is successful.

The distribution of western grown beef in our midst, is reduced to a keen business system, and is also successful against us.

The manufacture and sale of the constantly increasing supply of commercial fertilizers is reduced to a system, and is successful.

The lumber interest in our State is reduced to a great system, and is successful.

There is fortunately very much in favor and little against the application of method to successful work on our grass lands. The natural adaptability of Maine to produce hay on cultivated lands comes well to the front in view of the fact that in the history of two hundred years, rich Maine hay lands have never failed through conditions of drought, wet, blight, insect or frost, to yield a good crop—somewhat different from corn, potatoes and other crops.

This habit of our climate to always produce valuable grasses in summer as well as snow in winter, is the first great factor toward wonderfully increasing its production by a system. Secondly, with land once plowed in the cool days of autumn and laid down the following spring, it becomes necessary to perfect a system that some method or methods shall be found that will fertilize the land for six successive crops without re-plowing, or fertilizing.

It would seem in the face of present conditions to be well nigh impossible to do much real systematic work without some State assistance, and this $12,000,000 crop with a good possibility of pushing it to $25,000,000, in twenty years, ought to have liberal assistance. In fact, what condition in our agriculture to-day needs it as much.

The following system must be practical and if adopted must produce satisfactory results, viz.:

To have each of our well established agricultural societies offer hay premiums, as a part of their schedule list; for example: Some of our best societies could offer $200 to $300 on their own account, to be increased as much more from the State, this award to be divided among those farmers, in the precinct of the society, who entered for the premiums, by giving full details of number of acres, quality, soil, previous culture, etc., to be presented the society on a blank prepared for the purpose; it being a part of the original contract, that no premiums should be awarded until the expiration of a term of six years, it being the well-defined purpose of the system to establish methods by which long, lasting and economic methods for the production of hay may be established.

At the maturity of the first crop other blanks are supplied calling for specifications as to what crop produced, method of fertilization, cultivation and certified yield per acre, etc. These returns to be preserved and published by the secretaries of the societies. Similar blanks to be used and returns made at the maturity of the crop for each year, until the expiration of the sixth year, the awards to be based on the production of the largest amount of the best quality of hay at the lowest cost on a given area.

At the end of each season these returns to be forwarded to the department of State Agriculture where the results of the whole State's work would be issued in the form of from 500 to 1,000 experiments making a great hay bulletin, the clayey soil experiments to be kept by themselves, and rocky, gravelly, sandy, intervale, mucky, and all other soils the same, keep the original bulletin in type, and repeat each year to close of term, at the end of that time we should have something incomparably valuable to our hay interest, to the interest of our impoverished farmer and to the interest of our young men, who to-day are all at sea as to *how* to restore to fertility a piece of Mother Earth in our dear old State. One man gets a premium from growing a corn crop which pays all bills and produces a crop of hay for five years which costs him simply nothing. Another gets five crops of hay after a crop of oats, which paid the fertilizer bill. Another by using ashes. Another by plowing in clover. Another by bone meal. Another by barn dressing. Another by drainage, etc. The results of 1,000 experiments of this kind commenced in this way, would not be subject to the fatality of drought like the experiment of a corn crop, nor to the failure by rot like the potato crop, nor from loss from frost like the bean crop, the experiment would, in the large majority of cases, be made on worn soils and as such the starting point would be practically the same.

A sample of the goods used should be taken and kept sealed, that at the end of the experiment or at any time during the experiment, analyses could be made to determine the elements that produced the result, which would make any condition uniformly fair to all parties, and just in determining the premiums.

ANNALS OF MAINE AGRICULTURE.

At the present time, when summaries, abstracts and compendiums of information upon all scientific and economic subjects are being arranged and brought together as contributions to the world's store of knowledge for the great Columbian Exposition, it has been thought best to present in brief form in this volume, an abstract of the contents of previous volumes of the Reports of the Board of Agriculture. These reports really begin with that for the year 1856. Previous to that year, which is called the "first report," our agricultural volumes were entitled "Transactions," from 1850 to 1854, that for 1855 being issued as the "Report of the Secretary of the State Agricultural Society." These are largely made up of addresses delivered at fairs, statements of exhibitors and awards of premiums. Beginning with 1856 the reports assumed a more elaborate character, great thought and ability were given to their preparation and they contain treatises of permanent value and importance. A careful examination of the thirty-five volumes forming the series of our Board of Agriculture reports has been made, from which brief summaries and abstracts have been compiled, giving in condensed form our agricultural annals for the past thirty-five years. The record is one covering every important event, change, epoch and stage of advancement in our agricultural history during this period, and it is one which will be found very useful as a means of ready reference by all who wish to obtain a knowledge of our agricultural progress.

1856. The first report of the Secretary of the Board of Agriculture, S. L. Goodale, is somewhat general in character, embracing historical and introductory notices of agriculture in the country and State, its importance to the affairs of the world, the history of associated effort and legislation for its development in Maine, and a statement of the needs of agriculture in order to render it a successful, business industry. After an introduction treating of these points the bulk of the report is made up of conclusions and remarks based upon the answers to a series of thirty questions, sent by the Secretary to the leading farmers of the State, which questions were intended to cover the whole subject of the condition and prospects of Maine agriculture at that date. The points embraced were: methods of husbandry; supply of home raised breadstuffs; culture of the cereals and root crops; implements of husbandry; woodlands; swamp or bog lands; underdraining; manures; live stock; fruit; obstacles to agriculture in Maine. A careful study of the matter presented under these several heads shows some interesting facts regarding the actual conditions of Maine agriculture at that period. The general method of farming was that known as "mixed husbandry," ninety per cent of the answers, showing this condition, or, as stated by one farmer: "There is not a stock raiser in this town, though all raise stock; there is not a respectable dairy, though all make butter and cheese; there may be a flock of one hundred sheep, but twenty-five is not far from an average—a few lambs are annually sold, occasionally a fine horse, or a yoke of oxen, or a cow or heifer for the shambles." The Secretary remarks: "While our conviction is strong that we follow altogether too mixed a method, violent or sudden changes are not recommended, but only as fast and as far as may, upon due reflection, seem both warranted and demanded by the best interests of each individual farmer. In some cases no changes may be advisable." Regarding the yield of crops the Secretary says: "From the best information at hand the actual average throughout the State of the different crops is as follows, viz: Indian corn, 30 to 35 bushels to the acre; wheat, 10 to 12 bushels; oats, 30 to 35 bushels; barley, 20 to 30 bushels; rye, 10 to 20 bushels; potatoes, 150 to 200 bushels." Among the replies regarding the use of improved implements upon farms a few extracts will indicate the actual condition of this branch of the farm economy. Perry: "The cast iron ploughs have come into *almost* universal use." Naples: "One mowing machine has been put in operation in this town, of Ketchum's manufacture. But it does not fully meet the wants of the farmers." Bridgton: "We have but one mowing machine in town." Cape Elizabeth: "There is but one mowing machine in town. It is Ketchum's, but it is a failure. There is a Delano wheel horse hay rake which is considered an improvement over the revolving rake." The smaller farm implements, and hand tools such as hoes, scythes, axes, shovels, forks, grain cradles, were generally of an improved style and in common use. Upon the subject of fertilizers the Secretary says: "Regarding what are called special fertilizers, as gypsum or plaster, guano, poudrette, tafeu, superphosphate of lime, etc., but little of interest and nothing reliable as a guide to farther use has been obtained. They have been used to some extent in various parts of the State, and with very diverse results." Barn cellars for manures are recommended. An account of thorough underdrainage on the farm of B. F Nourse of Orrington is given, where the cost of laying tile drains, three and a half feet deep, was a little over one dollar per rod, including the tiles and all labor connected with the work. The leading breed of stock kept was the Durham, with some Devons and Herefords, and a few Ayrshires and Jerseys. Concerning orcharding the Secretary remarks: "Serious doubts have at times been entertained by many, lest the market for fruit should become overstocked, and the price fall below the cost of production. The fact that the production of choice fruit in New England has increased so rapidly, that the proportionate quantity of *good* fruit now grown to each person, is probably not less than a hundred fold greater than fifty years ago, and yet the demand is greater and steadier and at higher prices than then, is perhaps sufficient to quiet any such apprehensions for the future." In 1856, the Board of Agriculture consisted of twenty-three members—one from each incorporated agricultural society in the State.

1857. The report of this year is divided into two parts: the first embraces a brief outline of the agricultural capabilities of Aroostook county, with sketches of some of its best farms and most successful farmers; and the second takes up the condition of agriculture in the older parts of the State treating it in the manner of the first report by giving extracts from answers to circulars of inquiry sent out to leading farmers, with remarks and summaries upon the same. The subjects treated are: restoration of exhausted soils; manures; fallows; rotation of crops; root culture; sheep husbandry; the hay crop, and defects of our agricultural system. The Board of Agriculture this year consisted of fourteen members and eight "honorary members." These honorary members were those "elected by their respective societies, but not legally entitled to seats" under an act which confined representation to one member from each county. It is worthy of mention as one of the very first official acts relating to the planting of trees in Maine, that at the meeting of the Board this year, on motion of Seward Dill, it was voted: "That the Board recommend to the several agricultural societies, the offer of liberal premiums to encourage the planting and culture of ornamental trees by road-sides, in parks, commons, and about churches and school-houses." This action of the Board really contains the germ of the present "Arbor day" observances in all parts of the country, as it is doubted if any state agricultural organization took earlier action upon the important matter of tree-planting than this.

1858. The subject of dairy farming is for the first time in the annals of Maine agriculture, quite fully treated in the report for this year; the Secretary remarking that "as a profitable branch of stock husbandry, the manufacture of dairy products deserves more attention at the hands of the Maine farmer than it has yet received." The subject as treated embraces the dairy characteristics of the different breeds; an examination of the Guenon system of classification; the manufacture of cheese; chemistry of milk, and management of dairy cattle. Wheat growing having almost gone "out of fashion," the obstacles to its culture were treated of. Underdraining was the subject of a long essay which also embraced an account of the drainage of the farm of Mr. B. F. Nourse of Orrington—the first example of thorough drainage upon an extensive scale in Maine agriculture.

1859. Grasses and the best methods of handling the hay crop formed the leading contribution of the Secretary to the report for this year. Agricultural education was also treated by the Secretary in a brief essay, in which he enforced the importance of mechanics, geology, chemistry, botany, animal physiology and veterinary science as the leading fundamental branches to be taught in an agricultural school. The Board this year consisted of twenty-six members, the essays and reports presented from individual members at the annual meeting occupying a large part of the volume.

1860. In the report for this year appeared the treatise of Secretary Goodale on the "Principles of Breeding"—one of the earliest and most elaborate works on this subject published in this country. It was re-published at Boston in 1861, in a volume of 164 pages, with this title: "The Principles of Breeding; or Glimpses at the Physiological Laws involved in the Reproduction and Improvement of Domestic Animals." An article showing the value of cotton seed meal as a cattle food, was inserted in this report—the first instance of its manurial value being published and its use recommended to dairy farmers. An analysis made by Prof. S. W. Johnson of Yale College is published, one of the first determinations ever made in this country, from which it appears that it contained: of nitrogen, 7.05 per cent, and of phosphoric acid 2.36 per cent. Prof. Johnson says: "It is the cheapest and best food for milch cows in the market. It is found to increase the flow of milk considerably beyond an equal weight of Indian corn or any other grain, the animal at the same time improving in condition. It deserves to be more generally known, and it deserves regard not less for its fertilizing than for its nutritive properties. From the results of careful research it appears that this article returns a large proportion of its cost in the manure yielded from its consumption." A table prepared by J. Bennett Lawes of England, "showing the value of the manure obtained from the consumption of one ton of different articles of food, each supposed to be of good quality of its kind," is published, which is exceedingly valuable for comparison with the results obtained by recent analyses of the same products. For this purpose a portion of the table is published below:

Ton of:	Value of Manure in:
Cotton seed meal (or cake)	$27 86
Linseed meal (or cake)	19 72
Beans	15 75
Peas	13 38
Oats	7 40
Wheat	7 08
Indian corn	6 65
Barley	6 32
Clover hay	9 64
Meadow hay (upland)	6 43
Oat straw	2 90
Potatoes	1 50
Mangolds	1 07
Swede turnips	91
English turnips	86
Carrots	86

In remarks upon this table the Secretary says: "But we hear it asked, 'is it true that the manure made from one ton of clover hay is worth as much as that made from a ton and a half of Timothy hay?' There is no doubt of it, and this is one reason why we so repeatedly urge the importance of an increased growth of clover as a means of enriching the soil." On grape growing the report says: "That grapes can be grown and ripened in the open air in our State from Kittery Point to Calais has been demonstrated. A luxury so great and so healthful is worth the expenditure of considerable care and expense." This has long since been proved a fallacy, and few are found to recommend any "care or expenses" to be given to grapes in the open air in Maine. In view of the outbreak of contagious pleuro-pneumonia or lung murrain in Massachusetts, and the appointment by Governor Lot M. Morrill of a commission to visit that state and examine into and report upon the nature of the disease, its treatment and remedies, Secretary Goodale says: "It would be a wise measure for Congress to establish some quarantine regulations, and enforce a rigid inspection of such animals as may be imported in future; and I suggest that it would also be wise for the legislature of this State to enact a general law applicable to any cases where a deadly contagious disease should appear among cattle, thus threatening the most important interest of the State. The loss of our herds would be nothing short of a death blow to the agriculture of the State." This is the first suggestion in our agricultural annals of any legislative enactments upon the diseases of farm animals.

1861. The volume for this year contained the first part of the "Preliminary Survey on the Natural History and Geology of Maine," in consequence of which the report of the Board of Agriculture was embraced in about eighty pages of the volume. It was almost entirely devoted to the subject of marine manures, including sea weeds, salt, muscle-bed and fish refuse.

1862. This volume embraced the second report on the scientific survey of the State. No publications of the Board have been more widely or frequently sought, than the two containing these special reports, which are of great scientific value. They have long since passed out of circulation and are now obtained with great difficulty. In this report appears for the first time anything like an exhaustive treatise on the dairy advantages of Maine with reference to cheese manufacture. This treatise embraced eighty-five pages and was based upon a personal examination and study of the associated cheese factory system of Herkimer county, N. Y., its conditions of agriculture, its dairy herds and the methods employed in the manufacture of cheese at its factories, with a view to the introduction of the system into this State. This report also gives in full the Morrill Land Grant bill of 1862, by which Congress endowed an agricultural college in each State, regarding which the Secretary says: "It is earnestly hoped that the legislature of Maine will not prove backward in accepting the offer which Congress, with far-reaching sagacity, has tendered to us, and will establish a school where the sons of farmers may freely obtain all the necessary facilities to fit them to become ornaments to their profession and, when themselves established on their farms, to become so many centres of light, radiating knowledge to all within the scope of their influence, both by precept and example."

1863. The two subjects forming the chief contents of the report for this year are upon: "The manufacture of cheese as an article of export by means of associated dairies;" and "Fruit culture." In reference to the proposed college in aid of agricultural and mechanical education, the Board went on record as recommending that the institution to be established should be distinct from any of the existing literary institutions in the State, "because they are designed for, and are adapted to, a different style of education and training," than the one proposed, which is designed to educate pupils for industrial pursuits; and that such a college as is proposed "should possess as a part of its apparatus, a farm and a work-shop, which are indispensable for practical illustration."

1864. In this report the subject of fruit culture is continued; Dr. E. Holmes' treatise on the artificial propagation of fish is given, and the report of a board of commissioners on the location of the proposed State agricultural college is published in full.

1865. Important contributions to this volume are: Meteorological tables; list of birds of central Maine; survey of the agriculture of Kennebec county; biographical sketch of Dr. E. Holmes, and report on the State College. This report says: "It is a matter of great satisfaction and of sincere gratitude that after the varied and widely differing plans for an agricultural college which were strenuously urged before the legislature of this State for three years past, that body did, at its last session, adopt one which accords in its distinctive features with the views of the great majority of farmers throughout the State—a plan which, if faithfully and effectively carried out, will secure to our children and our children's children better and more accessible educational advantages than have hitherto been enjoyed in the State, and very possibly a better school in some important respects than has yet been established on this continent." This was the establishment of the State College as an independent institution, disconnected from any of the already existing colleges in the State.

Among the valuable tables contained in the report for this year, is one giving the dates of the opening and closing of the Kennebec river at Gardiner from 1785. This is deemed so important that it is here reproduced, having been brought down to the year 1892-3:

Year.		Closed.	Opened.	Days Closed.
1785			April 24	
1786			March 21	
1786–7		November 18	April 7	140
1789			April 4	
1790–1		January 5	April 18	103
1791–2		December 10	April 3	114
1792–3	*a*	November 23	April 1	126
		December 10		
1794–5	*b*	January 4	April 6	
1795–6			April 1	
1796–7		November 28	April 4	128
1797–8		November 22	April 12	142
1798–9		November 23	April 13	142
1799–0		November 24	April 10	138
1800–1	*c*	November 28	Dec 13	113
		January 2	April 10	
1801–02		December 10	March 28	108
1802–3		December 16	March 22	96
1803–4	*d*	November 16	Dec. 13	
		December 22	April 12	138
1804–5		November 19	April 2	134
1805–6		January 2	March 15	72
1806–7			April 7	
1807–8		December 18	March 29	101
1808–9		December 6	April 17	132
1809–0		November 23	April 9	137
1810–1		December 9	March 24	105
1811–2		December 14	April 18	125
1812–3		December 10	April 11	122
1813–4	*f*	December 13	Dec. 15	
		December 21	April 6	108
1814–5		December 4	April 18	135
1815–6		December 2	April 20	140
1816–7		November 29	April 17	139
1817–8	*h*	November 25	Nov. 30	
		December 7	April 12	131
1818–9		December 4	Dec. 6	
		December 10	April 14	126
1819–0		December 5	April 15	132

a Opened after closing.

b January 4, 1795, opened to within two miles of Nahumkeag Island.

c Opened December 13th; plowing at Christmas.

d Vessels came up to Gardiner December 2d; whole river opened December 13th and closed December 22d.

f Vessels came up to Gardiner December 15th.

h River broke up from Gardiner November 30th; vessels came up to Gardiner December 3d; whole river broke up December 7th and closed same day.

Year.		Closed.	Opened.	Days Closed.
1820–1	*j*	November 16	Nov. 20	
		November 29	April 11	137
1821–2		December 1	March 19	119
1822–3		December 6	April 11	126
1823–4		November 16	March 28	133
1824–5		December 1	Dec. 3	
		December 9	April 5	119
1825–6		November 23	Nov. 28	
		December 12	April 2	116
1826–7		December 4	Dec. 10	
		December 29	March 29	96
1827–8		November 24	Nov. 30	
		December 6	March 25	116
1828–9		December 3	April 12	131
1829–0		December 3	April 1	120
1830–1	*k*	December 13 December 19 January 11	Dec. 15 Dec. 27 March 30	88
1831–2		December 2	April 14	133
1832–3		December 2	April 5	124
1833–4		December 14	April 3	110
1834–5		December 8		
1835–6		November 23	April 9	138
1836–7		November 29	April 14	137
1837–8		November 27	April 3	127
1838–9		November 24	April 6	133
1839–0	*l*	December 18	March 31	104
1840–1		November 28	April 5	129
1841–2		December 1 December 7 December 11	Dec. 3 Dec. 11 March 20	102
1842–3		November 28	April 19	142
1843–4		November 30	April 9	131
1844–5		November 27	March 31	124
1845–6		December 7	March 28	111
1846–7		December 2	April 20	139
1847–8		December 21	April 1	102
1848–9		December 22	March 30	98
1849–0		December 8	April 3	116
1850–1		December 8	April 6	119
1851–2		December 1	April 12	133
1852–3		December 16	March 29	103
1853–4		November 27	Nov. 30	
		December 4	April 21	141

j River opened November 17th, from Gardiner, and the whole river opened November 20th.

k Two vessels arrived from Boston January 1st.

l Very great water freshet January 28th.

Year.		Closed.	Opened.	Days Closed.
1854–5		December 3	April 9	127
1855–6	n	November 23	Dec. 10	
		December 11	April 9	137
1856–7		December 1	April 5	125
1857–8		December 5	April 3	119
1858–9		November 30	March 31	121
1859–0		December 4	March 31	118
1860–1		December 6	April 7	120
1861–2		December 12	April 18	127
1862–3		December 3	April 13	130
1863–4		December 3 December 6 December 17	Dec. 5 Dec. 15 March 29	114
1864–5		December 12	March 22	100
1865–6		December 8	March 31	113
1866–7		December 13	April 10	118
1867–8		December 1	April 15	137
1868–9		December 2	April 11	130
1869–0	o	December 4 January 8 February 21	Jan. 4 Feb. 20 April 5	117
1870–1		December 16	March 12	85
1871–2		November 29	April 16	140
1872–3		December 1	Dec. 2	
		December 7	April 15	130
1873–4		November 19	April 3	134
1874–5		December 1	Dec. 3	
		December 5	April 14	133
1875–6		November 22	April 7	137
1876–7		December 1	Dec. 2	
		December 9	March 28	111
1877–8		December 10	March 16	96
1878–9		December 18	April 10	112
1879–0		December 18	March 24	
		March 25	March 31	104
1880–1		November 23	March 22	119
1881–2		November 28 December 11 December 16 January 2	Dec. 1 Dec. 14 Dec. 30 April 5	113
1882–3		December 1	April 14	134
1883–4		December 2	April 7	127
1884–5		December 13	April 16	124
1885–6	p	December 12	April 16	125
1886–7		December 2	April 21	140

n Opened December 10th; vessels came up to Gardiner.

o Opened February 20, above, and for three miles below Gardiner.

p The ice broke up January 6th, and jammed at Swan Island, the jam extending nearly to Hallowell, and completely ruining the ice crop above Swan Island.

Year.	Closed.	Opened.	Days Closed.
1887–8	December 1	Dec. 5	
	December 22	April 15	100
1888–9	November 22 December 13 January 20	Nov. 28 Jan. 10 March 20	82
1889–0	December 4 December 14 December 27	Dec. 9 Dec. 22 April 4	107
1890–1	December 2	April 3	122
1891–2	December 17 January 9	Dec. 25 March 30	87
1892–3	December 18	April 12	115

1866. In an article on the cultivation of the hop, in the report for this year, it is stated that only five states in the Union raised more hops in 1866 than did the State of Maine; the yield for that year being given as 102,987 pounds, of which Oxford county produced 85,000 pounds, and Franklin county 11,000 pounds. The hop has now ceased to be a factor of importance in Maine agricultural products.

1867. Contained the second part of the survey of the agriculture of Kennebec county, and an article on the agricultural advantages of Aroostook county.

1868. Important articles in the report for this year were: Wheat Culture in Maine, and Rinderpest.

1869. Radical changes took place in the organization and work of the Board of Agriculture during this year. Previous to 1869, the Board had held one session annually of two weeks' duration, at Augusta, in the month of January. At this time the Board consisted of sixteen members, one from each county. By an act of the legislature approved March 1, 1869, entitled "an act to secure harmony of action between the Board of Agriculture and the State College of Agriculture and the Mechanic Arts," the Secretary of the Board was constituted a member *ex-officio* of the Board of Trustees of the college, and to the membership of the Board of Agriculture was added five "members at large" appointed by the Governor "of whom two at least shall be from the faculty of the State College." By this same act the two weeks' annual session of the Board was discontinued and in its place the Board was authorized to hold two sessions annually of not more than four days each, one of which was fixed at the college or within such distance as the students and faculty could readily attend. These meetings were called Farmers' Conventions. The first of these was held in Augusta, and the second in Bangor, both being addressed by members of the Board and also by distinguished agricultural lecturers from out of the State. The leading contribution to the report of this year was on "The Weeds of Maine," by Frank L. Scribner. The abstract of this paper presented below omits much historical and descriptive matter regarding the species, leaves out entirely the minute botanical descriptions of each plant named, and only includes the more troublesome and better known weeds. Reference to Gray's or Wood's botanies is now so easy that it seems unnecessary to repeat here technical matters which can be readily found in these every-day hand books:

CROWFOOTS. Ranunculaceæ.

Bulbous Crowfoot. *Ranunculus bulbosus.*
Creeping Crowfoot. *Ranunculus repens.*
Buttercup. *Ranunculus acris.*

MUSTARDS. Cruciferæ.

Field Mustard: Charlock. *Brassica Sinapistrum.*
Black Mustard: Common Mustard. *Brassica Nigra.*
Shepherd's Purse. *Capsella Bursa-Pastoris.*
Wild Peppergrass. *Lepidium Virginicum.*
Wild Radish: Jointed Charlock. *Raphanus raphanistrum.*

PINKS. Caryophyllaceæ.

Boston Pink. *Saponaria officinalis.*
Corn Cockle. *Agrostemma Githago.*
Common Chickweed. *Stellaria media.*
Mouse-ear Chickweed. *Cerastin viscosum.*
Tares: Corn Spurrey: Devil's Flax. *Spergula arvensis.*

PURSLANES. Portulacaceæ.

Common Purslane. *Portulaca oleracea.*

MALLOWS. Malvaceæ.

Common Mallow. *Malva rotundifolia.*

GERANIUMS. Geraniaceæ.

Yellow Wood Sorrel. *Oxalis stricta.*

SUMACKS. Anacardiaceæ.

Poison Ivy. *Rhus toxicodendron.*

ROSEWORTS. Rosaceæ.

Five-finger Cinquefoil. *Potentilla Canadensis.*

ONAGRADS. Onagraceæ.

Fire Weed. *Epilobium augustifolium.*

HOUSE-LEEKS. Crassulaceæ.

Live-for-ever. *Sedum Telephium.*

UMBELWORTS. Umbelliferæ.

Wild Carrot. *Daucus carota.*

Wild Parsnip. *Pastinica sativa.*

Poison Hemlock. *Conium Maculatum.*

Caraway. *Carum carui.*

COMPOSITES. Compositæ.

Asters. Twenty species are natives of Maine.

Goldenrod. *Solidago bicolor.*

Rag-weed: Roman Wormwood. *Ambrosia artemisiæfolia.*

Cocklebur. *Xanthium Stumarium.*

Cone-flower: Yellow-weed. *Rudbeckia hirta.*

Common Beggar-ticks: Bur Marigold. *Bidens frondosa.*

May-weed: Dog's Fennel. *Maruta Cotula.*

Common Yarrow. *Achillea Millefolium.*

Ox-eye Daisy: White Weed. *Leucanthemum vulgare.*

Poverty-weed: Everlasting. *Gnaphalium decurrens.*

Canada Thistle. *Cirsium arvense.*

Common Burdock. *Lappa officinalis.*

Succory: Cichory. *Cichorium Intybus.*

Fall Dandelion. *Lenntodon autumnale.*

Common Dandelion. *Taraxacum Dens-leonis.*

Wild Lettuce. *Lactuca Canadensis.*

Common Sow-Thistle. *Sonchus oleraceus.*

PLANTAINS. Plantaginaceæ.

Common Plantain: Ribwort. *Plantago Major.*

FIGWORTS. Scrofulariaceæ.

Common Mullein. *Verbascum Thapsus.*

Toad Flax *Linaria vulgaris.*

Lousewort. *Pedicularis Canadensis.*

MINTS. Labiatæ.

American Pennyroyal. *Hedeoma pulegioides.*

Catnip. *Nepeta cataria.*

Hemp-Nettle. *Galeopsis tetrathit.*

Motherwort. *Leonurus Cardiaca.*

BINDWEEDS. Convolvulaceæ.

Hedge Bindweed. *Calystegia sepium.*

Flax Dodder. *Cuscuta Epilinum.*

American Dodder. *Cuscuta Gronovii.*

NIGHTSHADES. Solanaceæ.

Common Nightshade. *Solanum nigrum.*

DOG-BANES. Apocynaceæ.

Spreading Dog-bane: Indian Hemp. *Apocynum Androsæmifolium.*

MILKWEEDS. Asclepidaceæ.

Common Milkweed: Silkweed: Wild Cotton. *Asclepias Cornuti.*

POKEWORTS. Phytolaccaceæ.

Common Poke: Garget. *Phytolacca decandra.*

CHENOPODS. Chenopodiaceæ.

Pigweed. *Chenopodium album.*

AMARANTHS. Amaranthaceæ.

Pigweed: Green Amaranth. *Amaranthus retroflexus.*

SORRELWORTS. Polygonaceæ.

Smartweed. *Polygonum Persicaria.*

Door-weed: Knot-grass. *Polygonum aviculare.*

Black Bindweed. *Polygonum Convolvulus.*

Curled Dock. *Rumex crispus.*

Sheep Sorrel: Field Sorrel. *Rumex Acetosella.*

NETTLEWORTS. Urticaceæ.

Stinging Nettle. *Urtica dioica.*

Clearweed. *Pilea pumila.*

GRASSES. Gramineæ.

Cheat: Chess. *Bromus secalinus.*

Couch Grass: Witch Grass. *Triticum repens.*

Barn-yard Grass. *Panicum Crus-galli.*

SHRUBS.

Poison Sumach. *Rhus venenata.*

Common Sumach. *Rhus typhina.*

Hardhack: Steeple-Bush. *Spiracæ tomentosa.*

Dewberry. *Rubus Canadensis.*

Common Elderbush. *Sambusus Canadensis.*

Sheep Laurel: Lambkill. *Kalmia augustifolia.*

Common Alder. *Alnus incana.*

Common Juniper: Ground Hemlock. *Juniperus communis.*

The rushes, horsetails, ferns, lichens and mushrooms have been excluded in this re-publication of the list, as they are generally found upon wholly waste land, and never appear in well drained fields, or in land under good cultivation.

1870. A representative to the Board from the State Agricultural Society was admitted this year, the Board consisting of twenty-two members. The volume for this year is wholly made up of the lectures and discussions at the two farmers' conventions held during the year. The most important lectures are: Country Roads, by C. B. Stetson, and Farm Law, by Hon. A. G. Lebroke.

1871. The farmers' conventions this year were held at Farmington and Lincoln. Among the leading speakers were X. A. Willard of New York, and O S. Bliss of Vermont. The former lectured upon Associated Dairying, especially with reference to the making of cheese by the factory system; and Mr. Bliss treated the subject of butter making. These subjects were introduced for the purpose of interesting our farmers in the greater development of the dairy business in the State.

1872. At the farmers' conventions this year, which were held at Paris and Skowhegan, leading speakers were: Hon. T. S. Gold, Secretary of the Connecticut Board of Agriculture, and Hon. J. Stanton Gould of New York. Their subjects were: The Production of Milk, and Management of Meadows and Pastures. Other subjects embraced in this report are: Needs of the Dairy, by T. D. Curtis of New York; Soil Exhaustion and Rotation of Crops, by Prof. S. W. Johnson; and The Relation of Botany to Agriculture, by Prof. W. S. Clark.

1873. The report of this year enumerates twenty-five cheese factories in operation in Maine, the first one ever formed in this State being the Sandy River Cheese Company which was organized in Strong, in April, 1871. The State Pomological Society was incorporated this year, and entitled to a member on the Board of Agriculture. This volume contains the "Agricultural Survey of Waldo County," by J. W. Lang.

1874. Important papers and essays in the volume for this year are: On Milk, by Hon. Harris Lewis of New York; The Science of Cattle Feeding, by Prof. W. O. Atwater of Connecticut; One Hundred Years' Progress of American Agriculture, by Hon. Charles L. Flint, and Epizootics and Contagious Diseases of Farm Animals, by Prof. James Law of Cornell University. These were given at farmers' conventions held at Wiscasset and Orono. Other contributions were: Ornamental and Useful Plants of Maine, by F. Lamson Scribner, B. S., and History of Maine Cattle, by the Secretary. The work by Prof. Scribner upon our native plants was the first part of a treatise which he designed should embrace a catalogue of all our useful and ornamental trees and shrubs, but the work was never completed, this first part being the only portion ever published.

1875. The Board this year consisted of twenty-four members—sixteen from the county agricultural societies; five members at large, and one each from the State Agricultural Society, State Pomological Society and Maine Poultry Association. The farmers' conventions of the Board were held at Waterville and Calais, and a county or branch meeting of the Board, attended by the Secretary and by three members of the Board was held at Etna in Penobscot county. The design of these local meetings was to extend the benefits of the Board to rural localities at places beyond the general reach of the two stipulated yearly conventions, and they formed in fact the commencement of the now popular farmers' institutes held all over the State. Forty-one cheese factories are reported this year, the largest receiving the milk of 350 cows, the smallest of 55 cows. The largest amount of cheese made by any one factory was that at Kenduskeag, 66,480 pounds; the smallest that at Union, 4,462 pounds. The volume for this year embraced a report on the menhaden and herring fisheries of Maine as sources of fertilization, a lecture on the "Dairy Cow," by Dr. E Lewis Sturtevant, and two lectures on the "Needs of the Dairy," by Prof. L. B. Arnold of New York.

1876. Regular meetings of the Board were held at Brunswick and Fryeburg. Leading subjects presented at these meetings were: Fences and Fencing; the Beet Sugar Industry; Plant Nutrition; Management of Pastures; the Horse at Agricultural Exhibitions, and the Wool Industry in our National Economy. The subject of the growing of sugar beets and the manufacture of sugar therefrom received much attention at the meetings of the Board this year, due to the fact that Gov. Selden Connor in his annual message to the legislature recommended the feasibility and advisability of the culture of the sugar beet in this State. A valuable paper upon this subject was that prepared by Prof. A. B. Aubert of the Maine State College, and published in the report of this year. Thirty-five cheese factories made returns to the Secretary of the Board this year, against sixty in 1875, one of which, the South Newburg factory, received the milk of 220 cows and manufactured 34,489 pounds of cheese. This year marked the first general appearance of the Colorado beetle upon the potato fields of Maine.

1877. Leading subjects discussed at the meetings of the Board this year were, Indian Corn and Manures, the Secretary saying in his report: "When it is realized that we purchase annually nearly three millions of bushels of corn, and pay out over $325,000 for commercial fertilizers of different kinds, it is time our farmers turned their attention to the husbanding and enlarging the home resources of manures and to growing more corn and wheat for our own consumption." Twenty-seven cheese factories made reports of their operations. The "Agricultural Survey of Hancock County" appeared in this volume. A law was passed by the legislature this year authorizing the Governor and Council to contract with any party or company for the establishment of a beet sugar factory in Maine, and to pay said party or company a bounty of "one cent per pound on all beet sugar manufactured in this State from beets raised in this State, the amount of bounty so paid not to exceed $7,000 in any one year, and not to exceed ten years from the time of the payment of the first bounty."

1878–9. Representation from the different agricultural societies in the State had increased to such an extent that in 1878 the membership of the Board was twenty-six. The conventions were held at Warren and Presque Isle, at the latter meeting the subjects of papers and discussions having special reference to the agriculture of Aroostook county, such as the stock and sheep husbandry, dairying, and farm crops specially adapted to that section of the State. This year witnessed the starting of the factory of the Maine Beet Sugar Company at Portland, and the building of its dry house for drying the sugar beets at Presque Isle. The factory was fitted up at a cost of $15,000, started up October 21st, and operated fifteen days. During this time it manufactured 94,000 pounds of standard granulated sugar, consuming from seventy to one hundred tons of beets daily during this period. The company proposed to grow the sugar beets largely in Aroostook county, dry them and ship them to Portland for being manufactured into sugar—hence the building of the dry-house at Presque Isle. Farmers realized from $80 to $120 per acre for the beets grown for the factory. The beet pulp was re-shipped to farmers who used it as a cattle food with the best results. The factory operated but two seasons when it was closed and the machinery taken out. This volume embraced a compilation of the laws of Maine relating to agriculture and of direct interest to farmers.

1880. A re-organization of the Board took place this year, by which the membership was fixed at eighteen—one from each county, and the President and Professor of Agriculture of the State College of Agriculture. One annual meeting, of two days' duration, was fixed at Augusta, in January, and one farmers' institute in each county annually, was authorized. Twenty-five cheese factories were in operation in the State. The subject of silos and the preserving of ensilage fodder was treated in this report.

Interesting facts relating to the agriculture of Maine from the report of the national census for this year are given below: Number of farms, 64,309; acres of improved land, 3,484,908; value of farms, $102,357,615; value of farming implements and machines, $4.948,048; value of live stock, $16,499,376; annual cost of building and repairing fences, $663,358; bushels of barley raised, 242,185; buck-wheat, 382,701; Indian corn, 960,638; oats, 2,265,575; rye, 26,398; wheat, 665,714; value of orchard products, $1.112,026; tons of hay, 1,107,788; pounds of hops, 48,214; bushels of potatoes, 7,999,625; number of horses, 87,848; working oxen, 43,099; milch cows, $150,845; other cattle, 140,527; sheep, 565,918; swine, 74,369; pounds of wool, 2,776,407; gallons of milk, 3,720,783; pounds of butter, 14,103,966; pounds of cheese, 1,167,730.

1881. The Board this year called the attention of the legislature to the necessity for legal action in the control, inspection and sale of commercial fertilizers, in order to protect our farmers against fraud in their use. Thirty-one cheese factories were in operation in the State, the largest amount of cheese, viz.: 76,642 pounds, having been made by the Winthrop Dairying Association. Total amount made in the State, 732,803 pounds; value $100,000. The growing of sweet corn for canning was largely increased this year. The leading subject presented by the Secretary was that of co-operative butter making by the creamery system—the first general discussion of this subject by the Board.

1882. The volume for this year is largely occupied with reports of the farmers' institutes which were held in every county in the State, with the lectures and essays, in full or by extended abstract. A total of twenty-one institutes were held. The Board recommended the establishment of an experiment station at the State College; and a law was recommended requiring sellers of oleomargarine and all forms of adulterated butter to plainly label every package or parcel sold with its true name. The legal inspection of fertilizers was introduced this year.

1883. Twenty-two farmers' institutes were held in fourteen counties this year. The yield of hay was given as 1,384,722 tons; of Indian corn, 1,000,000 bushels; of potatoes, 12,000,000 bushels, (the crop of Aroostook county being 2,248,594 bushels;) of oats, 3,000,000 bushels; of wheat, 800,000 bushels; of barley, 300,000 bushels. The production of sweet corn was estimated at ten million cans. Butter making by the factory system was first introduced in Maine this year, factories having been established at Wales, New Gloucester and Machias. Leading subjects treated at the farmers' institutes this year were: Profits of Dairying; Soil Exhaustion; Holstein Cattle; Breeding Merino Sheep; Cost of Making Milk.

1884. The prominent subjects treated in this volume are: Butter Making as a Business; Milk and its Secretion; Cattle Husbandry in New England; Fertilizers; Cost of Growing a Ton of Hay, and the Grasses of Maine. The latter treatise is from the pen of Prof. C. H. Fernald and is accompanied by forty-two full-page plates of the species described. Eighteen farmers' institutes were held this year, one in each county and in two counties two each. The Secretary says: "The dairy interests of the State are in a thriving condition. The few remaining cheese factories in the State are doing a thriving business in manufacturing cheese. The creamery method of butter making so far is proving well adapted to the conditions found here prevailing. Nine creameries have been put in operation in this State up to the present time." The Eastern State Fair at Bangor has proved that Maine is "large enough in extent, and her stock and products meritorious enough in quality and numerous enough in extent to make up two great fairs in the State each year."

1885 The Board recommended that agricultural societies receiving the bounty of the State should spend a portion of the same in liberal provisions for the best system of farm improvement and general farm management; best kept farm accounts, or best experiment in feeding and growing steers. It also recommended an enlargment of the dairy industry of the State. The hay crop of the State this year was estimated at 1,142,396 tons; oats, 3,200,000 bushels; wheat, 500,000 bushels; barley, 400,000 bushels. "The creameries are becoming well established in the favor of their patrons, and have done a thrifty business through the year." Seventeen farmers' institutes were held this year, the leading subjects presented being Dairying; Silos and Ensilage; Cattle Feeding and Stock Farming, and Farm Accounts. By an act of the legislature approved March 3d of this year, the "Maine Fertilizer Control and Agricultural Experiment Station" was established; "for the purpose of protection from frauds in commercial fertilizers, and from adulteration in foods, feeds and seeds, and for the purpose of promoting agriculture by scientific investigation and experiment." It was located in connection with the State College at Orono.

1886. The report for this year says: "Changes in the live-stock interests are chiefly in the direction of an increase of dairy stock. Breeds noted for milk and butter production are receiving marked attention. Dairying is on the increase, and especially so in those sections where creameries have been successfully established." Three new creameries were established this year. Growing grain for feeding purposes upon the farm has received a marked increase. Subjects presented at farmers' institutes this year were: Potato Culture; Municipal Taxation; Bovine Tuberculosis and Cattle Diseases; Trichinous Infection of Man and Animals, and Strawberry Culture. Two new agricultural societies were incorporated this year.

1887. Twenty-seven farmers' institutes were held this year at a total expense of $1,370.43, or an average of $50.75 for each. "The co-operative cream-gathering plan of butter making is now established on a substantial basis in our State and is rapidly on the increase. Much of the work the Board has been called upon to do at the institutes has been to give information in regard to creamery butter making and the dairy business." Four new creameries were established this year, and reports from sixteen were given in the report for this year. At its annual meeting this year the Board passed the following vote: "That in view of the recent calamity at the farm of the State College of Agriculture, involving the destruction of its valuable herd, the Board recommend that the sum of five thousand dollars as asked by the Trustees, be appropriated to repair the loss." The Board also voted: "That the Secretary be requested to use his efforts to secure such legislation at the present session of the legislature as shall better protect the stock interests of the State from the introduction or spread of contagious diseases." Subjects of lectures and essays in the volume for this year were: Sweet Corn Culture; Organization among Farmers; The Rationale of Cattle Feeding; Clover in Agriculture; Stock Feeding; Experiment Stations, and Corn Ensilage.

1888. Eleven new creameries were put in operation this year, making a total of twenty-seven in the State. The first stallion of the French coach-horse breed ever brought into Maine was imported this year. Twenty-seven farmers' institutes were held this year at a total cost of $1,634.98, an average of $60.55. A State dairy conference was held at Oakland, at which special subjects of interest in the dairy business were discussed, among them, prize butter making, the equipment of a creamery, co-operative butter making and profits of the dairy business. Other subjects presented in the volume for this year are: Dairy Cattle; Stock Feeding; Farm Improvements, and Fertilizers and Plant Food. The Maine State College Experiment Station, established under the provisions of the Hatch Bill of 1887, went into operation this year.

1889. At its session this year the legislature passed an act appropriating $2,500 for defraying the expenses of farmers' institutes, and also one increasing the salary of the Secretary to $1000. It also passed an act increasing the bounty paid to county agricultural societies; and giving $1000 annually, each, to the Maine State Agricultural Society and Eastern Maine State Fair Association. Thirty-three creameries were in operation this year. Charles B. Coy, of Presque Isle, was the winner of the prize of $1,100 for growing the largest yield of potatoes on one acre raised in the United States, viz.: 738 bushels, 24 pounds. Nineteen farmers' institutes were held, at an expense of $1,351.17, or an average of $71.12. Leading subjects discussed at these institutes were: Indian Corn; Specialties in Farming; Business Dairying; Leaks on the Farm, and Growing Lambs for Early Market.

1890. This year the Board occupied its spacious and finely appointed rooms in the new extension of the State House, the report saying: "The office is to be at all times kept open for business, and a clerk is provided to aid in carrying out this plan." Twenty farmers' institutes were held during the year. Special or short courses in agriculture and dairying were established at the State College this year. Dairying has increased. Three new agricultural societies were incorporated. A State dairy conference was held at Winthrop, at which, among other subjects, lectures were given on Quality in Butter; Fine Points in Butter Making; Work of Cream Separator and Dairy Temperament in Cows. Subjects presented at the institutes were: An honest Horse Industry; Education for Farmers; Profits of Orcharding; Products of the Dairy and How to Secure them, and Our Stock Industry.

1891. Acts were passed by the legislature this year increasing the salary of the secretary to $1,500, and appropriating $3,000 annually for carrying on the work of farmers' institutes. Nineteen farmers' institutes were held at an expense of $1,464.23, or an average of $77.06 each. At the annual meeting the Board took action on having the agriculture of the State properly represented at the World's Columbian Exposition in 1893. The chief papers in the volume for this year are: The Babcock Milk Test; Profits of the Dairy Business; Variation in Milk and its Products; The Latest Conclusions in Creamery Work; Milk Production; Food Production for the Dairy; Sheep Husbandry; Horse Breeding; Raising Corn for the Silo; Farm Drainage; The Farmer's Garden, and Corn as a Farm Crop.

A FULL ABSTRACT

OF

CATTLE COMMISSIONERS' REPORT, 1892.

To His Excellency, the Governor of Maine:

We present our bi-annual report for the year closing December 31, 1892, together with an account of our expenditures, and other proceedings under provisions of the law relating to contagious diseases in this State as amended in 1889, chapter 177.

A summary of the whole number of cases inspected by our Commission in 1892, will be found to be one hundred and fifty-eight, an excess of forty-one over any previous year. Ninety-five herds of cattle were inspected, and sixty-three stables and lumber camps. Thirty-eight head of cattle were condemned and destroyed at an appraisal of $1,271.50, and twenty-four horses were also condemned and destroyed at an appraisal of $1,225.00, the total amount of appraisal amounting to $2,496.50. The number of horses destroyed is larger than any previous year, and again it will be seen that a very small percentage of them were "State of Maine" bred, we being indebted to Massachusetts for eleven head, to Canada and the Western States for nine, and Maine four. The number of cattle destroyed is also larger than of any previous year, and of the thirty-eight head condemned and appraised, sixteen of them came to us directly from Massachusetts, the balance being mostly Maine bred; so that, out of sixty-one animals destroyed in 1892, Massachusetts has contributed twenty-seven. In 1891, thirty-one head of cattle were destroyed at an appraisal of $1,109.50, and eighteen horses were also condemned and destroyed at an appraisal of $1,480.00, the total amount of appraisal amounting to $2,589.50.

These summaries show that the actual appraisals of horses and cattle condemned and destroyed during 1891 and 1892, amount to

$5,086 00, which is $86 00 in excess of the whole appropriation for these years, thus reducing the amount for salaries and actual expenses of our board, in inspecting cases scattered from "Kittery to the Aroostook," and from the "Mountains to the Sea," into so small a compass, that the work cannot be properly or faithfully performed by the present board, or by any other who may succeed them; and we most respectfully submit for the consideration of the present legislature, these facts, together with the suggestion that no money can ever be better appropriated or expended, than for the preservation of the public health.

The facts of a year ago are in the main the facts of to-day, and owing to the excess in amount of appraisals over previous years, the expenditures have considerably over-run the bi-annual appropriation of $2,500 a year, and we again take occasion to say that the present appropriation is always likely to prove insufficient, if we are to keep the contagious diseases of this State under as perfect control in the future as in the past. The expenditures of 1891 had exceeded the appropriation approximately a thousand dollars, so that at the commencement of 1892, we had but $1,500 to carry on the work of the present year, while the demand upon our services has been greater than in any previous year.

For a number of years after the present law went into effect, the appropriation proved to be sufficient to carry on the work, if we except the noted cases of "Foot and Mouth" disease at Portland in 1883, (caused by the importation of fourteen Hereford bulls, which were allowed by the United States Inspector to be landed at that port) and the more serious outbreak of tuberculosis at the "State College Farm" in 1886, for which a special appropriation of $5,000 in each case was provided. We know it has required practical demonstration to convince the public of the value and necessity of our work, but the severe lessons taught by these outbreaks, have impressed upon them the necessity of observing the laws which govern health, and ward off disease. The reports published by authority of the Secretary of Agriculture in January, 1892, show that there were at that time three hundred and twenty-eight thousand five hundred and forty-three head of cattle in Maine, of the total valuation of $8,437,714, and one hundred and ten thousand seven hundred and nineteen horses valued at $9,860,299. The number of horses since then has been constantly on the increase, and their character and value greatly improved by judicious breeding, while in Androscoggin, Kennebec, Penobscot, and portions of Aroostook counties, where dairying is receiving marked attention, cows have increased in numbers and value. The founding of a new industry in this State within the past year, whereby two immense factories are already extensively engaged in the production of "condensed milk," has al o created an increased demand for the "raw material," the purity of which is now conceded in all the markets of the world, and these important industries will continue to demand as they deserve the constant protection of the State, if we are to maintain the high reputation Maine now enjoys for the almost absolute condition of health among our "flocks and herds."

The quarantine against Massachusetts cattle which went into effect on January 1st, 1892, is still in force, the experience of our board during the year just closed, having fully satisfied us, that the measure was both wise and necessary for the protection of all concerned, and as yet no results have been reached in Massachusetts, that lead us to believe tuberculosis among the bovine population has received such official restraint as to materially decrease the disease to any marked extent among the cattle of the old Bay State. Aside from the fact that Massachusetts occupies a much more exposed position than Maine as a receiver of diseased cattle and horses, while we are more safely apart from the turbulent current of the cattle trade that "ebbs and flows" at Brighton, there is a reason much more potent to our minds than any other why these diseases should continue to baffle control in the former State, while we remain practically free from them in Maine.

By reference to section 2, chapter 177, of our statute laws it will be seen that Maine pays to the owner or owners of any animal destroyed by order of the cattle commissioners "one-half of their value, as determined upon the basis of health before infection, out of any moneys appropriated by the legislature for that purpose," while the Massachusetts law renders the owner *no compensation for any diseased animal destroyed by order of their commissioners*, the only exception to this being, that if an animal having been condemned, should prove upon post-mortem examination to be sound, the owner may recover a fair value for such animal. So long as the laws of these states remain so diametrically opposed to each other as at present, we can see no reason for any immediate change in our relations.

The days of discussion regarding the heredity and contagion of tuberculosis have passed away, and it is no longer possible to doubt the dangers to which tuburculous animals expose their neighbors and their progeny. So long as such animals discharge virus by the respiratory and digestive passages, and by the mammary secretion, they can infect healthy subjects by its introduction into their digestive apparatus with food or drink, or into their respiratory apparatus with the atmospheric air, they will continue to remain a menace to the public health. Rigorously, the theory can be maintained that a tuberculous animal is a subject dangerous to the property of others, and it is not permitted to any person to wittingly injure any one, while, if the animal that is the source of the injury does not disappear by the good will of the owner, society has the right to exact its destruction. But more conciliatory measures have long been sustained, so that in imposing upon the owner a sacrifice for the public good, it is well that society should charge itself with a part of the loss. Moreover, the efficacy of the law requires that the owners of tuberculous animals should not have to run too much counter *to their own interests* in submitting to the *obligations to report. The only means of diminishing their resistance is to establish the principle of compensation in the case of slaughter.* It is to the principle of mutuality that recourse must be had—a principle which should be applied under the control of the State.

Almost all the veterinarians who took part in the discussions of the Brussels Congress in 1883, 1885 and 1888, claimed *compensation* as to the corollary of the seizure or interdiction of tuberculous flesh. An opinion of great value in this respect, and one that I am pleased to cite, is that of Van Hertsen, who for a long time had charge of the abattoir at Brussels. "Although quite sharing the opinion of those who are in favor of total seizure of all tuberculous flesh" said Van Hertsen in 1888, "it would be impossible for me, despite the confidence with which I am honored by the Communal Administration of Brussels, to carry this idea into practice, if in executing it, I could not rely upon *partial or total compensation.* This is the arm furnished by M. Lydtin to destroy the plague of bovine tuberculosis. *Compensation* for slaughter of animals attacked or suspected of the disease. *Compensation* for the seizure and destruction of tuberculous flesh because there is danger in consuming it."

At the last session of the legislative assemblies of the state of New York, there was also passed and approved by the Governor, May 5, 1892, "An act in relation to tuberculosis in milch cows and other cattle and infectious and contagious diseases of cattle." The act places the work under the supervision of the State board and directs it to use all reasonable means for ascertaining the existence of diseases and for preventing all injury from tuberculosis in milch cows; and to take measures to suppress this disease promptly. The act also provides "for the *indemnity* to the *owner* for *slaughtered animals*, of the *actual value at the time they are killed.*" And regarding the inspection of dairy herds for tuberculosis in the state of New York, Dr. Cooper Curtice of Albany, an official of the state board of health, says: "As an official of the state board of health, I am busily engaged inspecting for tuberculosis and believe I am building up quite a strong case in favor of the board's continuance of the work. While my results show that the scrutiny is worth doing to provide for the purity of milk, they also prove, even more strongly, that it is worth doing for the business interests of the farmer."

We believe that any law of non-compensation that seeks to govern or control the contagious diseases of a state, resolves itself into one of *self preservation* among the very class of men the law seeks to reach, the *producers* and *dealers* in diseased milk and meat; so that if an owner has animals in his possession of which he is himself suspicious, his utmost efforts are directed towards *concealment of the facts* and *evasion of the law* that affords him *no compensation if his animals are condemned.*

If the official reports of the Cattle Commissioners, and also those issued by the "Boards of Health" and other State officials of Massachusetts for the past five years, are to be accepted as true, the old board turned over to the present board (appointed in 1892) 176,476 milch cows and 96,799 oxen and other cattle among which a certain amount of tuberculosis existed variously estimated by the most conservative of their veterinary surgeons at from 10 to 25 per cent.

Doctor Alexander Burr, Inspector at the Brighton Abattoir, in his official report to the Boston "Board of Health" for the year ending December 31st, 1890, relating to tuberculosis, said "that in relation with the abattoir we have an establishment where fertilizers are manufactured, and dead animals of all kinds received, many of which are cows, and these animals represent a fair average of the cows of our neighborhood; having died, *the owners have seldom any disposition to hide them.*" Dr. Burr found the percentage to be

10.03 per cent. and says, "No better opportunity, it seems to me, could be found to reach a fair average of the extent to which the disease prevails among our animals "

Dr. Austin Peters, M. R. C. V. S., who was the colleague of Dr. Earnest, M. D., in conducting the extensive experiments at Mattapan, under the patronage of the "Massachusetts Society for Promoting Agriculture," says "Cattle in the neighborhood of large cities (Boston) are much more the victims of tuberculosis than those kept out on the farms; therefore, while perhaps from *ten to twenty-five per cent. of the milch cows in Eastern Massachusetts are tuberculous*, it is much more rare in the western part of the State, although I do not mean by this to say that it does not exist there," and it is not a little significant that Dr. Abbott, M. D., of Boston, at the hearing before the committee on public health, February, 1891, in giving the *vital statistics of deaths by consumption in Massachusetts*," said, "Now, with regard to the difference in different counties of the State; it is true that tuberculosis has prevailed to a greater extent for the whole of this period in the *eastern counties* than in the *western counties*." In 1887, Dr. William Rose, United States Inspector, of Washington, D C., after examining two hundred herds of cattle in Massachusetts, found over twenty-five per cent. affected with tuberculosis, and the same year the Cattle Commissioners in their annual report to the legislature, Senate, No. 2, said, regarding tuberculosis, "The disease continues with no apparent abatement or increase, although as the veterinary profession increases in number, and attention is called to it more and more, there is call for more active work. The disease could, doubtless, be eradicated by placing it in the same catagory with pleuro-pneumonia, and applying to it the same provisions of law; but it would, doubtless, necessitate the destruction of twenty animals to save one, and require the payment of many hundreds of thousands of dollars."

It may be asked how all these reports, even if true, affect the State of Maine, and we answer simply this, that if we were to accept twenty-five per cent. as the maximum amount of tuberculosis among the *milch cows* of Massachusetts (176,476 head), (*excluding* 96,799 oxen and other cattle, given by the last census,) we would reach the number of milch cows alone whose products are being daily offered for sale in their markets as *forty-four thousand one hundred and nineteen*, as opposed to twenty-two head found affected in Maine the past season out of a total of 328,543, together with the much more important fact that the percentage of all the cows from Massachusetts, whether registered or unregistered, brought into Maine, within the prescribed time, have proved by post mortem tests to be *forty per cent. or over*, the present year proving no exception, as our report shows that out of thirty-eight bovines condemned, sixteen of them were contributed by Massachusetts.

If on the other hand it should be urged that the minimum estimate of ten per cent should as fairly be accepted as the truth, it is very unfortunate for Massachusetts that all the cows or bulls that have been brought into Maine and New Hampshire for the past few years, continue to show a percentage far above either of their own estimates, by the official annual reports of these two neighboring states, both of which continue to quarantine against Massachusetts.

We state the above facts in no spirit of antagonism or discouragement to the present board of Massachusetts commissioners, representing as it does gentlemen of the highest professional ability and qualifications for the important work they have undertaken, and but just fairly begun. Since the new board was appointed, out of 357 cities and towns in Massachusetts, but 330 of them have yet selected inspectors, whose duty it is to report to the board of cattle commissioners any suspicious cases of contagious diseases among cattle or horses, within their respective limits, so that the efforts of the new board have been largely directed thus far in perfecting a thorough organization for the prosecution of the work, but we submit the above without further comment, as a full justification of the continuance of our present quarantine regulations.

When we come to analyze the contagious diseases of our State, practically we have only tuberculosis among cattle, and glanders and farcy among horses, to deal with, although emphysema among cattle and catarrh among horses are very often mistaken for the former diseases, and it is to enable the owner to make a differential diagnosis in these disorders that we have often pointed out such symptoms as would enable casual observers not to be too easily led astray. We are often summoned long distances and at considerable expense to decide cases where the owner has had the animals under his care for a long time and able to compare with one another animals subjected to the same hygienic conditions, where if he had heeded our suggestions, and proceeded with more deliberation, such expense and attendance might well have been avoided, especially when we come to consider that our veterinarian is required to give his diagnosis with certainty, in the great majority of cases that are for the first time presented for his notice. In our State, with the exception of emphysema, the non-tubercular diseases of the lung and pleura are rare in the ox, so that when one observes in a bovine animal irregular respiratory movements, especially during inspiration, a harsh *bruit* due to pleural friction, a slight abortive cough, difficult to provoke by compression of the trachea, an exaggerated sensibility on percussion of the costal region, and enlargement of the retro-pharyngeal glands, one may safely conclude there is thoracic or pulmonary tuberculosis.

We should always recognize the fact, however, that appearances in this disease are very deceitful, and that the emaciation that oftentimes accompanies tuberculosis is not absolute, and that while a lean animal having a diseased aspect may be suspected, other animals in the same stable in good external condition, (embonpoint) in which tuberculosis exists, may be entirely overlooked.

In emphysema, which is non-contagious, the thorax externally appears unnaturally convex and prominent. The intercostal spaces are widened, but depressed. The inspiratory efforts are increased. The sound or percussion is morbidly clear, but not tymphanitic, on auscultation, the *inspiratory* murmur is feeble or suppressed, and the *expiration* which is more frequently audible is prolonged, laborious and wheezing. The cough is also more easily provoked and is very characteristic.

In regard to the use of milk or meat from tuberculous animals, there is nothing to offer, and we do not know of any protest in favor of the milk or meat of such animals for human consumption. Whenever a diagnosis of tuberculosis has been fairly made out as regards the milk, whatever its character may be, the sale and consumption by mankind ought to be absolutely interdicted; although the use of it for feeding animals might be permitted, after it had been thoroughly boiled. The milk may even be dangerous when the udder presents no sign of tuberculization. It hence results that all cows ought to be submitted to a careful surveillance, and we believe that surveillance of dairy stocks can give good results only when the proprietor lends his assistance to the authorities.

In regard to meat, we advise that the flesh of tuberculous animals, whatever may be the degree of tuberculosis and the apparent quality of the flesh, ought to be eliminated from the consumption of man and of animals.

The Congress for the Study of Tuberculosis in Man and Animals, held in Paris in 1888, put at the head of its labors the study of the dangers attending the use of the flesh and milk of tuberculous animals, and after a long discussion, passed unanimously the following resolution. "There ought to be pursued by every means, comprising the compensation of those interested, the application of the principle of total seizure and destruction of all the flesh derived from tuberculous animals, whatever may be the extent of the specific lesions found on these animals."

The condition of the contagious diseases of the country were never in a more prosperous condition, and the proclamation of the secretary of agriculture, under date of September 26, 1892, assures the people of the United States, "and the rest of mankind," that our country is free from contagious cattle diseases, especially from pleuro-pneumonia, and that there is no further reason to apprehend danger from outside sources. The secretary says, referring to pleuro-pneumonia, "the removal of the aforesaid quarantines (New York and Jersey City) completes the dissolving of all quarantines established by this department in the several sections of the United States for the suppression of the above named disease." We are assured that it is full six months since a case of contagious pleuro-pneumonia has occurred in the United States, yet the inspection system has been maintained in full force during all this time. He says: "The seaboard and frontier inspection and all necessary cattle quarantine will be strictly enforced, and there being no possibility of the occurrence of contagious pleuro-pneumonia, save by its introduction from foreign countries, the country may congratulate itself upon the removal of all apprehension for its cattle interests on the score of contagious pleuro-pneumonia." So we have now only Asiatic cholera to tussle with in the immediate future.

As regards glanders, the unusual number of cases that have been brought into the State within the past few years, would seem to call for some more restrictive legislation in regard to them, for not only does the State pay out a large amount annually for such diseased brutes, but they invariably act as a menace to all our native stock with which they are brought in contact.

Out of sixty-three stables and "lumber camps" inspected during 1892, but twenty-three of them proved to contain cases of glanders, thus proving that forty of these notices were "false alarms" even after corresponding with the parties giving such notices, in every case, and we would impress upon such parties in the future, that while we regard the prompt disposal of cases of glanders as always important, we wish to avoid the impression that seems to exist, that all horses having a profuse discharge from one or both nostrils, are necessarily cases of glanders, as catarrh is very common among coarse bred horses, and always difficult to remove, and we again reprint the symptoms of glanders and farcy for the benefit of all having suspects to deal with.

Essentially an equine affection, this fearful and intractable malady equalled in this respect by syphilis alone is readily propagated by inoculative contagion (and, according to some authorities, by infection) to the human subject, though there is no case on record in this country, so far as I am aware, in which it has been so conveyed by ingestion of the flesh of diseased animals. This may be probably due to the fact that horse-flesh is so seldom used as an article of food, and, consequently, if such transmission had at any time occurred, it might have easily been overlooked. For a very long period proprietors of menageries have entertained an overwhelming dread of the effects of horse-flesh on the carnivora in their establishments, and that, too, on account of their belief that glanders is transmitted by the uncooked flesh of infected animals to such of their beasts as may be fed on it; and they invariably make a searching inquiry into the antecedents of the animal whose carcass they may purchase for feeding purposes.

Fortunately, glanders does not arise as an indigenous affection in cattle, neither can it be transmitted to bovines, though a statement has recently been made to the effect that sheep do not possess immunity from the disease.

Personally, I have never met with a single instance of disease in cattle that I could in any way identity as of glanderous origin, and I am quite satisfied that the cases which have from time to time been placed on record were cases either of pyaemia, or more probably, of malignant catarrh.

Glanders and farcy are one and the same disease, the local manifestations of their existence in the system alone presenting distinctive characters; the former having its lesions mainly localized in the respiratory tract, the latter mainly in the cutaneous and subcutaneous structures and in the superficial lymphatics. It is due to a specific organism, a bacillus, which seems to find a favorable pabulum for its development mainly in the tissues and juices of the equine species. It is to the pathogenic effects of this organism that the local lesions of glanders and farcy are due. In the acute form of the disease febrile conditions are pronounced, there is usually a profuse catarrhal discharge from the nostrils, diffulent ulceration of the lining membrane of the nasal chambers the ulcers having a very angry appearance, enlargement of the submaxillary lymphatic glands, and, occasionally, specific inflammation and rapid degeneration of the glands of the groin (inguinal) with the adjacent muscular tissues, constituting glanders tumour. In the internal organs, the lesions are localized in the lungs, and consist of consolidation, congestion, effusion, and the formation of the characteristic miliary tubercles and abscesses, distributed mainly in a racemose manner.

In chronic glanders, the characteristic symptoms are an agglutinous discharge from the nostril with slight enlargement and hardening of the sub-maxillary lymphatic gland on the same side; a pale (anaemic) or blueish (cyanotic) colour of the mucous membrane of the nose, with the development of glanders ulcers thereon; the latter being most largely found on that part of the membrane covering the septum of the nose. The affected animal may be in splendid condition, and, if there is no fever, the muscular tissue may present after death, no appreciable departure from the normal; on the contrary, the animal may be more or less emaciated, and the carcass, as a result, deficient in flesh which may be pale in color, or even dropsical. The lungs, in the large majority of cases, are studded with the miliary nodules of the disease; but they are not always distinguishable from other nodular formations by visual examination, even by experts.

Farcy may be acute or chronic. The former is characterized by a remarkably febrile condition of the system, and by rapid swelling of one or more limbs, which may be only the forerunner of the pathognomonic lesions of the disease, viz.: the so-called farcy buds-nodular swellings about the size of a cherry formed along the course of the lymphatics, which burst and discharge a yellowish-colored, synovia-like fluid, the eruption being followed by an angry-looking sore, the fluid discharge from which possesses specific characters. Chronic farcy is usually afebrile, and here also there is swelling of one or more limbs, but the tumefaction is much less inflammatory than it is in the acute form. The lymphatic vessels, too, become swoolen, and nodular swellings (farcy buttons) form at intervals along their course, which, like those of acute farcy, undergo softening, discharge a glairy fluid, and form a specific sore. These lesions may be distributed more or less over the surface of the body, particularly on the sides of the neck, the withers and the back.

As in glanders, so in farcy, the animal may be in splendid condition; on the other hand, it may be anaemic and emaciated, and its tissues may be dropsical. The local lesions of farcy may be readily mistaken for those of pyaemia or *vice versa*.

Energetic inspection of all stables, in places where the disease is known to exist, should be carried out, and the law strictly enforced, in order that there may not be the slightest possibility of such a repulsive and intractable malady being conveyed to the human subject, either by contagion from the live animal, or by ingestion of its flesh.

[Signed] THOMAS DAGGETT, *President.*

F. O. BEAL, *Treasurer.*

GEORGE H. BAILEY, D. V. S.

State Veterinary Surgeon.

ANNUAL REPORT

OF THE

Maine State College

Agricultural Experiment Station.

1892.

GOVERNING BOARD.

TRUSTEES.

STATION COUNCIL.

REPORT.

NOTE—That part of Part I of the Station Report which gives the tables of the fertilizer analyses is omitted.

OBSERVATIONS ON THE FERTILIZER INSPECTION OF 1892, AND REMARKS ON METHODS OF BUYING PLANT FOOD.

In the case of sixty-four brands of fertilizers analyzed, the average selling price as given to the Station Agent was $34.08. The average station valuation of the same brands was $24.07, or $10 less than the selling price.

The station valuation is the same for which the fertilizing ingredients in one ton can be bought in the large markets in a condition ready for use, consequently in 1892 it is costing the farmer $10 per ton or forty per cent of the retail price in Boston, for instance, to have the goods placed at his door. Perhaps it may be said that some manufacturers are furnishing plant food more cheaply. In the case of seventeen brands sold by two leading manufacturers. the average selling price is $36.38, and the average station valuation $27.05, a difference of $9.33, or 34.5 per cent of the cost in the market.

It appears then, that even with the manufacturers most largely patronized, there is a margin of over $9 00 between what farmers are actually paying for a ton of superphosphate and the cost of the same amount of plant food in unmixed goods when bought in the large markets. It certainly does not cost $9.00 for freight and mixing. The other items of expense are agents' commissions, credit, etc., and these might be saved by a change in business methods.

This subject has been extensively studied and discussed by the New Jersey Experiment Station, and the following admirable comments by Mr. Voorhees, chemist of the station, are of interest to farmers in general.

"The principal points which have been shown are—1. That the nitrogen, phosphoric acid and potash in raw or unmixed materials can be bought at a less cost per pound than the Station's valuations; and 2. That the cost of the same elements in mixed fertilizers is at least 25 per cent greater than Station's valuations. The difference between these two methods of buying would amount on the basis of last year's sales to over $336,000. (For New Jersey.) This sum is consumed not in manufacturers' profits alone, as some suppose, but in the transportation of a vast amount of absolutely worthless material, in agents' commissions and in credit.

There are two classes of farmers who claim that it does not pay to buy the unmixed or incomplete materials: First, those who use very small quantities; and, second, those who act as selling and advertising agents. In the first case less favorable terms are quoted for unmixed materials, and the expenses of freight and handling are proportionately increased, thus adding materially to the cost of actual fertilizing elements. In the second case specific brands are bought direct from the manufacturer in large lots at low rates for cash, thus saving in freight, commission and credit upon personal supplies. The majority of farmers, however, especially those who make farming their sole business, do not belong to either of these classes, and hence these arguments lose their force, though not their influence, on such farmers as are not progressive and do not study closely the matter of economical buying. Still, if manufacturers would treat all buyers as they do their agents and sell to them direct, and farmers could be made to realize the importance of co-operation and of cash purchases, the trade in complete fertilizers would be more satisfactory to both producer and consumer. Under present conditions, however, the evidence gathered by the Station is manifestly in favor of the buying of unmixed materials and applying direct, as needed, or mixing to suit the varied needs of crop and soil."

Among the causes which should receive emphatic mention as producing the high prices for mixed fertilizers sold by agents, is the credit system, and for this the farmer is himself largely responsible. A cash system would make a saving of so large a per cent of the cost of fertilizers as to render it profitable for farmers to hire money at six per cent in order to pay down for their goods. Still further advantage would be secured by co-opertion in the buying of large quantities.

Unmixed fertilizers, such as plain superphosphates, nitrate of soda and muriate of potash, have been mentioned as furnishing plant food more cheaply than the mixed goods, but this is not necessarily the case. It so happens that the former materials are the ones which can be purchased without the intervention of the travelling and local agents, whose interests must be protected by the manufacturer, and these are the goods to which the more economical method of buying can more easily be applied. As Mr. Voorhees suggests, the common brands of superphosphate could doubtless be obtained on just as favorable terms, provided a change could be made to direct sales of large quantities for cash.

If farmers would give this matter immediate practical attention, they would be more certain to secure prompt and important financial advantages than by the long drawn out discussions over tax and tariff reforms, however important these may be.

The disadvantages of the present method by which our farmers are largely obtaining their fertilizers may be summarized as follows:

(1) It is a costly system of selling, due to the large expense for agents and the great loss on credits.

(2) It is a system which unfortunately seems to be accompanied by so many unfair arguments and so much of distortion of facts that the farmer is, to some extent, hindered rather than aided in gaining clear ideas of true facts.

(3) And so this is a system which leads farmers to consider chiefly the rival claims of competing manufacturers rather than to study his own needs and then to buy such plant food as is adapted to his wants.

If farmers are to purchase commercial plant food, great advantages would result in a change to the following system:

(1) The buying of plant food as such under proper names, and thus avoid the confusion and uncertainty attending the purchase of an ever increasing number of brands whose names mean little or nothing.

(2) The purchase of fertilizers in large quantities for cash.

MISCELLANEOUS ANALYSES.

835. *Muck* from I. O. Winslow, St Albans.

841 and 842. *Mucks* from E. E. Light, Burkettsville.

	835.		841.		842.	
	Original condition.	Water-free.	Original condition.	Water-free.	Original condition.	Water-free.
Water	77.52	-	80.66	-	79.54	
Ash and sand	4.30	19.15	1.49	7.70	7.04	34.43
Potash	.03	.14	.02	.08	.04	.20
Phosphoric acid	.24	1.08	.10	.54	.19	.96
Nitrogen	.38	1.70	.42	2.16	.34	1.67

When received at the station samples of muck contain so much water that it is necessary to dry them before they can be properly pulverized for analysis. The results obtained are recalculated for the original content of water and also, for purposes of comparison, to a water-free basis. The first figures are, of course, of most interest to the farmer, as they represent more nearly the condition of the muck as it is ordinarily used for agricultural purposes.

672. *Feldspar.*—From Cumberland Bone Co. Potash 12.07 per cent. A typical orthoclase feldspar may contain as high as 16.6 per cent potash. Here, as in most feldspars of the orthoclase variety, a part of the potash is replaced by soda.

676. *Fish Pomace.*—From P. B. Friend, N. Sedgwick. This is said to consist for the most part of the heads of herrings, from a sardine factory. It contains: Water 54.66 per cent, Nitrogen 5.26 per cent, Potash .26 per cent, Phosphoric acid 2.05 per cent.

684. *Sea Weed.*—From H. A. Long, Gt. Beach, Roque Island. Water 76.00 per cent, Nitrogen 1.04 per cent, Phosphoric acid .07 per cent.

834. *Cedar Ashes.*—From Judge Robinson, Houlton. Water 1.52 per cent, Potash 5.09 per cent, Phosphoric acid 1.91 per cent.

843. *Ashes from Burned Muck.*—From Albert Pease, Phillips. This material is largely siliceous, about 95 per cent being insoluble in hydrochloric acid. It contains traces of phosphoric acid, but not enough to give it any value.

ANALYSES OF CATTLE FOODS.

Certain cattle foods have been sent to the Station for analysis from time to time, the composition of some of which is given below.

CXXXVI. Linseed Meal, sent by Hon. Z. A Gilbert.

CXXXVII. Feed Flour, " "

CXXXVIII. Flour Sweepings, sent by E. F. Roundy, North Hermon.

CXXXIX. Flour Sweepings, sent by E. F. Roundy, North Hermon.

CXXIII. Pratt's Food, sent by A. C. Chandler, New Gloucester.

Station number.		Air-Dry.						Water-Free.				
		Moisture.	Ash.	Protein N x 6.25.	Fiber.	Nitrogen free extract.	Fats.	Ash.	Protein N x 6.25.	Fiber.	Nitrogen free extract.	Fats.
CXXXVI....	Linseed meal.....	9.03	5.60	39.94	7.28	35.27	2.88	6.15	43.94	8.00	38.77	3.15
CXXXVII...	Feed flour........	7.32	2.82	20.81	1.93	62.44	4.68	3.04	22.44	2.08	67.38	5.05
CXXXVIII..	Flour sweepings..	11.33	2.50	10.62	1.89	72.03	1.63	2.82	11.98	2.13	81.23	1.84
CXXXIX....	Flour sweepings..	8.80	15.95	9.19	1.50	59.35	5.21	17.49	10.07	1.64	65.09	5.71
CXXIII.....	Pratt's food.......	12.36	5.79	13.75	5.94	56.80	5.36	6.60	15.69	6.77	64.83	6.11

The above analyses of cattle foods call for no special comment with the exception of Pratt's Food for horses and cattle. There are several weighty reasons why this food should receive careful consideration.

(1) It is sold at the rate of $120 per ton.

(2) Its manufacturers claim that it prevents nearly all of the common diseases and disorders to which farm animals are subject, that it is, besides, a preventive of certain serious contagious diseases, that it produces richer milk and more of it, that animals fatten quickly when it is fed, and that it gives to horses greater power of endurance.

If the manufacturers of this material have succeeded in combining a food that in its relation to disease has such a high preventive and remedial influence, and in its relation to the nutrition of an animal produces the highly valuable results which appear to be claimed by their circulars, they should be classed among the benefactors of the age. It must be confessed, however, that the advertised claims of this food exceed the credible and pass into the absurd.

This becomes all the more evident when we consider what the food is. It has received a careful examination at this Station, and while we are not prepared to say that it does not contain minute quantities of substances which we have not discovered, we have become convinced that its composition does not warrant its purchase at any unusual price. The results of our examination are as follows:

(1) The food has the appearance of being chiefly ground bran or shorts and is undoubtedly what it appears to be.

(2) The food contains a small amount of fenugreek, an aromatic seed supposed to have mild medicinal properties.

(3) It contains something less than three per cent of common salt.

(4) The quantities of any other substances which it may contain are so small as to not be easily discovered. It is the opinion of those examining the food that no other compounds exist in it save those which are the proper constituents of any food.

(5) The analysis of the food gives about the same figures that we should expect from bran or shorts, with a somewhat smaller percentage of protein than these milling products now contain.

Even if it were found that this food is so coumpounded as to have, under certain circumstances, a positive medicinal effect, this fact would not constitute a good reason why farmers should purchase and feed it indiscriminately. We no longer believe in quack nostrums that will cure all troubles. The course which the intelligent farmer takes to-day in the treatment of diseased animals is to secure the attendance and advice of a competent veterinarian who will administer remedies suitable to the case in hand. As for the prevention of disease it is a common experience that all that is ordinarily necessary is cleanliness, good care and proper and sufficient food. If these conditions do not prevail it is useless for the farmer to attempt to remedy the faults in his management by the use of any advertised cure-all, such as the one under consideration. This food may not possess any injurious properties because of the small amount of unusual constituents which it contains, but in the opinion of the writer its purchase at a price exceeding the ordinary cost of commercial cattle foods is a waste of money.

PRELIMINARY NOTES ON THE SECONDARY EFFECTS OF POLLINATION.

By W. M. Munson.

The change produced by contact of embryo sac and pollen tube is not confined to the mere vivification of one or more cells; though this is the chief end,—the primary object of all pollination. There are certain secondary effects which are of interest to the botanist and may be of great practical value to the horticulturist.

When there is a difference between male and female parents, the embryo partakes to a greater or less extent of the nature of both parents. In general, this influence is apparent first in the offspring of the cross; but in some instances there appears to be an immediate effect on the ovary or other portions of the female parent. In some cases also, the pollen seems to have a direct stimulating influence on the ovarium, without effecting the impregnation of the ovules. Again, in certain instances, the vigor of the plant seems sufficient to develop a marked growth of the ovary in the entire absence of the male element. The form and size of the ovary are often materially affected by the application of different amounts of pollen to the stigma. In some plants more than one embryo is developed in a single ovule, indicating the possibility of superfœtation. These, and other secondary problems arising in connection with the systematic amelioration of cultivated plants, are often of great practical importance.

The following notes can be regarded only as preliminary; as forming a basis from which to start in future work in this direction. Although some of the problems considered have been under discussion for more than a century, they are still unsolved. There has not been sufficient systematic study to warrant the formulation of general laws, and this study must necessarily extend over a long series of years. In the notes are embodied as concisely as may be the more important results obtained by leading experimenters in this country and in Europe, together with some observations of the writer on the subjects in question.

Special acknowledgment is due to Professor L. H. Bailey of Cornell University, for the use of certain notes and photographs, and for free access to his private library.

I. On the Immediate Influence of Pollen on the Mother Plant.

Even before the sexual theory regarding plant reproduction was commonly accepted, the question of the immediate effect of pollen on the form and character of the female parent received the attention of careful observers. Bradley early gave directions for performing the operation of crossing and wrote: "By this knowledge we may alter the property and taste of any fruit by impregnating the one with the farina of another of the same class; as, for example, a Codlin with a Pearmain, which will occasion the Codlin so impregnated to last a longer time than usual and be of a sharper taste; if winter fruit be fecundated with dust of the summer kinds, they will decay before their usual time."*

In 1745 Benjamin Cook, in a paper before the Royal Philosophical Society,† cited the appearance of russet apples on trees ordinarily producing smooth fruit, and the reverse, as examples of the effect of pollen. Other cases have been frequently noted as proofs of the existence of the same phenomenon.‡ Even at this early date, however, careful experiments undertaken by Thomas Andrew Knight and others, tended to show that the apparent effects might be due to bud variations, or other causes aside from the action of pollen. Knight at this time wrote: "I have in some hundred instances introduced the pollen of one variety of the plum, the pear, the apple, the cherry, the peach, the melon, and other fruits into the blossoms of very different and opposite habits, and I have never, (although I have most closely attended to the results) found in any one instance the form, colour, size or flavor of the fruit belonging to such blossoms in any degree whatever changed or affected."§

In 1865 Thomas Meehan opened discussion of the subject in the columns of the Gardener's Monthly, remarking: "For ourselves, without being satisfied that there is any material change in the quality of the fruit, we cannot deny there is some; and there may be much more than we at present imagine. At any rate, we think it may be taken for granted that melons grown near squashes often have a suspicious squashy flavor, that gives some ground for the popular theory of mixing."‖ The suggestion is further made

*Bradley, New Improvements in Planting and Gardening, 7th ed. (1739), p. 18.

†Philosophical Trans. 1745.

‡Trans. Lond. Hort. Soc., V, 65.

§Trans. London Hort. Soc., V. 67.

‖Gard. Month., VII, 305.

that if the change be found to occur in squashes, the same law will apply to the whole region of fruit — an assumption which is altogether too broad.

There is evidence which goes to show that within certain limits there is an immediate effect of the male element, but that those limits are quite restricted. As early as 1729 the presence of both white and blue peas in the same pod was observed, when two varieties of the different colors were planted near each other.* This fact has been repeatedly confirmed. In 1822 examples were presented to the London Horticultural Society. A variety known as Blue Prussian was crossed with a white variety. The resultant peas were yellowish-white like the male parent.† Laxton, in 1866, crossed the Tall Sugar Pea which bears thin green pods, with pollen of a purple-podded variety. "The pod resulting was clouded with purple, while one of the peas was of a clear violet-purple tint and another was irregularly clouded with purple." The results, in so far as the changed color of the peas is concerned, were confirmed by Darwin.‡

Crucknell§ cites an instance of apparent immediate influence in case of the pear. A single branch on a Belle Lucrative tree bore a few specimens resembling Vicar or Winkfield. As Vicars were growing near, the conclusion is drawn that the fruits in question were affected by the foreign pollen. There is no reason to suppose, however, that this and the numerous cases of the appearance of russet apples on trees not usually russeted, are other than instances of bud variation, as pointed out by Knight.‖

Of about one hundred artificial pollinations performed by Charles W. Garfield at the Michigan Agricultural College, but three of the crosses showed any variation which could in any way be construed as the effect of pollen. "These were: *First.* Wagener upon Tallman Sweet. There was a modification of flavor quite noticeable, the fruit being sub-acid. *Second.* Tallman Sweet upon Astrachan. In this instance there was a manifest change in the color, flavor and shape. The apples were quite mild to the taste, the color was very much modified, and the form was that of a flat apple. *Third.* Tallman Sweet upon Wagener. The modification here was noticable in

* Philosophical Trans., XLIII, 525.
† Trans. Hort. Soc., V, 234.
‡ An. and Plts. Under Domest, I, 428.
§ Gard. Month., IX, 165.
‖ Trans. London Hort. Soc., V, 67.

all the specimens, in flavor and color."* I am informed, however, that at the present time Mr. Garfield doubts the influence of pollen in causing the variations here noted.

Professor L. H. Bailey in 1887, performed many crosses with different varieties of apples "and got no effect in any way, not even in season of maturity or in texture."† Similar results were obtained by Crozier in 1888. More than one thousand crosses were made, and they were carefully observed during the season with a view to detecting any immediate effects. "The examination failed to show any differences which could be attributed to the influence of the cross. In several instances different varieties were crossed upon the same tree, but the resulting fruits did not differ materially from each other or from the remainder of the crop upon the tree."‡

In many species, both wild and cultivated, sports bearing fruit differing from the normal type, are not uncommon. Diœcious plants of this character must necessarily receive pollen from an individual of a different character, but as a rule no effect is observed on the appearance of the fruit of either individual. A single plant of *Mitchella repens*, bearing white berries, was discovered by Mr. Meehan and removed to his grounds. Thus isolated, it produced no fruit, but in the natural state, and fertilized by pollen from the red-berried form, the white fruit was produced in abundance. *Ilex verticillata* as a rule has red berries, but a white-berried form on the grounds of Professor Sargent regularly produced white fruit, although necessarily receiving pollen from the red form.§

On the other hand, instances are cited to show that there is a marked effect on the color of flowers when two varieties of different color are in close proximity. White verbenas, growing by the side of a pink variety are said to have produced striped flowers on the side of the plant next to the pink variety—the other side of the plant retaining the white color.‖ Similar instances of changed color in case of phlox and petunias have come under my own observation, but in each of these cases the plants were so situated that the change could not be construed as due to the influence of pollen.

If pollen exerts a modifying influence on the character of the fruit, we should expect the color of black grapes to be less intense if fertilized by pollen from white varieties, than if self-fertilized, or

* Gard. Month.. XVIII, 23, (Jan., 1876.)
† Proc. Am. Pom. Soc., 1887, 22.
‡ Crozier, Bul. 3, Iowa Agr. Expt. Sta., 92.
§ Gard. Month., XXVII, 116.
‖ Berckmans, Am. Agriculturist, July, 1889, 344.

crossed by other dark varieties. That such influence is doubtful, however, is indicated by the work of Goff, of Crozier and others.

In 1886, Goff crossed several varieties of black grapes with pollen from a white variety—the Lady Washington. Other flowers on the same vines were self fertilized. At maturity it was impossible to detect any difference either of color or of flavor between the the self-fertilized and the crossed berries of the same variety.* Similar results were obtained by Crozier at the Iowa Experiment Station in 1888.†

The cotton plant furnishes an instance in which there is apparently unmistakable evidence of the immediate effect of foreign pollen. In 1890, at the Georgia Experiment Station, flowers of upland cotton, *Gossypium Barbadense*, were crossed with pollen from common Okra, *Hibiscus esculentus*. Apparently perfect bolls of cotton were formed, but in every instance the seed failed to germinate when planted. The reciprocal cross resulted in apparently normal Okra seeds, but the offspring varied from the normal in time of flowering and fruiting.‡ In 1891 the work was repeated, and Director R. J. Redding in a private letter to the writer reports, "bolls of cotton, the result of cotton blooms pollenized with Okra pollen this year, in which one and sometimes two of the carpels contained a very small quantity of lint adhering to the seed while the other divisions of the ovary were abortive."

It was early observed§ that there is an immediate visible effect of foreign pollen on corn, extending in many cases even to the receptacle, and the repeated confirmations by Crozier, Sturtevant,‖ Kellerman,¶ Tracy** and others would leave little doubt as to the accuracy of the observations.

That there is a difference in varieties, in the readiness with which the influence of pollen is shown, is altogether probable. Sturtevant lays down the general proposition: "Under the conditions of ordinary seed, maize does not in general show the effects of current cross-fertilization, the exception being the sweet corns which exhibit the influence of current foreign pollen very readily."†† The proposition is based on the study of about one hundred and twenty-five

* 5th Rep. N. Y. Agr. Exp. Sta., 180.
†Agr. Sci., II, 319.
‡Expt. Sta. Record, III, 135.
§Philosophical Trans., XLVII 206.
‖3rd Rep. N. Y. Exp. Sta., 148.
¶2nd Rep. Kan. Exp. Sta., 288-335, (1889).
**Rep. Mich. Hort. Soc., 1888, 43.
††3d Rep. N. Y. Ag. Exp. Sta., 149.

named varieties, including flint, dent, pop, and sweet corns. That the flint and dent varieties often exhibit a change the current year, however, is abundantly proved by the work of the other experiments referred to; though all agree that the change is most readily seen in sweet corn, and least so in the flint varieties. In this connection, also, Sturtevant makes the statement that "cross-bred corn has a greater tendency to current cross-fertilization than has purely bred corn"*—a condition we should naturally expect from the variable tendency of hybrids and cross-breeds. While there would seem to be no doubt as to the immediate influence of foreign pollen in the case of corn, it is not improbable that what is in reality seminal effect, may sometimes be credited to the immediate action of the foreign pollen.

Darwin cites numerous instances† to prove the existence of an immediate effect of crossing, and though some of the examples to which he gave credence are now discredited, many of them are apparently well authenticated.

Seeds of *Matthiola annua* are normally of a light brown color, while those of *M. incana* are violet black; yet *M. annua* crossed by *M. incana* yielded about fifty per cent of black seeds. Flowers of the orange fertilized by pollen from a lemon tree produced fruit bearing a longitudinal stripe of peel having the color, flavor and other characters of the lemon. Recent observations in this country and in Europe would appear to confirm the statements regarding citrus fruits‡ Sabines§ cites an instance in which the form of the ovary of *Amaryllis vittata* was altered by the application of foreign pollen; while Maximowicz made reciprocal crosses between *Lilium bulbiferum* and *L. davuricum* and found "each species produced fruit almost identical with the pollen bearing species."‖ Fritz Müller crossed *Cattleya Leopoldi* by *Epidendron Cinnabarianum*, and obtained a marked change in the form of the seeds.¶

Rhododendron dalhousiæ crossed by *Rhododendron Nutallii* is cited by Darwin as an example of the increased size of ovary resulting from the action of foreign pollen, while *Arabis blepharophylla* crossed by *A. Soyeri* produced pods larger than either parent species.** Darwin also gives credence to the story of the St.

*3rd Rep. N. Y. Ag. Exp. Sta., 149.
† An. and Plts. Under Domest., I, 428 et seq.
‡ See Repts. Am. Pom. Soc., 1889 and 1891.
§ Trans. Lond. Hort. Soc., V, 69.
‖ Darwin, An. and Plts. Under Domest., I, 431.
¶ Ibid.
** Ibid, 432.

Valery apple, the stamens of which are abortive, and being artificially pollinated, the fruits are said to differ from one another in size, flavor and color, resembling in character the various kinds by which they have been fertilized.*

In the cultivation of pistillate varieties of strawberries, it is usually considered necessary to set some variety with well developed stamens in the immediate vicinity to furnish the pollen requisite to the fertilization of seeds, and consequent development of the receptacle. It is believed by many growers that the character of these pistillate varieties may be varied at will, by using different varieties for the male parent. In other words, it is believed that there is an immediate effect of the male element in determining the time of maturity, the color, the shape, and even the flavor of the receptacle of the variety crossed. If this theory be based on fact, it is of no small practical importance. If it were true, that in all cases, or that as a rule, the fruit partakes of the character of the male parent, there could be no fixed character to any pistillate variety. But will the facts warrant the assumption that this immediate effect in the case of strawberries is by any means universal, if common? Personally I have conducted no work bearing upon this point, but several experiments have been performed by careful observers, and the results obtained by them are of interest in this connection. The results as published differ considerably, but in general, the weight of authority goes to show that the receptacle is not materially affected by the male element.

At the meeting of the American Pomological Society in 1885, extended and spirited discussions of this subject were held. Professor W. R. Lazenby of the Ohio Experiment Station, had found the influence of the male element decidedly manifest When blossoms of Crescent were fertilized by pollen from Downing, Vick, or Sharpless, the characteristic shape, texture and other qualities of the male used, were impressed on the receptacle to such an extent that it was possible to determine the male parent from the general appearance of the crop.† A repetition of these experiments the following season, however, failed to give any marked results.‡

A. S. Fuller who has made a careful study of the subject since 1859, claims to have obtained very marked indications of an immediate directing influence on the form and size of the recep-

* Darwin, An. and Plts. Under Domest. I, 432.

† Proc. Am. Pom. Soc., 1885, 66.

‡ Rep. Ohio Exp. Sta., 1885, 107.

tacle.* Mr. Fuller attributes this apparent influence to the direct action of the pollen in stimulating the growth of ovary or receptacle without reference to the fertilization of the ovules. Admitting the stimulating effect, however — and of this there seems to be but little doubt — does the directing effect necessarily follow?

From an extensive field experiment conducted by Professor T. J. Burrill in 1884, it was found "easy enough to select individual berries conspicuously different from each other, as is always the case, but it was not possible to detect the slightest tendency towards a resemblance to the pollen bearer." † In a similar experiment conducted the following year on the farm of P. M. Angur of Connecticut, like results were obtained. ‡

In none of the carefully conducted experiments of Goff and Hunn at the New York Experiment Station, have any immediate effects been discerned. Berries from Crescent blossoms, receiving the pollen of Lennig's White, were not different in color from those fertilized with Wilson or Sharpless pollen. Flowers fertilized on one side by pollen from the white variety, and on the other with Sharpless pollen were symmetrical in form and uniform in color.§ Out of one hundred and sixty seven successful crosses made by Crozier, there was not an individual instance that pointed to a specific influence of the foreign pollen.‖

The nature of cucurbitaceous plants is admirably adapted to show the immediate effects of crossing if such occur. In a mixed plantation many of the flowers on any individual plant, when left to natural processes, would necessarily receive pollen from very different sources. If now, there were an immediate effect of pollen, we should expect to find fruits of very different character on any vine. Such is not the case, however. I have repeatedly looked for this difference, but have never seen it; nor have I observed it when several flowers on the same plant were artificially crossed with pollen from different varieties or species. Crozier¶ and Bailey have repeatedly obtained like results. Bailey, whose crosses of cucurbits ran up into the thousands, asserts positively that: "There is no immediate influence whatever, except such as

* Proc. Am. Pom. Soc., 1885, 68.
† Proc. Am. Pom. Soc., 1885, 67.
‡ Ibid, 70.
§ 4th Rep. N. Y. Agr. Exp. Sta., (1885), 227; 5th Rep. (1886), 179; also Bul. 24, (N. S.), 330, (1890).
‖ Agr. Sci., IV, 287.
¶ Agr. Sci., I, 227.

is due to imperfect development caused by insufficient or impotent pollen."*

In our work with tomatoes and egg plants there has in no case occurred an instance of immediate effect, other than alteration of form due to insufficient pollen. During the past winter numerous crosses and hybridizations of tomatoes have been made. The accompanying photographs of the most violent of these crosses indicate the entire absence of apparent effects.

Figure 1 represents the "Lorillard," crossed by pollen of the "Currant" (*Lycopersicum esculentum* crossed by *L. Pimpinellifolium*). The Lorillard is a smooth, nearly spherical variety, of medium size, and as grown under glass, seldom weighs more than three or four ounces.

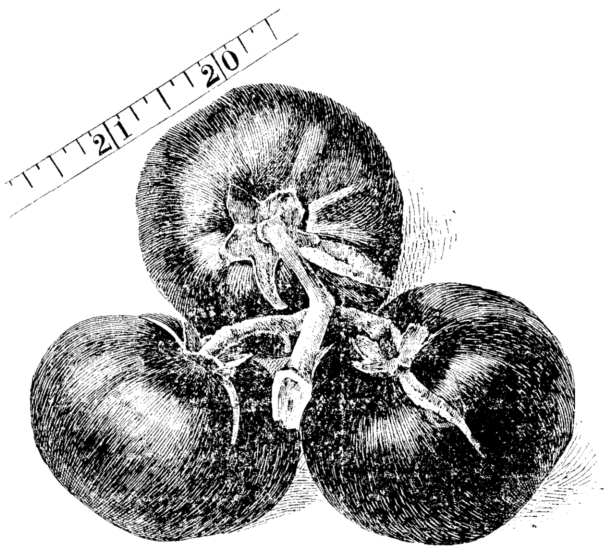


FIG. 1. *Lorillard* × *Currant.*

As will be seen, the fruit is in every respect typical of the Lorillard. The offspring from this cross, however, show unmistakable evidences of the influence of the male parent, both in the habit of the plants and in the character of the foliage and flowers. The fruit also is intermediate between the parents in size and character.

* Bul. 25, Cornell Univ. Exp. Sta., 181 (Dec., 1890).

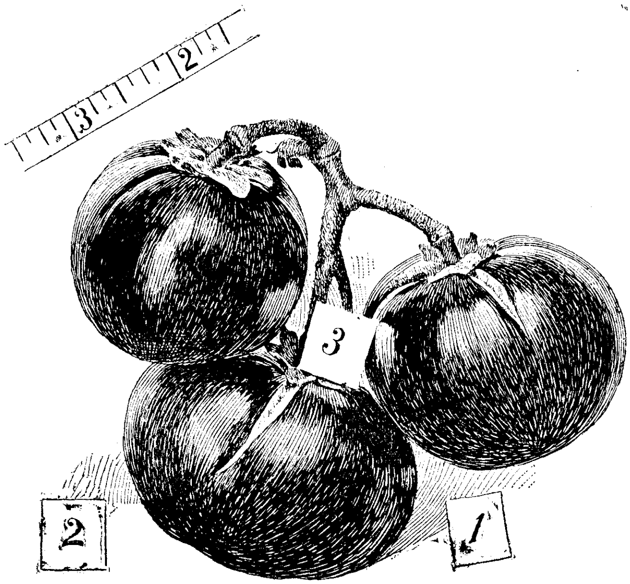


FIG. 2. *Lorillard* × *No. 1, Lorillard; No. 2, Currant; No. 3, Peach.*

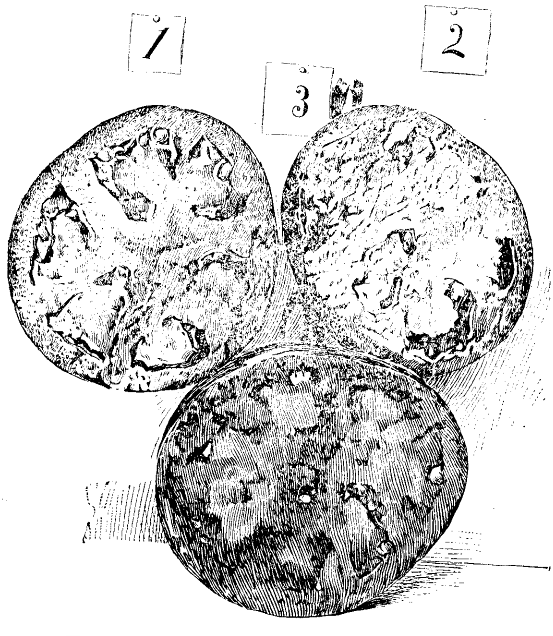


FIG. 3. *Section of Fruits shown in Fig. 2.*

Figures 2 and 3 are from photographs of a cluster in which each fruit has a different male parent. The variety used was the Lorillard. Number 1 received pollen of the same variety, while number 2 was given pollen from the "Currant," and number 3 from the "Peach." As in the previous instance, there is no apparent effect on the form of the fruit; and the seeds gave no indication of the different parentage—all were apparently typical Lorillard seeds.

In the offspring, the differences are very marked. The lines are sharply drawn between the crosses with Peach and Currant, the influence of the respective male parents being very evident, while the Lorillard cross is apparently unaffected by either of the others; indicating that there was no error in the operation, also that there has been no transfer of influence along the short peduncles, as suggested by Lowe.*

In an extended series of experiments with egg plants, conducted for three consecutive years at the Cornell University and the Maine State College, the most widely varying types have been crossed. In no instance, however, has there appeared an immediate effect of the male parent. The little Round White when crossed with pollen from Black Pekin, differed in no respect from other fruits on the same plant. But the offspring of this cross showed very marked variations. The same facts were observed regarding several other crosses.†

As before noted, instances have been reported in which the color of flowers was apparently changed by the action of foreign pollen the current season. An instance of such change has never come under my observation, though I have made numerous crosses of different varieties of Tropæolum, Fuchsia, Silene, Phlox, Petunia, and other ornamental plants.

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* See page 54.

† Bailey and Munson, Experiences with Egg Plants, Bul. 26 Cornell Ex. Sta p. 14.

REPORT OF THE HORTICULTURIST.

W. M. Munson.

In many respects the work of the horticultural department has been a continuation of that of last year. As indicated in my last report two distinct lines of work are in view; one being a study of principles and the laws affecting plant growth; the other a practical investigation of ways and means for immediate guidance in the culture of fruits and vegetables.

In studying the variations of plants, it is interesting and important to know what results may be expected from certain of the operations performed in the process of amelioration. During the past year special attention has been given to a study of the effects of pollination. The results of this study were published as Part II of the annual report of the experiment station. The field for investigation in this direction is very promising.

The work with insecticides and fungicides has been continued during the year and valuable lessons have been learned Owing to the excessively wet season, results were not so marked as last year, but the beneficial effects of spraying are evident, and further effort in this line is warranted.

In our work with vegetables the tendency is to specialize rather than to grow a large number of varieties—particular attention being given to cabbages, tomatoes and egg plants. In the forcing house the pepino and the English cucumber, as well as the tomato, lettuce, radishes and other common crops demand attention. It is believed that with proper management the pepino may be made a profitable crop for winter forcing in those localities which can command a fancy market. A special report concerning the forcing of vegetables is now in preparation.

The fruit plantations have been largely extended and systematized, and with the provisions for increased assistance next year it is hoped the work may be prosecuted with renewed vigor.

THE VEGETABLE GARDEN.

While a greater variety of vegetables was grown during the past year than in 1891, we shall confine our report at this time to certain notes concerning cabbages, tomatoes and egg plants. Other important vegetables will receive attention at a later date.

I.— Notes of Cabbages.

As in the previous season, the study of cabbages was confined mainly to a few questions relative to methods of culture,— including the effects of handling; effects of trimming; a comparison of varieties, and the testing of the newer varieties.

No strictly new varieties were grown this year. "Nonesuch" and "Worldbeater," which were grown for the first time last year, were tried again and the good opinion expressed at that time regarding the first variety is confirmed. It is a very good second early sort. The average weight of this sort was about eight and one-half pounds. "Worldbeater" is a little later and in no way so satisfactory. The average weight of the heads is about the same as that of "Nonesuch."

Seeds from Long Island and from Fidalgo, Washington, did not give widely different results. The plants from both lots were very strong and vigorous from the start.

1. *Effects of Trimming:* It is frequently asserted that cabbage plants will thrive much better and give better results, if the leaf surface is reduced by about one-half at time of transplanting; since little growth will be made till the roots become established and the first leaves usually wither and fall away. To test this point, a number of plants of several varieties were trimmed at the time of setting in the field, while others of the same lots were not disturbed. Rain fell soon after the plants were set and all of them grew remarkably well. The results are shown in the table.

TABLE I—Effects of Trimming Cabbage Plants.

Variety.	Number of heads.	Total weight—pounds.	Heaviest head—pounds.	Lightest head—pounds.	Av'r'ge weight—pounds.	Number of heads cracked.	Number heads immature.	Number heads not cut.	Ratio.
Early Summer:									
Trimmed	8	24.0	3.75	2.25	3.00	0	0	0	1.00
Not trimmed	6	22.1	4.75	2.50	3.70	0	1	2	1.23
All Seasons:									
Trimmed	15	116.5	12.87	3.87	7.77	1	0	1	1.28
Not trimmed	11	66.5	11.50	2.19	6.05	0	3	0	1.00
Worldbeater.									
Trimmed	15	124.5	11.75	4.56	8.30	1	0	0	1.00
Not trimmed	17	143.0	13.37	5.37	8.40	0	0	0	1.00

As will be observed, there is little difference in the average weight of the heads from trimmed and untrimmed plants. With one variety the ratio is decidedly in favor of the trimming, while with another the indications are generally as positive in the opposite direction; while the third is neutral.

Conclusion: From work performed, it is impossible to make definite statements as to the value of trimming cabbage plants at time of setting.

2. *Influence of Transplanting*: Limited space in the forcing house prevented the continuation of this experiment on a scale as extensive as had been planned. A number of plants of two varieties, however, were given the same treatment as last year, *i. e.*: The plants handled in pots were removed from the seed-flats to three-inch pots, and later to four-inch pots. Those handled in boxes were placed two inches apart at the first transplanting and about four inches each way at the second. The boxes used were ordinary seed-flats, 16x20 inches, and about three inches deep. When placed in the field, all were set in rows three and one-half feet apart and two feet apart in the rows.

The results are shown in table II.

TABLE II—POTS VS. BOXES.

VARIETY AND TREATMENT.	Number of heads.	Heaviest head —pounds.	Lightest head —pounds.	Av'r'ge weight —pounds.	Number of heads cracked.	No. of heads immature.	Number of plants not cut.	Ratio.	Remarks.
JERSEY WAKEFIELD: (Brill.)									
Pots	22	5.50	2.00	3.50	7	1	0	1.42	Cut Aug. 4.
Boxes	56	5.94	.87	2.47	5	12	2	1.00	
STEIN'S FLAT DUTCH: (Thorburn.)									
Pots	17	12.87	4.31	8.62	5	0	0	1.12	Cut Aug. 24.
Boxes	24	13.00	2.94	7.67	4	0	0	1.00	

In each instance the average weight of the product is decidedly in favor of the plants handled in pots. This result confirms that obtained last season with the first variety, but contradicts that obtained with the second. The plants handled in pots were manifestly earlier and better than those from boxes, and the question now arises, whether the difference is sufficient to warrant the additional expense.

It is of interest to note that *Jersey Wakefield* seems specially susceptible to good treatment. In 1891 the ratio of the pot-grown plants to those grown in boxes was as 1.38 : 1.00, while the present season, as will be seen from the table, the ratio is as 1.42 : 1.00. Plants of this variety which were set deeply have almost invariably given better results than those set shallow, while other varieties have given various results in different years, though the same treatment was given.

Conclusion: The results are contradictory to those obtained in 1891, and indicate that pot-grown cabbage plants are earlier and better than those grown in boxes.

II —Notes of Tomatoes.

The number of varieties grown the past season was not so large as in 1891, attention being given more particularly to methods of culture.

1. *Effects of Early Setting*: From our study of this subject last season, we found that: "On a warm, sandy soil, the earliness and productiveness of tomatoes were in direct ratio to the earliness of setting in the field," and that "a chill is not as fatal to success as is commonly supposed."* Accordingly, our principal setting was made on June 1st this year—nearly two weeks earlier than usual in this climate.

To verify the conclusions reached last year, when only one variety was used, three dozen plants of each of four varieties were set apart and given the same treatment in every way while in the house, all being transferred from the seed flats to 2-inch pots, then to 3-inch, and finally to 4-inch pots. The season being somewhat backward, the first lot was not put out until May 19. The other two lots were put out June 1st and June 15, respectively.

The night following the first setting there was a slight frost and the weather was cold and raw for a week following. As the plants were taken directly from the hot house, without "hardening off," the test was a severe one.

Table III shows very clearly the results obtained from this trial.

*Rep. Maine Exp. Sta. 1891, p. 91.

TABLE III—EARLY AND LATE SETTING.

VARIETIES.	Date of setting.	Number of plants.	Av. number fruits per plant.	Av'r'ge weight of fruits per plant—pounds.	Av'r'ge weight of individual fruits—ounces.	Date of first ripe fruit.
EARLY RUBY:						
First setting	May 19	8	22.6	5.87	4.2	July 29.
Second setting	June 1	11	13.3	4.47	4.2	July 26.
Third setting	June 15	11	7.7	1.69	3.5	July 22.
ATLANTIC:						
First setting	May 19	12	10.2	2.14	3.4	Aug. 1.
Second setting	June 1	10	9.3	1.89	3.2	July 29.
Third setting	June 15	12	5.3	0.98	2.9	July 22.
NEW JERSEY:						
First setting	May 19	12	12.8	5.19	6.5	Aug. 9.
Second setting	June 1	12	12.0	5.00	6.7	Aug. 8.
Third setting	June 15	12	4.4	1.33	4.8	Aug. 6.
BEAUTY:						
First setting	May 19	12	18.4	7.10	6.2	Aug. 9.
Second setting	June 1	10	16.6	6.60	6.4	Aug. 1.
Third setting	June 15	12	1.4	0.17	1.9	Aug. 3.

From the table we learn first of all, that the first ripe fruits, in every instance save one, were obtained from the plants set latest. This fact, however, is not necessarily an indication of earliness, as the late-set plants were older than is usually desirable for setting and the first fruits were in some cases from blossoms formed while in the house. After these had ripened there was a long interval before others followed.

Without exception, the average number of fruits and the average weight of the product per plant, was in direct ratio with the earliness of setting,—a direct confirmation of results obtained last year. The average weight of individual fruits was not essentially different in the first two settings, but was decidedly less in the last lot.

2. *Effects of Bagging Fruit:* The editor of one of the leading agricultural papers* last year suggested covering the fruit with paper bags, as a means of inducing early ripening, claiming that in this way maturity might be hastened by several days. It is impracticable to cover individual fruits, but whole clusters on different plants of several varieties were covered and duplicate clusters of the same age were marked for comparison.

The following notes indicate the results:

* Rural New Yorker.

		Size at time of covering.	Date of ripening.
IGNOTUM:			
1	Covered July 14	Size of pea.	Aug. 29
	Not covered	"	Aug. 19
2	Covered Aug. 6	"	Sept. 21
	Not covered	"	Sept. 21
PERFECTION:			
1	Covered July 12	"	Aug. 19
	Not covered	"	Aug. 19
2	Covered July 14	"	Aug. 29
	Not covered	"	Aug. 19
3	Covered July 14	½ inch.	Aug. 29
	Not covered	"	Aug. 19
4	Covered Aug. 6	"	Sept. 27
	Not covered	"	Sept. 21
5	Covered Aug. 6	Size of pea.	Sept. 27
	Not covered	"	Sept. 27
PRELUDE:			
1	Covered July 14	½ inch.	Aug. 19
	Not covered	"	Aug. 17
2	Covered July 14	"	Aug. 18
	Not covered	"	Aug. 15
3	Covered Aug. 13	¾ inch.	Sept. 27
	Not covered	"	Sept. 27

In no instance did the fruit ripen earlier when covered, and in more than half of the cases considered, that not covered matured first.

Conclusion: Little or no benefit seems to be derived from the practice of bagging tomato fruits.

3. *Individual Variation*: In the culture of tomatoes, as of other garden crops, conclusions as to best methods are too often drawn from the results of a single season's work There is little doubt that many of the conclusions thus reached are often misleading, for it is believed that the individual variation of the plants of any given variety is often such as to obscure any effects of different methods of treatment.

As bearing upon this question, duplicate lots of one dozen of each of several varieties were selected at the time of the first transplanting, and were given the same treatment at all times, being handled alike in the house and set in parallel rows in the field.

The comparative results are seen in table IV.

TABLE IV—INDIVIDUAL VARIATION.

VARIETY.	Av. No. ripe fruits per plant.	Av. weight of fruits per plant—pounds.	Av. wt. of individual fruits—ounces.	Date of first ripe fruit.
Golden Queen	11	3.96	5.6	Aug. 8
	20	6.00	4.9	" 4
Ignotum	13	5.87	7.0	Aug. 1
	12	5.23	7.2	" 1
Perfection	24	8.90	5.8	Aug. 4
	17	5.70	5.5	" 1
Prelude	27	3.36	2.0	July 25
	41	4.82	1.9	" 29

In no case were the results obtained from the duplicate lots uniform. The variation in weight of individual fruits, and in the time of ripening, varied but slightly; but the number and weight of the product was very marked.

Conclusion: Positive conclusions should never be drawn from the results of a single season's work.

4. *Color*: As noted in last year's report, many attempts have been made to improve upon the color of the fruit of the tomato. The cross between Golden Queen and Ignotum, grown in the college gardens last year, gave no indication of any influence of the yellow parent; but the second generation was decidedly variable, about half of the plants bearing red fruits and the others yellow, with no indication of the desired blush form.

A selected strain of Golden Queen having a tendency to produce fruit with a blush cheek, is as yet only imperfectly fixed; but as grown in the house, this tendency is very nicely brought out and the fruits are very attractive.

A new variety to be introduced in 1893 by J. M. Thorburn & Co., of New York, as "Lemon Blush," is said to be a firmly fixed variety of the type sought. This variety originated with Mr. E. S. Carman, editor of the Rural New Yorker.

5. *Crossing*: Tomato growing in the high latitudes is often unsatisfactory for the reason that but a very small proportion of the fruit will mature before the plants are killed by frost. It is thereupon important that some variety be secured which shall perhaps combine the size and quality of the better market sorts now extant with the earliness and prolificness of some of the smaller

sorts valuable only for preserves or catsup. With this end in view numerous crosses have been made, and the results obtained are interesting and promising.

During the winter of 1891-2 crosses were made between Ignotum, one of the most valuable market varieties, and the Peach, a very productive variety of excellent quality but small and soft.* Several plants resulting from this cross were grown in the field during the past summer, and were highly satisfactory. The fruit was in general not very different from the Ignotum, though averaging smaller; but the increase in productiveness was very marked. Whereas the average number of ripe fruits per plant on the pure Ignotum plants was but 18, that on the crossed plants was 40. The average weight of individual fruits, however, was but 3.3 oz. as compared with 7.5 oz. in case of the Ignotum.

In another instance two flowers on one cluster of the Lorillard were artificially pollinated—the one with Peach, the other with Lorillard pollen. The products of these crosses were given the same treatment throughout the season and were planted side by side in the field. The plants were essentially Lorillard in appearance, and the fruits as a rule were of this type, but some of the fruits showed distinctly the effects of the staminate parent.

The following figures represent very well the comparative yield of the two lots:

	Av. No. ripe fruits per plant.	Av. weight of fruit per plant—pounds.	Av. wt. of individual fruits—ounces.	First ripe fruit.
Lorillard × Peach	40	8.1	3.2	Aug. 12
Lorillard × Lorillard	13	4.1	5.0	" 23

The figures are significant. As will be observed, the individual fruits of the cross with Peach are somewhat smaller than those of the pure Lorillard—being about intermediate between the usual sizes of the two parents—but the number of fruits is trebled, while the average weight per plant is doubled. The date of ripening also is hastened by more than a week The fruit showed little tendency toward the peculiar roughness of the male parent. All things considered this cross is very promising.

*For description of these varieties see Rep. Maine Exp. Sta. 1891, pp. 91 and 92.

FIG. 1. *Lorillard* × *Currant*.

1. Currant. 2. Hybrid. 3. Lorillard.

Besides the crosses already named, a true hybrid was secured between the Lorillard and the Currant. The Lorillard is a well-known variety of medium size and of only moderate productiveness, belonging to the common type of *Lycopersicum esculentum*, while the Currant belongs to a distinct species—*Lycopersicum pimpinellifolium*. The Currant tomato is of weak spreading habit, with small, thin foliage and very delicate flowers, arranged in two ranks on a long raceme. These flowers, from ten to twenty in number, are highly self-fertile and the fruit very closely resembles long clusters of cherry currants. The difference in the appearance of the leaves of the two varieties is very well shown in Fig. 1, Nos. 1 and 3. The difference in the flowers is equally marked, those of the Lorillard being somewhat conical, with the calyx lobes much longer than the petals; while those of the Currant are slender and the calyx lobes are so small the petals and stigma often protrude.

The resulting hybrids were intermediate between the parents in nearly every particular. The character of the foliage is well shown in Fig. 1, No. 2. The fruit, which from a practical point of view is most important, presented a very attractive appearance. Much of the productiveness of the Currant is shown, while the influence of the size of the Lorillard is also exhibited. The size and character of the fruit may be seen from Fig. 2. No. 1 represents the male parent—Currant; No. 3, the female—Lorillard; while No. 2 is the hybrid, all being about one-half size. The detached fruit shows the natural size of the hybrid with the Lorillard, to increase the size of the fruit, at the same time retaining if possible the prolific tendencies of the plant. To this end crosses have been made of the hybrid on the Lorillard and of the Lorillard on the hybrid and the results are awaited with interest.

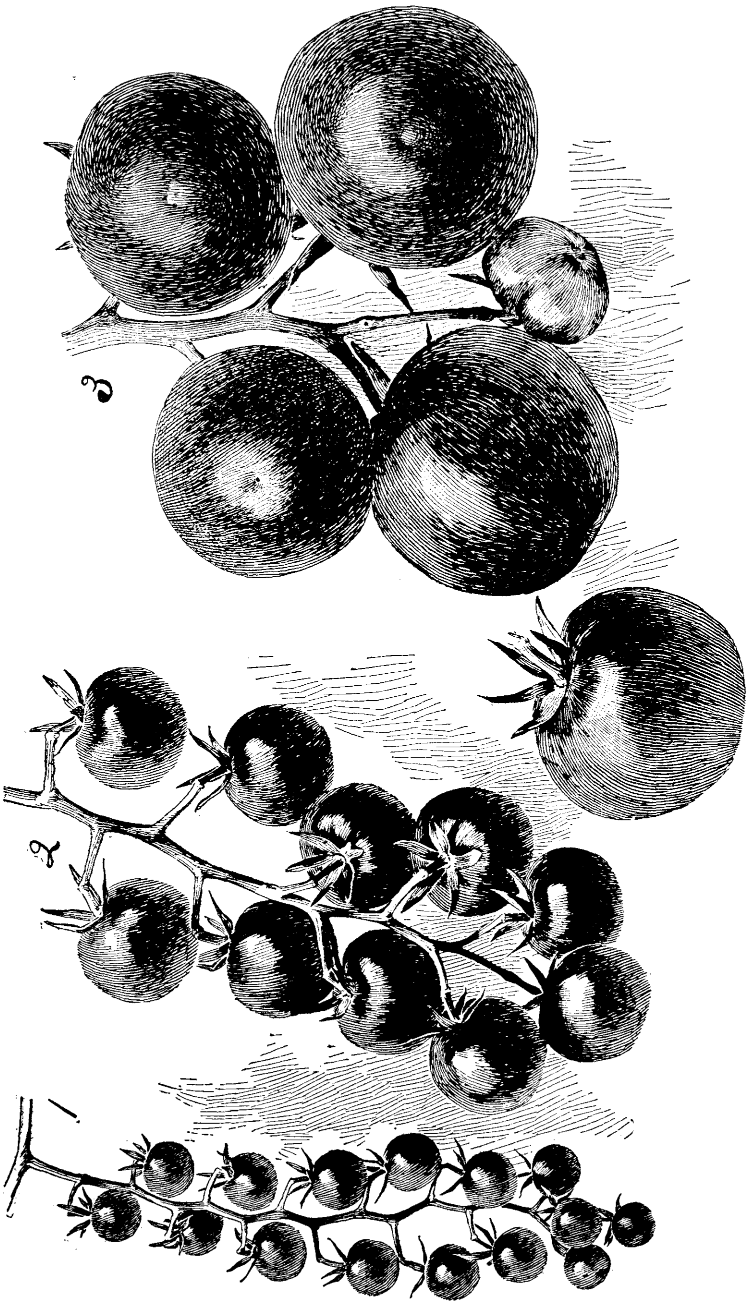


FIG. 2. *Lorillard* × *Currant.*

1. Currant. 2. Hybrid. 3. Lorillard.

6. *Secondary Effects of Pollen:* This matter was discussed in Part II of the annual report of this experiment station for the present year; but as that report was of a technical nature and not printed for general distribution, some of the notes there given referring to the tomato may be repeated in this connection. From our studies of the subject of plant breeding, we have found that the amount of pollen falling on the stigma of the tomato flower may have an important bearing in determining the form and size of the resulting fruit. In the winter of 1890-1, while crossing tomatoes, two stigmas in the same cluster of flowers were given different amounts of pollen. The first was given a very small amount, while the other was given an excess. The resulting fruit from the first flower was small and deformed, while the other was of normal size and nearly symmetrical in form. The larger fruit produced an abundance of seeds and all of the cells were well developed; the smaller developed seeds on one side only, while the other side was nearly solid. This difference is very well shown in figures 3 and 4.

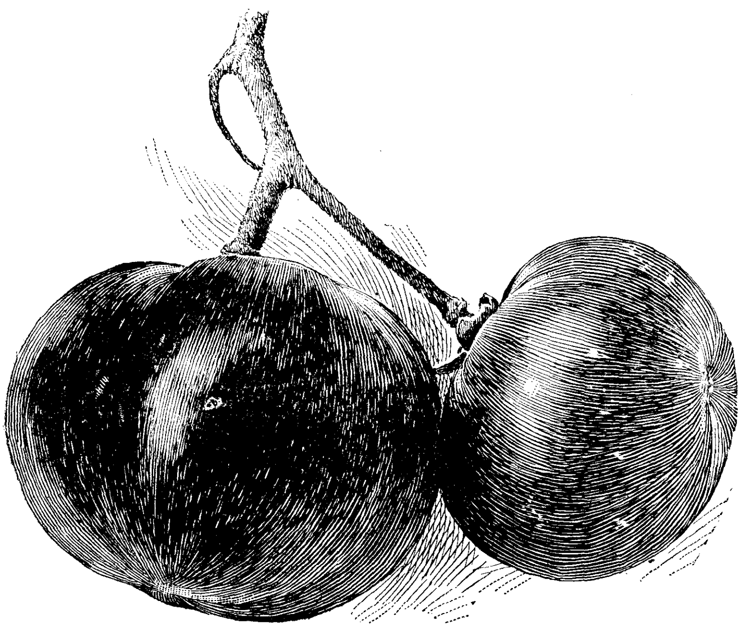


FIG. 3. *Different Amounts of Pollen.*

It is certain that the secondary action of pollen in stimulating the growth of the fruit is very important, and the question naturally arises as to what influence would be manifested on the offspring. Seeds from several of the fruits under study were sown in the house, but owing to an accident the test as to per cent and rapidity of germination was abandoned. Several plants of each lot were grown, however, and were treated precisely alike during the season, with the results shown in the accompanying table.

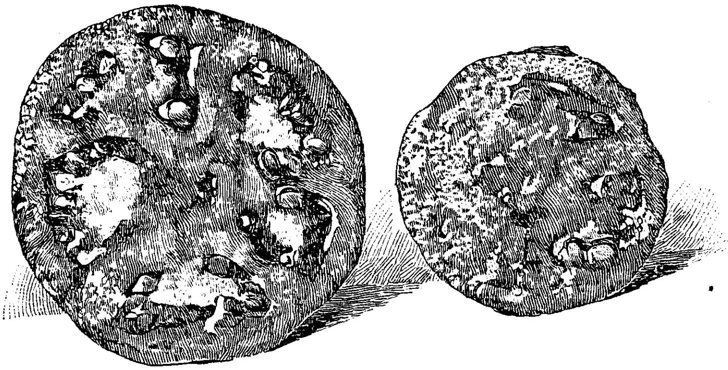


FIG. 4. *Different Amounts of Pollen.*

Each cluster of fruits is designated by a letter and the individval fruits by the word "maximum" or "minimum" according as an excess or a very small amount of pollen was employed.

TABLE V—SECONDARY INFLUENCE OF POLLEN.

		No. of plants.	Av. No. of fruits per plant.	Av. wt. of fruit per plant—pounds.	Av. wt. of individual fruits—ounces.	Date of first ripe fruit.	No. fruits ripe before Sept. 15.
A	Max	3	69	17.7	4.11	Aug. 9	23
	Min	3	68	17.3	4.09	" 8	25
B	Max	4	50	10.7	3.43	Sept. 1	21
	Min	2	27	4.6	2.74	" 5	3
C	Max	6	58	13.3	3.70	Aug. 6	38
	Min	3	70	15.3	3.49	" 12	15
E	Max	6	82	21.1	4.62	Aug. 17	20
	Min	4	74	20.0	4.32	" 18	22

As a rule, the offspring from the fruits receiving an excess of pollen were slightly the more productive and without exception the average weight of the individual fruits from these plants was greater. In general, however, the difference was but slight.

Further study on this point may throw some light on the question of the importance of the individual characteristics of a fruit.

in the selection of seed. We have already observed* that the character of the individual fruit is of less importance than that of the parent plant as a whole, but it also seems that the small size of the fruit, which we now believe specifically due to imperfect pollination, may be co-incident with lack of vigor, and that this lack of vigor will be apparent in the offspring to a greater or less extent.

8. *Varieties:* Among the varieties grown the past season were most of the older standard sorts and some of the more recent introductions. The accompanying table will give a comprehensive view of the comparative merits of these varieties as regards size, productiveness and earliness.

TABLE VII—COMPARISON OF VARIETIES.

VARIETIES.	No. of plants.	No. of fruits.	Average number fruits per plant.	Weight of fruit per plant—pounds.	Av. weight of individual fruits—oz.	Date of first ripe fruit.	No. of fruits ripened before Sept. 15.
Americus Hybrid	11	131	11.9	4.74	6.4	Aug. 1...	40
Atlantic	12	194	16.2	4.20	4.2	July 29..	70
Chemin Market	12	169	14.1	3.96	4.5	Aug. 1..	59
Cleveland	11	158	14.4	6.00	6.7	" 11..	39
Early Richmond	12	201	16.7	5.65	5.0	" 3..	89
Early Ruby	12	200	16.7	5.13	4.9	July 26..	81
Essex Hybrid	11	117	10.6	3.92	5.9	Aug. 2...	35
Faultless	12	310	25.8	7.21	4.5	" 1...	93
Favorite	12	135	11.2	4.46	6.4	" 8...	39
Golden Queen	11	124	11.3	3.96	5.6	" 8...	38
Ignotum	12	161	13.4	5.87	7.0	" 1...	61
Ithaca	10	202	20.2	5.34	4.2	July 29..	82
Long Keeper	12	241	20.1	6.93	5.5	Aug. 11..	34
Lorillard	12	249	20.7	7.57	5.8	" 3..	69
Livingston's Beauty	12	164	13.7	4.95	5.8	" 9..	45
Mikado	11	170	15.5	8.00	8.3	July 25..	42
Mitchell	11	203	18.5	6.11	5.3	Aug. 3..	50
New Jersey	12	168	14.0	6.48	7.4	" 12..	31
Optimus	12	299	24.9	7.89	5.1	" 1..	98
Paragon	12	141	11.7	4.74	6.5	" 9..	38
Perfection	10	140	14.0	5.00	5.7	" 2..	41
Ponderosa	11	67	6.1	4.19	11.0	" 11..	14
Potomac	12	207	17.2	2.55	7.0	" 4..	47
Potato Leaf	11	222	20.2	7.40	5.9	" 2..	48
Prelude	12	327	27.2	3.36	2.0	July 25..	129
Red Cross	12	209	17.4	6.00	5.5	Aug. 2...	46
Stone	11	111	10.1	3.90	6.2	" 8...	25
Table Queen	12	173	14.4	6.40	7.1	" 2...	51
The Hovey	9	153	17.0	6.20	5.8	" 5..	45
Volunteer	12	226	18.8	6.73	5.7	" 5...	73
Yellow Victor	12	328	27.3	7.27	4.3	" 1...	136

*Bulletin 21, Cornell University Experiment Station, page 75.

The most productive varieties, in point of numbers, were Yellow Victor and Prelude, with an average of 27 ripe fruits per plant, before frost. Following these were Faultless with 26, and Optimus with 25; while Lorillard, Potato Leaf, Ithaca and Long Keeper ripened about 20 fruits each. Some of the larger fruited sorts produced a greater weight of fruit, but there were not as many individuals, and as a rule, medium-sized varieties are more to be desired. Prelude is very small and Optimus, with its average of 25 fruits, is far superior to it.

The date of the first ripe fruit is not an exact criterion of earliness of the crop, but in average seasons frost may be expected any time after Sept. 15, and the number of fruits ripe at that date is a safe guard, other things being equal, in selecting an early variety. The five varieties ripening the greatest number of fruits at this time were respectively, Yellow Victor, Prelude, Optimus, Faultless and Early Richmond. As will be seen, Optimus again stands third in the list and it is by far the best of the five varieties named. Of the other most productive and valuable sorts, Ithaca matured the most fruit before the date above mentioned, while Early Ruby and Volunteer came next in order.

The following field notes concerning the most important varieties were made:

Atlantic. (*Atlantic Prize*, Thorburn)—Of medium size, red, irregular, better than in 1891, but not of sufficient merit to retain.

Beauty. (*Livingston's Beauty*, Livingston).—Still a favorite pink tomato. Smooth and handsome, but not quite as productive as in former years.

Chemin. (Cornell University). Larger than in 1891 and very productive, but too late for field culture. It is one of the most profitable varieties we have under glass.

Cleveland. (*President Cleveland*, Farquhar.)—Large, smooth, red, resembling Perfection, with which it compares very favorably this year. Better than in 1891.

Faultless. (Farquhar).—Although one of the most productive varieties grown, the fruit is too irregular to be of value.

Ignotum. (Cornell University).—One of the best, but not quite so productive this year as some others.

Ithaca. (College Garden, 1891).—One of the most promising purple varieties in our collection. Is worthy the attention of seedsmen.

Long Keeper. (Thorburn).—The good impression formed last year is confirmed. It is one of the best purple tomatoes, though not quite as early as Beauty.

Mitchell. (Gregory).—Large, smooth, red; much flattened and stem set in deep basin. Ripens evenly and is productive. Much better than last season.

Optimus. (Thorburn).—Of medium size, smooth, red; productive. All things considered the most satisfactory variety in our collection this year.

Perfection. (Livingston).—Sustains its reputation as one of the best red tomatoes.

Ponderosa. (Henderson). Very large, irregular, light purple, resembling Mikado except in foliage. Quality mild and good, but not productive. Rarely more than two or three fruits in a cluster.

Potomac. (Harris).—Large, pink, considerably flattened but not irregular. Not superior to other sorts of this class.

Potato Leaf. (Livingston.)—Of medium size, smooth, pink. Plant vigorous and productive. Good.

Red Cross. (Farquhar).—Of medium size, smooth, red. Ripens evenly with little tendency to crack; but like the preceding, rather late.

Richmond. (*Early Richmond*, Landreth).—Large, red, very irregular. Not valuable.

Ruby. (Henderson).—Of medium size, red, angular. Early, but otherwise not valuable.

Stone. (Livingston).—Large, smooth, scarlet, solid. Productive, but late.

Volunteer. (Cornell University).—Of medium size, smooth, red. Plant vigorous and productive. Good.

Yellow Victor. (Gregory).—Of medium size, much flattened, inclined to be irregular. Resembles the old Large Yellow, though somewhat smoother. Of no special value.

The varieties which gave best satisfaction during the past season were: Optimus, Lorillard, Long Keeper, Ignotum, Ithaca, Perfection, Potato Leaf. Stone and Chemin Market are too late for profit. Ponderosa, though exceedingly large and of good quality, is too irregular and too uncertain to rank high.

Ithaca, which has never been introduced to the trade is a valuable sort worthy of dissemination.

Early Ruby and Atlantic Prize, while early, are not enough superior to other varieties in this respect to overcome the objections as to irregular form.

Summary.

1. The average productiveness of tomato plants, both as regards number of fruits and weight of product, appears to be in direct proportion with the earliness of setting in the field.

2. Little or no benefit seems to be derived from the practice of bagging fruit.

3. Individual variation is such as to render conclusions drawn from a single season's work very unreliable.

4. Crossing between small fruited plants of very prolific habit and the larger fruited sorts, is a promising method of securing valuable varieties, which shall be sufficiently early for the best results.

5. Plants grown from seeds of small fruits—those receiving little pollen—were slightly inferior to those grown from large fruits from the same parent plant.

6. The best variety grown during the season, all things considered, was the Optimus.

7. Among the best varieties for general use are: *Red*, Optimus, Perfection, Ignotum, Lorillard; *Pink*, Potato Leaf, Beauty, Long Keeper; *Yellow*, Golden Queen.

8. Of the newer varieties, Cleveland, Long Keeper, Mitchell and Stone are desirable; while Richmond and Yellow Victor do not appear to be of special value.

III. Notes of Egg Plants.

The egg plant is one of the important vegetables which has as yet received little attention in this State, and the poor withered specimens sent in from other states give consumers little idea of the delicious character of this plant when fresh and well served. No doubt also, the fact that it is not common, and that cooks are not accustomed to serving it, may account to a large extent for its neglect.

The egg plant is a native of tropical America, and reaches perfection only in a warm climate and near the coast. By careful treatment, however, and by a process of acclimatization, it may be successfully grown far inland and much farther north than commonly attempted, as the successful plantings in the college gardens for the past two years abundantly prove.

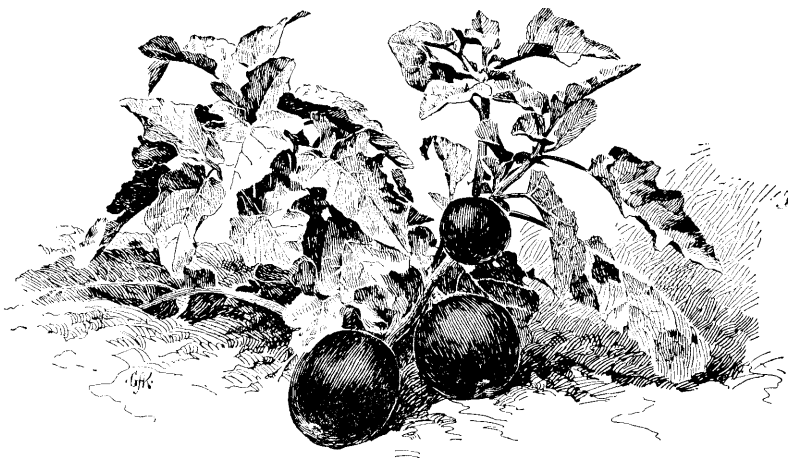


Fig. 3. *Black Pekin.*

The following notes embrace the more important results of our experiences with this plant during the past four years:

1. *Culture:* As a long season is required for the egg plant to mature, it is highly important that the plants be started early. It is our practice to sow the seeds in "flats"—shallow boxes about three inches deep—in a warm forcing house about the middle of March or the first of April. After about a month, or when the first true leaves are nicely started, the young plants are pricked off into other boxes, two inches apart each way, or, better, into 2-inch pots. About three weeks later, when the pots are well

filled with roots, or when the plants begin to crowd, the latter should be shifted to four-inch pots. We have almost invariably had better success when the plants were handled in pots than when they were transplanted into other flats, the check caused by frequent disturbance of the roots appearing to be detrimental to most sorts. An exception is noted, however, in case of the Early Dwarf Purple which seems able to withstand very harsh treatment.

It is important that the plants be kept growing vigorously from the start, as they seldom fully recover from a check, and in order that fruit mature the plants must be strong and vigorous when planted in the field.

The plants may be set in the field, in this latitude, about June 10th to 15th. We usually set them in rows about three feet apart that they may be cultivated by horse power. The soil should be a rich sandy loam containing an abundance of organic matter. Heavy dressings of stable manure are advisable. Frequent and thorough cultivation are absolutely essential to success.

Perhaps the worst insect enemy of the egg plant is the potato beetle. The tender foliage of the young plants is specially subject to attack, and as the growth is so slow, severe injury nearly always proves fatal. Paris Green, one pound to one hundred gallons of water (about one-half teaspoonful to a large pailful of water), applied about once a week, will be found useful.

2. *Methods of Serving:* No doubt the fact that cooks are not familiar with methods of serving the fruit of the egg plant accounts to a large extent for the failure to use it more. The following recipes for cooking the fruits are given in Bulletin 26 of the Cornell University Experiment Station, and have been found satisfactory:

"1. *Fried.* Cut in slices cross-wise not over a half-inch thick and parboil about fifteen minutes; then remove and fry in a hot spider in butter and lard.

"2. *Fried.* Cut into slices 1-4 to 1-2 inch thick and lay in strong brine for two hours; then wash *very* thoroughly; sprinkle with brown sugar, pepper and salt and fry slowly to a dark brown.

"3. *Baked.* Cut in two length-wise, remove the seeds and pulp and fill with dressing made of half teacupful bread crumbs, one teaspoonful butter, and salt and pepper to taste; lay the halves side to side in dripping pan, add a little water and bake nearly an hour.

"4. *Fritters.* Pare, cut in slices cross-wise and soak in salt water for eight or ten hours; dry on a towel, dip in beaten egg and roll in bread crumbs, then fry slowly in hot butter until the pieces become rich brown; serve hot."

3. *Varieties:* For several seasons we have grown such varieties as we could obtain from all sources. The number of varieties is comparatively limited, but there are several distinct types of varying importance. These types vary in regard to color, size, form, habit of plant and season of maturity. Some from their earliness and productiveness but small size, are valuable only for home use. Others by virtue of their large size and attractive appearance are popular in the markets, but as a rule they are not sufficiently early and productive for the short seasons of this latitude.

The following varieties have been grown in the college garden during the past two seasons and the illustrations are from photographs of plants grown here.*

Black Pekin.. (Thorburn).—Plant large and vigorous; stems, petioles and veins always deep purple; leaves large, more or less distinctly lobed, purple with metalic lustre above. Fruit large, 5 to 7 inches in diameter,—often larger—spherical or oblate, very dark purple. Entirely distinct from every other variety, rather late but it fruited well the past season. A popular market variety. —See fig. 3.

Fig. 4. *New York Improved.*

New York Improved. (Thorburn, Gregory).—Plants large and vigorous, erect; stems, petioles and veins dark green or purplish on upper surface; leaves very large, lobed, downy, with large

* Cuts for figures 6, 8, 9 and 10 were loaned us by the Cornell University Experiment Station

spines on the mid-rib. Fruit large to very large, oblong, dark purple. The most common market variety, but too late for this latitude. See fig. 4.

Round Purple. (Thorburn, Landreth).—Plant of medium size but vigorous and fairly productive. Fruit small to medium in size, spherical or oblong, pale violet. Its color renders it undesirable.

Fig. 5. *Long Purple.*

Early Long Purple. (Thorburn, Gregory).—Plant of medium size, dark green or slightly purplish; leaves medium in size, slightly lobed. Fruit long, club shaped, dark purple, of excellent quality, one of the very best for general culture. See fig. 5.

Early Dwarf Purple. (Gregory).—Plant low, weak, spreading, spineless; stems and petioles dark purple, slightly downy, leaves small, dark green with purplish tinge. Fruit small—three to six inches long—pyriform, dark purple. The earliest and most productive variety grown; hence perhaps the most valuable for home use. It is too small, however, for a market sort. We have found this sort better able to overcome the effects of neglect than any other variety grown, and plants started in a hot bed as late as the first of May have given excel'ent results. Fig. 6.

FIG. 6. *Early Dwarf Purple.*

Long White. (Thorburn).—Plant of medium size, erect light green, downy; leaves of medium size with undulate margins. Fruit long, frequently curved, abruptly rounded at the apex; pure white, becoming yellowish at maturity. A good variety—See fig. 7.

Round White. (Thorburn).—Plant small, upright bright green; stems, and petioles smooth and shining under a slight covering of down. Fruit small—rarely four inches long—egg shaped, white and like the preceding yellowish, at maturity, very prolific and early, but hard and tough rendering it scarcely edible. Valuable only as an ornament. See fig. 8.

Striped on Guadeloup. (Thorburn) —Plant vigorous, erect, resembling that of Long White. Fruit oblong,—three to five inches long—white with purple longtudinal stripes. Exceedingly prolific, but valuable only for ornament.

4. *Experiences in Crossing:* Our studies of this subject began in 1889, when several crosses were made with the specific purpose of producing new types combining the most valuable features of existing varieties. Some of the earlier results were published in a bulletin from the Cornell University, in 1891;* but it will be necessary to repeat some of the statements there made in the present connection.

In 1889 three distinct series of crosses were made. The first of them, which we called *Series A*, was the Round White crossed by pollen from Black Pekin (see figures 8 and 3). These varieties represent two widely different types, and it was hoped we could combine the earliness and productiveness of the former with the beauty of form and color and the excellent quality of the latter.

FIG. 7. *Long White.*

In the second cross, which we called *Series B*, Giant Round Purple was crossed with pollen from White Chinese. The first of these—figure 9, differs little from New York Purple except in size of fruit which is very large. White Chinese differs little in habit from Long White described on page 41, but the fruits are slightly larger and usually curved, (see figure 10). It is a very handsome variety. These two sorts have not been grown in Maine.

In the third cross, *Series C*, Long White was crossed with Black Pekin. Long White in this case differed from the sort described under that name on page 41, in that the fruit was shorter, being somewhat ovoid in form, while the color was greenish white.

*Bailey & Munson, Bul. 26, Cornell Univ. Exp. Sta., March, 1891.

The seeds resulting from all of the above crosses were sown in 1890, and the plants were given conditions as nearly uniform as possible. The plants proved quite variable, and crosses and selections were made in the hope of fixing the more valuable types. Seeds of some of the best of these were brought by the writer to Maine, and were planted in 1891.

Following, is a somewhat general account of the results obtained with each series:

FIG. 8. *Round White.*

SERIES A.

Round White × *Black Pekin.*—One fruit, the result of the first cross, gave in 1890 a series of plants intermediate in general character, between the parents. The young shoots were much like the pistillate parent,—Round White—but as they became older, the upper surface of the stems, the petioles and the veins of the leaves became of the purplish color of the male parent. In form and size, most of the fruits varied in the direction of the pistillate parent. Some were larger, however, and frequently the same plant would bear mature fruits two inches and others five inches in diameter. In color, the fruits were purple while young—usually dark purple with lighter apex. Occasionally this color was retained till time of edible maturity, but as a rule, the dark purple became of a dull greenish cast, while the apex became metallic gray with streaks of grayish purple extending towards the base.

From this first generation, several crosses and selections were made for further study. These were as follows:

A 1. Given pollen from another flower of same plant.
A 2. Given pollen from Round White (female parent).
A 3. Given pollen from Black Pekin (male parent).
A 4. Same as A 3.
A 5. Same as A 1.
A 6. Same as A 1.
A 7. Same as A 2.
A 8. Selection, parentage uncertain.

Of the above selections the fruit was uniformly of the color before described, but varied considerably in size. The general characteristics of the plants were as follows:

A 1. Of the general habit of Round White,—the pistillate parent—but the upper surface of stems, petioles and veins was purple, showing influence of the male parent. Of the four fruits borne, two were the size of a hen's egg, and two much larger—6 inches long.

A 2. Similar to the first, but the purplish tinge less marked.

A 3. Plant strong and vigorous, with upper surface of stems and leaves dark purple.

A 4. Plant vigorous, leaves much larger than with the first three, many of them being considerably lobed, and all of the pronounced purplish cast of Black Pekin. The fruits, however, were shaped like Round White.

A 5. Plant of medium size, bright green. Two fruits of medium size—about six inches long—mostly of two shades of purple, with upper surface dark green. Very mature fruit has yellowish cast of Round White.

A 6. Very similar to A 5.

A 7. Plant of the general type of the series. Fruits of three distinct forms, one like Round White, a second four inches in diameter and like Black Pekin, the third spherical and very small.

As an example of variability induced by crossing, this series is one of great interest. There were no immediate effects of pollen, but we find in the first generation marked indications of the influence of both parents — the habit of the plant and the size of the fruit resembling the female, while the color of the male is apparent.

None of the products of this series promised to be of any commercial value, however, and they were not considered by the writer after leaving Cornell. All of the seeds from each of the individuals treated as indicated on page 45 were sown by Professor Bailey, in 1891, and his comments on the behavior of the resulting plants, as published in a recent bulletin,* are here given:

FIG. 9. *Giant Purple.*

"It is interesting to note the influence of Black Pekin in A 3 and A 4, into which this variety has twice entered as a staminate parent. All the plants, 203 in number, were purple in foliage and like Black Pekin in habit; and the most of the fruits were solid purple, although a few striped fruits still showed the influence of the Round White two generations back. The ones into which the Round White entered twice — A 2 and A 7 — do not show so strongly the marks of the double infusion of blood. In A. 2,

*Bulletin 49, Cornell University Experiment Station, Dec., 1892.

there are a few more plants with green, than with purple herbage, and the green ones were more productive than the others; these are marks of the Round White, and it may also be said that even the purple plants were of a light cast, and that nearly all showed the influence of the dwarf habit of Round White. A. 7 the other Round White Cross, produced a lot of small plants, but they were unproductive and much over half of them had purple herbage."

A 1, A 5 and A 6, pollinated from another flower of the same plant were exceedingly variable. "In fact A 1 was probably the most hopelessly mixed of any in the entire list. The fruits ranged from pure white to green with white stripes, purple striped, light solid purple, and very dark purple; and the mature fruits varied from the size of an egg to that of Black Pekin. About equal numbers of the 175 plants were green and purple. A 5 was nearly as badly mixed, and some plants appeared which had the peculiar spreading habit of Early Dwarf Purple, a variety which had never entered any of the crosses. A 6 showed wide variations also. A 8, which was simply a selection and had not been artificially pollinated, was about as variable as the rest."

It will thus be seen by comparing the characteristics of the plants of the two generations that crossing with either parent served merely to intensify tendencies already existing, and that the use of pollen from another flower of the same plant was apparently ineffectual in serving to "fix" any type.

Series B.

Giant Round Purple × *White Chinese*.—This cross resulted in some of the most promising types I have ever grown. The plants, as in series A, were as a rule intermediate in habit and character between the parents. The sturdy, vigorous habit of Giant Purple, the female parent, was exhibited, but the leaves were smaller and less distinctly lobed than in that variety.

In form, the fruits, as a rule, resemble the male parent, White Chinese, but they were of great diameter. The color at edible maturity was rich dark purple with lighter apex. When left for seeds to ripen, the dark purple body of the fruit became of a dull greenish hue, while the lighter apex became gray, then yellowish like the male parent.

As in the first series, a number of individuals were again crossed with the original parents and some of the more promising types were selected without artificial pollination. All of these crosses and selections were grown by Professor Bailey at Cornell University,* and some of those appearing most valuable were brought by the writer to Maine.

FIG. 10. *White Chinese.*

The parentage of those grown at this station was as follows:

B 1. Crossed by Giant Purple (female parent).

B 2. Pollinated by another flower from same plant.

B 3. Crossed by Giant Purple.

B 5. Crossed by Giant Purple; as in B 1 and B 3.

B 7. Selection, not artificially pollinated.

In every instance these parent fruits were of the general form and color above described. The offspring, however, were exceedingly variable. The plants were of the intermediate type, charac-

*See Bulletin 49 Cornell Univ. Exp. Sta., Dec., 1892.

terizing those of the first generation, but in the fruits wide differences were noted. B 1 into which Giant Purple has twice entered — first as pistillate, then as staminate parent — still showed the effect of White Chinese in two out of the eight plants grown. As a rule the fruits were dark purple and of greater diameter than the immediate parent, but one fruit while of the form of Giant Purple had the light apex and streaks of the immediate parent, while another was very light purple with green apex and stripes even when very immature.

B 2, which contained no fresh admixture of either parent showed a marked tendency to revert to the light form. With three exceptions the fruits were much lighter colored than the parent. Two plants bore fruits of a dark green ground color with apex nearly white and dotted and splashed with purple; while another bore very light green fruit with splashes of purple fading to a yellowish green at maturity.

B 3 showed very plainly the double influence of Giant Purple. In no case was the immediate parent perpetuated The plants were exceedingly vigorous; leaves large, considerably lobed. Fruit ovate — about 6 inches long and 4 inches in diameter — very dark purple, almost black Two plants bore fruit with lighter apex, but the very light forms seen in B 1 were not present.

B 5 very closely resembled B 3 in form and color but with greater tendency to light apex. The fruits were very handsome — often 9 inches long and 4 inches in diameter. B 7 was exceedingly variable both in form and color — the latter ranging from very dark purple through all gradations to light green with white apex and no trace of purple.

Selections from all of the above types were again made, but most of the fruits failed to ripen and were lost. Those saved were grown the past season and gave the following results; B 1 (a) — a selection from B 1, bearing purple fruits shaped like Giant Purple — retained the form of its immediate parent but was exceedingly variable as to color, many of the fruits being dull green with white apex and stripes, others irregularly splashed and mottled with purple. B 5 (a) also showed a marked tendency to revert to the white form. The parent was in no case perpetuated and no valuable form appeared. B 7 (a) — selected from the light type of B 7 in 1891 — in no case gave a suggestion of the purple color of the Giant Purple. The form was oblong-pyriform, about 3 1-2 by 6 inches. Aside from the very small sorts this selection was the most prolific sort grown, but its color would condemn it as a market sort. A specimen of this type is shown as No. 7 in the frontis-piece.

SERIES C.

Long White × *Black Pekin.*—In 1890, the first generation, the effect of the staminate parent was very marked in giving color to the foliage, much more so than was the case in series A in which the male parent was also Black Pekin. The plants were uniformly tinged with purple, and in some instances the color was nearly as dark as in the male parent. The fruit was of intermediate color with the purple predominating, but in form was quite variable. Some individuals resembled the staminate parent, others the pistil-late, and others were entirely distinct.

This was the least promising of the series and though four fruits were again crossed or selected, but one, C 4, was brought by the writer to Maine. Of the others, grown at the Cornell Experiment Station in 1891, Professor Bailey reports: "In these lots the fruit pollinated from the same plant, C 1, gave a variable and very unproductive offspring. C 3, into which Black Pekin has gone twice gave only purple fruits."*

C 4 was not artificially pollinated, but was selected because of its excellent form, being almost cylindrical with very abruptly rounded ends. Seeds were sown in 1891 and of the resulting plants only two showed a tendency to perpetuate the type of C 4, and these failed to mature fruit. There was a variation in the direction of both of the original parents, but in general the plants were of the type of the previous generation.

Selections were again made, and in 1892, there was almost complete reversion to the original male parent in the habit and color of the plants. They were hardly distinguishable from the plants of Black Pekin in adjacent rows. The form of the fruit, however, was still quite variable.

Conclusions as to Effects of Crossing: As a result of four years of breeding, we have as yet obtained no type sufficiently constant in color to be of commercial value. We have found, however, a marked increase in vigor and productiveness as a result of crossing.

* Bulletin 49 Cornell Univ. Exp. Sta., Dec., 1892, p. 344.

In the first generation the purple-fruited types seem stronger in their power to transmit color to the offspring than do the white-fruited types; and this law appears to hold whether the purple type is used as the male or as the female parent. In later generations the inherent strength of the white-fruited types appears more strongly than in the first; for in the third generation, after the purple type had twice entered the cross, the effect of the original white parent in imparting color to the fruits was more marked than in the first generation.

In all cases the white-fruited types appear stronger in the power to transmit form and productiveness.

SUMMARY.

1. With careful treatment the egg plant may be successfully grown in Maine. The most important requisites of success are: Early sowing; vigorous plants; late transplanting to the field; warm, rich soil; thorough cultivation; constant watchfulness for the potato beetle.

2. The best varieties for this latitude are Early Dwarf Purple, Early Long Purple, Long White, and possibly Black Pekin. Other large varieties are too late.

3. The chief advantage derived from the crossing of the different races of egg fruits appears to be in the increased vigor and productiveness of the offspring. No valuable market sorts have as yet been developed.

FRUIT TESTS.

The winter of 1891-2, was very mild and little injury was done in the fruit plantations. All varieties made a good growth during the season, and as far as practicable the vacancies in the orchard, caused by the previous severe winter, were filled. Several additional varieties of pears, also of cherries were obtained, and a plum orchard has been established. The small fruit plantation has also been largely increased in extent.

The fruit plantations are now systematized, and maps and well defined forms for records have been constructed, thus rendering the plantations more valuable, for purposes of study and avoiding danger of confusion.

The additions to the experimental orchards and small fruit gardens the past season consist of the following:

Apples 5 varieties; pears 8 varieties; plums 13 varieties; blackberries 2; currants 3; dewberries 1; gooseberries 2; raspberries 11; strawberries 14.

With the exception of a few varieties of raspberries and blackberries, there is as yet no basis for a comparison of the merits of different varieties for this region. As soon as the various sorts come into bearing, more detailed reports may be made for the benefit of planters.

The work of securing valuable sorts that will stand the trying climate of the northern part of the State is being continued on an extended scale. During the past season cions of the following varieties have been sent to Perham, Aroostook Co.: Arthur, Borst, Duchess Seedlings number 4 and number 8, North Star, Patten's Greening from C. G. Patten, Charles City, Iowa; Daisy, Gideon number 6, Malinda, McMahon, Okobena, Ostrakoff, Patten's Greening and Utter from J. S. Harris, LaCresent, Minnesota; Hibernal, Korsk Annis, Red Queen, Repka from Wm. Somerville Viola, Minnesota; Palouse from Geo. Reudy Colfax, Wash.; Rolfe, Maine State College.

Besides the above named cions, two year old trees of the following varieties were kindly donated by the Jewell Nursery Co. of Lake City, Minn. Thompson's seedlings numbers 24, 26, 29, and 43. As was the case last season part of these cions were set in bearing trees and part in seedling stock raised from Duchess seed.

The season was a favorable one for young stock, and all varieties made a vigorous healthy growth. None of them were taken up in the fall, and as the present winter is a very severe one with little snow, the test as to hardiness will be a crucial one.

The following varieties of Russian plums, purchased from the Iowa Agricultural College in 1891, were also placed on trial the present season: Bessarabian, Early Red, Hungarian Prune, Moldavka, Orel Sweet, Varonesch Yellow, White Nicholas, Nos. 19, 20 and 23 Orel; besides these one tree each of Cheney, Wolf and Wyant from the same source and Rollingstone from O. M. Lord, Minnesota City, Minn. All of these last named sorts are valuable varieties of the hardy native *Prunus Americana*, originating in the trying climate of the northwest. It is our purpose to increase the list of plums next season and if possible by crossing some of these very hardy sorts with others of higher quality secure desirable sorts which will rank with Moore's Arctic as a profitable variety for this region and possibly shall not require the winter protection demanded by that variety.

There is little doubt that with proper management small fruits might be made even more profitable in the northern parts of the State than in the southern, as at this latitude the crop ripens so late as to escape more southern competition. With this end in view, a number of varieties are being introduced. Some are already grown at Houlton—notably the Houghton gooseberry and the Agawam blackberry, but so far as I can ascertain little is being done even in the home gardens of northern Maine toward raising other small fruits.

Last spring plants of Windom and Lucretia Dewberry and of North Star Currant were sent to Perham for trial. Others will be sent later.

At the present time an effort is being made to determine the exact status of the fruit industry in the State, especially in the more southern portions, that we may have a basis for intelligent work in developing this line of work. A report on this subject will be published during the ensuing year.

SPRAYING EXPERIMENTS.

The work of spraying to prevent the attack of the apple scab was continued on the same line as last year, both Mr. C. S. Pope of Manchester and Mr. C. E. Moore of Winthrop, co-operating. The season was very unfavorable and it was difficult to find a suitable time for the work. In nearly every instance rain fell within twenty-four hours after the spraying was completed. As a result, the effects of the fungicides were somewhat modified and were less striking than those obtained last year.

Results in Mr. Pope's Orchard.

In Mr. Pope's orchard the work was of sufficient extent to warrant very free conclusions from a commercial point of view. The orchard is situated on a gravelly hill-side having a northwestern exposure and has been very subject to the attack of the fungus for some time.

The main object in view in this work was to determine the relative values of different solutions and to study the effects of applying the mixture at different times.

To this end, instead of single trees, given different treatment, contiguous rows extending down the hill-side were selected. In this way all rows presented essentially the same conditions, part of the trees being on high land and part on low. This matter of location is of the highest import since it has been observed—in this orchard and some others I have studied—that trees on high, exposed situations are apparently more subject to attack than are those on lower ground.

Three solutions were used in the test as follows:

Solution A. Modified *eau celeste*, consisting of two pounds copper sulphate, two and one-half pounds carbonate of soda, one and one-half pints ammonia and thirty gallons water.

Solution B. Five ounces carbonate of copper, three pints strong ammonia, fifty gallons water.

Solution C. Three ounces carbonate of copper, one pound carbonate of ammonia, fifty gallons water.*

*For directions as to preparation of mixtures see Rep. Maine Ex. Sta., 1891, p. 116.

To be doubly sure of results, duplicate series were used. In this way we have two rows in different parts of the orchard sprayed with each solution; while for comparison three rows alternating with these were left without treatment. Naturally all of the trees were not equally productive, and in counting the fruit only those trees which were under approximately the same conditions were selected.

Because of the large number of trees to examine it was impossible to count all of the fruit from each tree, hence five basketfuls, or two and one-half bushels were taken from all parts of each tree.

Table VIII gives the results obtained from the first series, and table IX those from the second.

TABLE VIII.

Solution.	Average number fruits examined.	Free from scab.	Slightly scabbed.	Badly scabbed.	Per cent free.	Per cent No. 1 apples (as regards scab).	Remarks.
"A"	563	219	332	14	39.00	97.6	Average of four trees.
Check	681	0.6	203	477	0.09	30.1	" " five "
"B"	550	47	410	93	8.50	83.7	" " " "
"C"	663	24	429	209	3.73	68.6	" " " "
Check	663	0.6	207	425	0.12	35.5	" " " "

TABLE IX.

Solution.	Average number fruits examined.	Free from scab.	Slightly scabbed.	Badly scabbed.	Per cent free.	Per cent No. 1 apples (as regards scab).	Remarks.
Check	633	0.6	207	425	0.12	35.5	Average of five trees.
"A"	552	123	361	67	23.6	88.3	" " four "
"B"	637	12	290	336	2.1	49.8	" " three "
Check	556	17	324	215	3.1	62.1	" " four "
"C"	535	46	388	101	8.9	81.7	" " three "

The superiority of the fruit on trees treated with solution *A*—modified *eau celeste*—is seen at a glance; while solutions B and C do not appear widely different. With a single exception the average increase of marketable fruit as a result of the treatment ranges from 19 to 60 per cent. Row "B" in table IX was a short row and contained one tree which was very badly attacked—only 27.6 per cent of the fruit being "No. 1"—thus bringing the average below that of the adjoining check row, which was better than the average.

Combining the results obtained in the duplicate trials, these facts stand out even more clearly as seen in table X.

TABLE X.

Solution.	Number examined—average per tree.	Free from scab—average.	Slightly scabbed—average.	Badly scabbed—average.	Per cent free—average.	Per cent No. 1 apples (as regards scab)—average.	Remarks.
"A"	559	171	347	41	30.1	93.0	Average of 8 trees.
"B"	583	34	365	184	6.1	71.0	" 8 trees.
Check	615	32	414	169	5.6	73.5	" 8 trees.
"C"	628	5	239	384	.93	41.2	" 14 trees.

As will be observed, the average proportion of "No. 1" fruit on unsprayed trees—considering fourteen trees in all parts of the orchard—was only 41.2 per cent of the crop; while the average proportion on trees sprayed with the least effective solution was 71 per cent, a gain of nearly 30 per cent. With the modified *eau celeste* this difference was much more marked, amounting to nearly 52 per cent, or a saving of more than half of the total crop.

The amount of fruit absolutely free from scab is not as large as might be wished; but the standard adopted in sorting the fruit was very rigid, and much of that classed as "slightly scabbed" was in reality better fruit than that classed as "free." It was observed, however, that fruit from the trees sprayed with *eau celeste* were frequently russetted, as though the solution was too strong.

With these figures in view, and considering the fact that the results are in direct confirmation of those obtained last year, there would appear to be little doubt as to the effectiveness of the treatment when the work is properly conducted.

The value of duplicating any experiment of this kind is well shown by comparing tables VIII and IX. Table VIII gives data which would apparently warrant drawing very positive conclusions as to the relative merits of the different solutions; while table IX would appear to reverse the relative positions of solutions "B" and "C," and even indicates that solution "B" is of little if any value. But by combining the data we approximate nearly the true results.

When Shall we Spray? A part of the work in Mr. Pope's orchard was conducted with a view to determining the best time for applying fungicides, as well as the relative value of several applications. To this end some trees were sprayed but once, early in the season; others were sprayed twice, some three times and some four times; while some trees were not sprayed. Solution "B" was used in every instance.

The results of this trial are shown in table XI.

TABLE XI.

Number times sprayed.	Number fruits examined.	Free from scab.	Slightly scabbed.	Badly scabbed.	Per cent free.	Per cent No. 1 apples (as regards scab).	When sprayed.
Once	499	13	314	172	2.6	65.6	May 26.
	497	1	161	335	0.2	32.6	
	481	12	301	168	2.5	65.1	
	604	0	212	392	0.0	35.1	
	600	4	267	329	0.7	45.2	
Average per tree	536	6	251	279	1.2	48.7	
Twice	688	0	287	401	0.0	41.7	May 26, June 23.
	610	2	314	294	0.3	51.8	
	542	26	355	161	4.8	70.3	
	556	0	237	319	0.0	42.6	
Average per tree	599	7	298	274	1.3	51.6	
Three times	583	30	439	114	5.1	80.3	May 26, June 23. July 21.
	617	38	455	124	6.2	79.9	
	684	27	432	225	3.9	67.1	
	485	36	360	89	7.4	81.6	
Average per tree	592	33	421	138	5.6	77.2	
Four times	588	21	346	221	3.6	62.4	May 26, June 23. July 21, Aug. 20.
	438	45	292	101	10.3	76.9	
	552	18	372	162	3.2	70.6	
Average per tree	526	28	337	161	5.7	70.0	
Three times	559	6	315	238	1.1	57.4	June 23, July 21. Aug. 20.
	707	7	285	415	1.0	41.3	
	462	25	300	137	5.4	70.3	
Average per tree	576	13	300	263	2.5	56.3	

There is a very noticeable difference in the percentage of good fruits on adjacent trees when treated in the same manner. But trees sprayed three or four times are more uniformly good than those sprayed once or twice. As seen in the table, in the row sprayed once, there is a difference of more than 32 per cent in the amount of fruit on the second tree, and that on the trees on either side—a difference frequently noted on the unsprayed rows. In the rows treated twice this difference is not quite so marked; while in the rows sprayed three or four times the greatest difference is only about 14 per cent, the lowest percentage being nearly equal to the highest on the trees sprayed but once.

By comparing the last division of the table with the third, it will be observed though each row was sprayed three times the average quality of the fruit is much lower in the former case, the average per cent of No. 1 fruit being 56.3 as opposed to 77.2 in the third row. That is, the indications point strongly to the value of spraying *early*. The two rows in question were under essentially the same conditions, being parallel and separated by only one row, which was sprayed four times, but the first was sprayed once before the blossoms opened, while the other was not sprayed till June 23rd.

The results obtained are not conclusive, but in general they point to the value of repeated applications and to the desirability of spraying early in the season.

Results in Mr. Moore's Orchard.

To check our work still further, arrangements were made with Mrs. C. E. Moore of Winthrop to continue the work of the previous year in this direction. Mr. Moore's orchard is usually very badly attacked, and would seem to be an excellent field for work. The trees bore very heavily in 1891, however, and were not as well adapted for our use as they otherwise would have been. Those trees which bore but little fruit are not considered in compiling the tables, as such trees are seldom attacked so severely as are those which bear a full crop. As will be observed, the character of the fruit on the different trees is very unequal; that on some trees being either excessively scabby or remarkably free from scab, while that on other adjacent trees may represent the opposite extreme. Thus it follows that the average percentages as given in the tables do not always represent the true average condition of the trees, especially is this the case when a larger number than common is taken from any one tree. As before noted, however, the amount of fruit was so variable, that in order to get proportionate quantities from the different classes, it was impossible to adopt an inflexible rule as in the first orchard considered.

But two solutions were used in Mr. Moore's orchard, viz: Solutions "B" and "C" described on page 92.

In comparing the two solutions a number of trees were sprayed four times each, on May 26, June 15, July 15, and Aug. 15, or as near these dates as possible. Rain followed soon after each application, and the results are not striking, as seen by table XII.

TABLE XII.

Treatment.	Number fruits examined.	Free from scab.	Slightly scabbed.	Badly scabbed.	Worthless.	Per cent free.	Per cent No. 1 apples (as regards scab).	Remarks.
Solution "B"....	1892	8	829	797	348	0.4	42.2	Always one of the worst in the orchard. Very full; fruit small; ¾ of whole counted.
Sprayed 4 times,	839	138	493	183	25	16.4	75.2	All the fruit taken. Opposite Check No. 3.
	456	28	359	61	8	6.1	84.9	All the fruit.
Average.......	1092	58	560	347	127	5.3	56.6	
Checks	577	9	318	227	23	1.6	56.7	Small tree; light crop.
	2334	6	1175	927	226	.3	56.0	All the fruit counted; opposite No. 1, solution "B."
	1006	0	415	565	26	0.0	41.2	¾ of all counted.
Average	1306	5	636	573	93	0.4	49.1	
Solution "C"	522	6	246	224	46	1.1	48.3	All the fruit.
Sprayed 4 times,	854	24	415	382	33	2.8	51.4	¾ of all.
	1047	20	542	469	16	1.9	53.7	¾ of all.
Average.......	808	17	401	358	32	2.1	51.7	

As will be observed the average results are slightly in favor of the sprayed trees as compared with the unsprayed, while solution B gave slightly better results than did solution C, the average increase in No. 1 fruit being 5.5 per cent in the former case and 2 6 per cent in the latter. The percentage of fruit absolutely free from scab is very low in every instance, but in a general way the work has some value in that it confirms the results obtained in Mr. Pope's orchard.

Number of Applications.

Some of the trees in Mr. Moore's orchards were sprayed twice with solution B, and others three times, while others in close proximity were left as checks. Trees sprayed four times were under somewhat different conditions and can not be compared with these.

Table XIII shows the results obtained from this trial.

TABLE XIII.

No. times sprayed.	Number fruits examined.	Free from scab.	Slightly scabbed.	Badly scabbed.	Worthless.	Per cent free.	Per cent No. 1 apples (as regards scab).	Remarks.
Twice	696	28	452	195	21	4.0	68.9	All the fruit counted.
	917	35	620	252	10	3.8	71.4	About ½ the fruit. Adjacent to first tree sprayed three times.
	529	231	278	30	00	42.9	94.5	All the fruit.
Average	717	98	450	159	10	13.7	76.4	
Three times	833	73	574	168	18	8.8	77.7	All the fruit.
	787	78	491	206	12	9.9	72.3	¾ of all; very good.
	970	55	764	151	00	5.7	84.4	About half; small.
Average	863	69	610	175	10	8.0	78.8	
Checks	1006	00	415	565	26	0.0	41.2	¾ of all.
	839	38	485	265	51	4.5	62.3	All the fruit.
	774	98	531	120	25	12.7	81.3	All the fruit.
Average	873	45	477	317	34	5.1	59.8	

A single tree in the first group being exceptionally free from scab, the average percentage of fruits absolutely free is brought higher than in the other cases; but the average proportion of fruit which would be classed as "No 1" is greater on those trees which were sprayed three times. With a single exception the amount of "No. 1" fruit on all sprayed trees is considerably greater than that on unsprayed trees, the average increase being 16.6 per cent on trees sprayed twice, and 19 per cent. on those sprayed three times.

SUMMARY.

1. Spraying with copper solutions proves an effective means of checking the apple scab.
2. The average increase in the amount of salable fruit on the trees sprayed with the least effective solution over that on the unsprayed trees was 30 per cent while the increase on trees sprayed with *eau celeste* was nearly 52 per cent.
3. *Eau celeste* proves more effectual than does the ammonio-copper carbonate solution but as used there was a slight injury to surface of the fruit.
4. Indications point strongly to the value of spraying early in the season, before the blossoms open.
5. Repeated applications of the fungicide during the season are beneficial.

REPORT OF BOTANIST AND ENTOMOLOGIST.

PROF. F. L. HARVEY.

PROF. W. H. JORDAN.

Dear Sir:—I have the honor to submit herewith my fifth annual report as Botanist and Entomologist for the Experiment Station. Judging from the number of letters received the past season, asking questions about plants, insects, fungicides and insecticides, there is an increased demand on the part of farmers in the State, for information upon Economic Botany and Entomology. Below will be found tabulated the more important plants and insects that have received attention during the past season. Those requiring more than a passing notice are considered in detail, and so far as necessary illustrated.

The past season has been somewhat remarkable because of the appearance in the State in injurious numbers of several insects that have not before been reported, viz: The Corn or Boll worm, which was found in the vicinity of Farmington feeding on sweet corn; the Chinch Bug, doing great damage to grass grounds in the vicinity of N. Fryeburg; the Horn Fly which proved quite annoying to cattle in the western part of the State, and *Bruchus obtectus*, *Say*, the Bean Weevil, boring in stored beans after the manner of pea weevils in peas.

We stated in our report for 1891, that the Fall Canker Worm had been increasing in the Penobscot valley for the past four years, and that considerable trouble might be expected from it in the future. It has proved very troublesome the past season about Winterport, Bowdoinham and Stockton, doing great damage to fruit and shade trees. We learn through a Vermont correspondent that the Apple Maggot, *Trypeta pomonella*, Walsh, infests pears in that State. As we have never seen it working in pears in Maine any information on the subject from Maine orchardists will be appreciated. We received specimens of the Melancholy Cetonia (*Euphoria melancholica*,) from Mr. John A. Smedberg, Unity, which were eating sweet corn at the top of the ear. So far as we know this habit has not been recorded. The Oyster-Shell Bark-louse must be doing great damage in Aroostook County judging from the badly infested specimens of apple twigs received from David Crane of Houlton. Those interested in this insect will find it considered in Expt. Sta. Rept. 1888, p. 157.

The Three-toothed Aphonus, accused of cutting corn in our last report has been fully convicted of the charge the past season, by Mr. C. V. Manley of Auburn. He says, "I found this beetle which I send you, in a hill of corn with his head in a cut in the side of a stalk that had begun to wilt."

Mr. E. W. Merritt of Houlton, reports that he keeps the plant lice on his gooseberry bushes in check by removing the twigs bearing curled leaves in the fall. We have received insects during the past season from Illinois and California sent for determination by the editor of the Maine Farmer. Investigation of a species of mite called by us the Two-spotted Mite has been continued This mite has done considerable damage the past season in the greenhouse at the college, and we found it had almost entirely destroyed a patch of German Wax Beans in our garden. Should it prove able to injure to any extent out of door plants, its capabilities of doing damage would be greatly enhanced. As we were doing laboratory work on the mite, it might have been carried to the beans on our clothing. We wish to study the coming season, insects affecting currant and gooseberry bushes, and will be pleased to receive specimens from all parts of the State.

We received from Mr. Ira Porter, Houlton, Maine, a bunch of clover, *Trifolium medium*, L., in which the heads had assumed the form of compound umbels. This was interesting as a confirmation of the belief by botanists, that the head, a kind of inflorescence found in the clover, is an umbel with the axis of inflorescence and the pedicils, shortened. Mr. Henry Sprague of Charlotte, for whom we examined some mosses last season in reference to their value as food for swine, reports that he fed during the winter about six barrels of *reindeer moss*, four of *hypnum splendens*, two of *sphagnum cymbifolium*, to three *swine*.

As the pigs all had other food he had no definite way of telling how much nutriment they got from the mosses. Thinks they liked either of the others as well as the reindeer moss. Thinks all had a constipating effect, which he overcame by liberal doses of sulphate of magnesia (salts).

Mr. W. H. Burgess of Monroe, says that he grafts the Arctic and Lombard plums into the common Pomgranite and avoids the black knot, which has proved so destructive to plum trees in general. We don't know how thoroughly the experiments were tried, but have serious doubts about its being a protection. We doubt whether any of the varieties are exempt from this disease, though we admit that such a variety would be a great blessing to plum growers. We received from Mrs. Myra Damon, Newport, Maine, a specimen of Stinkhorn found in a cistern. These plants grow in decaying organic matter and are often found about sink spouts, drains and other places where decomposing organic matter occurs. They may be known by their curious habit of growth. At first they look like a puff-ball, finally the top bursts and from it comes a large spongy stipe which bears at the apex a slimy mass of brownish offensive spore bearing matter. The bottom part (utricle) of the form sent is about as large as a filbert, the stipe pink and three or four inches long. Finding it about the cistern would lead one to suspect that a sink spout or drain was too near, and that the water might be contaminated by it. These fungi are poisonous, but a single one in a cistern would not render the water harmful. Too great care cannot be exercised in placing drains and sink spouts where they cannot possibly contaminate water supply, as decomposing organic matter in drinking water is a very common source of diseases.

Samples of sage sent by Mr. Willard Lothrop, of Leeds Center for examination as to adulterations, proved to be free from foreign matter, but were composed largely of old stems and poorly cured and blackened leaves. As to color and richness of flavor, the material was quite inferior, and would give dark color and poor flavor to sage cheese.

Walter M. Haines, M. D., of Ellsworth, sent us some specimens of fresh water Cord Grass, and asked whether they were not Wild Rice. Wild Rice was sown quite largely in the marshes and ponds of Maine some years ago to attract water fowl, but so far as we know it has not become established in the State. If any one knows of its occurrence in the State, we would be glad to learn the localities. Mr. Fernald gives it in his Portland Catalogue as indigenous to the State, but we do not know the locality.

The Orange Hawkweed is spreading rapidly in the State and threatens to be a serious pest in meadows and pastures. Farmers should study the description given in this report, and be prepared to recognize the pest as soon as it appears, and destroy the straggling plants before they form large patches hard to manage. Below we give an extended account of the most important plants that have claimed attention during the past season.

The Potato Rot has been quite bad in the State the past season. We hope that potato growers will see the importance of using Bordeaux mixture to hold this disease in check. It has proved a great help in other States when applied at the time, or just before the disease makes its appearance.

REMARKS.

The cuts and plates to illustrate this report were obtained from the following sources: From the Department of Agriculture, Washington, D. C.; cuts of the Orange Hawkweed, and of the Horn Fly. From Prof. S. A. Forbes, cuts of the Corn Worm and Chinch Bug. From Prof. F. D. Chester, cuts showing the results of spraying against Pear Leaf Blight. Plate II is original.

Directions for sending specimens will be found in the Annual Report of the Experiment Station, 1888, p. 194, or in Maine Agricultural Report, 1888, p. 158. Correspondence regarding injurious insects and fungi is invited. Insects and plants will be named, and when injurious, remedies suggested. It is to the interest of farmers to detect injurious insects and fungi before they become established, so that remedial measures can be adopted before the pests are beyond control. As the Entomologist's duties prevent him from going much about the State, it is largely through correspondence that the Station learns of insects doing injury in the State.

INSECTS REPORTED AND EXAMINED—1892.

No.	Common Name.	Technical Name.	From Whom Received.	Remarks.
1	Cecropia Emperor Moth..	Platysamia Cecropia, Linn...	Ross C. Higgins, Thorndike...... M. H. White, Bowdoinham.......	Cocoons attached to branches of apple trees. See Ex. St. Rept. 1890, p. 121.
2	Fall Canker Worm........	Anisopteryx pometaria, Harris...........................	M. H. White, Bowdoinham....... Hon. F. Atwood, Winterport..... Freeman Partridge, Stockton....	Eggs attached to apple trees, larvæ upon foliage, male and female moths about orchard. See Ex. St. Rep. 1888, p. 166.
3	Fall Web-worm..........	Hyphrontria, cunea, Drury= H. textor, Harris..........	Ross C. Higgins, Thorndike......	Foliage of apple trees making a web at the ends of the branches. See Ex. St. Rept. 1890, p. 124.
4	Corn or Boll-worm........	Heliothis armigera, Hub...	J. M. S. Hunter, Farmington...... D. H. Knowlton, Farmington.....	Boring through the husks and eating the kernels from the cobs of sweet corn.
5	Melancholy Cetonia.......	Euphoria melancholica, Gory	John A. Smedburg, Unity...	Eating sweet corn at the top of the ear.
6	Three-toothed Aphonus..	Aphonus tridentatus, Say.....	C. V. Manley, Auburn............	Cutting off stalks of sweet corn in the hill. See Ex. St. Rept. 1891, p. 199.
7	Plum Curculio............	Contrachelus nenuphar, Herbst	H. T. Cummings, S. Paris.........	Pears badly punctured by this insect. See Ex. St. Rept. 1888, p. 178.
8		Pasimachus Species..........	Ross C. Higgins, Thorndike....	On the ground; a beneficial species feeding on other insects.
9	Scabous Osmoderma......	Osmoderma scabra...........	Ross C. Higgins, Thorndike......	Found on an apple tree. Larvæ bore in apple trees.
10	The Squash Bug.	Anasis tris-tis, De Geer.......	S. Dill, Soquil, Cal..................	Feeding on squashes.
11	The Chinch Bug...........	Blissus leucopterus, Say....	W. B. Nutter. B. Walker McKeen, Simeon Charles, North Fryeburg..........	Destroying timothy meadows.
12	Currant Worm............	Nematus ventricosus, King..	H. H. Osgood, Blue Hill..........	Eating foliage of currant bushes. See Ex. St. Rept. 1888, p. 182.
13	Oyster-shell Bark-louse...	Mytilaspis pomorum, Bouchè	David Crane, Houlton............	Badly infesting the branches of apple trees. See Ex. St. Rept. 1888, p. 157.
14	The Horn Fly.............	Haematobia serrata..........	Hon. B. W. McKeen, Augusta......	Troublesome to cattle.
15	Two-spotted Mite..........	Tetranychus 2-maculatus, n. sp.	Prof. L. H. Bailey, Ithaca, N. Y., and others.......................	A bad pest in hot houses and also affecting house plants, and sparingly out of door plants.
16	Wood Louse, or Sow Bug.	Porcellio species.......	Henry Roffe, Orono..	Mistaken for the Buffalo Carpet Beetle. Lives on decaying wood and organic matter.
17	Long-Horned Wood-borer	Monohammus tittalator, Fabr	O. F. Brigham, Newport............	A wood borer.

PLANTS RECEIVED FOR EXAMINATION—1892.

WEEDS.

No.	COMMON NAME.	SCIENTIFIC NAME.	FROM WHOM RECEIVED.	REMARKS.
1	Fall Dandelion	Leontodon autumnale, L	Henry Norcross, Augusta	Weed in meadows.
2	Orange Hawkweed	Hieracium aurantiacum, L	Geo. W. Chamberlain, Calais. H. L. Leland, E. Sangerville. G. S. Paine, Winslow	Weed—meadows, roadsides and pastures.
3	Canadian Hawkweed	Hieracium Canadense, Michx	I. T. Merrill, China	Border of fields; not a bad weed.
4	Knapweed	Centaurea nigra, L	I. T. Merrill, China	Weed in fields; should be looked after.
5	Rabbit-foot Clover	Trifolium arvense, L	I. T. Merrill, China	Weed—roadsides, etc.; very common in Maine.

GRASSES.

No.	COMMON NAME.	SCIENTIFIC NAME.	FROM WHOM RECEIVED.	REMARKS.
6	Red Top	Agrostis alba, L. Var. vulgaris, Thurb	S. H. Berry, Wayne	Sold by Parker & Wood, Boston, as Kentucky Bluegrass (*Poa pratensis*, L.)
7	Freshwater Cord-grass	Spartina cynosuroides, Willd	Walter M. Haines	Sent to learn whether it was wild rice.
8	Orchard Grass	Dactylus glomerata	Joseph F. Warren, W. Buxton	Growing in grass ground.

FUNGI.

No.	COMMON NAME.	SCIENTIFIC NAME.	FROM WHOM RECEIVED.	REMARKS.
9	Pear Leaf Blight	Entomosporium maculatum, Lev	Arthur D. Moore, Portland	Parasitic on leaves of pear trees causing them to curl, turn red and drop; a bad disease.
10	Hair Mold	Phycomyces nitens	N. H. Martin, Fort Fairfield	Growing on excrement of cats in a potato hill. Not of special economic importance.
11	Anthracnose	Glæosporum venetum, Speg	Chas. S. Pope, Manchester	Raspberry bushes badly infested.
12	Anthracnose	Glæosporum venetum, Speg	H. H. Osgood, Blue Hill	Affecting Shaffer's Colossal Raspberry.
13	Stinkhorn	Mutinus Ravenelii (B. and C.) Fisch.	Mrs. Myra Damon, Newport	Found in a cistern. An offensive, poisonous species.

MISCELLANEOUS.

No.	COMMON NAME.	SCIENTIFIC NAME.	FROM WHOM RECEIVED.	REMARKS.
14	Zigzag Clover	Trifolium medium, L	Ira J. Porter, Houlton	Heads changed to compound umbels. Flowers malformed and dwarfed.
15	Golden Rod	Solidago squarrosa, Muhl	E. F. Hitchings, Bucksport	Sent for verification.
16	Golden Rod	Solidago latifolia, L	E. F. Hitchings, Bucksport	Sent for verification.
17	Aster	Aster acuminatus, Mx	E. F. Hitchings, Bucksport	Sent for verification.

BOTANY.

Fall Dandelion.

Leontodon Autumnale, *L.*

(Ord. Compositæ.)

The above species continues to be reported as troublesome in grass lands. It has a firm hold in the State, and should be known by farmers so they can check it before a whole field is overrun. When there are only a few plants, the extermination is a simple matter, but if neglected serious trouble will follow. Much of the clover seed offered for sale in this State contains the seed of this weed.

The following reply to Mr. Henry Norcross may interest others.

Mr. Henry Norcross of this city, brought a specimen plant to this office for identification. He says his fields are infested with it, and that it is killing out the grass far and near. We forwarded the sample to Prof. Harvey, Botanist at the Experiment Station, who kindly forwarded the following to the *Farmer*:

The plant you enclose for determination belongs to the sunflower family (*Compositæ*) and is called by botanists, *Leontodon autumnale*, *Linn*. Its common name is Fall Dandelion. The Latin name means the *Liontooth that blooms in the autumn*. The leaves are incised, suggesting the name of liontooth. The plant is a native of Europe, but is thoroughly naturalized in the United States, and quite widely spread. It is especially plentiful in New England, and a bad weed. Being an abundant seeder and a perennial, it is hard to exterminate. It grows under the most unfavorable circumstances, and will replace grasses in meadows. Should it become too abundant, there is no way to destroy it excepting cultivation in some hoed crop until it disappears. The plants about roadsides, edges of fields and lawns, should be pulled by the roots, or kept from seeding by careful mowing. In this region it is abundant along the roadsides, and is increasing. Occasionally a field is noticed nearly overrun with it. Roadsides are prolific seed gardens that supply the public gratis with an abundance of seeds of the vilest weeds. The town authorities should be empowered by law to exterminate patches of weeds that appear, and might become the centres of distribution of troublesome pests. This weed will be found figured and described in Experiment Station Report, 1890, p. 120. F. L. Harvey,

Orono. Botanist for the Station.

ORANGE HAWKWEED
(*Hieracium aurantiacum.* Linn.)

Orange Hawkweed.

Hieracium aurantiacum, Linn.

(Ord. Compositæ.)

The following letters were received the past season at the Station regarding the above plant. They show how rapidly the weed is spreading, and what a bad pest it is regarded by farmers. The plant has been found in limited quantities on the College farm in a pasture near the river, and has not spread very much in that place, but the past season we noticed it in several places in the meadow land. Mr. James Walker of Bangor, reported a field of several acres near Pea Cove, nearly overrun with it. Mr. George W. Chamberlain reports it from Calais. These together with the localities given in the following letters show it is widely distributed in the State. The question so pointedly asked by Mr. Paine, whether "*we are at the mercy of our neighbors in the matter of spreading weeds*" is one that should seriously claim the attention of the legislature. There should be a law preventing farmers from harboring vile weeds in their fields or letting them grow at the roadsides on their premises. On property for which no one is especially responsible, the dangerous weeds should be eradicated at public expense. Why do not farmers urge some enactment for their protection? There should be a law subjecting seed sold in the State to inspection. The character of the seed sown is as important as the composition of the fertilizer used.

WINSLOW, ME., June 20, '92.

THE STATE AGRICULTURAL COLLEGE,
For the Prof. of Botany, ORONO, ME.

DEAR SIR:—About two years ago I sent you, I think, a plant found in this vicinity which you identified as the Orange Hawkweed. It was not regarded as a dangerous weed at all. I wish to give my experience with it and ask if there is any way to compel farmers to stamp out such weeds under our law. I have fought it on this farm for about five years. It comes from a farm one-fourth miles square, two narrow farms intervening, and these farms are getting rapidly stocked with it. I have watched it with the greatest care and have picked it clean the middle to the last of June, and again scoured the fields after the haying and at frequent intervals till fall. In spite of the greatest care it is gaining on me, and when these other farms are well covered I shall have to give it up. I am surrounded by the wild carrot, and have no difficulty in keeping it off the farm, but the Hawkweed, one of the vilest to smell, seems almost impossible to eradicate. In my opinion, if its behavior indicates anything, it is the most dangerous weed that has threatened us, not excepting the Canada thistle. Will you be kind enough to inform me if we are at the mercy of our neighbors in the matter of spreading such weeds? A line from you will greatly oblige

Yours very respectfully,

G. S. PAINE.

EAST SANGERVILLE, ME., July 1, 1892.

BROTHER BALENTINE:

Find enclosed a plant (weed) that is rapidly encroaching into fields and pastures. It is known locally as *Missionary* weed. Its mission however is one not to be desired. The weed is described in the Report of the United States Department of Agriculture 1890 under the name Orange Hawkweed. This plant is rapidly spreading in the county from many different points. A recent trip in the town of Guilford and Foxcroft showed many fields completely overrun. The village streets and numerous grass flats in Foxcroft village are painted red with this weed. In fact it is a *monopoly* plant taking full possession of the soil, and destroying everything else. Do you know whether the weed is common in the State? It seems to me it cannot be, as I do not remember to have seen anything said of it in the Agricultural papers. Can you or any of your associates tell us how successfully to fight it? If you know ought of it, and methods of eradication please give them to me for publication in the Piscataquis Observer.

The rapidity with which this weed is taking possession of our fields is alarming to our farmers.

Truly,

H. L. LELAND.

REMARKS.

This weed has recently been introduced into the Eastern United States from Europe. It has been in Maine on the College farm for at least ten years, and according to Mr. Paine, about Winslow for more than five years. We have no knowledge of the time or place of its introduction in the State. Such things are scarcely ever noticed until they do injury, when it is often too late or very troublesome to eradicate them. The experience of Maine farmers shows that the plant does not confine itself to roadsides and pastures, where the grass is short, but encroaches into meadows and overruns them. The plant being a perennial and developing runners and root-stocks, makes it a very difficult weed to control. Nothing short of destroying the roots will suffice. Besides, it is so hardy and tenacious of life that it takes almost complete possession of the soil. It is prolific of seeds, which are provided with a row of bristles (pappus), giving it the power of wide dissemination by the wind. We will be pleased to hear from anyone who has noticed this weed and to learn how long it has been known or anything regarding its introduction in the State. On the opposite page we give a cut of this weed and below a description, both copied without change from the United States Department of Agriculture, Report for 1890. They will enable anyone to recognize this vile weed.

"Perennial by slender root-stocks and by runners; stem simple, erect, one to one and one-half feet high, nearly leafless, densely hirsute, the hairs toward the apex of the stem black at the base; leaves mostly radical, oblong-lanceolate, denticulate, hirsute on both sides, sessile, those of the stems two or three; all but the lowest reduced to bracts; heads in a bracted cyme; peduncles with black, glandular hairs and a close, brown coating of stellate hairs; involucre about one-third of an inch in diameter, its bracts linear-lanceolate, little imbricated, provided on the back with straight, glandular and stellate hairs; flowers all perfect, with ligulate orange-covered corollas; achenia about one line long, dark brown, linear in outline, terete, ten-ribbed, truncate; pappus a row of dirty white bristles."

Leaf Blight of the Pear.

Entomosporium maculatum, Lev.

Attention has been called to the above fungus as doing damage to the leaves and fruit of pear trees in Maine.

The letters from Mr. Moore given below will indicate the nature of the inquiries. Mr. Moore's pear trees are located upon Diamond Island, Portland Harbor.

May 24, 1892.

Horticulturist Maine Experiment Station.

Dear Sir:—I enclose a few leaves from my Clapp's Favorite pear tree.

The leaves began to have this appearance two seasons ago, on one branch of the tree. Last year more branches were effected, and this year it seems to have spread over the whole tree. Is it Pear blight? and is there any remedy?

Yours respectfully,

Arthur D. Moore.

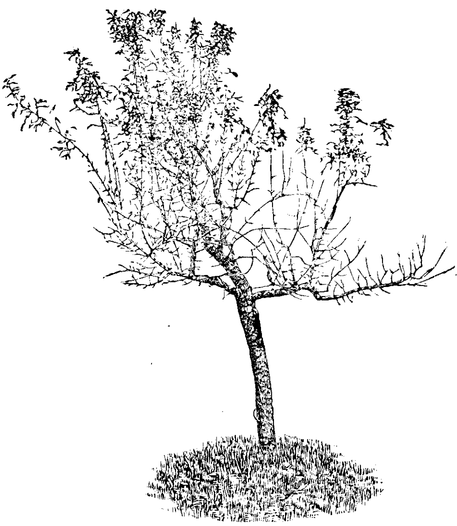


Fig. 1. *Tree not sprayed.*

The above letter shows how rapidly this disease spreads, and the necessity of applying remedial measures as soon as possible. We recommended the use of the ammoniated carbonate of copper solution, made as follows:

Dissolve three ounces of carbonate of copper in two quarts of commercial ammonia water (22°) and dilute with water to thirty-five gallons.

The first application should be made when the leaves are half grown and repeated according to the severity of the case every three or four weeks during the season.

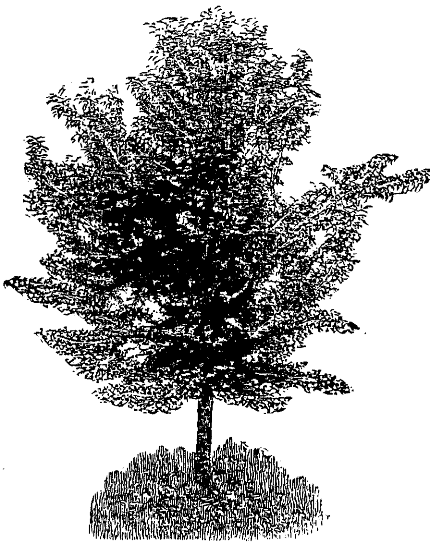


FIG. 2. *Showing beneficial effects of spraying.*

The experiments made by Mr. Chester of the Delaware Experiment Station, in 1891, show that the carbonate of copper and carbonate of ammonia solution is cheaper, as well as one of the most effective of the copper compounds used as fungicides. It is made as follows: Mix three ounces of carbonate of copper with one pound of pulverized carbonate of ammonia; dissolve in two quarts of hot water and dilute further with water to fifty gallons. Figures 1 and 2 show the relative condition of sprayed and unsprayed trees. Mr. Moore made the following report:

Jan. 3, 1893.

PROF. F. L. HARVEY,

DEAR SIR:—Yours of the 27th at hand. I sprayed my pear trees with the ammonia and copper carbonate solution, according to directions as nearly as possible, June 13 and again July 16.

The fungus had already appeared when the first application was made, but it did not spread nor seem to kill the leaves as much as the year before. The leaves remained upon the trees this year until the usual time, whereas in '91 that part of the tree affected was entirely bare for a month before it should have been. I think the spraying has been of great benefit and will eventually cure the disease.

I thank you very much for your kindness to me, and for the interest you have taken in the matter. I also wish to thank you for the reports which you so kindly sent me. I have enjoyed them very much and have found much in them of value to me.

I will write you again in regard to the pear trees when the leaves appear next spring. Yours respectfully,

ARTHUR D. MOORE.

P. S. The spraying seemed to stop the disease just where it was. In '91 it spread all over the leaf and seemed to burn it all up, so that they were all dead by the last of August.—A. D. M.

Characters of the Fungus.

This fungus causes a premature discoloration and dropping of the foliage and in some cases the spotting and cracking of the fruit. It has done considerable damage to pear and quince orchards. It does not seem to be as bad in Maine as in the Atlantic States farther South, but it is here and should be known and precautions taken to prevent its spread. Sometimes the leaves all drop early, but usually they drop slowly during the season. The leaves are unhealthy, the trees do not make a normal growth and sometimes a second blossoming occurs.

The disease first shows itself in the form of minute red spots, which increase in number and size and finally cause the leaf to shrivel and drop. The tender twigs are affected and often destroyed. The disease upon the fruit causes it to crack, through which germs enter and cause early decay.

Black or Hair Mold.

Phycomyces nitens.

We received the above-named fungus from Mr. Martin, and as the species is quite common in Maine we give Mr. Martin's letter and an account of the plant.

Fort Fairfield, Me., March 31, 1892

Friend Jordan,

Dear Sir:—Enclosed with this letter you will find a piece of an elephant potato, to which is attached a hairy mane.

In the same hill there grew seven potatoes, all of which had a hirsute growth similar to the enclosed.

Will you please let me know whether this is the much-sought-for missing link, or what it may be?

This has elicited much curiosity and we would like to know of what nature it is.

Respectfully yours,

N. H. Martin.

The above-named mold belongs to an order of fungi known as *Mucorini* or *Black Molds*. The species of the genus *Mucor* are quite common on decaying organic matter and are frequently seen on rotten potatoes, squashes, pumpkins and other vegetables in the garden and in the cellar. They also are very annoying to housewives, appearing quickly upon bread, or cooked vegetables kept in warm, moist places. They may readily be known by their smoky black color, and the dense, erect coating of fine thread-like fibres with which they cover the substance attacked. These fibres bear at the ends small, round head like fruits, that are filled with small, oblong bodies called *spores*, capable of reproducing the mold. Where the fibres cross, spore-bearing bodies are also produced by a sexual process called conjugation. These spores have great vitality and will grow after they have been dried a long time. This accounts for their being everywhere. The spores are light and can be carried a long way by wind. A dry atmosphere is always prejudicial to their growth. The specimen sent by Mr. Martin is not a *Mucor* but belongs to the genus *phycomyces* of the same *family*. It is quite common in Maine, but prefers oily instead of starchy substances to feed upon. We have frequently found it upon the excrement of cats, which was buried in dirt, or spent ashes out-of-doors, or more commonly in cellars that cats have access to, or under out-houses. The fibres of this plant are sometimes six or eight inches long and in dark cellars a beautiful, glossy black and wonderfully like hair in appearance. The specimens grown in more light or in the laboratory, are less luxuriant and paler colored. The common species of *Mucor* are much smaller and shorter fibred. The spores of specimens kept in a dry laboratory for five years, germinated readily on bread in a moist chamber. This species of *phycomyces* showed streaming of cells contents (cyclosis) very nicely in a double current along the walls of the cells which joined at the end and flowed back down the centre.

The origin of the specimens sent by Mr. Martin was plainly the excrement of some animal that had been buried in the potato hill. The specimen submitted was growing on excrement, not on a piece of potato. If the potatoes of the hill were affected the fungus originated in the excrement and spread to them. This fungus is interesting, and is sure to attract attention, though it is not to be regarded as especially injurious.

Anthracnose of the Raspberry and Blackberry.

Glœosporium venetum, Speg.

Mr. Chas. S. Pope of Manchester, Me., sent us the past season a bundle of raspberry canes badly infested with the above disease. He said: "My bushes are all dying with this disease.

They were obtained from a neighbor, who had them from Anderson, of New York. I find that my neighbor's are also dying with the same disease." Mr. H. H. Osgood of Bluehill, reports the same disease as affecting his bushes of *Shaffer's Colossal* raspberry.

History. This disease was first considered by Prof. Burrell under the name "Raspberry Cane Rust," but it is now generally known as *Anthracnose.* It is a foreign species, but has become widely distributed in this country and does much damage to raspberries and blackberries.

Characters. It attacks the canes, leaves, petioles of the leaves, and in some cases the fruit. It attacks both the fruiting and non-fruiting canes. It first appears near the base of the canes as small, purplish spots. As the disease advances it encroaches upon the tops, and in the last stages will attack the petioles, leaves and fruit. The purplish spots enlarge and finally coalesce, producing irregular, light-colored, blister like patches, often over an inch long and sometimes encircling the stem, producing the same effects as girdling with a knife. The leaves and fruit are much dwarfed from a want of nourishment and finally the plants die. The disease lives over winter upon the young canes attacked and renews its ravages the next season.

The fungus producing these effects is a microscopic, internal, thread-like parasite, that creeps between the cells of the host plants, sapping their vitality. It does not usually enter the pith, but confines its ravages to the cells of the bark and cambium layer, causing them to shrivel and die. Near the center of the diseased spots, where the ends of many of the capillary threads of the fungus meet and unite, are formed masses of short, club-shaped bodies called *basidia.* These are formed under the epidermis of the bark and finally burst it, appearing enveloped in a globule of gelatinous matter. Upon the ends of these basidia are borne singly, small, colorless, oblong, or oval celled bodies called *spores.* The spores are the reproductive elements and serve to spread the disease to adjoining plants and patches. The spores are held together in the gelatinous matter, which is soluble in water. The spores are liberated during rains and rapidly germinate in drops of water on the plants. Dry weather prevents the spread of the disease to new places, though the fungus will continue to grow in dry weather on canes where it is established. Spores liberated by rains are in a condition to be blown by the wind after the rainwater evaporates.

Spores taken from specimens kept in the herbarium for several months will germinate, showing the vitality of this parasite, and warranting the belief that the fungus will live over winter in the canes.

PRECAUTIONS.

(*a.*) In the case of Mr. Pope's plants the disease was no doubt on the canes when planted and probably on his neighbors' bushes when they came from the nursery. We reiterate the importance of carefully examining nursery stock before planting it, to see whether it is affected by fungus or insect parasites. If found to be affected by a fungus it should be burned without delay.

(*b.*) As it seems quite certain that the spores of this disease survive the winter in old canes, those that are through bearing, or dead, or badly affected, should be removed at the close of each season and burned.

(*c.*) As moisture favors the growth of fungi the plants should be trained and framed so as to admit as free a circulation of air and light as possible. Planting in rows six feet apart and the plants five feet in the rows will admit plenty of light and air, and will admit of cultivation each way.

(*d.*) Spraying with a solution of sulphate of iron (green vitril) two pounds, to five gallons of water, before the buds start in the spring has been recommended.

(*e.*) Should the disease appear after the leaves are expanded the use of Bordeaux mixture is recommended.

REMARKS.

Those who wish to read a fuller account of this disease will find it considered in the Report of the U. S. Department of Agriculture, 1887, page 357, and illustrated on plate V.

THE POTATO BLIGHT.

Phytophthora infestans, De Bary.

To determine whether the germs of potato rot live over winter in the soil, or are planted in the seed, the following experiment was performed:

A quantity of rotten potatoes from a badly infested patch was gathered and buried in the ground under as natural conditions as possible. The next spring, two lots of seed that had shown no evidence of rotting in the cellar, were selected and planted as follows:

1. Two rows, one of each kind of seed, on the ground where potatoes rotted badly the past season.

2. Two rows one of each kind of seed upon land that had not grown potatoes for two seasons.

3. Two rows planted as in lot 2, but each hill infested with the rotten potatoes buried the fall before.

All the rows were fertilized alike with phosphates and ashes.

Results.

The disease did not appear in any of the rows.

This would indicate, so far as one experiment goes, that the germs do not survive the winter in the soil, and would emphasize the importance of selecting seed free from the rot. We are not satisfied with the results and will repeat the experiment.

Bordeaux Mixture for the Rot.

Mr. B. Walker McKeen has experimented with Bordeaux Mixture the past season, to prevent potato rot and we give below his interesting and suggestive report.

AUGUSTA, December 31st, 1892.

DEAR PROF. HARVEY:

In reply to your favor of yesterday, asking for my experience with the Bordeaux Mixture for potato blight, I will say, that I used the mixture quite thoroughly through the entire season, putting it on three times, but the results were not such as to warrant me in recommending it to farmers without another trial. I raised a very fine crop of pototoes, all of good size, and the rust did not affect them to any great extent. Still there were some other pieces quite near me that were not affected materially. Other pieces suffered quite badly. I am inclined to the belief, that a *liberal fertilization* of the ground for potatoes will tend to place them beyond the reach of the rust, and that in this way farmers may prevent its ravages, in a great measure. Still I am prepared to say that I shall *certainly* use the mixture another year, as I am not yet prepared to condemn it, as I certainly think my crop was increased by its use. I hope to be able to report more fully after another trial.

In addition to my own experience, I might say that I furnished a neighbor material enough to put upon a small part of his piece and that he used it but once, and he is willing to say that the tops where the mixture was used remained green much longer than those which had not been treated, the difference being so great that the neighbors in passing stopped to learn the cause; but the difference in the crop was not what he expected it would be, from the looks of the tops. He will use it largely next season.

Yours very truly,

B. WALKER MCKEEN.

In reference to the plan of liberal fertilization suggested by Mr. McKeen, it is well to remember that a patch of potatoes may be destroyed by potato blight in *two* ways. The germs of the disease may be in the seed, or in the soil upon which the potatoes are planted. In either case the germs would soon enter the young plants, grow with them and finally destroy them. In the second case the soil and seed may be *entirely free* from germs and the crop almost reach maturity and then becomes infested by *summer spores* blown from an adjoining patch and rapidly destroyed.

It is a principle, equally applicable to plant and animal life, that healthy specimens (all other conditions being equal) are stronger and better able to resist the attack of diseases and parasites. It is also a good rule to fertilize highly and feed animals well for by so doing the profits are greater.

It must be also remembered that plants under cultivation and animals under domestication make a more rapid growth than in nature, and that their tissues are much softer, and when once attacked by a fungus or parasite they become an easier prey.

If the higher fertilization of potato land will hasten the maturity of the crop, and thus prevent infection from the poorly fertilized lands of a shiftless neighbor, it would be an advantage.

If the germs are already in the patch, high fertilization would make the plants more succulent and give the disease a better hold.

An overgrown patch would also fall an easier prey to summer spores should they reach it at the right time.

We believe it is better to adhere to the rule, that *adequate fertilization is always best* and prepare ourselves to fight the parasites that are sure to attack the soft tissues of cultivated plants. The planting of early varieties would be an advantage, providing our neighbors grow the later sorts.

Bordeaux Mixture cannot destroy the potato rot in plants where it is established. It can only prevent the disease *spreading* by destroying the summer spores.

In experimenting with Bordeaux Mixture some rows in the patch should be left unsprayed to serve as a check.

Bordeaux Mixture is a fungicide of great promise and we hope others will try it and report the results.

ENTOMOLOGY.

Fall Canker-worm.

Anisopteryx pometaria, Harris.

(Ord. Lepidoptera: Fam. Phalenidæ.)

This insect is increasing rapidly in the State. We have spoken in previous reports about its increase in Penobscot County, but it is also increasing in other counties. Mr. Freeman Partridge writes that it has done great damage about Prospect in Waldo County. Mr. C. A. Arnold, Arnold, Me., says: "They are the curse of my young apple trees, doing more damage to them by destroying the leaves and blossoms than all other insects combined." The shade and orchard trees about Orono were badly infested the past season. The garden fences in some parts of Orono were literally covered with egg clusters. As the insects feed largely on the tall elms and other shade trees and forest trees, there is no hope of exterminating them by confining our remedial measures to the orchard. We must take steps to keep them out of shade trees or they will continue to breed there and transfer their depredations to the orchard.

Mr. Partridge says the Canker-worms have troubled him for three years, increasing each season. Though the spraying done did not kill the Canker-worms it did destroy the *Codlin Moths*. He says he did not find a bushel of apples affected by this insect in his whole orchard, while he has had them in abundance before. This would indicate that the time to spray for Codlin Moths was about the time the Canker-worms are grown. We suggested the use of a band around the tree to prevent the *wingless females* ascending to lay their eggs. Mr. Partridge writes: "There is a bug nearly as big as a house fly that is crawling on the trees. I send you two. The little wingless bugs are lively on the south side of the trees though the snow is three or four inches deep among the trees." The insects spoken of above were the wingless females of the Canker-worm.

REMEDIES.

We would advise a trial of a tin band, which consists essentially of a band or circle of tin a few inches outside of the trunk of the tree, held there by a circle of muslin attached to the tin at its edge and drawn with a cord at the top, so as to fit the tree closely and prevent the insects from getting up without going over the tin. The tin is kept covered with a mixture of equal parts of castor oil and kerosene. As soon as they touch this they fall to the ground. The muslin can be fastened to the tin by turning over the edge of the tin before it is bent to a circle and inserting the edge of the muslin and hammering them together. The tin should be about three inches wide and long enough to stand out three or four inches from the tree, when bent around it and fastened by rivets. The whole inner surface of the tin is daubed with the mixture of castor oil and kerosene. The mixture should be renewed occasionally and the bands kept on the trees until the moths disappear. Fig. 3 shows the nature of the band and the way to attach it. Should the trees be full of eggs or young caterpillars then spraying would have to be resorted to.

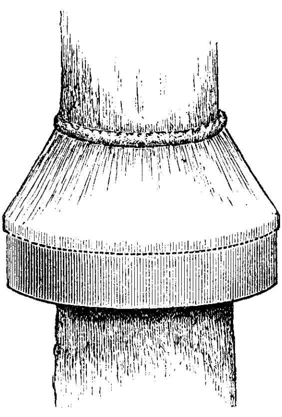


FIG. 3.

Mr. Partridge believes in thorough work and sprayed, using one-half pound Paris green to a barrel of water, consequently the leaves of Tallman Sweets were injured. He speaks of the flower buds of his trees being eaten, apparently before they open. This may have been done by the *Eye-Spotted Bud Moth*; see Sta. Rept. 1888, p. 169, also Rept. 1890, p. 128. The spraying should be done early enough to catch the young worms before they do much damage to the foliage. The time can be determined by watching a few clusters of eggs and when they are hatched the mixture should be applied, or to be safe two sprayings could be made, one just as the leaf buds are bursting and another a week later. While the leaves are young and tender we would advise a weak mixture, say one pound to two hundred gallons. It is a great shock to a tree to loose its foliage if it is not killed. The leaves are the food formers for the plant. They elaborate the food necessary to make the new wood and perfect the fruit, also it is their office to store, in the new wood and buds, the material necessary to form the leaves the next season. *It is important* to clear the trees of leaf-eating insects as early in the season as possible.

The reader will find an account of the habits of this insect in Expt. Sta. Repts. 1888, p. 166, and 1890, p. 137.

There is an insect closely related to the Fall Canker-worm known as the Spring Canker-worm. It differs principally in spending the winter in the ground, emerging very early in the spring and laying its eggs which soon hatch. The Fall Canker-worm changes to the moth state in the fall when the eggs are laid and do not hatch until spring. We have not noticed the Spring Canker-worm to any extent in Maine. We have at present to do with the more abundant one.

The females of both species are wingless, and as both feed on the foliage, spraying would be equally remedial for both. For the spring species bands would have to be applied in the spring. The bands on the trees in the spring would prevent the young caterpillars of both species climbing the trees.

THE BOLL-WORM OR CORN-WORM.

Heliothis armiger, Hübn.

(Ord. Lepidoptera: Family Noctuidæ.)

Last September we received a package of sweet corn from Mr. John M. S. Hunter of Farmington, Me., and the following communication:

CHRONICLE OFFICE,
FARMINGTON, ME., September 10, 1892.

SIR:—I send you by express to-day a box containing ears of sweet corn. A gentleman in this village planted the corn (sweet corn) in his garden. He tells me every hill is affected and corn in same condition as that which I send you. Will you please look it up and tell the readers of my paper what these worms are and how to exterminate them. This is a great sweet corn region and farmers fear these worms will give them trouble.

JOHN M. S. HUNTER, Editor.

About the same time we received specimens of the same insect from Mr. D. H. Knowlton, Farmington, Me., and learned from other sources that it was doing considerable damage to sweet corn in that vicinity.

The ears of corn received, each contained from one to half a dozen worms, snugly concealed beneath the husks at the top of the ears, that were feeding on the kernels. In some of the ears the kernels had been eaten nearly clean on the upper third of the cob. In some of the ears the worms had eaten most of the silk, and in others holes were gnawed through the husks at various places. We at once recognized the worms as the larvæ of the Cotton Boll-worm an insect that has done untold damage to cotton, corn and various other crops in the West and South. This insect has done more damage in the Southern and Middle States than in the extreme Northern, but judging from the specimens received, it finds congenial conditions in the sweet corn fields of Maine. There is reason for serious concern regarding it, for if it maintains itself and increases, it will jeopardize the corn packing industry.

The damage done is not confined to the kernels eaten. The sap exudes from the kernels gnawed and ferments, so that it would be impossible to use the affected ears for canning. The exuded sap invites a host of smaller insects and fungi to share in the spoils. The husks being left open by the worms eating the silks, allows rains and dew to enter and favor the growth of moulds.

It would not pay to examine carefully each ear to see whether it harbored worms, small insects or fungi before cutting it for canning. Practically a crop much infested by this insect would be worthless for canning, and would have to be utilized so far as possible as food for stock.

If the insect confined its ravages to corn alone it might have a hard time to perpetuate itself on account of the sweet corn being gathered before the worms have their growth. Some of the worms in the corn sent were not more than one-third grown, others were half grown and only a few mature. We put them in a breeding cage and the smaller ones lived until December and died without entering the pupa state, while the larger ones remained gnawing the ears for several weeks before entering the ground.

We are inclined to think the larvæ may in some cases hybernate. The insect is quite a general feeder, having been known to do much damage to peas, beans, pumpkins, tomatoes and tobacco, and probably has still other food resources. It should be carefully watched for the next two seasons, and if it shows a tendency to increase and spread, concerted action should be taken to exterminate it. That the insect may be known when seen, we give below a condensed description of it in the various stages of its life history and also cuts of the eggs, larva, pupa and moths.

Description.

Eggs—nearly globular, a little flattened at the base, with a slight depression at the top and a series of depressions running from this depression to the base; diameter .025 inches; color pale straw. The moths are said to be capable of laying five hundred eggs which are placed singly upon the leaves by the first brood, and upon the silks and husks at the top of the ear by the later brood. The time required to hatch is supposed to be from two days to a week. Two views of the eggs magnified are shown in Fig. 4, a and b.

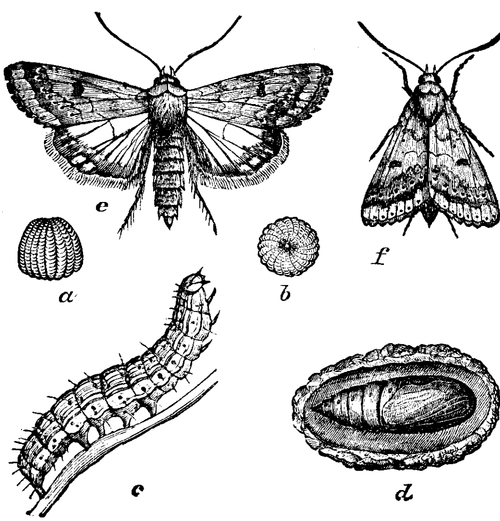


Fig. 4.

Larva—length 1.5 inches when full-grown; color variable, some being pale brown, striped with darker brown, others pale green striped with darker green. There is a dorsal brown band bordered by a narrow light line followed by a darker band that reaches to just above the breathing pores (stigmata) while the stigmata are in a light area that extends to the ventral surface which is of the general body color. On each segment are eight shiny black spots from which arise brown hairs. The four black spots on the back of each segment are arranged in the form of a trapezoid, with the parallel sides transverse with the body, the shortest side toward the head. The two black spots on the sides are just above the stigmata, one above and in front, the other back and on a line with them. Head and legs brown, shield on the neck (cervex) dark brown. A few short hairs scattered over other parts of the body. See Fig. 4, c. When full grown the worm enters the ground, forms a cocoon of earth interwoven with silk and changes to the chrysalis.

Chrysalis—length .8 of an inch. Color light chestnut brown, the dorsal line, stigmata and divisions of the segments darker. Rather slender, an indentation on the back where the abdominal segments begin, the last four segments moveable, two thorns at the extremity. See Fig. 4, d, which shows the chrysalis in the cocoon.

Moth—expanse of wings 1.5 inches. The color is quite variable in depth of shading. The more common color of the fore wings is pale clay yellow, with a faint greenish tint, and marked with darker olive, dark brown, or even black. A dark, conspicuous spot near the middle of each fore wing. Hind wings paler with a dark brown band along the outer margin interrupted in the middle by a large pale spot.

The moth with expanded and closed wings is shown in Fig. 4, e and f.

Life History.

In Maine there is probably only one brood of the moths, at least we have no evidence bearing upon the subject to indicate more than one. The moths probably are on the wing early in August. (The larvæ we received on September 10th were of various sizes, some full grown, and though we have not taken the moths in Maine we know the larvæ require three or four weeks to mature, and the eggs several days to hatch which would require that the moth be on the wing early in August). The small worms found in the corn received were from eggs laid on the same ears later, requiring that the moths continue on the wing for some weeks or the time of emerging from the chrysalis extends over considerable time.

The moths mate and the females lay their eggs probably one in a place upon the food plant. They are on the wing early in the evening. The eggs are laid upon the leaves, tassels, silks or husks and hatch in a few days. The worms gnaw through the silk at the top of the ears and feed upon the kernels forming channels at the top of the ears. They will gnaw holes through the silk and go to other ears on the same stalk or even go to new hills. After feeding about three weeks or longer according to the season and the weather, they are mature and make their way to the ground choosing preferably a spot where the earth is compact, burrow beneath the surface making a round hole which widens toward the bottom and is slightly closed at the top. In this gallery they change to the pupa state. Where there is only one brood they hybernate in the pupa state and appear the following season and the round of life is complete.

REMEDIES.

Natural.—Bacterial diseases of the worm, moth and eggs are known, besides a half dozen or more insect parasites, Tachinas Ichneumons, prey upon them in the larval state. Lady birds, several species of hyemenopterous insects, tiger and ground beetles prey upon them, and chalcid egg parasites on the eggs. Bats and other insectivorous animals eat the moths. Insectivorous birds and barnyard fowls are fond of them and destroy both worms and moths. Ants and spiders destroy the eggs and young. It is also well known that they will eat each other.

Artificial.—In the extreme North where there is probably but one brood this insect would be more easily checked than where there are two or three broods in a season. Where there are several broods a few survivors of the winter would in the last brood become numerous.

The single brood of Maine could be managed by deep fall ploughing of corn lands to break up the burrows and expose the chrysalides to the effects of fall rain and winter freezing. If a field is found badly infested it would be better to feed the corn green to stock than to allow the worms to mature and enter the ground. Infested ears should never be left in the field so the worms can leave them and crawl into the ground. When possible crush the worms found with the hand.

Any one wishing to look up this insect farther will find a condensed article in the Fourth Report of the United States Entomological Commission, p. 355, which is finely illustrated with colored drawings of the worms and moths.

The Chinch Bug.

Blissus leucopterus, Say.

Ord. Hemiptera: Subord. Heteroptera: Fam. Lygæidæ.

During the past season the following letters were received:

Scarboro, August 23, 1892.

Prof. Balentine:

My Dear Sir: I sent you a small lot of insects from North Fryeburg, on August 8th. I did not know how badly they were destroying the grass, but find they have spread over a large part of the town of Fryeburg, and that the farmers are at complete loss to know what to do to stop their spread. Any advice you can give them would be very thankfully received. I saw Brother B. W. McKeen on Saturday last, and told him what I had done. He was not aware that the damage was so great, as the bugs had not got to his section. Nathaniel Frye, Fryeburg Center, John Batchelder, or John Hastings, North Fryeburg, would probably give you any information asked for.

Yours respectfully,

Scarboro, Me. W. B. Nutter.

Prof. F. L. Harvey, Orono:

My Dear Sir: Your very kind letter of the 24th at hand, and contents noted. The bugs you speak of were collected in a field in my own town. They have been found there in years past, and have done considerable damage at times. Can you give me their origin, habits and remedy, if there is any? They work in the grass roots, particularly Timothy hay, which they completely destroy. Thanking you for your information, I am

Yours very truly,

B. Walker McKeen.

We answered Mr. Nutter's letter informing him that the specimens sent were immature forms of the Chinch-bug. We also wrote Mr. McKeen and asked him to secure for us some mature specimens of the insect so as to make its identification positive, and the following letters were received in answer:

SCARBORO, August 29, 1892.

PROF. F. L. HARVEY:

MY DEAR SIR:—Yours of August 26th at hand. In explanation of my sending the bugs to Prof. Balentine, will say I was on a business trip to Fryeburg and seeing the damage the bugs were doing I thought it the quickest way to find out what they were and what to do to destroy them, to send to headquarters. I did not know of anyone except Prof. Balentine to apply to. I have written B. Walker McKeen in regard to the matter and hope you will be invited to make a visit to North Fryeburg and make an investigation. I feel that the matter is quite serious and demands the attention of the State officials to keep it within bounds and to stamp it out if possible.

I have written to Simeon Charles at North Fryeburg to send you some of the bugs in alcohol, and have also written to Nathaniel Frye at Fryeburg Center. asking them both to give you any information they can in regard to the time of the first appearance of the pests, and also how extensive they have become.

Yours truly,

SCARBORO, MAINE. W. B. NUTTER.

PROF. F. L. HARVEY:

MY DEAR SIR:—Your letter received, and I have sent to Mr. S. C. Charles, North Fryeburg, for further samples. Think he has some of the full grown ones in alcohol. I find some of our Fryeburg farmers claim the bugs have been seen here occasionally for many years, twenty-five or thirty, at least.

B. WALKER MCKEEN.

NORTH FRYEBURG, September 6, 1892.

PROF. F. L. HARVEY:

DEAR SIR:—Brother Nutter wrote to me about those bugs that he sent you, saying you thought them to be the Chinch-bug. I have got some in a vial which I shall send by this morning's mail. They have worked here for years. Friend Batchelder thinks they were here twenty-five years ago, but did but little damage. They are confined to the intervale wholly—have not been on the upland at all. They have not meddled with anything but herd grass and red top until this fall, when they got on the sweet corn; but have injured it but slightly. Hoping to hear from you and some remedy for the pest, I remain,

Yours truly,

SIMEON CHARLES.

AUGUSTA, Sept. 8th.

PROF. HARVEY:

MY DEAR SIR:—I forward you this letter from Brother Charles. Please acknowledge receipt. Make a *full* investigation. If you plan to go to Fryeburg let us know.

Yours very truly,

B. WALKER MCKEEN.

NORTH FRYEBURG, Sept. 8, '92.

BROTHER MCKEEN:

DEAR SIR:—Received your letter last night. I sent the bugs the 6th. They seem to be going in an easterly direction. I think from what I can learn they are on the Hobbs' intervale. Mrs. Hobbs' boy told me about his grass. No doubt they are at work on it. Hoping to find some remedy,

Yours truly,

SIMEON CHARLES.

We were not able to visit the infested area without leaving class-room work at the college, and it was decided not to do so. Last fall we published a short article in the *Maine Farmer* announcing the occurrence of this insect in the State and suggested burning over the infested fields if possible. It will be desirable this season to learn the extent of the infested district, and we will be pleased to hear from all who may know of its occurrence even in small numbers upon their farms. That the insect may be known when seen, we give below a description of it in all the stages of its life history and suggest such remedies as have been tried in the West and South and have proved at all beneficial.

The information given below has been gleaned from the experiences of Riley, Forbes, Osborn, Gillette and others who have carefully studied the insect and remedies.

DESCRIPTION.

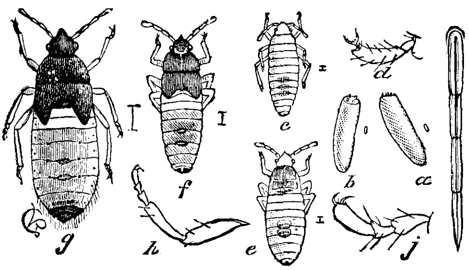


FIG. 5. *Chinch-bug, Larva, Pupa and Egg.*

a and *b*, eggs; *c*, young larva; *d*, tarsus of same; *e* larva after first molt; *f*, larva after second molt; *g*, pupa; *h*, leg; *i*, beak or tubular mouth; *j*, tarsus of mature bug.

Eggs—Average length .03 in. elongate oval, the diameter scarcely one-fifth the length. The top squarely docked and bearing four rounded tubercles near the center. Pale whitish and translucent when laid, but becoming amber colored with age, and finally the red parts of the enclosed embryo and the eyes show through. The eggs grow somewhat after being laid. See Fig. 5, a and b, which shows the eggs both natural size and magnified.

Larval stages.—The newly hatched larva (Fig. 5, *c*) is pale yellow, with simply an orange stain on the middle of three larger abdominal joints. The form scarcely differs from that of the mature bug, being but slightly more elongate; but the tarsi have but two joints (Fig. 5, *d*) and the head is relatively broader and more rounded, while the joints of the body are subequal, the prothoracic joint being but slightly longer than any of the rest. The red color soon pervades the whole body, except the first two abdominal joints, which remain yellowish, and the members, which remain pale. After the first molt (Fig. 5, *e*) the red is quite bright vermilion, contrasting strongly with the pale band across the middle of the body, the prothoracic joint [first behind the head] is relatively longer, and the metathoracic joint [third behind the head] shorter. The head and prothorax are dusky and coriaceous and two broad marks on the mesothorax [second joint behind the head], two smaller ones on the metathorax, two on the fourth and fifth abdominal sutures, and one at the tip of the abdomen are generally visible, but sometimes obsolete; the third and fourth joints of the antennæ are dusky but the legs are still pale. After the second molt [Fig. 5, *f*] the head and thorax are quite dusky and the abdomen duller red, but the pale transverse band is still distinct; the wing-pads become apparent, the members are more dusky, there is a dark red shade on the fourth and fifth abdominal joints, and ventrally a distinct circular, dusky spot covering the last three joints.

Pupa—[Fig. 5, *g*].—In the pupa all the coriaceous parts are brown-black, the wing-pads extend almost across the two pale abdominal joints, which are now more dingy, while the general color of the abdomen is dingy gray; the body above is slightly pubescent, the members are colored as in the mature bug, the three-jointed tarsus is foreshadowed, and the dark, horny spots at the tip of the abdomen, both above and below, are larger.

Perfect Insect (Say's description).—Blackish, hemelytra white with a black spot. Body long, blackish, with numerous hairs; antennæ, rather short, hairs; second joint yellowish, longer than the third, ultimate joint longer than the second, thickest; thorax tinged with cinerous before, with the basal edge piceous; hemelytra (elytra) white, with a blackish oval spot on the lateral middle; rostrum and feet honey-yellow; thighs a little dilated; length less than three-twentieths of an inch.

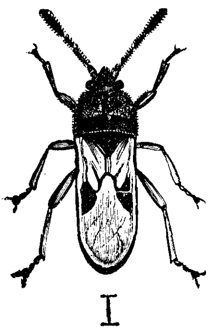


Fig. 6.
Chinch-bug. The short line below shows natural length.

(Le Baron's description.)—Length 1 2-3 lines, or three-twentieths of an inch. Body black, clothed with a very fine, grayish down not distinctly visible to the naked eye; basal joint of the antennæ honey-yellow, second joint the same, tipped with black, third and fourth joints black; beak brown; wings and wing-cases white; the latter are black at their insertion, and have near the middle two short, irregular black lines, and a conspicuous black marginal spot; legs dark honey-yellow, terminal joint of the feet and the claws black.

Life History.

The *mature bugs* hybernate and may be found during the winter months under grass, dead leaves and rubbish, in the field and about thickets and timber adjoining the infested area. When the weather is warm enough in the spring they emerge from their hiding places and after finding suitable food plants for their young deposit their eggs. This probably occurs in May in Maine, but we have not had opportunity to determine when they begin to move. Each female is said to be capable of laying about five hundred eggs, and oviposition extends over twenty days. After the eggs are laid the bugs live some time and may do damage before they die. The eggs hatch in due time and the young pass through the larval stages described above and finally pass into the pupa stage. Bugs hatched in May become mature in July when after pairing eggs for a second brood are laid. In July there is usually a flight of the bugs to new fields and by this means the infested area may be greatly extended. The second brood reaches maturity in the fall and by cold weather is ready to seek winter quarters, completing the life history.

Remedies.

It is well known in the West and South where the Chinch-bug has done so much damage, that there are Chinch-bug years, when climatic conditions combine to favor the rapid increase of this pest. A wet, backward spring and well distributed summer rains are known to destroy the eggs and young of the first brood and prevent the great increase of the second brood later in the season. The correspondence given above shows, that the pest has been in Maine in the infested district for a great many years, and it has not done serious damage until the past season. The conditions last year were probably a dry time while the eggs and young of the first brood were maturing and they survived in greater numbers than usual and gave rise to a much larger second brood. The coming season may be unfavorable for them and no great injury occur. The heavy rain fall of Maine will probably protect this State from such severe scourges as some of the Western States with less rain fall have suffered. The Chinch-bug seems very much adverse to fresh water baths and does not flourish in moist climates, upon very wet lands, or upon luxuriant crops that shade the ground and keep it moist.

The correspondence shows that the area is increasing and the matter is serious enough to demand careful attention. There should be concerted action upon the part of the farmers of the infested district. Whatever remedy is adopted to check this injurious insect will be of little avail unless it is a combined effect of the entire population in the infested district. One of the great difficulties is to secure concert of action. There are improvident farmers in every neighborhood who harbor weeds and injurious insects and will not destroy them, and there is no law to compel them. Public opinion and moral suasion are the only available levers. Below we suggest some remedial measures that may be applicable in Maine.

a, Clean Culture.—As the Chinch-bug hybernates under rubbish, etc., and those that survive the winter determine the number to lay eggs the following season; hence all rubbish and other material about the fields under which they can find shelter should be removed.

b, Ploughing.—When a grain field is badly infested it should be ploughed deep immediately after harvest before the bugs can migrate to adjoining crops. The land should be ploughed at least six inches deep and turned as nearly upside-down as possible. By this means a great many young bugs will be destroyed. We do not know whether the bugs have attacked grain fields in western Maine. This remedy would be applicable to a meadow as well as grain field if there was no objection to breaking it up. It is well to harrow and roll the land after ploughing to harden the surface and make it more difficult for the bugs to crawl out. If the bugs are found very numerous along the border of a meadow or in small patches in the field it would be well to plough these places early in the season and in two or three weeks sow to a late crop. Fall ploughing is advisable, and if rubbish, straw, manure, etc., are placed on the field the bugs will crawl under it for shelter and be ploughed under. In ploughing the use of a jointer is advised as it causes the surface of the ground to be more thoroughly buried.

c, Burning.—When the grass or grain stubble is dense enough or dry enough, the entire field should be burned over after harvest. If the bugs are found in a meadow in the fall, that you wish for grass the following season, and the stubble will not burn, then wind-rows of straw or swamp-hay should be put across the field. The bugs will seek shelter under them, when they should be burned early in the morning or late in the evening. The burning should be carried to all other places where they are known to be hybernating.

d, Miscellaneous Remedies.—*Early planting* and *heavy sowing* and good *fertilization* have been found important aids in the West to hold this pest in check. The Chinch-bugs only feed upon members of the grass family and rotation of grain with buckwheat, clover, peas, beans, or other root crops would starve them out. In the West they sow strips of millet, of which the bugs are very fond, and after they gather upon it it is cut and the ground immediately ploughed deep and rolled. Various insecticides have been used with more or less success, but they are omitted as perhaps of no application to checking the insect in Maine.

The Horn Fly.

(*Hœmatobia Serrata, Robineau Desvoidy.*)

Ord. Diptera: Fam. Muscidæ.

We received the following letters regarding the occurrence of the Horn Fly in Western Maine:

Augusta, Aug. 27, '92.

Prof. Harvey:

My Dear Sir:—The Buffalo Horn Fly has been very troublesome in Fryeburg and vicinity, so much so that I have used Kerosene Emulsion (Weed formula) on our cows to protect them from their very sharp bites.

Yours very truly,

B. Walker McKeen.

North Fryeburg, Sept. 6, '92.

Prof. Harvey:

Dear Sir:—We are having a visitation of the *Horn Fly*. Can you give us any information in regard to them? They do not appear to bite the cattle very much and do not annoy the horses at all, but they come in immense numbers and over a large territory at once.

Yours truly,

Simeon Charles.

Remarks.

This is a European species first noticed in this country in 1887, in the vicinity of Philadelphia. From that point it was spread both to the north and south but more rapidly southward, and now occurs from Canada to the Gulf, west to the prairie states and Texas. The first report of its occurrence in Maine was September, 1882, in the vicinity of North Fryeburg, Western Maine. We have not observed it in the Penobscot Valley.

Below we give a condensed account of the life history and such remedies as have been suggested. Those who wish to study the insect more in detail will find it considered in Insect Life, Vol. 4, No. 2, Washington Government Printing Office, 1892, and in U. S. Agrl. Rept., 1889, page 345.

The flies resemble the house-fly in general appearance but are only about half as large. While feeding the wings are spread at an angle of about 60° (see Fig. d) and elevated.

Life History.

The reddish brown oval eggs, Fig. a, are laid during the warmer parts of the day, singly and usually upon their sides upon the

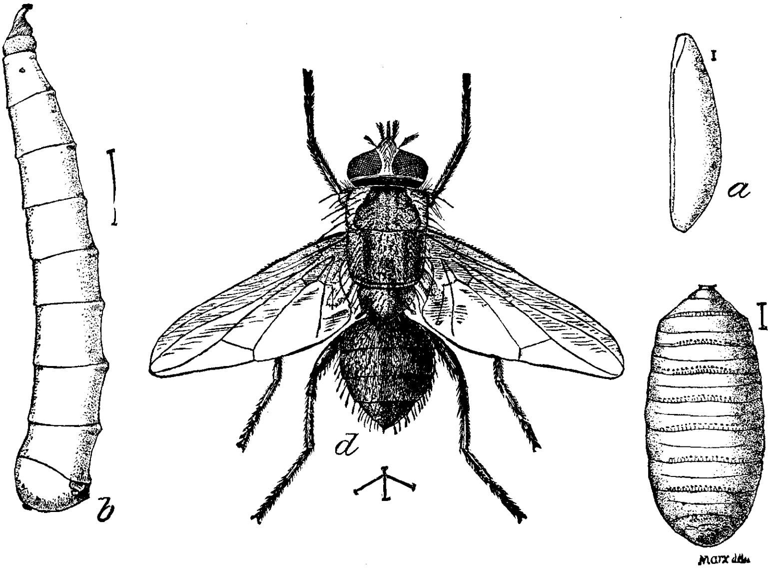


Fig. 1.

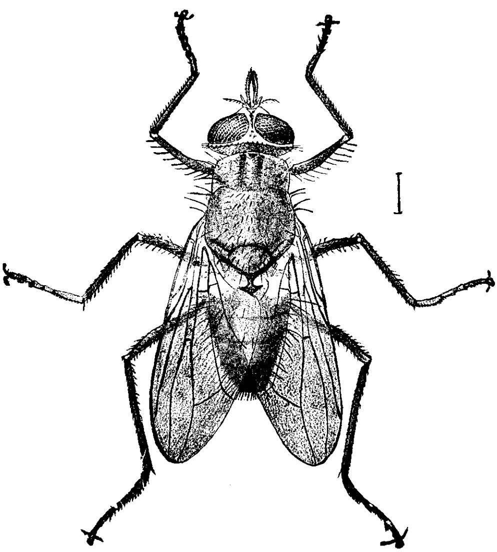


Fig. 2.

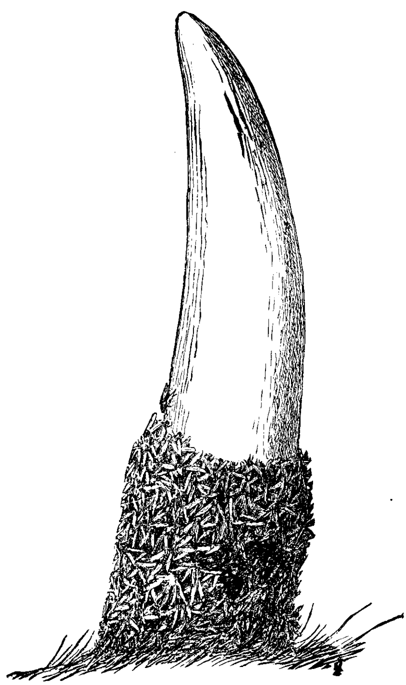


Fig. 3.

THE HORN FLY.

(*Hæmatobia serrata.*)

Fig. 1. *a* Egg; *b* Larva; *c* Puparium; *d* Adult in biting position—enlarged. Fig. 2. Adult in resting position—enlarged. Fig. 3. Flies in resting position at the base of the horn—reduced.

surface of the dung immediately after it is voided, the time of oviposition occupying about a minute. The eggs hatch and the larvæ (Fig. 1 b.) descend into the dung, remaining near the surface. When ready to transform the larvæ descend to the ground beneath the dung and enter it from a half to three-quarter of an inch, or if hard probably transform on the surface to the puparium. (Fig. 1 e.) In from ten to seventeen days from the time the eggs are laid the flies appear. (Fig. 1 d.) There are probably seven or eight generations annually in the middle or southern latitudes, but probably a less number in Maine. The fly makes its appearance in May or June and becomes most abundant in July and August, dwindling as cold weather approaches. It probably hybernates in the pupa and adult stages. The flies, when abundant and especially early in the season, collect about the base of the horns of animals to rest, hence the name.

Damages.

The milk of milch cows is reduced in quantity and animals for the shambles rapidly lose flesh. The irritation due to the bites cause the animals to rub themselves, producing sores. The flies bite the animals and suck the blood.

Remedies.

Protective Applications.—Almost any greasy substance will keep the flies off for several days. Train oil or fish oil alone, or with a little sulphur or carbolic acid will keep the flies off for several days. Tallow has been used to good advantage. Common axle grease will answer nearly as well. These should be applied on the parts of the body most frequented.

Applications to destroy the fly.—A spray of kerosene emulsion directed upon a cow would kill all the flies it happen to touch. Dusting the cows with parethrum or some other dust insecticide, as tobacco, is recommended.

Applications of insecticides intended to check the pest by destroying the flies are hopeless against the immense swarms of them.

How to destroy the early stager.—Thoroughly lime the dung or spread it so it will dry. This will destroy large numbers of the larvæ. The most of the dung is dropped in places where the cattle collect after feeding, or at night and could be treated without much trouble.

The Two-Spotted Mite.

(*Tetranychus 2-maculatus, n. sp.*)

Ord. Acarina: Fam. Tetranychidæ.

We first noticed this species in Orono, Me., early in the spring of 1891, upon rose bushes exposed in a window at the Post Office. Since then it has spread to most of the plants in the window excepting geraniums, for which it seems to have an aversion. Mr. White, whose rose bushes were infected, thought the mites got on while his plant was loaned to a sick lady, but on inquiring we found no other plants were in the sick room at the time and the only possible source of infection was cut plants, which was improbable. In order to learn how general the distribution of this mite was in this region, we visited several houses in Orono where house plants are kept, and in the majority of places found the mites doing considerable damage. Rejecting the positive statement of one party that these mites are the same as lice on hens and that her plants were all right until she set them out of doors and some lousy fowls infested them, we are inclined to think that the pest was introduced in Maine upon rose bushes and other plants purchased of a prominent dealer. The parties whose plants are infested in most cases had plants from this house, and one party positively affirmed that the roses received were noticed to be infested when unpacked. Though great vigilance ought to be exercised by dealers that the plants they send out are in good health and not infested with injurious insects and fungi, yet they cannot always be held responsible, especially when the parasite is small and readily overlooked. Those who receive infested plants will have to discard them, or fight the pest by aid of known remedies.

Even experience has been no protection against the introduction or this mite for it has found its way into the large green houses of the country, also in the green house at the college in our own State, and has been a source of much annoyance.

The mite is so small it is next to impossible to examine green house stock or house plants carefully enough to prevent its introduction, and the custom of exchanging slips of plants for culture, so common in every neighborhood, aids greatly in its rapid dissemination.

The mite being firmly established in Orono and no doubt in many other places in the State, and having given so much trouble at

PLATE III.

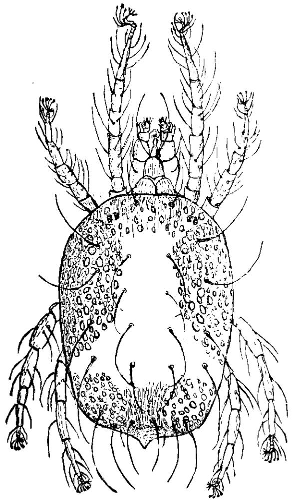


Fig 2.

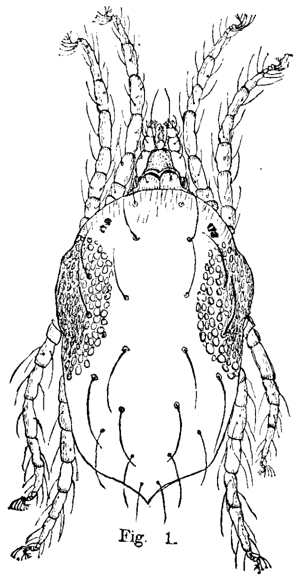


Fig. 1.

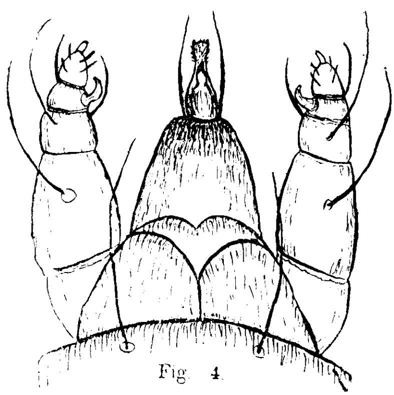


Fig 4.

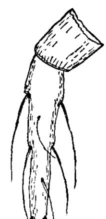


Fig 3.

F. L HARVEY, Del.

TWO SPOTTED MITE.

(*Tetranychus 2-maculatus, n. sp.*)

Fig. 1. Male mite magnified 100 times. Fig. 2. Female (probably) magnified 100 times. Fig. 3. Foot much magnified (*a*) showing location of moveable joint. Fig. 4. Mouth parts and palpi magnified about 250 times.

various green houses in the country and apparently never having been studied, described or figured by any of our entomologists; information regarding its life history, structure and control would seem to be of enough importance to warrant a careful study of the pest.

Having spent some time during the past two years investigating the nature of this species, the following preliminary notes upon it are humbly submitted, with the hope that they may aid in recognizing the form and put our florists upon their guard against it. We cannot hope to have been infallible in our observations, but have tried faithfully to record what we have seen.

We desire to acknowledge our indebtedness to Prof. L. H. Bailey of Ithaca, N. Y., for specimens of this mite, and also of the red spider for comparison, foı a list of host plants and other data from his experience with it; to the Dingee & Conard Company, West Grove, Pa., for specimens of red spider and notes; to Peter Henderson & Company for specimens of the mite on *Verbena* and notes; to Prof. Munson and citizens of Orono who from their abundance have supplied us without reluctance with all the specimens used for study.

Correspondence.

After discovering this mite at Orono, Prof. Munson suggested that it was probably the same species that had given so much trouble in the green houses at Ithaca, N. Y. We wrote Prof. Bailey and sent him a description of the mite. He responded: "Your description seems to match the mighty mite which we have. I do not know its name. Prof. Comstock does not know it." We wrote again for specimens for comparison and a list of food plants and in our letter called the species *Tetranychus 2-maculatus*, n. sp., as we had not been able to find any published description of it. Prof. Bailey responded with specimens upon Pepino, which proved to be the species found at Orono, also he stated: "This is the 'Verbena mite,' I suppose, of Henderson's Practical Floriculture." We responded to Prof. Bailey that the specimens sent were the same as the species found here, but whether they were the same as the *Verbena mite* referred to in Henderson's Practical Floriculture could not be determined by the vague description given in that work, which though it might serve the purposes of practical horticulture, was valueless from an entomologist's standpoint.

If you have seen what Henderson calls the "*Verbena mite*" and know it to be the same species as you sent me, that certainly is a clincher. Henderson's figure certainly is nothing like the mite in question. His figure is pointed in front while the mite we are considering is broadly oblong and rounded in front. Henderson's figure is 20 m m. (.8 in.) in length and he says it is magnified four hundred times. This would make the mite only .05 m m. (.002 in.), a *very minute microscopic form*. The mite we are considering is fully .5 m m. or .02 in. and *plainly* visible to the naked eye. Perhaps Henderson made a mistake and his drawing was only forty times magnified. We could believe this if he did not state that the *Verbena mite* "is so small that it cannot be seen by the naked eye." Henderson says it has the power of imbedding itself in the leaf, a habit which *certainly* does not apply to the species in question. Certainly Henderson has made a good many mistakes in his description or the species he examined was a different species. We believe it is best for entomologists to entirely ignore such loose, vague descriptions of insects as they are of no technical importance and only add confusion in defining species.

In the absence of any known technical description of this species, we concluded it would be better to describe it under the name *Tetranychus 2-maculatus*, n. sp., and have something *definite* than to leave the form without a name. Should it subsequently be shown that it has been described then our name drops and no harm is done. We will be most grateful for any evidence that this species has been described or named for we have no ambition to multiply synonyms.

Prof. Bailey responded: "I am aware that neither Henderson's description nor figures are applicable to the mite in question, and yet I think that he meant it, for I have known for some time that he has been troubled with the same species we have. Of course the reference, even if proved to apply to the mite, is of no scientific use, and I only referred you to it that you might perhaps gain a wider knowledge of its hosts and distribution. No doubt Alfred Henderson could send you specimens for determination."

Prof. Bailey kindly introduced us to Mr. Henderson and we requested specimens of the *Verbena mite* which proved to be the *same* species found at Ithaca and Orono.

Parties about Orono having stated *positively* that roses obtained from Dingee & Conard Co., West Grove, Pa., were infested by this mite, and we having seen the mite on rose bushes from that firm at one house and not on *any other* plants, and the mite having been first noticed at the post office in Orono on roses, we wrote Dingee & Conard Co. about the matter and below we give their reply.

WEST GROVE, PA., Jan. 21, '92.

FRANCIS L. HARVEY, ESQ.,
Orono, Me.

DEAR SIR:—Your kind letter to hand and contents carefully noted. We will gladly give you any information we can to assist you in this important undertaking. The insect or pest you describe which is so seriously affecting window and house plants through your locality, we must say we know nothing of. We have not come in contact with such a pest in any of our houses or on our plants like this, and can assure you it did not originate with us, or we would know something of it. Such pests are more frequently found among soft wooded plants. We have but little of this class of stock in our establishment and consequently are troubled but little with any insect. We are sometimes visited with the *red spider* on our roses, but such is a very rare occurrence, and when thus affected it is not at all a serious matter to get rid of them, syringing them twice a day being a very satisfactory remedy and always effective. We find when plants are kept in a perfectly healthy condition there is little or no danger of the pest or insect of any kind attacking them. The *red spider* can hardly be termed a pest. It is with us but a mild disease caused by too warm and dry an atmosphere. We shall be glad if this information is of any advantage to you and will gladly give you any other information we can.

Very truly yours,
THE DINGEE & CONARD CO.

We wrote again to Dingee & Conard Co. for specimens of what they regarded as the *red spider*, and the species sent was the same as the one found here so far as we could tell from a careful microscopic examination. We also requested Prof. Bailey to send us specimens of the *red spider*. He said they had none in their houses but one of his men procured some from another source which we were unable to separate from the Cornell green house specimens only by their being redder in color.

We must confess that we are very much confused by the above data. Henderson, Bailey and Munson, who have had considerable experience with this mite are decided in their opinion that it is entirely different in its habits from the *red spider* and will not yield to the same treatment. If the specimens sent us by Dingee & Conard Co. and Prof. Bailey's men, were the genuine *red spider*, we are forced to conclude that in this mite we have a species scarcely separable from the *red spider* by its structure but differing very much from it in habit. If called upon to decide from the structure alone we would be compelled to call it a form of the polymorphous species *Tetranychus telarius*, L., or *red spider*.

No importance can be attached to color in this species nor in the *red spider* for in both it is variable with the food plant and also with the age, each molt disclosing a different shade. All we have left upon which to construct this species is the marked physiological differences, noted by Henderson, Bailey and Munson. Can it be possible that it is a case of adaptability—a form of the *red spider* that has changed its mode of living to suit new conditions? Such cases are not uncommon among insects. We leave it an open question for a want of sufficient data. The published descriptions and figures of the *red spider* are so meagre and so lacking in minute detail that it would be very difficult to determine from them whether specimens in hand belonged to that species. Even the published characters of the genus Tetranychus are faulty on account of imperfect microscopical examination.

General Description.

Perfect insect—length of full grown specimens, including palpus, .4 to .6 m m.; breadth, .25 to .3 m m.; thickness, .175 to .2 m m. Broadly oval, about two-thirds as broad as long. Broadest in the anterior third of the body back of the eyes, where the sides are somewhat swollen. General color when young or free from food, pale orange or greenish yellow, becoming yellowish orange or orange with age. The *majority* of the specimens have a dark spot on each side as shown in Fig. 1, due to food contents. These spots first appear, in young specimens which have six legs, as scattered brownish or greenish spherical bodies that look like oil drops. These increase in number with age and are sometimes arranged in three groups. Finally they merge into a single mass as shown in Fig. 1. In older specimens dark patches are found in the anterior and posterior portions of the body, (see Fig. 2), or in full fed specimens the body is entirely dark colored. The shade seems to vary with color of the food, from the yellow orange and brown to green, dark green or black; those feeding on calla, especially, a deep, dark green.

The palpi and legs, especially in older specimens, are tinged with orange. The young are smaller, paler and have only six legs. Body and legs clothed with stout bowed hairs. There are four rows of about five hairs each on the dorsal aspect of the body. Eyes carmine, composed of two facets placed one ahead of the other, and obscurely bilobed. Palpi about one-fourth the length of the body. Eggs spherical, diameter variable, length 75 to about 110 micromillimetres, glassy, scattered and loosely attached to the web. Web delicate, filmy, stretched loosely over the surface of the plant, principally on the under surface of the leaves, though sometimes the upper surface is covered, often stretching across from leaf to leaf, or from the stem to the petioles. They are more plentiful along the principal veins, especially where they join the petiole, also in the angle where the petioles join the leaf, being plainly visible to the naked eye and giving a glassy or silvery reflection from the surface covered. Fibers of the web are from 10 to 20 micromillimetres in diameter but apparently composed of smaller fibrils. The web does not seem to be geometrically constructed as that of the spider. The mites walk freely over the surface or secrete themselves beneath it. The feet are long and the movement of the mite slow and spider-like.

MICROSCOPIC CHARACTERS.

The body, legs and mouth parts magnified five hundred diameters appear finely corrugated, the ridges and furrows often less than .001 m m. wide. On the under side of the body toward the posterior end is an elevation in which the corrugations are much wider and zig-zag. This probably marks the location of the spinerets and anal opening. The stout hairs clothing the body are in full grown specimens often one-fourth the length of the body, or about .15 m m. The eye facets are about .05 m m. in diameter. The hairs on the legs are about four times as long as the legs are wide where they occur, or sometimes fully .1 m m. long. The legs are composed of seven joints exclusive of the moveable foot portion. The seventh joint is short, a little longer than the three segments of the foot combined and has but little movement with the sixth joint. The foot portion is composed of three joints, the proximal two about equal in size, same length but wider than long; terminal segment curved and ending in a two claws; each fork ending in a brush of about three stiff, pointed, spreading hairs. At the back on the end of the preceeding segment arise four stiff bowed hairs over .02 m m. long ending in hemispherical swellings which are broadest at the end and flat or slightly rounded. These hairs curve in the same direction as the claw and extend considerable distance beyond it. There is a free joint between the seventh segment of the leg and the foot portion. The two joints and the claw make up the moveable parts. When walking on glass or any smooth surface the mite puts the paw out behind as one would bend the hand backward at the wrist, resting on the end of the seventh joint, the claw and the end of the four stiff hairs, the terminations of which are put squarely down upon the surface. These hairs with enlarged ends may be used for spinning as suggested by Murray, but one cannot watch the movements of this mite without believing they are adapted for locomotion.

According to Murray, the stiff hairs on the feet of *Tetranychus telareus* (the *red spider*) are attached to the claws, and he has so represented them in a cut (Economic Entomology, p. 97). In this species they are appendages of the small joint of the foot next to the claws. Also he says these hairs have globular terminations and so figures them. In our specimens the hairs end in trumpet-mouth like terminations, disc-like at the ends and are put flat on the surface in locomotion. Prof. Riley in *T. 6—maculatus*, (U. S. Agrl. Report, 1889, p. 111), represents the hairs as originating from the back of the claws and as hooked at the ends. The mouth-parts of the *red spider* as shown by Murray, and those of *T. 6 maculatus*, Riley, differ from those of our species.

According to the characters laid down for the genius *Tetranychus* by Murray, there should be only seven joints in the legs. We are at loss to know just what was included by him in the terminal or tarsal joint. There are seven segments in the leg above the moveable joint in the foot region spoken of above. If the three moveable elements below this joint constitute a distinct segment, then there are *eight* joints to the leg. If the fixed short segment above the moveable joint is concluded in the terminal segment, then there are only *seven* joints to the leg. The location of the joint is shown in Fig. 3, a. Extending from the front of the carapace are the mouth parts, made up of the palpi, rostrum or beak, proboscis, and mandibles. The *palpi* (see Fig. 4) are seven jointed. The terminal joint is short, about .008 m. m., with parallel sides and an obtuse rounded end, twice as long as broad. Second joint is broadly conical, somewhat broader at the base than long, length about .015 m. m. at top and .025 m. m. at base, bearing on the inner face about four bristles, see Fig. 4. The third joint is not more than half as long as broad (about .015 m. m by .03 m. m.) bearing on the inner side a claw about .02 m. m. long, curved toward the face of joint two, which bears the bristles. There is a free motion between segments two and three, and joints one and two are moveable and opposed to the claw on joint three, making nipping jaws. The structure of the end of the palpus of this species has a striking resemblance to that of *T. 6—maculatus*, Riley figured in U. S. Agrl. Report, 1889, pl. II, though the third short joint bearing a claw seems to be absent, or not shown in his drawing. The *rostrum* or *beak* is composed of three segments, (see Fig. 4) the basal one composed of two parts, broad at the base and rounded in front, and at the carapace reaching beyond and covering the base of the palpi. The second joint is short and emarginate in front, terminal segment tongue shaped, obtuse and emarginate in front. Originating beneath the rostrum and extending forward beneath the palpi are two stout hairs. The basal portion of the proboscis is covered by the beak of the carapace. The visible portion is composed of three joints. The basal is broadest and oblong; the terminal one slender, rounded in front and bearing at the edge two short spines and near the end numerous slender spines. The details of the mandibles we could not make out clearly but think they are rounded and plain on the outer margin, bearing at the end a lobe which projects beyond the end of the proboscis.

Greenish black spots are usually found on the leaves of plants affected by this mite. Probably this is the reason why Henderson called the disease by the inappropriate name "Black Rust." It is commonly believed that these dark spots are formed from juices of the plants that have exuded from punctures made by the mites and have dried. A careful microscopic examination proved them to be small usually globular masses from .1 m m. to .175 m m. in diameter and composed of spherical elements from .025 to .035 m m. in diameter. These spherules are clear with granular contents, or greenish with a darker centre. A careful comparison of them with the contents of the body of the mites proved that they were excreta. These yellowish, or black balls are often found attached to the fibres of the web in *mid air* between the points of attachment of the web where it stretches across from leaf to leaf or from stem to leaf. This could not possibly occur if they were exudations from punctures. The web running over the surface and dotted here and there with these yellow and black excreta reminds one of aminute erysiphe in different stages of development.

Host Plants.

From the table of host plants given below, it will be seen that this mite is a general feeder, attacking a wide range of both glabrous and hirsute plants belonging to a wide range of families. This list is no doubt far from complete, as no great pains has been taken to make it exhaustive. Should this mite prove capable of living out of doors it would become a double terror to horticulturists. It at present is found out of doors only in rare instances, and there is no evidence that it is as Henderson suggests, common in gardens, or the same as that which produces roughness to particular parts of cherry, plum and peach trees. Our experience does not warrant the belief that it attacks *especially* plants of lessened vitality. These mites, like plant lice, live by sucking the juice of plants, and are pretty good judges of proper feeding grounds. They are not likely to turn aside from a healthy juicy plant to one of the same species that is sickly and lacking in juices. They are small and would escape observation until a sickly condition was produced in the host plant and attention directed to it. We believe that instead of especially attacking sickly plants they are the cause of lessened vitality. The list of host plants given below shows that the mite has no special preference for pubescent plants, in fact, some of the worst cases of attack we have seen were upon glabrous species. Munson and Harvey are authority for the occurrence of the mite at the Maine State College green houses and at private houses in Orono and vicinity; Prof. L. H. Bailey for the occurrence of the mite in the green houses at Cornell College, Ithaca, N. Y.; Henderson for its occurrence in their green houses, New York City; Dingee & Conard Co. for its occurrence at West Grove, Pa.

HOST PLANTS.

ORDER.	COMMON NAME.	TECHNICAL NAME.	AUTHORITY.	REMARKS.
Ranunculaceæ	Jackman's Clematis,	Clematis Jackmanni	Munson, Harvey	College green-houses only.
Resedaceæ	Mignonette	Reseda odorata	Munson	College green-houses only.
Caryoplyllaceæ	Pink	Dianthus caryoplyllus	Munson	College green-houses only.
Malvaceæ		Malope grandiflora	Bailey.	
Malvaceæ	Indian Mallow	Abutilon species	Bailey.	
Geraniaceæ	Stork's Bill	Pelargonium species	Henderson	Plants of this family have not been attacked at the College nor in Orono.
Geraniaceæ	Canary Bird	Tropæolium peregrinum	Munson.	
Leguminosæ	Beans		Bailey, Munson, Harvey	At Orono beans out of doors badly affected.
Rosaceæ	Ordinary Roses		Havey, Durgee & Conard Co.	
Rosaceæ	Polyantha roses		Bailey.	
Rosaceæ	Apricot		Bailey	Growing out of doors, near green-house.
Lythraceæ	Cuphea	Cuphea Llavæ	Henderson.	
Onagraceæ	Godelia	Œnothera species	Bailey.	
Onagraceæ	Ladies' Eardrop	Fuchsia species	Harvey	Plants in Orono badly infested.
Passifloraceæ	Gronadella	Passiflora edulus	Bailey.	
Cucurbitaceæ	Cucumbers	Cucumis sativus	Munson, Bailey, Harvey.	
Cucurbitaceæ	Musk Melon	Cucumis Melo	Munson	College grounds.
Rubiaceæ		Manettia species	Henderson.	
Rubiaceæ		Bouvardia species	Henderson.	
Compositæ	Feverfew	Leucanthemum Parthenium,	Harvey	Plants in Orono.
Compositæ		Chrysanthemum	Harvey, Henderson.	
Scrophulariaceæ,	Monkey-flower	Mimulus tigricoides	Munson.	
Scrophulariaceæ,	Musk Plant	Mimulus Moschatus	Munson.	
Scrophulariaceæ,	Slipper Flower	Calceolaria species	Henderson.	
Acanthaceæ	Thumbergia	Thumbergia alata	Bailey.	
Verbenaceæ	Verbena	Verbena species	Henderson, Bailey, Harvey.	
		Lantana species	Henderson.	
Labiatæ	Sage	Salvia splendens	Munson.	
Borraginaceæ	Heliotrope	Heliotropum sp.	Henderson.	
Convolvulaceæ	Cypress-vine	Quamoclet vulgaris	Munson.	
Convolvulaceæ	Moon-flower	Ipomea noctophylon	Munson.	
Convolvulaceæ	Morning Glory	Pharbitis species	Bailey.	
Solonaceæ	Tomato	Lycopersicum esculentum	Munson, Bailey, Harvey.	
Solonaceæ	Pepino	Solanum muricatum	Bailey, Munson.	

HOST PLANTS—CONCLUDED.

ORDER.	COMMON NAME.	TECHNICAL NAME.	AUTHORITY.	REMARKS.
Solonaceæ........	Egg Plant	Solanum melongena	Bailey, Munson.	
Solonaceæ........	Pepper	Capsicum annuum	Munson.	
Solonaceæ........	....	Petunia species...........	Harvey, Henderson.	
Solonaceæ........	Wedding Bell........	Brugmansia arborea....	Harvey	Very badly infested.
Euphorbiaceæ ...	Castor Oil Plant	Ricinus communis	Harvey	Badly infested.
	Hop................. .	Humulus lupulus...	Munson	Out of doors.
Araceæ............	Calla..................	Calla species..................	Harvey.	
Smilaceæ..........	Boston Smilax.......	Myrsiphyllum asparagoides,	Bailey	Very bad.
Liliaceæ	Easter Lily	Lilium Harrisii...............	Harvey.	

Remedies.

The experience of Bailey, Henderson and Munson would lead one to conclude that there is no remedy at present known that is entirely effective.

Henderson writes us that one of the best remedies is Fir Tree Oil, and another very good one is Cole's Insect Destroyer but the cost of the latter almost prohibits its being used in large quantities. Prof. Bailey has had considerable experience with Fir Tree Oil but does not find it entirely satisfactory, though of considerable value.

Prof. Munson says he has used an alcoholic tincture of Pryethrum and finds it quite satisfactory. There is a general belief that the red spider is readily destroyed by a copious use of water and will not flourish in a moist atmosphere. Prof. Munson relates one instance of a cucumber house where the plants were badly infested though the atmosphere was kept quite moist. We believe, however, that spraying the plants frequently with water, would help hold them in check by reducing the temperature. They seem to enjoy a high temperature.

Henderson believes an ounce of preventive is better than a pound of cure and if the plants are kept in good health they will resist the disease. He has frequently noticed that where plants become pot-bound it would make its appearance while others potted at the same time and shifted as the occasion required would be perfectly free from it, thus showing that the disease is altogether the result of imperfect conditions of growth. We have commented upon this elsewhere under the head of host plants.

Fir Tree Oil can be obtained from August Rölker & Sons, 136 W. 24th St., New York, at a cost of $3.25 per gallon, in five gallon lots, less ten per cent for cash with order. It should be diluted about one hundred times with water and applied with a syringe or atomizer.

Alcoholic Tincture of Pyrethrum—Digest one part by weight of Pyrethrum (Dalmation Insect Powder) in four parts of commercial alcohol and apply the undiluted tincture to the foliage with an atomizer.

Cole's Insect Destroyer—Mr. Henderson says: "Is sold in half pint cans, price 50 cents. It is all ready for applying with an atomizer, such as is used for perfumery. Being very powerful a little is sufficient. For house plants we know of no better insecticide."

CUT WORMS.

We publish the following correspondence not to criticise Mr. Fowler but to call attention to the loose way in which names are applied to insects and the importance of being certain about the names of insects doing injury before applying remedial measures. We were glad to receive Mr. Fowler's letter for it offered us the opportunity of explaining the restricted use of the term cut-worm by entomologists and that it is not used in the broad sense that includes any kind of worm found feeding upon the roots of farm crops. We will always be pleased to answer questions or explain differences of opinion.

CORRESPONDENCE.

SEARSMONT, ME., Sept. 9, '92.

MR. F. L. HARVEY:

DEAR SIR:—Part V of Ag. Rept. is at hand and in reading about cut-worms I think my experience may help some one. Cut-worms used to trouble my beets and corn. I noticed when green manure was used in the spring and left uncovered for any length of time—say half a day—a yellow fly such as one sees around manure piles used to fly around and on the manure in the drills, and produce an abundant crop of dark gray or brown or nearly black cut-worms. When manure was hauled from *dark* barn cellar and *immediately covered* found no cut-worms. So by keeping manure in cellar until wanted for use and keeping cellar dark so no flies would stay there and covering manure immediately I am clear of the pest. Whoever uses barn-yard manure, or manure that is stacked will find plenty of them. For proof examine droppings of cattle in pasture and around buildings and enough of these pests will be found at some stage in the manure. Hoping this may help some as a suggestion I send it. Very truly,

MOSES A. FOWLER.

The following is our answer somewhat changed and extended for publication:

ORONO, ME., September 23, '92.

MR. MOSES A. FOWLER:

DEAR SIR.—You and I have different ideas about cut-worms. According to my understanding the term cut-worm is *restricted* by entomologists to the larval or caterpillar stage of Hawk Moths such as I have figured in my Report, Figs. 4, 6 and 7 and is not used in the broad sense suggested by you, which would include all worms that eat or cut the roots or other parts of farm crops.

The yellow insects to which you refer belong to the *Order Dieptera* or *two-winged flies*, related to the house-fly and in their worm stages should be called *maggots*. Our root crops are often affected by maggots, as the maggot of the Radish Fly and that of the Onion Fly, but these do not cut off the plants like cut-worms but bore into the roots. The moths of cut-worms lay their eggs near the roots on grass in meadows and pastures and *not* in manure piles. The white *grubs* found in manure are the larvæ or worm stage of beetles (Coleoptera) like the May Beetle and related species. Though the housing of manure is to be recommended to prevent leaching and no doubt if properly protected would be less infested with manure-loving larvæ, but cut-worms do not seek such a nidus for their eggs.

Your crops were probably affected by the maggot of some fly, or more probably the grub of some beetle, or possibly by genuine cut-worms that had crawled from adjoining meadow or pasture lands. It may have been the grub of the *three-toothed Aphonus* mentioned in my Report, 1891, p. 199, as cutting corn. The sources of insect pests are so many, and the species that feed upon our farm crops so numerous, it is important that each case of injury be carefully examined.

If you will send me in a small box the worms you call cut-worms I will take pleasure in examining them and tell you whether they are correctly named.

Very truly yours,

F. L. HARVEY,

Entomologist for Station.

REPORT OF METEOROLOGIST.

PRESIDENT FERNALD, METEOROLOGIST TO THE STATION.

MAINE EXPERIMENT STATION.

Lat. 44°, 54′, 2″, *N.* *Long.* 68°, 40′, 11″, *W.*

In presenting my fourth annual report as Meteorologist to the Maine Experiment Station, I desire to state definitely as in former reports, that the object sought "is not so much the observing and reporting of general atmospheric phenomena as the careful study of the special meteorological conditions which are more or less intimately connected with practical agriculture."

In order to secure trustworthy results, it is necessary that observations directed toward a solution of any problem in Meteorology be continued through a series of years. Accordingly, in presenting my first report, a plan of summarizing observations and deducing conclusions was adopted, which should be suited to the presenting of like data covering any number of years.

The present report is made in accordance with the prearranged plan and includes in addition to the results of the three preceding years those obtained from about eleven thousand observations taken during the year 1892.

The deductions, therefore, of this report are based upon more than forty thousand independent observations.

The instruments have remained unchanged in position during the four years for which this report is made, and the greater part of the observations have been taken by one observer.

In presenting the arrangement of instruments and other necessary descriptive or explanatory data, I draw freely from my report of last year, simply adapting its statements so far as needful to the more extended period of time.

The most of the instruments employed were manufactured by H. J. Green, of Brooklyn, N. Y. Mr. Robert H. Fernald of

Orono, has been observer during the four years that this work has been carried on. In this report the results of observations made during the years 1889, 1890, 1891 and 1892, are combined.

The several problems considered appear in definite order, in the following pages. The first to which attention has been given, is a determination of the percentage of moisture in forest as compared with that in open field.

The arrangement of instruments for this investigation is herewith submitted.

Hygrometer No. 1 is placed in a wooden stand constructed for thermometrical instruments and located in the open field remote from buildings. Hygrometer No. 2 also is enclosed in a wooden box, perforated to allow a free circulation of air, and located also in the open field. Hygrometer No. 3 is also enclosed in a perforated box attached to a tree in a moderately dense forest. Hygrometer No. 4 is placed in a similar box attached to a tree in a portion of the forest a little more open than that in which No. 3 is located, but near which is a running brook except during the driest part of the summer.

Each hygrometer is about four feet above the surface of the ground. Readings are taken three times daily, at 7 A. M , at 1 P. M., and at 7 P. M., local time.

Observations were commenced April 5, 1889, and they have been continued through the growing seasons of 1889, 1890, 1891 and 1892.

The monthly averages are given in the following tables on the scale of 100.

PERCENTAGES OF MOISTURE.

HYGROMETER No. 1—IN OPEN FIELD.

	1889.			1890.			1891.			1892.			
	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	Mean
April	81	53	66	74	50	58	85	61	67	74	47	57	64
May	84	60	71	81	62	74	82	57	67	78	63	67	71
June	88	67	81	83	72	75	83	62	71	86	69	74	76
July	85	65	75	85	74	79	87	61	72	84	57	69	74
August..........	95	70	80	90	63	77	89	67	83	92	70	80	80
September	93	68	83	93	76	85	92	67	84	97	61	81	82
October	94	66	79	90	62	79	90	63	80	86	64	76	77
Mean results,	89	64	76	85	66	75	87	63	75	85	62	72	75

HYGROMETER No. 2—IN OPEN FIELD.

	1889.			1890.			1891.			1892.			
	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	Mean
April	78	52	65	70	46	56	84	62	70	74	50	63	64
May............	80	53	68	78	61	74	80	55	68	78	63	70	69
June	84	66	74	78	68	75	82	62	73	84	67	73	74
July	79	60	69	80	63	71	86	62	75	82	55	67	71
August..........	87	67	75	88	62	73	87	65	80	90	68	81	77
September	91	60	81	91	67	83	91	67	85	92	60	81	79
October.........	93	66	81	91	62	79	91	65	82	83	64	77	78
Mean results,	85	61	72	82	61	73	86	63	76	83	61	73	73

HYGROMETER No. 3—IN FOREST.

	1889.			1890.			1891.			1892.			
	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	Mean
April............	81	62	60	78	61	69	90	73	77	83	63	71	72
May	83	63	73	87	74	81	86	68	75	86	71	76	77
June............	89	80	84	87	77	82	88	81	84	91	78	82	73
July	94	86	91	93	85	83	92	80	85	92	74	81	86
August..........	91	89	93	94	80	84	95	81	88	96	85	89	89
September	96	88	92	96	87	92	95	81	92	96	77	88	88
October	96	90	90	96	86	90	92	77	86	90	80	85	88
Mean results,	90	80	85	90	79	83	91	77	84	91	75	82	82

HYGROMETER No. 4—IN FOREST.

	1889.			1890.			1891.			1892.			
	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	7 A. M.	1 P. M.	7 P. M.	Mean
April.....	83	65	77	79	60	71	91	74	82	84	65	75	75
May	89	66	80	88	73	84	87	69	78	87	74	77	79
June.............	92	81	86	89	77	84	90	74	82	92	79	84	84
July	93	79	87	91	79	85	93	79	86	94	72	80	85
August.....	95	86	91	91	78	85	96	78	90	97	86	90	89
September	96	83	90	97	86	92	96	79	92	95	76	87	88
October.........	96	80	90	94	80	89	92	76	87	91	79	86	87
Mean results,	92	77	86	90	76	84	92	75	85	91	76	81	84

Percentages of Moisture.

results for 1889, 1890, 1891 and 1892, combined.

	7 A. M.	1 P. M.	7 P. M.	Mean.
Hygrometer No. 1, in open field,	86	64	75	75
" " 2, " "	84	62	73	73
" " 3, in forest,	90	78	84	84
" " 4, "	91	76	84	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 hygromenters 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,	91	77	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.
6	14	10	10

It thus appears from observations covering the period of growth of four years, that the excess of moisture in forest above that of open field in the morning, amounts to but 6 per cent, while in the middle of the day it rises to 14 per cent, and at night-fall drops down to 10 per cent, and that the mean excess for the day is 10 per cent. In a very dense forest the percentage of excess would undoubtedly rise much higher. The presence of patches of forest in any region exerts a marked influence on the hygroscopic conditions of the atmosphere, and this condition, in turn, is an important factor in the growth of vegetation.

Soil Temperatures.

In this investigation a knowledge of the temperature of the soil at different depths, during the growing season, is sought, and ultimately the law which represents the rate of change of temperature at different depths.

The periods covered by the experiment are from May 1 to Nov. 1, 1889, from April 1 to Nov. 1, 1890, 1891 and 1892, with thermometers placed in the soil to the depths of 1, 3, 6, 9, 12, 24 and 36 inches.

The thermometers have been allowed to remain in place during the winters intervening between the periods of observation.

Their location is in the open field, near hygrometer No. 2, in the tract of land assigned to the Station for experimental purposes and devoted to farm experiments. The character of the soil is regarded, therefore, as representative of that on which the field experiments by the Station are carried on.

A summary of results for the four seasons by monthly averages is given in the annexed tables.

Thermometer in the Open Air.

(Locality the same as that of the soil thermometers.)

1889.

	7 A. M. Deg.	1 P. M. Deg.	7 P. M. Deg.	Mean. Deg.
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. Deg.	1 P. M. Deg.	7 P. M. Deg.	Mean. Deg.
April	35.76	49.02	42.55	42.44
May	49.16	60.60	53.58	54.45
June	57.95	67.64	62.76	62.78
July	67.10	76.19	71.85	71.71
August	61.50	73.78	68.84	68.04
September	52.04	66.16	58.52	58.91
October	37.70	53.19	45.63	45.51
Mean	51.60	63.80	57.68	57.69

1891.

	7 A. M. Deg.	1 P. M. Deg.	7 P. M. Deg.	Mean. Deg.
April	36.33	48.26	43.64	42.74
May	47.07	61.75	53.30	54.04
June	58.28	72.42	65.38	65.36
July	64.08	76.05	68.81	69.65
August	62.07	74.94	67.47	68.16
September	56.13	69.72	61.80	62.55
October	38.11	54.02	45.56	45.90
Mean	51.72	65.31	57.99	57.34

1892.

	7 A. M. Deg.	1 P. M. Deg.	7 P. M. Deg.	Mean. Deg.
April	37.29	51.93	45.10	44.77
May	47.00	58.95	54.19	53.38
June	58.74	70.65	67.29	65.56
July	65.58	78.54	71.92	72.11
August	61.16	74.15	67.46	67.50
September	53.33	68.19	56.52	59.68
October	40.98	51.65	45.13	45.94
Mean	52.05	64.87	57.38	58.43

Table Showing Changes of Temperature in the Soil for Increased Depths—1889.

Depth of Thermometer.	Mean temperature for 6 months, May to October, inclusive—deg.	Difference in mean temperatures—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 7 months, April to October, inclusive—deg.	Difference in mean temperatures—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

1891.

Depth of Thermometer.	Mean temperature for 7 months, April to October inclusive—degrees.	Difference in mean temperatures—degrees.	Changes in temperature for one inch—degrees.
1 inch	56.65		
3 inches	56.89	+0.24	+0.12
6 inches	55.56	—1.33	—0.44
9 inches	54.74	—0.82	—0.27
12 inches	54.52	—0.22	—0.07
24 inches	52.49	—2.03	—0.17
36 inches	51.36	—1.13	—0.09

1892.

Depth of Thermometer.	Mean temperature for 7 months, April to October inclusive—degrees.	Difference in mean temperatures—degrees.	Changes in temperature for one inch—degrees.
1 inch	55.62		
3 inches	55.63	+0.01	+0.003
6 inches	54.79	—0.84	—0.28
9 inches	54.16	—0.63	—0.21
12 inches	54.15	—0.01	—0.003
24 inches	52.39	—1.76	—0.14
36 inches	51.13	—1.26	—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 1 inch during the period of observations was 5°.22: at the depth of inches, 4°.54; at the depth of 6 inches, 1°.81; at the depth of 9 inches, 1°.02, and 12 inches very slight.

At the depth of 3 inches, the average temperature of the soil was somewhat higher than at the depth of 1 inch. The surface soil averaged about five degrees warmer than the soil 36 inches below the surface.

The rate of reduction of temperature with depth below the layer three inches from the surface is shown in a general way in the foregoing tables.

This rate is probably in accordance with a simple law which can be expressed by a mathematical formula, variable, undoubtedly, for different soils. However, on examining the "changes in temperature for one inch" in the foregoing tables, it will be noticed that the rate has been clearly vitiated since 1889 by the record of the nine inch thermometer.

The anomalous action of this instrument is accounted for by the fact, that at the end of the year 1889, the nine inch thermometer first used was broken and a new one was substituted. The contact of the latter with the soil was not the same as that of the former, nor has it been the same as that of the other instruments which have not been disturbed in the four years.

This accident, although vitiating the results of the present investigation, is not without its value, since it clearly indicates the need of maintaining uniform conditions in carrying on a work of the nature and delicacy of that for which soil thermometers are employed.

Comparing soil temperatures with air temperatures during the four seasons, the following mean results appear: At the depth of 1 inch, the temperature of the soil was lower than at that of the air by 2°.32; at the depth of 3 inches, by 2°.12; 6 inches, by 3°.22; 9 inches, by 3°.94; 12 inches, by 4°.12; 24 inches, by 5°.86, and at the depth of 36 inches, by 7°.16.

Amount of Sunshine.

The amount of sunshine as an essential factor in crop production is worthy of observation and record. Observations were commenced May 1, 1890, and the table below furnishes the summary for the six months following and for seven months, April to November, 1891, and for seven months, April to November, 1892.

Bright Sunshine in Hours.

1890.

	May.	June.	July.	Aug.	Sept.	Oct.	Mean.
Sunshine,	180	186	216	193	126	133	172
Hours per day, mean,	5.8	6.2	7.0	2.6	4.2	3.3	5.6

1891.

	April.	May.	June.	July.	Aug.	Sept.	Oct.	Mean.
Sunshine,	174	207	217	259	225	234	154	209
Hours per day, mean,	5.8	6.7	7.2	8.4	7.3	7.8	5.0	6.9

1892.

	April.	May.	June.	July.	Aug.	Sept.	Oct.	Mean.
Sunshine,	228	123	198	294	173	259	149	203
Hours per day, mean,	7.6	4 0	6.6	9.5	5.6	8.6	4.8	6.7

During the period covered by the above table, the average hours of bright sunshine per day were 6.4 or 46 per cent. of the possible amount.

WIND AND RAIN.

The velocity of the wind has been determined by a Robinson's Anemometer, with electrical recording apparatus, attached to the Experiment Station building, and the amount of rain by means of a guage, 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.

April	241.83	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	155.50	6.45	4.21
October	189.01	7.85	3.19
Mean	200.74	8.34	Total, 32.52

1891.

April	210 55	8.77	3 13
May	206.25	8.59	2.76
June	182.71	7.61	3.13
July	185.44	7.73	3.36
August	169.58	7.07	4.38
September	162.07	6.75	3.50
October	191.92	8.00	2 81
Mean	186.93	7.79	23.07

1892.

	WIND. Mean distance travelled per day. Miles.	WIND. Velocity per hour. Miles.	RAIN. Amount. Inches.
April	244.99	10.21	1 09
May	262.23	10.93	1.99
June	197.87	8.24	5.66
July	199.50	8.31	1.88
August	168.36	7.02	6.11
September	185.28	7.72	3.43
October	199.13	8.26	1.46
Mean	208 19	8.67	21.62

For the full year 1890, the mean daily velocity of the wind was 211.16 miles and the mean hourly velocity, 8.90 miles; for the full year 1891, the corresponding velocities were respectively 214.82 miles and 8.95 miles; and for the full year 1892, 217.33 miles and 9.05 miles.

The rain-fall in May, 1890, amounting to 10.13 inches was larger than in any other month in twenty-four years.

TREASURER'S REPORT.

THE MAINE AGRICULTURAL EXPERIMENT STATION,
In account with
THE UNITED STATES APPROPRIATION.

RECEIPTS.

From the Treasury of the United States as per appropriation for the year ending June 30, 1892,		$15,000 00

EXPENDITURES.

Chemical Laboratory	$434 54	
General Expense	297 77	
Field and Feeding	790 34	
Horticultural Department	793 34	
Head House	468 93	
Library	62 97	
Printing	1,667 35	
Stationery and Postage	108 00	
Traveling Expenses	147 00	
Trustee Expenses	50 40	
Construction and Repairs	277 19	
Botany and Entomology	33 50	
Fertilizer Inspection	209 16	
Meteorology	20 50	
Veterinary Science	28 46	
Fuel Account	294 45	
Salaries	9,316 10	
		$15,000 00

I hereby certify that the above is a correct statement of the amount expended by the Maine Experiment Station for the year ending June 30, 1892.

GEO. H. HAMLIN,
Treasurer of Trustees, Maine State College of Agriculture and the Mechanic Arts.

I hereby certify that I have examined the accounts of the Maine Experiment Station for the fiscal year ending June 30, 1892; that I have found the above to be a correct statement of expenditures both as to amount and classification, for all of which proper vouchers are on file.

HENRY LORD,
Auditor of the Trustees, Maine State College of Agriculture and the Mechanic Arts.

I hereby certify that the above are the signatures of the Treasurer and Auditor of the Trustees of the Maine State College of Agriculture and the Mechanic Arts.

W. H. JORDAN, *Director of Station.*

DIRECTOR'S REPORT.

M. C. Fernald, Ph. D., President Maine State College:

SIR: The work of the Maine Experiment Station for the year 1892, a report concerning which I have the honor to submit herewith, has been conducted along the lines previously established. It has included the following: 1st, inspection of fertilizers; 2d, analyses of cattle foods, including certain patent foods which are offered for sale at greatly advanced prices. An attempt has been made to demonstrate to the farmer the very poor economy of purchasing the latter; 3d, investigations concerning the secondary effects of pollination. In presenting the results, Prof. Munson has taken the occasion to collect in the form of a monograph all the available information which has been published on the subject; 4th, experimental work on varieties and methods of treatment of certain garden vegetables, including cabbages, tomatoes and egg plants; 5th, contents, cultivation and care of small and large fruits which are being tested; 6th, spraying experiments, specially with reference to the apple scab and codling moth; 7th, the identification and description to inquirers of such injurious plants and insects as are sent to the Station; 8th, investigations in plant nutrition bearing upon the economical use of crude fertilizing materials; 9th, digestion experiments; 10th, feeding experiments with swine and milch cows.

PUBLICATIONS OF THE STATION.

The publications of the Station by means of which the results of the above experiments and investigations are set forth have consisted of a report issued in five parts. In this report have been included everything excepting the digestion and feeding experiments. These have so far been in the immediate charge of the Director of the Station, but owing to increased duties in connection with the World's Fair, he has not been able either to undertake the past season as extensive experiments or to report them as promptly as otherwise would have been the case. Only a limited edition of Part 2, of the report (Secondary Effects of Pollination) was issued as it was sent out only to newspapers, experiment stations and experiment station workers. The reason for this was that the publication was of a strictly scientific nature and while presenting the results which it is hoped will lead to practical conclusions eventually, its contents were of such a nature as to be of little general interest. Besides the five parts of the station report, there was also issued a bulletin on the Babcock Milk Test and six newspaper bulletins, the latter being designed as a concise and simple statement of the outcome of certain practical experiments.

STATION EXHIBIT AT THE COLUMBIAN EXPOSITION.

At a mee.ing of the association of colleges and experiment stations held at Champaign, Ill., in November, 1890, it was voted that the experiment stations unite with the United States Department of Agriculture in making a co-operative exhibit at the Columbian Exposition. A committee of five was appointed to act in conjunction with the Central Office of Experiment Stations in forming and executing plans for this exhibit. It was decided that instead of inviting each experiment station to make an individual exhibit, thus causing very much of repetition, it would be better to co-ordinate the total exhibit into sections, each section to represent a particular subject. I was invited to take immediate charge of the section devoted to Animal Nutrition, and after consultation with yourself, agreed to do so. It was evident from the first that because of the nature of this subject, the exhibit could not consist so much of objects of special interest as of a graphic display of results. For instance, it was very evident that the main factor of the exhibit must be a display of the relation of food and growth under varying conditions, and if such a display were to mean anything as an expression of the work of American experiment stations, it must be based upon their experimental data. This necessitated the review of all the station literature bearing upon experiments in animal nutrition. All the experiment stations that had conducted feeding experiments were invited to assist in this work, and some of them very kindly furnished the data of their own feeding experiments so arranged and digested as to be immediately useful in obtaining certain necessary general averages. The required data from swine feeding experiments were very kindly furnished by the Office of Experiment Stations from manuscript prepared by Dr. Armsby, of State College, Pennsylvania.

In order to obtain the necessary figures pertaining to milk production and the growth of bovines and sheep, there were used the results of one hundred and twelve feeding experiments made by American stations. As before stated, many of these results were put into the desired form by the stations making the experiments, but considerably more than half of them were worked up in this office from the original data. Moreover, a large part of the exhibit itself has been prepared here. All of this required my personal attention. I make the above statements as an explanation why that line of experimental work in which I am immediately interested has been to some extent neglected.

Work in Plant Nutrition.

Through you I desire to urge upon the attention of the Board of Trustees a proposed enlargement of our work in plant nutrition. Since the establishment of the Experiment Station under the provisions of the Hatch Act, the experiments and investigations in plant feeding have been under the immediate charge of Prof. Balentine. He has attempted to reach beneficial results through field experiments on the College Farm, through experiments conducted by farmers in different parts of the State, and through more or less experimentation in pots with a view to a more exact work than can be done in the field.

It is very evident and has been for some time that not only are the errors of field experimentation very large, but that the usefulness of this method of work is limited to the testing of theories as to the correct methods of maintaining fertility. An exact study of the fact and principles of plant nutrition must be accomplished by some other method. It is a noticeable fact that American Experiment Stations are giving comparatively little attention to this subject, at least in the way of rigid scientific investigation, and an inviting and important field of work seems to be open. The nutrition of animals has received a much larger amount of attention.

Experiments now under way in the forcing house give promise of a far greater degree of success than has been possible under previously existing conditions, and Prof. Balentine is desirous that there shall be erected a new forcing house which shall be entirely utilized, for a time at least, by experiments of this kind. This idea has my most hearty endorsement, and through you I wish to urge upon the trustees the importance of developing this line of investigation. The present forcing house is entirely inadequate to accommodate any additional experiments. As this new forcing house would stand in a prominent place, it should be somewhat more ornamental than the one already built, and not less than $1,500 should be available for its construction.

Acknowledgments.

The Experiment Station is under obligation to the following parties for gifts of various kinds:

Donations, 1892.

O. M. Lord, Minnesota City, Minn., apple cions.

J. S. Harris, La Crescent, Minn., apple cions.

C. G. Patten, Charles City, Iowa, apple cions.

Jewel Nursery Co., Lake City, Minn., 6 Thompson Seedling Apple Trees; 6 Windom Dewberry; 6 North Star Currants.

Ellwanger & Barry, Rochester, N. Y., specimen fruits of autumn pears.

Field Force Pump Co., Lockport, N. Y., 1 Little Gem spraying pump.

The following newspapers and other publications are kindly donated to the Station by the publishers during 1892:

Farmers' Home, Dayton, Ohio.

Holstein Friesian Register, Boston, Mass.

Farm and Home, Springfield, Ill.

Jersey Bulletin, Indianapolis, Ind.

Monthly Bulletin, Philadelphia, Pa.

Farmers' Advocate, London, Ont.

Maine Farmer, Augusta, Me.

Southern Cultivator, Atlanta, Ga.

American Dairyman, New York, N. Y.

The Pharmaceutical Era, Detroit, Mich.

The Sun, Baltimore, Md.

Massachusetts Ploughman, Boston, Mass.
Practical Farmer, Philadelphia, Pa.
New England Farmer, Boston, Mass.
Louisiana Planter, New Orleans, La.
Mirror and Farmer, Manchester, N. H.
Texas Farmer, Dallas, Texas.
Hoard's Dairyman, Fort Atkinson, Wis.
Iowa Farmer and Breeder, Cedar Rapids, Iowa.
Detroit Free Press, Detroit, Mich.
Orange County Farmer, Port Jervis, N. Y.
Farm Journal, Philadelphia, Pa.
Delaware Farm and Home, Wilmington, Del.
The Western Rural, Chicago, Ill.
American Cultivator, Boston, Mass.
Farmers' Review, Chicago, Ill.
The Rural Canadian, Toronto, Ont.
Vick's Magazine, Rochester, N. Y.
The Farm and Dairy, Ames, Iowa.
The Clover Leaf, South Bend, Ind.
New York World. (Weekly).
The Grange Visitor, Lansing, Mich.
The Industrial American, Lexington, Ky.
The American Grange Bulletin and Scientific Farmer, Cincinnati, Ohio.
Agricultural Epitomist, Indianapolis, Ind.
The Prairie Farmer, Chicago, Ill.

W. H. JORDAN.
Director.

MAINE STATE COLLEGE,
ORONO, ME., December 31, 1892.

APPENDIX.

Annual Report of the State Pomological Societv.

1892-93.

FARMINGTON, June 1, 1893.

HON. B. WALKER MCKEEN,

Secretary Maine Board of Agriculture:—

I have the honor to transmit herewith for publication in the annual report on the agriculture of Maine, the transactions of the Maine State Pomological Society for the year 1892–93.

Yours respectfully,

D. H. KNOWLTON, *Secretary.*

MAINE STATE POMOLOGICAL SOCIETY.

Transactions for the Year 1892–93.

REPORT OF THE SECRETARY.

A YEAR IN POMOLOGY.

For various reasons that I am unable to explain, it has not been the custom in our society for the secretary to offer any formal report at the annual winter meeting. As we are meeting this year in the city where the society twenty years ago held its first meeting and perfected its organization, it seems best to depart from the custom of recent years. This is the only apology I have for offering this paper, which aims at giving a hasty review of the work accomplished in the State the past year.

It is gratifying to note that our own people are beginning to realize that here in Maine we have the most favorable conditions for successful fruit culture. While it seems to be a hard lesson for the State as a whole to learn, year after year the facts of successful fruit culture accumulate, and bear tangible evidence to him who will read them that year after year the fruit growers are making profitable gains from their orchards and small fruits. The surprising thing to sharp business men is that the farmers do not more quickly "catch on" to these facts and devote more time and intelligence to fruit culture. When Florida oranges can be profitably grown and retailed in towns several hundred miles from Boston for a cent and a quarter each, there can be no doubt about the profit of growing apples in this State that will retail for more money than these oranges. But there has been a steady gain from year to year though it sometimes seems to be very slow. So that there are now more fruit-bearing trees in the State than ever before.

For several years past the fruit crop of the State has been large, and of these crops the last one harvested is probably the largest and in quality ranks as one of the best. Of the extent of this crop we will quote the following from a recent issue of the *Maine Farmer:*

"Never before were so many apples harvested in the State in a single year. This conclusion can be relied on, without question, for growers have actually got the apples to prove it. From all the principal fruit growing sections of the State the reports are the same—'more apples than ever before raised in this vicinity.' This increase over past years is not due to extraordinary bearing. Many times before the trees have fruited as bountifully as this year. While trees generally bore a full crop, there are many young trees coming into bearing each successive year, and these are adding greatly to the crop. Maine has uudoubtedly doubled her crop of winter apples in the last ten years, and if no killing winter interferes, will double it again in the next decade. This great crop is chiefly winter fruit. It is of good size, unusually high colored, and very free from worms. All in all it has been a great harvest of fruit."

To give some idea of the extent of fruit culture in individual instances we will refer to a few orchards in the State. President Pope from his orchard this year harvested nearly 2000 barrels of apples, mostly Baldwins. A. C. Carr of Winthrop gathered 500 barrels from his orchard, the Longfellows in the same town had 600 barrels, mostly of russets. Phineas Whittier of Chesterville has a crop that will reach 2000 barrels, largely Baldwins. The Rickers of Turner had nearly as many. There are others quite as large, and hundreds of farmers have gathered from 50 to 500 barrels of apples each, making in the aggregate one of the largest and most profitable of farm crops during the season.

Two years ago a Massachusetts dealer in apples who cares for nothing but the best fruit for his own market came to Franklin county and bought several car-loads of apples. The apples were of excellent quality, and this season he began to look around for fruit. He came to the county for the second time and began first of all to seek fruit of those of whom he had bought two years before. When he found fruit that suited him, he bought it if he could. In some cases he paid fifty cents more than the local buyers would offer because he wanted the fruit. His coming annoyed other buyers, but he bought what fruit he needed. The circumstance suggested two lessons, that good fruit sold this year not only brings a good price but recommends the fruit of the locality for years after, the other lesson is the importance of producing and offering for sale only the best fruit.

The markets in which our fruit has found a sale are also deserving of some notice as well as the improved facilities that are being afforded for forwarding the fruit. The crop in the West and Southwest was very light, and thousands of barrels of Maine apples have been sent to Chicago, Minneapolis, Cincinnati, Omaha, and to other points West and South. It may be well to note that on one occasion an entire train loaded with apples was sent from the city of Portland to the West. We regret to learn that much complaint has been made of the quality of these apples, for it takes a long time in trade as well as morals to overcome the ill odor that hovers about a bad name. The foreign markets have been largely supplied with Canadian fruit, and most of the season prices have ruled low, so low in fact that buyers have found the market in the states as good or better. Several ocean steamers have provided artificial ventilation for the apartments in which the fruit is stored. The fruit stands up much better and reaches the foreign market in much better condition. This suggests that there may be more satisfactory methods of packing our fruit, especially such as sell for the dessert. When this class of fruit is worth as much as oranges in the markets of the world we are quite confident that fruit growers should take as much pains in sorting and packing as do the orange growers of Florida and California.

As a pleasing incident in connection with our fruit interests it gives us pleasure to call attention to the exhibit made by Mr. C. A. Arnold, a member of our society from Arnold, at the Brockton, Mass., fair which occurred shortly after ours. The officers of that society were so well pleased with this exhibition, that although it was missent and arrived late, a liberal gratuity was awarded Mr. Arnold. We approve of making exhibits at other fairs and believe it would pay for our fruit growers to follow it up. From this particular exhibit we learned through several private sources, satisfying us that Mr. Arnold deserves our thanks for making the exhibit.

There have been only two special meetings of the Executive Committee. Other meetings were held the day following our winter meeting at Cornish and during the exhibition in Lewiston. It has been the purpose of the officers to have as few meetings as possible on account of the expense connected with them. At the first meeting the premium list was revised. At the annual autumn meeting the accounts of the fair were examined and approved, and arrangements were entered into between the Executive Committee and the Executive Commissioner of the World's Columbian Fair, and in November the committee were again called together on account of matters connected with the World's Fair.

The Executive Committee were not inclined to have anything to do with the World's Fair, as they did not think at so late a date it would be possible to make a creditable exhibition of Maine fruits and their products. Just before the time of our fair we were notified by the Executive Commissioner that he was ready to make a contract with our society to make a fruit exhibition at the World's Fair, and that for that purpose the sum of $1000 had been placed at his disposal. The matter was referred to our annual meeting, and the executive officers were authorized to take such action as their judgment might dictate. They were in doubt as to the best course to pursue, but many members urged the officers to undertake the collection of the fruit exhibit and do all the means at the disposal of the society would permit. It was not, however, until the 30th day of September that arrangements were finally determined. At this time the committee appointed H. W. Brown and A. E. Andrews to have "charge of collecting, preserving and preparing fruit for the exhibition of fruit at the World's Fair." Later having completed the collection and placed it in cold storage, the Executive Committee contracted with Mr. Willis A. Luce to forward the fruit at the proper time and install the exhibition. Some fifty varieties of fruit were collected, some of which were contributed, and others purchased. The following is the list of fruits contributed by the members of our society and others.

Alexander—	Miss Grace M. Sleeper, Lewiston,	specimens.
American Beauty—	Benson W. Brown, East Wilton,	"
American Golden Russet—	Alonzo Butler, Union,	"
American Golden Pippin—	" " "	"
Bailey Sweet—	Mellen Hayes, Farmington,	"
	J. B. Knowlton, Strong,	"
Baldwin —	C. C. Cushman, Farmington,	"
	I. C. Dudley, Readfield,	"
	Miss Mary Addle, Readfield,	"

Baldwin — Miss H. Della Porter, Readfield, specimens.
J. E. McCormick, " "
Elina Royal, " "
J. T. Sherburne, " "
G. K. Staples, Temple, one barrel.
J. W. True, New Gloucester, one barrel.
E. K. Whitney, Hartford, "
Charles S. Pope, Manchester, "
Charles I. Perley, Vassalboro, "
B. M. Titcomb, Farmington, one bushel.
Ben Davis—T. M. Merrill, West Gloucester, one barrel.
H. A. P. Kyes, Industry, specimens.
Black Oxford—Alonzo Butler, Union, "
Blue Pearmain—John Knowlton, Farmington, specimens.
John F. Norton, " "
Alonzo Butler, Union, "
Boardman—E. F. Purington, West Farmington, "
Boston Baldwin—Miss Emma A. Glidden, Readfield, "
Canada Red—B. M. Titcomb, Farmington, "
Wm. H. Hunter, Strong, "
Carver—Miss Emma A. Glidden, Readfield, "
Miss Mary Addle, " "
Chenango Strawberry—M. P. Tufts, Farmington, "
Crab-apples—Miss Minnie A. Dudley, Readfield, "
Deane (Nine Ounce)—M. P. Tufts, Farmington, "
Dudley's Winter (seedling) —J. W. Dudley, Castle Hill, specimens.
Ewart—C. C. Cushman, Farmington, specimens.
Fallawater — Alonzo Butler, Union, "
C. M. Knowlton, Belfast, one barrel.
J. S. Hoxie, Fairfield, "
Fall Harvey—John S. Gay, Farmington, specimens.
E. W. Gould, Jay, "
B. W. Brown, East Wilton, "
Fall Pippin —D. H. Knowlton, Farmington, "
Fameuse— John S. Gay, Farmington, "
Alonzo Butler, Union, "
C. C. Cushman, Farmington, "
R. H. Smith, " "
Fameuse Sucre—C. C. Cushman, " "
Fletcher Sweet—Alonzo Butler, Union, "
Furbush Sweet (seedling) —A. W. Furbush, E. Wilton, specimens.

Garden Royal—E. Lord, Farmington, specimens.
Gilliflower — John S. Gay, " "
Wm. H. Hunter, Strong, "
J. E. McCormick, Readfield, "
Golden Ball—A. F. Hardy, Farmington, "
Herman Corbett, " "
Granite Beauty—C. C. Cushman, " "
Gravenstein—Charles S. Pope, Manchester, "
S. F. Knowlton, Strong, "
Grimes' Golden—Alonzo Butler, Union, "
Hurlbut—A. N. Goodridge, Industry, "
Jewett's Fine Red (Nodhead)—R. H. Smith, Farmington, specimens.
Alonzo Butler, Union, "
King of Tompkins—J. F. Norton, Farmington, specimens.
Alonzo Butler, Union, "
King Sweet—Dennis H. Smith, Farmington, "
Lord Russet (seedling) —E. Lord, " "
Mann—A. F. Hardy, " "
McIntosh Red—C. C. Cushman, Farmington, specimens.
Phineas Whittier, Chesterville, "
Mother—Alonzo Butler, Union, "
Miss Amy A. Dudley, Readfield, "
Mt. Vernon Red—Hiram Gilman, " "
Northern Spy—David Dudley, " "
E. A. Lapham, Pittston, one barrel.
Hall C. Burleigh, Vassalboro, one barrel.
Elina Royal, Readfield, specimens.
Miss H. Della Porter, Readfield, specimens.
Olive (seedling) —Albert W. Furbush, Farmington, "
Oxford—S. A. Dudley, Readfield, "
Peck's Pleasant—S. R. Sweetser, Cumberland Cen., "
Pennock's Red Winter—Alonzo Butler, Union, "
Porter—S. F. Knowlton, Strong, "
Poughkeepsie Russet—Alonzo Butler, Union, "
Pound Sweet—B. W. Brown, Wilton, "
Pumpkin Sweet—Dennis H. Smith, Farmington, "
Rambo—Alonzo Butler, Union, "
Rhode Island Greenings—C. S. Phinney, Standish, one barrel.
David Dudley, Readfield, specimens.
J. T. Sherburne, " "
Roxbury Russets—G. W. Waugh, Winthrop, one barrel.

Rubicon—E. Lord, Farmington, specimens.
Russian Crabs—S. A. Dudley, Readfield, specimens.
Sally (seedling) —A. W. Furbush, E. Wilton, "
Sarah—B. W. Brown, " "
Seedling (unnamed)—J. B. Knowlton, Strong, "
Seek No Further—Wm. H. Hunter, " "
Specimens—M. V. Dudley, Readfield Depot, one barrel.
L. H. Blossom, Turner, "
S. H. Dawes, Harrison, "
S. C. Harlow, Bangor, "
James Nutting, E. Perham, one box.
W. S. Phinney, Standish, "
J. A. Wellman, Brooks, "
——— ———, Waldoboro, "
David Morrill, Cornish, one box.
S. R. Sweetser, Cumberland Center, one box.
A. A. Eastman, Dexter, "
S. R. Carleton, Cedar Grove, "
D. J. Briggs, So. Turner, "
Spitzenburg—John F. Norton, Farmington, specimens.
S. Frank Knowlton, Strong, "
Stark—J. Libby, Gray, "
St. Lawrence—Alonzo Butler, Union, "
Twenty Ounce—A. B. Jennings, Farmington, "
Unnamed Varieties—John Knowlton, " "
(4)—Alonzo Butler, Union, "
Wagener—Benson W. Brown, E. Wilton, "
Wealthy—H. L. Foot, Wilton, "
Winthrop Greening—A. F. Hardy, Farmington, "
Yellow Bellflower—R. H. Gardiner, Gardiner, one barrel.
Miss Emma A. Glidden, Readfield, specimens.
Wm. R. Wharff, Gardiner, one barrel.
A. E. Andrews, " "
Yellow Favorite—Alonzo Butler, Union, specimens.
York Russet—A. F. Hardy, Farmington, "
Pears—S. C. Harlow, Bangor, one box.
M. V. Dudley, Readfield, specimens.
Alonzo Butler, Union, "
Cranberries—A. C. Greenleaf, Farmington, one box.
L. H. Blossom, Turner, "
Barberries—Mrs. Fitzsimmons, Moscow "

The apples credited in the list to Alonzo Butler, Union, include his own contributions and apples contributed by R. B. Robbins, A. J. Young, G. W. Butler, Union; Hon. N. A. Farwell, Rockland; E. D. Gushee, A. F. Gushee, V C. Kellar, Dr. Frank A. Gushee, Appleton.

Experiments were undertaken to preserve more or less of the fruit so as to show in glass, but they were not successful and the fruit was destroyed.

At first we suppossed it was reasonably certain just what we could do, but as the collection of fruit was progressing we found there were many uncertainties about the whole matter and some of them even unsettled up to the last moment. We expected one of our special committee would be able to visit Chicago and study the situation, but in this we were disappointed and were obliged to await the slow process of correspondence. As it is uncertain how well our fruit may hold up for the purpose of exhibition, it was our intention to show as many varieties as possible along with our green fruits, in some preserving fluid, but it took a long while to get the consent of the Chief of the Horticultural Department to do so. It is the purpose of the Executive Committee to make the best showing possible with the money placed at their disposal. Many fruit growers have generously contributed fruit already and it is hoped that we may be able before the time comes to make arrangements for showing more varieties of green fruit to good advantage next fall. As soon as arrangements are perfected they will be announced, and it is hoped that the fruit growers of the State will lend a hand in making up the supply of suitable specimens for exhibition. Should another year be as good as the past year we are confident that we can make a good showing of single varieties in competition with other states. We believe, moreover, that the fruit growers of the State owe it to themselves to take advantage of any favorable opportunity that may offer itself in this direction.

Prof. Van Deman has always been ready to aid us in our work, and he and his assistants have the best wishes of our members. As illustrative of the work the Division of Pomology is doing, we were informed by Mr. Taylor that the department would exhibit at the World's Fair hand-painted models in wax of the following varieties of apples from this State:

Alexander, Bailey Sweet, Baldwin, Ben Davis, Blue Pearmain, Black Oxford, Bullock, Dudley's Winter, Fallawater, Fameuse, Granite Beauty, Garden Sweet, Hubbardston, Mary, Minister, McIntosh Red, Mother, Nodhead, Naked Limb Greening, Northern Spy, Porter, Pewawkee, Peck's Pleasant, Pound Sweet, Rhode Island Greening, Roxbury Russet, St. Lawrence, Salina (seedling from Aroostook county), Stark, Starkey, Swaar, Tolman Sweet, Tompkins King, Twenty Ounce, Wagener, Wealthy, Yellow Bellflower.

Reference is also made to the business transactions of the executive committee and the society to be found in another part of this volume. Further mention is also made of the society's transactions under the reports covering the annual exhibition and the public meetings. To the general reader we commend the papers and discussions presented at our public meetings. In another part of these transactions these papers, etc., in condensed form, may be found. The class exercise, conducted by Miss Wilson, illustrative of agriculture and horticulture in the schools, may be found in the report of the secretary of the Board of Agriculture.

In this connection it is a pleasure to state that I am under obligation in many ways to Secretary McKeen, who has shown himself an active factor in promoting the interests of agriculture in Maine. At all times he has cordially aided us, and his assistance has been of the most efficient nature.

D. H. KNOWLTON, *Secretary.*

OFFICERS FOR 1893.

President.

CHARLES S. POPE, Manchester.

Vice Presidents.

S. H. DAWES, Harrison.

D. P. TRUE, Leeds Centre.

Secretary.

D. H. KNOWLTON, Farmington.

Treasurer.

CHARLES E. WHEELER, Chesterville.

Executive Committee.

The President and Secretary, *ex-officio*; H. W. Brown, Newburg; A. E. Andrews, Gardiner, resigned at winter meeting and Willis A. Luce, South Union, elected to his place; 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. Lapam, Pittston.
Knox	"	Alonzo Butler, Union.
Lincoln	"	H. J. A. Simmons, Waldoboro'.
Oxford	"	C. H. George, Hebron.
Penobscot	"	C. A. Arnold, Arnold.
Piscataquis	"	A. W. Gilman, Foxcroft.
Sagadahoc	"	A. P. Ring, Richmond.
Somerset	"	James S. Hoxie, North Fairfield.
Waldo	"	D. B. Johnson, Freedom.
Washington	"	M. S. Springer, Danforth.
York	"	John C. Small, 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.

Willis A. Luce, South Union; T. M. Merrill, West Gloucester; 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., 14 Quincy St., Portland
Chase, Martin V. B..............Augusta
*Clark, Eliphalet................Portland
Cole, Horatio G............ Boston, Mass
Crafts, Moses......................Auburn
*Crosby, William C................Bangor
Dana, Woodbury S.............Portland
Dawes, S. H......................Harrison
DeRocher, Peter........Bradentown, Fla
Dirwanger, Joseph A............Portland
Dunham, W. W..... .... .North Paris
Dyer, Milton..... ....Cape Elizabeth
*Emerson, Albert..................Bangor
Emerson, Charles L........South Turner
Farnsworth, B. B.... ....Portland
Frost, Oscar F................Monmouth
*Gardiner, Robert H............Gardiner
Gardiner, Robert H........Boston, Mass
George, C. H. ....Hebron
Gilbert, Z. A............ ...North Greene
*Godfery, John E..................Bangor
Gurney, Lemuel...................Hebron
Hackett, E. C...........West Gloucester
Hanscom, John.......... ....Saco
Harlow, S. C.......... ... .Bangor
*Harris, N. C. ....Auburn
Harris, N. W.... ....Auburn
Harris, William M.............. Auburn
Harvey, F. L.........................Orono
*Hersey, T. C....................Portland
Hobbs, M. Curtis......West Farmington
Hoffses, Elmas....................Warren
Hoxie, James S...........North Fairfield
Hoyt, Mrs. Francis.............Winthrop
Ingalls, Henry....... ....Wiscasset
Jackson, F. A....................Winthrop
*Jewett, George..................Portland
Johnson, Isaac A..................Auburn
Jordan, Francis C.............Brunswick
Kenniston, E. H....................Arnold
Knowlton, D. H.............Farmington
Lapham, E. A......................Pittston
Lombard, Thurston M............Auburn
*Low, Elijah........... ....Bangor
*Low, S. S............. ....Bangor
McLaughlin, Henry...............Bangor
Merrill, T. M....... ....West Gloucester
*Metcalf, M. J..................Monmouth
Moody, Charles H..................Turner
Moore, William G.............Monmouth
Moor, F. A.....................Waterville
Morton, J. A.........................Bethel
Morton, William E.............Portland
*Noyes, Albert.....................Bangor
Perley, Chas. I...Seward's (Vassalboro')
Pope, Chas. S..................Manchester
Pulsifer, D. W......................Poland
Purington, E. F........West Farmington
*Richards, F. G..................Gardiner
Richards, John T................Gardiner
*Richardson, J. M...............Gardiner
Ricker, A. S........................Turner

*Deceased.

LIFE MEMBERS—CONCLUDED.

Roak, George M.................. Auburn
Robinson, Henry A..............Foxcroft
Rolfe, Samuel....................Portland
Sawyer, Andrew S....... Cape Elizabeth
Sawyer, George B..... ....Wiscasset
*Shaw, Stillman W.........West Auburn
Simmons, H. J. A............Waldoboro'
*Smith, Alfred.................Monmouth
Smith, Henry S...............Monmouth
Starrett, L. F.......................Warren
Stetson, Henry....................Auburn
*Stetson, Isaiah...................Bangor
Stilphen, Asbury C.............Gardiner
Stanley, Charles................Winthrop
Stanley, O. E....................Winthrop
Staples, G. K... ....Temple
Strout, S. F...............West Falmouth
Strattard, Mrs. A. B..............Monroe
Sweetser, S. R........Cumberland Center
*Taylor, Joseph..................Belgrade
Taylor, Miss L. L., (Lakeside) Belgrade
Thomas, William W., Jr........Portland
Thomas, D. J..............North Auburn
Tilton, William S....... ...Boston, Mass
True, Davis P.... ....Leeds Center
True, John W............New Gloucester
Varney, James A.....The Dalles Oregon
Vickery, James..................Portland
Vickery, John....... ....Auburn
Wade, Patrick....................Portland
Walker, Charles S.....................Peru
Waterman, Willard H......East Auburn
*Weston, James C.................Bangor
Wharff, Charles S...............Gardiner
Whitney, Edward K.............Harrison
Woodard, Mrs. S. M.............Gardiner
Woodman, George W...........Portland

ANNUAL MEMBERS, 1892.

Abbott, L. F. ....Lewiston
Allen, W. H..... ....Augusta
Arnold, C. A........ ....Arnold
Bailey, W. G.....................Freeport
Bartlett, B. W.............East Dixmont
Bickford, James...................Carmel
Brown, Henry W................Newburg
Chandler, Lucy A...............Freeport
Cook, Elijah ....Manchester
Doyle, Mamie E...............Woodfords
Dunbar, E. W..............Damariscotta
Dunton, John ....Lewiston
Eastman, A. A.....................Dexter
Goddard, Calvin S............Woodfords
Goddard, Edward H............Woodfords
Grant, Mrs. Benson............Lewiston
Harlow, F. L............ ....Turner
Hawkins, M. P....................Auburn
High School.........................Orono
Keith, Walter E...............Winthrop
King, Mrs. Louisa............South Etna
Larrabee, P. P.............North Sebago
Leech, H. T.............East Monmouth
Luce, Willis A..............South Union
Mansur, A. M.............East Dixmont
Merrow, J. H.......... South Smithfield
Munson, W. M.......................Orono
Nelson, O. C...........Upper Gloucester
Nutting, James....................Perham
Osgood, Mrs. A. J...Cumberland Center
Peacock, J. R....................Gardiner
Penley, H. E....... ....Auburn
Perkins, C. S....................Cross Hill
Plaisted, R. C....... ....Gardiner
Pulsifer, H. A.....................Auburn
Sleeper, Grace N...............Lewiston
Sleeper, L. D. N...................Lewiston
Small, John C ....Cornish
Townsend, Mrs. B. T............Freeport
Weston, C. M.....................Belgrade
Wharff, W. R.....................Gardiner
Wheeler, Charles E..........Chesterville
Wright, Fred...................... .....Bath
Wright, L. E...................Woolwich

ANNUAL MEMBERS, 1893.

Allen, W. H................ .....Augusta
Dudley, J. W.................Castle Hill
Munson, W. M............... .....Orono
Nelson, O. C...........Upper Gloucester
Wheeler, Joseph B...............Corinth

Annual Statement of the Maine State Pomological Society for the Year Ending Dec. 31, 1892.

RECEIPTS.

Cash received State bounty, 1891	$500 00	
State Agricultural Society	500 00	
Manufacturers' National Bank notes	400 00	
life members	20 00	
annual members	43 00	
Wiscasset Savings Bank	19 63	
interest Farmington National Bank stock	12 00	
Merchants' National Bank stock	6 00	
Dr. Twitchell	10 00	
Balance due Treasurer Dec. 31, 1892	30 31	
		$1,540 94

EXPENDITURES.

Cash paid Secretary's salary	$125 00	
clerk	12 00	
expenses	65 30	
C. S. Pope's "	31 55	
A. E. Andrews' "	24 70	
J. W. True's "	14 00	
H. W. Brown's "	35 60	
A. S. Ricker's "	17 25	
Manufacturers' National Bank notes	300 00	
interest Manufacturers' National Bank notes	1 54	
two shares Merchants' National Bank stock in favor permanent fund	207 60	
dividend Wiscasset Savings Bank	2 37	
Manufacturers' National Bank note	10 77	
Knowlton, McLeary & Co	36 10	
sundries	40 09	
premiums	613 50	
overpaid by Treasurer, 1891	3 57	
		$1,540 94

Financial Condition of Society December 31, 1892.

ASSETS.

Due from State Treasurer, bounty for 1892	$500 00	
Property owned by the Society, estimated	150 00	
Permanent fund, Farmington National Bank stock	400 00	
Merchants' National Bank stock	200 00	
Wiscasset Savings Bank	115 09	
		$1,365 09

LIABILITIES.

Due Manufacturers' National Bank	$350 00	
Treasurer (overpaid)	30 31	
		$380 31

PERMANENT FUND.

CREDIT.

By fees of 109 life members to December 31, 1892	$1,090 00	$1,090 00

DEBIT.

To deposit in Wiscasset Savings Bank	$115 09	
Farmington National Bank stock	400 00	
Merchants' National Bank stock, Gardiner	200 00	
balance due permanent fund	374 91	
		$1,090 00

A. S. RICKER, *Treasurer*.

TURNER, January 2, 1893.

Maine State Pomological Society.

Report of the Twentieth Annual Exhibition held in Lewiston, September 6, 7, 8 and 9, 1892.

Our annual exhibition was held in Lewiston September 6-9, 1892. It was held in connection with the annual show and fair of the Maine State Agricultural Society, and upon the same terms as in former years. There is, perhaps, only one criticism that can be justly passed upon this arrangement, and that is the early date at which the fair is held. Many of our best fruits cannot be shown to advantage, as they are immature, poorly colored, and only partially grown at that time. To show these fruits to the best advantage the exhibition should be held not earlier than the fifteenth of October. It would not be practicable to hold a separate exhibition, and we see no way in which the present plan can be very much improved. There is one advantage, however, the earliness of the fair secures a large exhibition of open-air flowers and plants that could not be shown after the frosts.

The entire third floor of the hall was given to our Society, and the officers of the Agricultural Society expressed themselves as well pleased with the manner in which the hall was filled. For the purpose of making the hall as attractive as possible, the flowers were scattered about the hall. There were some disadvantages in this arrangement, as the specimens could not be so readily compared by the judges. As a matter of convenience it may be better to have one or two of the wings devoted to plants and flowers. The exhibition of fruit was very large, and among those who were present to examine them were several buyers who have since bought large quantities of Maine fruit for their customers. As already hinted at, the late winter varieties were too green to be shown at their best, but the autumn fruits were large, well colored and handsome. One thing was very noticeable in the exhibition of fruit and that is the increased interest in the winter varieties.

A new and attractive feature of the exhibition was the display of plants made by school children of Lewiston and Auburn. The plants were arranged around the elevator shaft and the stairway leading to the cupola. By request of Mr. Gilbert, the secretary prepared the following summary of the window garden department for publication in the Maine Farmer. This summary is as follows:

Origin. As a part of a horticultural exhibition, or horticultural work, the plan originated, we think, with Mrs. H. L. T. Walcott, of the Massachusetts Horticultural Society. The committee in that society who have had special charge of the work were Mrs. Walcott and Mr. M. B. Faxon. It has outgrown the limits to which it was first confined, and now several hundred dollars are expended in this work and several exhibitions held. Secretary Knowlton of the Pomological Society first called the attention of the society to the subject of window gardening for the children. Interest was shown in the matter, which was finally referred by the executive committee to President Pope and Secretary Knowlton to work up for the fair.

Object. Too little attention is given to the study of plant life, and it is believed that the care of a plant for a few months by a child will teach the child something of interest about the plant, and he will learn something about the plant, how it grows and what makes it grow. A few things learned of one plant will encourage the child to study other plants, and in the end interest him in all that grows on the farm or in the garden.

Medium. Dr. Twitchell gave the society $10 to be used for premiums. L. F. Abbott gave for the same purpose ten annual subscriptions to *Vick's Magazine*, and D. H. Knowlton & Co. for the same purpose presented twenty annual subscriptions to their school papers. President Pope and L. F. Abbott also presented potted plants, and other plants were purchased and distributed to the children, who were expected to care for the plants, etc. To all who returned their plants, free tickets were furnished by the Agricultural Society, admitting to the park one day, Thursday. The children carried their plants to one of the school houses at the appointed time, received their tickets, and the plants were taken to the fair grounds, placed on exhibition, and later returned to the school building.

Results. About 350 plants were exhibited at the fair. They were arranged on receding shelves on three sides of the elevator shaft, and about the stairway leading to the observatory. About 350 out of 450 plants were placed on exhibition by the children, and they formed a very attractive feature in the floral display, and were admired by the public. The children showed a deep interest in the plants, and many of them were enthusiastic over their success in cultivating. They have also learned some things they will never forget; better still, this care of the plants has taught them to learn much of other plants. The general plan has proved so successful it is hoped the society may be able to continue this line of work in the future. It is also hoped that other societies may give some features of this work a fair trial in the future. Premiums were awarded the best plants in each class.

It is hoped the executive committee may see the way clear to continue the department next year, but there is considerable expense connected with it. The scope of the work should be extended, so that the plants should all be named before they are given out to the children, with the idea in view that the child will learn more about the plant if it is some particular species than if it is simply a geranium without name. A few more plants should be furnished by some one, and the premiums should be paid to the children at once, as delay with them is a cause of much anxiety.

It is a cause of regret to the writer that so little interest is shown in competing for the botanical premiums offered by the society. For the premium offered to high schools there was only one competitor, and that was the Orono High School. It is gratifying, however, to note that this collection was an excellent one, and we take pleasure in making a public recognition of its merit. With the increased interest in introducing the study of agriculture in the schools we are disappointed in not having the efforts of the society in this direction more generally appreciated.

The officers have been aiming at a closer following of the rules, believing that the interests of all will be best subserved thereby. There are several rules that ought to be changed or enforced, and it is the intention of the committee to follow them this year.

It is pleasant to note that there were no complaints made after the premiums were publicly announced.

Premiums were awarded as follows:

For Apples—	Collections	$190 50	
	Specials	41 00	
	Single plates	55 00	
			$286 50
For Pears—	Collections	$23 00	
	Specials	10 00	
	Single plates	25 50	
			58 50
For Plums—	Collections	$10 00	
	Single plates	23 00	
			33 00
For Grapes			5 00
For miscellaneous articles			43 50
For Flowers.			187 00
Total premiums awarded			$613 50

List of Premiums Awarded at the Twentieth Annual Exhibition, 1892.

APPLES — General Collections.

Best general exhibition of apples grown by the exhibitor in any part of the State: S. H. Dawes, Harrison, $15; Miss L. L. Taylor, Lakeside, $10.

Best exhibition of apples grown by exhibitor, to consist entirely of varieties *not named* in the society's premium list: Alonzo Butler, Union, $5; C. H. George, Hebron, $3.

COUNTY EXHIBITIONS.

Best general exhibition of apples grown by the exhibitor in Androscoggin county: John Dunton, Lewiston, $8; D. J. Briggs, South Turner, $6.

For same in Aroostook county: James Nutting, Perham, $8.

For same in Cumberland county: S. H. Dawes, $8; J. W. True, New Gloucester, $6.

For same in Franklin county: E. F. Purington, West Farmington, $8; M. C. Hobbs, West Farmington, $6.

For same in Kennebec county: C. I. Perley, Cross Hill, $8; W. R. Wharff, Gardiner, $6.

For same in Knox county: Alonzo Butler, Union, $8; Willis A. Luce, South Union, $6.

For same from Lincoln county: E. W. Dunbar, Damariscotta, $8.

For same from Oxford county: C. H. George, $8; Lemuel Gurney, Hebron, $6.

For same from Penobscot county: C. A. Arnold, Arnold, $8; E. H. Kenniston, Arnold, $6.

For same from Sagadahoc county; Fred Wright, Bath, $8; L. E. Wright, Woolwich, $6.

For same from Somerset county: J. S. Hoxie, North Fairfield, $8; J. H. Merrow, South Smithfield, $6.

For same from Waldo county: B. W. Bartlett, East Dixmont, $8; A. M. Mansur, East Dixmont, $6.

CRAB APPLES.

For best collection crab apples: C. A. Arnold, $1; E. H. Kenniston, 50c.

SPECIAL PREMIUMS.

For best dish of Baldwins: S. H. Dawes, $5; C. I. Perley, $3.

Gravenstein: A. S. Ricker, Turner, $3; Chas. S. Pope, Manchester, $2.

Northern Spy: S. H. Dawes, $3; S. R. Sweetser, Cumberland Center, $2.

Rhode Island Greenings: A. R. King, North Monmouth, $5; Lemuel Gurney, $3.

Roxbury Russets: C. I. Perley, $3; Miss Louisa King, South Etna, $2.

Tompkins King: H. G. Fairbanks, North Monmouth, $3; Alonzo Butler, $2.

Yellow Bellflower: R. H. Gardiner, Gardiner, $3; James Bickford, Carmel, $2.

SINGLE VARIETIES.

Alexander: Grace M. Sleeper, Lewiston, $1; D. S. Thomas, North Auburn, 50c.

American Golden Russet: Walter E. Keith, Winthrop, $1; A. P. Ring, Richmond Corner, 50c.

Ben Davis: S. R. Sweetser, $1; C. I. Perley, 50c.

Deane: Simeon L. Farwell, Cumberland Center, $1; E. F Purington, 50c.

Duchess of Oldenburg: S. H. Dawes, $1; Walter E. Keith, 50c.

Early Harvest: J. S. Hoxie, $1; Mrs. A. J. Osgood, Cumberland Center, 50c.

Fallawater: J. S. Hoxie, $1; Charles S. Pope, 50c.

Fall Harvey: C. H. George, $1; M. C. Hobbs, 50c.

Fameuse: C. H. George, $1; E. F. Purington, 50c.

Garden Royal: S. H. Dawes, $1; Walter E. Keith, 50c.

Hubbardston Nonsuch: T. M. Lombard, Auburn, $1; H. T. Leech, E. Monmouth, 50c.

Jewett's Fine Red: T. M. Lombard, $1; S. H. Dawes, 50c.
King Sweeting: E. F. Purington, $1; C. I. Perley, 50c.
Large Yellow Bough: S. H. Dawes, $1; Grace M. Sleeper, 50c.
McIntosh Red: C. H. George, $1; J. S. Hoxie, 50c.
Milding: C. I. Perley, $1.
Mother: Miss L. L. Taylor, $1; Mrs. A. J. Osgood, 50c.
Munson Sweet: E. F. Purington, $1; S. R Sweetser, 50c.
Peck's Pleasant: Mrs. A. J. Osgood, $1; R. H. Gardiner, 50c.
Pomme Royale: Charles S. Pope, $1; C. H. George, 50c.
Porter: E. F. Purington, $1; Willis A. Luce, 50c.
Pound Sweet: S. H. Dawes, $1; C. I. Perley, 50c.
Primate: J. S. Hoxie, $1; E. F. Purington, 50c.
Pumpkin Sweet: E. F. Purington, $1.
Red Astrachan: Herman Corbett, Farmington, $1; H. T. Leech, 50c.
Red Canada: A. R. King, $1; H. G. Fairbanks, 50c.
Rolfe: S. R. Sweetser, $1; A. A. Eastman, Dexter, 50c.
Russell: D. C. Averill, Temple, $1; Herman Corbett, 50c.
Somerset: C. M. Weston, Belgrade, $1; Miss L. L. Taylor, 50c.
Starkey: C. I. Perley, $1; J. S. Hoxie, 50c.
Talman's Sweet: D. S. Thomas, $1; E. F. Purington, 50c.
Tetofsky: M. C. Hobbs, $1; S. H. Dawes, 50c.
Wagener: T. M. Lombard, $1; J. S. Hoxie, 50c.
Wealthy: S. R. Sweetser, $1; J. W. True, 50c.
William's Favorite: Miss L. L. Taylor, $1; E. F. Purington, 50c.
Winthrop Greening: A. R. King, $1; H. G. Fairbanks, 50c.
Yellow Transparent: M. C. Hobbs, $1; C. I. Perley, 50c.

PEARS—General Exhibitions.

For best general exhibition of pears: S. H. Dawes, $10; C. I. Perley, $8; D. P. True, Leeds Center, $5.

SINGLE VARIETIES.

Clapp's Favorite: A. S. Ricker, $3; D. J. Briggs, $2.
Bartlett: S. H. Dawes, $3; Walter E. Keith, $2.
Belle Lucrative: J. S. Hoxie, $1; Alonzo Butler, 50c.
Beurre d'Anjou: Thurston M. Lombard, $1; C. I. Perley, 50c.
Beurre Hardy: R. H. Gardiner, $1.
Beurre Superfin: S. H. Dawes, $1; D. P. True, 50c.

Beurre Clarigeau: G. N. Prescott, E. Monmouth, $1; C. M. Weston, 50c.

Beurre Diel: C. M. Weston, $1.

Buffum: D. P. True, $1; Walter E. Keith, 50c.

Doyenne Boussock: S. H. Dawes, $1; C. I. Perley, 50c.

Duchesse d'Angouleme: S. H. Dawes, $1; Alonzo Butler, 50c.

Eastern Belle: J. S. Hoxie, $1.

Glout Morceau: D. J. Briggs, $1; C. I. Perley, 50c.

Goodale: C. M. Weston, $1; C. I. Perley, 50c.

Howell: C. I. Perley, $1; J. S. Hoxie, 50c.

Lawrence: I. V. McKinney, Auburn, $1; Walter E. Keith, 50c.

Louise Bonne de Jersey: C. H. George, $1; S. H. Dawes, 50c.

Nickerson: Miss L. L. Taylor, $1; C. M. Weston, 50c.

Seckel: D. J. Briggs, $1; C. I. Perley, 50c.

Sheldon: Walter E. Keith, $1; S. H. Dawes, 50c.

GRAPES — General Exhibitions.

For best collection of air-grown grapes: S. H. Dawes, $3; Charles S. Perkins, Cross Hill, $2.

PLUMS — General Exhibitions.

For best general exhibition plums: S. H. Dawes, $6; Willis A. Luce, $4.

SINGLE VARIETIES.

Bavay's Green Gage: Willis A. Luce, $1; E. F. Purington, $50c.

Bradshaw: Lemuel Gurney, $1; T. M. Lombard, 50c.

Coe's Golden Drop: S. H. Dawes, $1; C. H. George, 50c.

Green Gage: D. H. Knowlton, Farmington, $1; M. P. Hawkins, Auburn, 50c.

Prince's Imperial Gage: T. M. Lombard, $1; D. P. True, 50c.

Red Gage: E. F. Purington, $1; R. H. Gardiner, 50c.

Guii: E. W. Dunbar, $1; M. P. Hawkins, 50c.

Jefferson: J. W. True, $1.

Lawrence: C. H. George, $1; E. F. Purington, 50c.

Lombard: J. S. Hoxie, $1; S. H. Dawes, 50c.

Magnum Bonum: John Dunton, $1; M. P. Hawkins, 50c.

McLaughlin: R. H. Gardiner, $1; Willis A. Luce, 50c.

Moore's Arctic: H. T. Leech, $1; J. S. Hoxie, 50c.
Niagara: S. H. Dawes, $1.
Smith's Orleans: T. M. Lombard, $1.
Yellow Egg: J. W. True, $1; John Dunton, 50c.
Purple Damson (Gratuity): J. W. True, 50c.

MISCELLANEOUS ARTICLES—Canned Fruits, Preserves, etc.

Peaches: S H. Dawes, $2.

Peck Cultivated Cranberries: I. T. Waterman & Son, East Auburn, $2.

Orange tree in fruit: H. E. Penley, Auburn, $1.

Banana: H E. Penley, Auburn, $1;

Collection Canned Fruits, etc: Mrs. Annie S. Corbett, Farmington, $8; Mrs. Benson Grant, Lewiston, $5.

Canned Blackberries: Mrs. Annie S. Corbett, 50c.; Mrs. Frank P. Carr, Topsham, 25c.

Canned Blueberries: Mrs. Frank P. Carr, 50c.; Mrs. Francis Hoyt, Winthrop, 25c.

Canned Cherries: Mrs. E. F. Purington, West Farmington, 50c.

Canned Gooseberries: A. A. Eastman, 50c.; Mrs. Annie S. Corbett, 25c.

Canned Peaches: Mrs. Benson Grant, 50c.; Mrs. Francis Hoyt, 25c.

Canned Pears: M. Lela Averill, Temple, 50c.; Mrs. Frank P. Carr, 25c.

Canned Plums: A. A. Eastman, 50c.; Mrs. Benson Grant, 25c.

Canned Quinces: Mrs. Francis Hoyt, 50c.; Mrs. Benson Grant, 25c.

Canned Raspberries: A. A. Eastman, 50c.; Mrs. Francis Hoyt, 25c.

Canned Strawberries: Mrs. Annie S. Corbett, 50c.; Mrs. Francis Hoyt, 25c.

Canned Tomatoes: Mrs. Francis Hoyt, 50c.

Preserved Apples: Mrs. E. F. Purington, 50c.; Miss E. B. Butler, Union, 25c.

Preserved Currants: Mrs. Francis Hoyt, 50c.; Mrs. Annie S. Corbett, 25c.

Preserved Cherries: Miss E. B. Butler, 50c.; Mrs. Francis Hoyt, 25c.

Preserved Pears: Mrs. D. S. Thomas, North Auburn, 50c.; Mrs. Annie S. Corbett, 25c.

Preserved Plums: Mrs. Francis Hoyt, 50c.; Mrs. Annie S. Corbett, 25c.

Preserved Quinces: Mrs. Francis Hoyt, 50c.; Mrs. Annie S. Corbett, 25c.

Preserved Raspberries: Miss E. B. Butler, 50c.; Mrs. Francis Hoyt, 25c.

Preserved Strawberries: Mrs. Francis Hoyt, 50c.; Mrs. Annie S. Corbett, 25c.

Assorted Pickles: Mabel E. Grover, Bean's Corner, 50c.; Mrs. Benson Grant, 25c.

Tomato Catsup: Mrs. Francis Hoyt, 50c.

Best Collection Apple Jellies: Mrs. Benson Grant, $2; Mrs. D. S. Thomas, $1.

Apple Jelly: Mrs. D. S. Thomas, 50c.; Mrs. Francis Hoyt, 25c.

Currant Jelly: Mrs. L. F. Abbott, Lewiston, 50c; Mrs. Benson Grant, 25c.

Grape Jelly: Miss E. B. Butler, 50c; Mrs. Francis Hoyt, 25c.

Quince Jelly: Mrs. Francis Hoyt, 50c.; Mrs. Benson Grant, 25c.

Raspberry Jelly: Mrs. Benson Grant, 50c.; Mrs. Francis Hoyt, 25c.

Rhubarb Jelly: Mrs. L. F. Abbott, 50c.; Mrs. Francis Hoyt, 25c.

Strawberry Jelly: Mrs. L. F. Abbott, 50c.; Mrs. Annie S. Corbett, 25c.

Maple Syrup: Charles Fletcher, Augusta, 50c.; Lemuel Gurney, 25c.

Maple Sugar (gratuity): Lemuel Gurney, 50c.

CUT FLOWERS.

For best display of cut flowers: Mrs. Charles Stanley, Winthrop, $10; Mrs. B. T. Townsend, Freeport, $8; Charles S. Walker, Peru, $5.

Exhibition of Roses: John Burr, Freeport, $5.

Dahlias: Nellie A. Day, South Turner, $2; Mrs. Charles Stanley, $1.

Chinese Pinks: Mrs. B. T. Townsend, $1; Mrs. Charles Stanley, 50c.

Asters: Charles S. Walker, $1; Mrs. B. T. Townsend, 50c.

Pansies: Charles S. Walker, $1; Mrs. D. H. Knowlton, Farmington, 50c.

Zinnias: Mrs. Francis Hoyt, $1; Mrs. Charles Stanley, 50c.

Phlox Drummondii: Mrs. Charles Stanley, $1; Mrs. G. K. Staples, Temple, 50c.

Stocks: Mrs. G. K. Staples, $1.

Balsams: Mrs. Charles Stanley, $1; Mrs. Francis Hoyt, 50c.

Petunias: Mrs. Charles Stanley, $1; Mrs. D. H. Knowlton, 50c.

Gladioli: Lucy A. Chandler, Freeport, $2; W. G. Bailey, Freeport, $1.

Verbenas: Mrs. Francis Hoyt, $1; Mrs. Charles Stanley, 50c.

Calendulas (gratuity): E. C. Pope, Manchester, 50c.

Vase of cut flowers (amateur): Mrs. Annie S. Corbett, $3; Mrs. Francis Hoyt. $2; Mrs. Charles Stanley, $1.

Best twelve button-hole bouquets: John Burr, $2; Mrs. G. A. Keist, 335 Minot avenue, Auburn, $1.

Floral design (professional): C. S. Goddard & Son, Woodfords, $8.

Floral design (amateur): Mrs. Charles Stanley, $5; Mrs. Lizzie M. Walker, Peru, $3.

Floral wreath: C. S. Goddard & Son, $2; Lucy B. Burr, Freeport, $1.

Dish of cut flowers: Mrs. Francis Hoyt, $2; Mrs. Anthony Cummings, Auburn, $1.

Basket of cut flowers: C. S. Goddard & Son, $2; Mrs. Francis Hoyt, $1.

Artistic Exhibition of everlasting flowers: Mrs. Charles Stanley, $1.

GREENHOUSE AND POT PLANTS.

Exhibition greenhouse plants: W. G. Bailey, $15; C. S. Goddard & Son, $10; John Burr, $8; Charles S. Walker, $8.

Exhibition pot plants: Lucy A. Chandler, $10; Mrs. Anthony Cummings, $8.

Ferns: John Burr, $3.

Geraniums: John Burr, $2.

Begonias: W. G. Bailey, $2; John Burr, $1.

Coleus: Charles S. Walker, $2; John Burr, $1.

Gloxinias: Charles S. Walker, $2.

Dracæna: W. G. Bailey, 50c; John Burr, 25c.

Double Geranium: Mrs. Anthony Cummings, 50c.

Single Geranium: Linnie Varnum, Auburn, 50c.; Lizzie Dagneau, Auburn, 25c.

Salvia Splendens: John Burr, 50c.

Foliage Begonia: John Burr, 50c.; W. G. Bailey, 25c.

Flowering Begonia: W. G. Bailey, 50c.; Charles S. Walker, 25c.

Coleus: S. H. Dawes, 50c.; Charles S. Walker, 25c.

Fuchsia: W. G. Bailey, 50c.

Carnation: Lucy A. Chandler, 50c.; W. G. Bailey, 25c.

Ever-Blooming Rose: Mrs. Anthony Cummings, $1.

Single pot plant: S. H. Dawes, $1.

Climbing plant on trellis: John Burr, $2; Mrs. Anthony Cummings, $1.

SPECIAL PREMIUMS.

Cut wild flowers: Mrs. C. E. Waterman, East Auburn, $3.

Pressed wild flowers: Mamie E. Doyle, Woodfords, $2.

Pressed wild flowers collected by High School: Orono High School, Orono, Household Microscope, costing $6.

WINDOW GARDEN DEPARTMENT.

First premiums of 35 cents each were awarded to the following children for geraniums: Winnifred Thompson, Eddie Plummer, Grace Woods, Emma Armstrong, Charles Eldredge, Irwin Norcross, Harry Goss, Arthur Hayes, Lena Jones, Cochraine Cartwright, Herbert LaRoe, Lola McQuestion, Willie Whittum, Florence Whittum, Marion Ames, Lewiston; Ethel Payson, Paul Preble, Percy Haskell, Blanche Crafts, Letitia Frost, Auburn.

Coleus: Louise Bradstreet, Ernest Gould, Lewiston; Charles Carter, Donald Garcelon, Harold Davis, Fred Dorman, Arthur Thompson, Auburn.

Fuchsias: Carrie Fickett, Violet Reynolds, Marion Owen, Lewiston.

Vick's Magazine was sent for one year as a premium to each of the following, for geraniums:

Gracie Mills, Shirley White, Lewiston; Maud Preble, Guy Fitz, Inez O. Decker, Josie Pratt, Auburn.

For Fuchsias: Clara Pingree, Hattie Dresser, Lewiston.

For Coleus: Maggie Doyle, Lewiston; Mary Roak, Bertha Cushman, Auburn.

The School World was sent for one year as a premium to each of the following:

For geraniums: Emma Reichel, Grace Evans, Ida Epstein, Lillian Soule, Arthur McGibbon, Ida Andrews, Florence Cash, William Davis, Lewiston; Fannie Harlow, Annie Mullary, George Tainter, Alice Chase, Eva Larrabee, Theisa Jordan, Annie Curtis, Cora Gould, Auburn.

For Fuchsias: Daisy Young, Auburn.

For Coleus: Madge Lane, Harold Reynolds, Arthur Sherman, Lewiston; Bertha Woodbury, Auburn.

For the premiums in the Window Garden Department, $10 was contributed by Dr. Geo. M. Twitchell, *Vick's Magazine* was presented by L. F. Abbott, of the *Lewiston Journal*, and the *School Worlds*, by D. H. Knowlton & Co., publishers, Farmington.

Business Transactions.

Annual Meeting.

September 7, 1892. Meeting of the society held in Park Hall, Lewiston, at 6.30 o'clock P. M. Officers for 1893 were elected. See page 12. The committee, to whom was referred the resolution of Mr. Wheeler, presented at the last winter meeting, was granted further time, to report at winter meeting.

The Secretary read the following letter:

"OFFICE OF EXECUTIVE COMMISSIONER,
PORTLAND, August 27, 1892.

MR. D. H. KNOWLTON,

Secretary Maine State Pomological Society.

DEAR SIR:—Our Board finally appropriated $1,000.00 to be expended upon the pomological exhibit. Of course some of the appropriations may lapse and thus increase this one; but the sum of $1,000.00 is all we are sure of. I write to ask if your Society will undertake to get up an exhibit, or, in other words, get up as good an exhibit as you can with this money, and if so, upon what terms? Very truly yours,

C. P. MATTOCKS (P.)"

On motion of Mr. Briggs, of Turner, the matter was referred to the Executive Committee for such action as the interests of the Society may require.

Winter Meeting, January 17th and 18th, 1893.

By previous arrangement with Hon. B. Walker McKeen, Secretary of the State Board of Agriculture, a programme for a union meeting was prepared and agreed upon.

Assembled in Meonian Hall, Tuesday, January, 17th, at 10 o'clock, A. M. The temperature of the hall was so low that no meetings were held there during the session. The forenoon meeting was adjourned to Hotel North, and the other meetings were held in the hall of Highland Lodge, A. O. U. W. who kindly tendered our Society the use of the same. At Hotel North President Pope called the meeting to order.

In the absence of A. S. Ricker, treasurer for 1892, his report was presented by Charles E. Wheeler, the treasurer-elect for the year 1893. The report was accepted.

Secretary Knowlton, in behalf of the committee "to consider the advisability of petitioning the next [present] Legislature for an increased appropriation for the society," reported that "in view of the facts presented your committee are convinced that it is advisable at this time to ask the Legislature to increase the annual appropriation for the society."

The committee recommend that the Legislature be asked to amend the act of incorporation by changing the words "five hundred dollars" to "one thousand dollars," in Section 2 of said act of incorporation, so that said section, when amended, shall read as follows:

SEC. 2. Said Society shall have all the rights, privileges, and powers conferred by the laws of this State upon county and local agricultural societies, and shall be subject to all liabilities imposed by existing laws upon societies, so far as the same are applicable to the objects of this Society; but the bounty to be paid by the State to said Society shall not exceed the sum of one thousand dollars in one year.

Voted, That the committee who have been investigating the advisability of asking the legislature for additional appropriation for the uses of this Society be instructed to present the matter to the legislature in any form that their judgment may determine; that to this end they confer with the State Board of Agriculture and solicit their co-operation in gaining the desired result.

[Memorandum. Before leaving Augusta the committee conferred with the Board of Agriculture, put the matter in proper form and placed the papers in the hands of the Hon. Edward Wiggin, chairman of the committee on agriculture, the Board of Agriculture co-operating. Some time later a favorable report was made on the matter, and the bill was passed by the Legislature without dissent, and was approved by the Governor.]

The Secretary reported the resignation of Mr. A. E. Andrews as a member of the executive committee. It was voted to accept the same and to proceed to the election of his successor.

Balloted and made choice of Willis A. Luce of South Union.

The president appointed the following committee to examine the fruit and flowers on exhibition: Charles E. Wheeler, W. A. Luce and S. H. Dawes.

The committee reported as follows:

"Mr. PRESIDENT:—The committee which you appointed to report on the exhibit of fruit have attended to that duty and report, with much pride, that the exhibit this year we believe to be the best for many years and it may be the best that has been shown at any of the winter meetings. We find in all 100 plates, shown by thirteen exhibitors.

From the State College forcing-house, Prof. Munson shows *results* of the work being done there.

From the orchardists that are attracting especial attention is Dudley's Winter, an apple originating from a Duchess seed fertilized by a Hyslop Crab. Mr. J. W. Dudley, Castle Hill, is the exhibitor.

The Stark, which has brought out some notes and letters, of late, in the *Maine Farmer*, is found on the tables in fine form from the orchard of J. Libby, Grey.

Three plates of King are shown, and from those of J. W. True and J. Pope & Son your committee do not desire the honor of deciding which is best.

Especial mention is called to the plates of Fallawater, Baldwin, Minister, Mother and Nodhead exhibited by J. Pope & Son.

Among J. W. True's exhibit is an extra fine dozen of Beurre d'Anjou pears. The Ben Davis, R. I. Greening and Nodhead are fine specimens of their kinds.

D. P. True shows Lawrence pears and Angers Quince.

Peck's Pleasant, from S. R. Sweetser are extra fine. E. A. Lapham, Pittston, fourteen plates; J. Pope & Son, Manchester, twelve plates; S. R. Sweetser, Cumberland, eight plates; J. W. True, New Gloucester, six plates; S. R. Lapham, Pittston, five plates; D. P. True, Leeds, two plates; S. R. Clark, China, two plates; James Nutting, Perham, two plates.

Flowers from different florists do much to make the tables pleasing to the eye, and we trust that in the years to come this part of our work may receive far greater attention.

Your executive committee having in charge the World's Fair exhibit shows some fine fruit taken from the collection which is now in cold storage awaiting the opening of the Columbian Exposition."

The following resolutions were presented and passed by unanimous vote:

WHEREAS, There exist between the executive committee of the Maine State Pomological Society and the State Board of Agriculture very pleasant relations and a mutual desire to help forward the kindred work of every branch of agriculture,

Resolved, That we tender to that Board our thanks and pledge them our support.

Resolved, That we further extend our thanks to B. Walker McKeen, Secretary of the Board, for his aid at this meeting.

Resolved, That this Society hereby acknowledges the courtesies extended by the railroad and hotels to its members, and to the Maine Central Railroad extends its thanks for excursion rates, and to Hotel North and Cony House for reduced rates of entertainment.

Resolved, That the thanks of this society be and hereby are extended to the newspapers for the publication of our notices and for the excellent reports of our meetings.

In connection with the making of awards at the World's Fair, after discussion, the following resolve was passed:

That it is the judgment of Maine fruit growers that the late-keeping fruits grown in the northern belt should be examined near the opening of the Fair, as it is at this season only that these varieties can be shown in their greatest perfection, and that for this purpose 1892 apples should be shown; that the secretary be instructed to submit this resolve to the consideration of the proper authorities.

Meetings of Executive Committee

February 19, 1892. The committee met at the West End Hotel, Portland, as per adjournment, and proceeded to business, President Pope in the chair.

The premium list for the next fair was discussed and revised.

The expediency of giving plants to children, and offering premiums for the best ones shown at our fair, was discussed and referred to President Pope and the Secretary. The Agricultural Society co-operating, plants were distributed among the children of Lewiston and Auburn, and premiums were offered. [See list of premiums awarded.]

April 11. The executive committee authorized and instructed the Treasurer to purchase two shares ($100 each) of the Merchants' National Bank of Gardiner, at a cost of $207.60. The same to be held to the credit of the permanent fund.

September 9, the committee met at Lewiston. In the World's Fair matter, Messrs. Knowlton, Andrews and Brown were authorized to confer with the executive commissioner and take such action as their judgment might determine.

The committee chosen for the purpose thereupon took the train for Portland where, by previous arrangement, Gen. Mattocks was expected to meet them. The executive commissioner did not appear, but under date of September 12, 1892, the following was received from Gen. Mattocks:

"While away Friday my clerk tried to reach me by wire but was unable to as I was out of reach of telegraph, although my clerk supposed I was within reach, and never knew to the contrary until after Friday night, so I was in utter ignorance of your movements as well as the telegram. Now I am exceedingly sorry I failed to see you, but hope we may have a favorable response as to your society's taking hold of the Chicago matter.

Very truly yours,
C. P. Mattocks,
Executive Commissioner.

Portland, September 30. In response to the call of the Secretary, each member of the executive committee was present. The meeting being called to order, the Secretary read the following from C. P. Mattocks, Executive Commissioner, under date of September 22:

DEAR SIR:—I inclose copy of vote of our executive committee. I am ready to contract with anyone you may designate to collect the pomological exhibit, with the understanding that we are to use but $1,000. However, if you think advisable, I think I am safe in saying that our Board will do what we can, with your help, to get an additional $500 from the Legislature. Of course, if I contract with a man he will be supposed to come under the reasonable discipline of an employee, but we look to you to help guide him in his work.

Yours very truly,

C. P. MATTOCKS,
Executive Commissioner.

The Secretary stated that he had invited General Mattocks to be present and with Mr. Fassett he was presented to the committee. After discussing the matter the following vote was taken:

That the executive committee, in behalf of the Society, accept the proposition of the executive commissioner.

Later a contract was executed between the parties on the terms proposed.

Voted, That Messrs. Brown and Andrews of the committee be placed in charge of collecting, preserving and preparing fruit for the exhibition of fruit at the World's Fair.

At this meeting the schedule of premiums awarded was presented and the Treasurer was directed to pay the same.

The Treasurer was authorized to make a loan, not exceeding four hundred dollars, to pay premiums and bills, for a time not to exceed six months.

November 18th. The committee met at Gardiner. Matters connected with the winter meeting were discussed, but no formal action was taken.

Matters connected with the World's Fair were considered and action taken to place in storage the fruit collected, &c.

Later the Executive Committee perfected arrangements for holding the annual winter meeting in Augusta, January 17th and 18th, 1893.

PUBLIC MEETINGS

OF THE

Maine State Pomological Society.

Papers, Discussions, Reports, Etc.

Annual Meeting, Lewiston,

September 8, 1892.

UNION WINTER MEETING, AUGUSTA,

January 17 and 18, 1893.

Public Meetings.

Thursday evening, September 8th, in Park Hall, Lewiston, a convention of Maine fruit growers followed the election of officers. There was a good attendance, though the hall and its surroundings are ill-adapted to such gatherings. We have the idea that the time has now arrived that the people of Maine would be rejoiced to know that the scope of the agricultural fair was extended so as to return, if you please, to the custom of former days, so that along with sight-seeing, the horse trot and the meeting of friends, there may be an intellectual feast in waiting for those who may wish to enjoy it. With this in view and a suitable place in which to gather, meetings for the discussion of rural and domestic affairs, would be largely attended. A few popular speakers under the auspices of the various agricultural organizations would attract to the ground many visitors who now stay at home. Let us introduce among our attractions all the intellectual and moral elements possible. In this way we may hope to purify all the surroundings of the fair, and win to our support many who are now indifferent. We would hold these meetings during the day as well as evening, and by making them attractive many would be glad to attend them.

The general subject for this meeting was "Small Fruits in Maine." It was introduced by President Pope with a talk on their culture, and followed up by Willis A. Luce of South Union on their profits, and by S. H. Dawes of Harrison, on the difficulties of small fruit culture. Discussions followed, in which many joined. Messrs. Smiley of Skowhegan, and G. Parker of Newport furnished excellent music for the occasion.

Just twenty years ago the first meeting of our society gathered in the city of Augusta, since which time more of our winter meetings have been held there; a fine collection of winter apples were in readiness for exhibition by Messrs. Brown and Andrews, the best ever shown in the State; it was determined to ask the legislature for a larger annual stipend; several florists expressed a willingness to exhibit plants and flowers. Under these conditions it was determined to hold our winter meeting in Augusta Secretary McKeen of the Board of Agriculture was in full accord, and a union winter meeting was accordingly arranged. The exercises were of a very high order and the programme was well carried out. It was a special pleasure to our members to meet with Mr. W. A. Taylor of the agricultural department. Besides the papers he read to us, in many ways he was able to render a service to our society that will long be remembered. It will be seen by the programme which follows, that several new topics are presented, among which we may mention "Cranberry Culture," "Plant Breeding," "Study of Plant Life," "Agriculture and Horticulture in the Schools" and "The Apple in Cookery."

PROGRAMME.

Mr. W. A. Taylor, Assistant Pomologist, U. S. Department of Agriculture, will be present during the meetings.

TUESDAY FORENOON, 10 O'CLOCK.

Report of the Treasurer.

Report of Committee to consider the advisability of asking the Legislature to increase the stipend to our Society.

Report of Secretary—A Year in Pomology, D. H. Knowlton.

Anniversary Address—The Society's Record in Pomology, President Chas. S. Pope.

TUESDAY AFTERNOON, 2 O'CLOCK.

Results of Spraying Experiments in 1892, Prof. W. M. Munson, Agricultural Experiment Station.

Benefit Derived from Top.Grafting the Baldwin, Frank Bowman, Eureka.

The Reverse of the Picture, S. T. Cannon, Augusta.

TUESDAY EVENING, 7.30 O'CLOCK.

More Education in Floriculture Necessary to Profitable Enjoyment Therein, Edward H. Goddard, Woodfords.

Floriculture, Mrs. Alonzo Towle, Freedom, N. H.

WEDNESDAY FORENOON, 10 O'CLOCK.

Flowering and Vegetable Plants for the Home Garden,
Charles S. Walker, Peru.

Cranberry Culture,
Rev. N. H. Chamberlain, Monument Beach, Mass.

WEDNESDAY AFTERNOON, 2 O'CLOCK.

Plant Breeding,
Prof. W. H. Munson, Agricultural Experiment Station.

Study of Plant Life in Schools,
Miss H. M. Merrill, First Lady Assistant, Farmington Normal School.

Agriculture and Horticulture in the Schools,
Practical exercises with a class of pupils from the Auburn Schools, conducted by Miss M. L. Wilson, Auburn.

WEDNESDAY EVENING, 7.30 O'CLOCK.

Report of Committees.

The Apple in Cookery,
Miss Anna Barrows, Principal of the School of Domestic Science, Boston.

ORGANIZED HORTICULTURE IN THE STATE OF MAINE.

By D. H. KNOWLTON, Farmington.

The beginning of things is not easily determined. We may trace the development step by step, but like the mirage on the desert waste, the nearer we approach it the farther it seems to be from us, and at the moment when our search seems to be rewarded the whole disappears from our view. This is as true in pomology as in other things, and here in Maine we are able to mark its progress, while its origin goes back into the dim history of other states and countries. The early settlers in the interior of the state were a hardy, independent class of people, who with their own hands produced their homes and provided them with all the necessaries of life, which now and then were supplemented with some luxuries. The first effort was in the direction of home making and support of the family. At the same time it is narrated that many of the early settlers coming from localities where fruit was grown brought with them seeds of apples and pears. Those were planted and watched over with a sort of paternal interest until the trees bore fruit to reward the planter for his care, and for long years after brought forth fruit to cheer and invigorate succeeding generations. Pear and apple trees, that have outlived a century's winters, mark the site of many an early home.

It may be asked what relation these venerable and sadly neglected trees have to the present condition of fruit culture in the state? Our reply is, they have very much to do with it, for they were the pioneers of fruit culture, the spies if you please that were to gain a knowledge of the newly settled land. Their roots ran deep down into the soil, and their branches floated in the breezes, and in this way they soon bore evidence that soil and climate were favorable for the production of luscious fruits. They tell us as we behold them that nature has provided all the conditions necessary, and that successful fruit growing in Maine only needs the skillful hand of the intelligent husbandman to yield bountiful returns for his labor and care.

THE FIRST ORGANIZATION.

The first attempt at an organization of fruit growers in Maine was made in 1847, when the Maine Pomological and Horticultural

Society began its important career. It was chartered in 1854 and had, as Mr. Sawyer in his first report of the Maine State Pomological Society says, for a "time a direct and powerful influence upon the business of fruit culture in the State. Among its members, or contributors to its exhibitions, were many of the men whose names are recognized as among the most successful fruit growers of the present day, and many equally well known who have deceased. In 1855 it made an exhibition at Gardiner, a most successful and varied exhibition of fruits. It is doubtful if a better show of apples and pears has since been made in the State, or could be at the present day."

THE PRESENT ORGANIZATION.

For some reason unknown to the writer this society gave up its organization shortly after the Gardiner exhibition referred to, and until several years after the close of the war no State organization specially interested in pomology existed in Maine. The State Board of Agriculture recognizing the importance to the State of some organization of the kind, frequently had the matter under consideration, and largely through its influence the present Pomological Society was organized in 1873. The expediency of attempting to effect such an organization was considered by the Board at its meeting in Skowhegan the year before. An "Address to the Fruit Growers of Maine" was prepared by a committee, consisting of Messrs. Z. A. Gilbert, J. A. Varney and A. L. Simpson, and published in the newspapers. In accordance with this address a provisional organization was effected at a subsequent meeting of the Board held in Winthrop, January 17, 1873. The officers there designated were as follows: President, Z. A. Gilbert; Vice Presidents, Geo. W. Woodman and A. L. Simpson; Secretary, George B Sawyer; Corresponding Secretary, J. C. Weston; Treasurer, Chas. S. Pope; Executive Committee with President and Secretary, Samuel Rolfe, James A. Varney and Albert Noyes, with one trustee from each county.

Another committee was chosen to procure an act of incorporation of the Legislature, which was then in session. The Legislature passed the act, and the corporators met in Augusta, March 27, 1873, accepted the act of incorporation and elected as officers of the society those proposed at the Winthrop meeting of the

Board of Agriculture. Thus as an offspring of the Board of Agriculture, the society was first organized, and to its fostering care since, the society owes all the gratitude a child can bestow upon a parent. Co-laborers in the great field of agriculture, they have readily walked shoulder to shoulder, and the work of each has been carried on with the most cordial good wishes of the other.

EXHIBITIONS OF FRUIT AND FLOWERS.

The first exhibition of the society was held the following September, in City Hall, Bangor. The Bangor Horticultural Society gave the society a very cordial welcome, and the exhibition was said to have been one of the best ever held in the State. Some fifteen hundred dishes of fruits were shown. The second annual exhibition was held in City Hall, Portland, by invitation of the Portland Horticultural Society. Among the pleasing features of this exhibition were an address by the Hon. W. W. Thomas, Jr., and a fruit supper under the auspices of the Portland Horticultural Society. The next year the society joined with the State Agricultural Society, and held an exhibition in City Hall, Portland. Two years the society held exhibitions with the Kennebec Agricultural Society in Waterville. Another year in City Hall, Lewiston, and since then in connection with the State Agricultural Society in their exhibition hall in Lewiston. Of these exhibitions many pleasant things were said by the newspapers of the state. It may also be said of these exhibitions that it has been the object of the officers to make them attractive to visitors, educational to the students of pomology, and helpful to exhibitors. Objectionable features have been rigidly excluded and the popularity of the exhibitions has steadily increased. For several years the society was obliged to scale down its premiums rather than burden itself with debt, but in recent years all premiums have been paid in full.

It may be added here that many advantages have followed from holding joint exhibitions, the most important of these is the fact that more people are in attendance than could be expected if we held our exhibitions by ourselves. The fairs are popular and thousands of people from all parts of the State are in attendance daily.

At the first exhibition of the society held in Bangor and at several subsequent exhibitions there were addresses and discussions upon fruit topics. The first address was by the Hon. Z. A. Gilbert, who was then president of the society, and we think a member of the Board of Agriculture For several years past we have held a public meeting one evening of the fair, at which papers were read and discussions were partcipated in by those in attendance.

The first winter meeting of the society was held in Augusta the year following the organization of the society. After calling the meeting to order President Gilbert introduced the Hon. S L. Goodale, who delivered an address on the question, "Shall the State of Maine grow her own fruit trees, or buy them from other states?" It is proper to remark at this point that Mr. Goodale was a zealous friend of the farmer, and in fruit matters as well as other agricultural affairs was sound to the core. Discussions followed and other papers were read, and if we may believe the report, which was ably edited by Geo. B. Sawyer, Esq., the first and ablest secretary the society has ever had, the meeting was of a high order and compares favorably with other meetings held by the Society since. Each year since a winter meeting has been held in some part of the State. A two days' programme (and in several instances more than two days) has been carried out, and in each instance, so far as the writer knows, the meetings have awakened great interest in pomological affairs. The programmes at these meetings consisted of papers and discussions upon fruit ma ters. Some of the papers are of a high order, and as reported in our transactions are not excelled by those given before similar organizations in other states.

A fruit exhibit has formed an attractive feature of these gatherings, and has been closely examined and much enjoyed.

With the exception of two or three years, when the wisdom of the legislature withheld funds, or rather denied the farmers of the State the advantages of an agricultural report, the transactions of this Society have been carefully edited and published for distribution in the State.

SPECIAL MENTION.

Of the original members of the Society it is a pleasure to mention some whose devotion to its interests has had very much to do with establishing it on a firm foundation. Its first president, the Hon. Z. A. Gilbert, of Greene, was at the time of his election a prosperous farmer and a member of the State Board of Agriculture. Later he became one of the most efficient secretaries the Board ever had, acting in that capacity until the winter of 1892. He has been a firm friend of the Society, and in his official capacity as secretary of the Board, in many ways rendered valuable assistance to the Society and largely increased its usefulness as one of the organized industries of the State.

Of those who have been identified with the Society's work, none have done more or displayed greater fitness and ability than its first secretary, George B. Sawyer, Esq., of Wiscasset. The transactions of the Society during his official term are edited in the most scholarly manner. These volumes show how carefully he gathered facts bearing upon the industry of fruit culture in Maine. In carrying out the purposes for which the Society was organized, he undertook many tasks that involved great labor and many sacrifices. The fruit growers of Maine owe him a debt of gratitude, which we fear this generation may never be able to recompense, but the transactions of the Society will bear witness to succeeding generations of the excellence of the service he rendered.

The Honorable Henry Ingalls of Wiscasset was at one time president of the Society, and though in recent years he has not been permitted to meet with us, he has in many ways actively encouraged the cause. He is a member of the Horticultural Committee of the World's Fair Managers, and has actively aided us in bringing before the Board the importance of the fruit industry in the State.

For several years the Hon. Robert H. Gardiner of Gardiner was president of the Society. He was an active member and an exhibitor of some of the finest fruit grown in the State. In September, 1886, having arranged to exhibit his fruit at the fair as usual, but before his fruit was in place, the messenger of death had sealed his lips. A beautiful floral tribute, in the midst of his fruit, with emblems of mourning told the visitors of his death while his remains were being borne to their last resting place. At the winter meeting following, the Hon. Samuel L. Boardman, who was then the efficient secretary of the Society, read a finely written memorial sketch,—a graceful and beautiful tribute from a personal friend. This sketch was published in the Society's Transactions for that year.

There are others whose names are deserving of special mention in this connection, but space and time will not permit; but in closing this hastily written sketch the writer wishes to call attention to the character of the early work done by the Society. It was above all a work of love for fruit growing, of devotion and loyalty to the State. By fruit growers it had been determined that conditions in Maine were favorable for profitable fruit culture. The first great work was to spread this knowledge before the people. The mediums were well chosen, for at the exhibitions of fruit all could see the real product itself in the most attractive form, and real object lessons the exhibitions have proved, bearing indisputable evidence of the great importance of the fruit industry to the State. The other medium was the public meeting for teaching the *how* of profitable fruit culture. The papers and discussions at these meetings were reported in the press and published in the Transactions of the Society, and thousands have studied the theory and science of fruit culture from them. To do this great work there was enthusiasm enough, but the funds were always short, and even to the present time the only compensation paid to the officers has been a meagre salary to the secretary. The time has been cheerfully given, and the Society has only paid the actual travelling expenses. Nor does this tell all the story, for often the early members when the Society was struggling to pay its bills rather than contract a debt, contributed from their own pockets. They preferred this to having their Society burdened in its youth with a debt. The extent of this aid we shall never know, as there is no complete record of the aid they gave. Rarely in the history of organizations are there such instances of loyalty to the cause.

The extension of fruit culture has been the chief object of the Society. First, it is and has been one of the cardinal principles of the Society that every family that controls an acre of land or even a garden spot should produce an abundance of fruit for home use; and second, that as a profitable industry none in the State pays better. That fruit growing in the State has now become so general is a most gratifying result, but the end is not yet, for there is now constant demand for more knowledge of fruits, how to raise them, how to sell them, and last but by no means least, how to use them to increase the health and happiness of our people.

The Pomological Society has ever been true to the principles on which it was organized and has steadily labored to promote the industry of fruit growing in the State. It has no rivals, but has found friends among kindred societies in the State. This is especially true of the Bangor Horticultural Society and the Portland Horticultural Society, organizations that have been active factors in promoting the culture of fruits and flowers. Many from these organizations have been identified with the Pomological Society. Dr. James C. Weston of Bangor was the Society's first corresponding secretary. There were others from the Queen City who bore an active part in the early history of the society. Dr. Weston in the Transactions for 1876 contributed a memorial sketch of Albert Noyes and on the pages immediately following was a memorial of himself written by Mr. Sawyer.

THE BENEFIT DERIVED BY TOP-GRAFTING THE BALDWIN.

By FRANK BOWMAN, Eureka.

The Baldwin is the most popular apple grown in Maine, and in commercial importance it heads the list. The tree is wonderful for its productiveness. It is also possessed of a most excellent feature in having a rich, heavy and healthy foliage, which insures a crop of fruit free from scab or rust Although but half-hardy, the Baldwin tree is tenacious of life. Its thick bark protects the sap-wood and preserves the dormant buds, for these are observed to spring out and form bearing limbs when there is but little woody substance to build on, thus renewing and prolonging the usefulness of the tree.

The weak point in a Baldwin tree is its soft and spongy wood, the cells of which are ruptured and destroyed by severe freezing. There are in consequence very severe losses in some localities among newly planted Baldwin orchards. The stem or trunk of the young Baldwin tree until of two or three inches in diameter is the first part to show its half-hardy nature.

Now, we cannot change the nature of the tree, but we can in a great measure remedy this most discouraging feature simply by setting hardier sorts and changing them into Baldwins when of suitable size. Of the hardy sorts of stock to graft the Baldwin on the seedling is the best. The seedling tree at 10 or 12 years of age will be possessed of more of the elements of substantial durability than the grafted tree. The limbs are more firmly attached to the body. The roots have extended to a greater distance. This fact is abundantly substantiated in our nursery practice where we have dug hundreds of large trees, both grafted and seedling, and have observed uniformly a larger and better developed root on the seedling. In explanation of this phenomenon it should be remembered that the growth of the roots of a tree depends upon the character of the top. Some varieties in the nursery, all the conditions of growth, age, fertility, soil, culture, etc., being the same, are always found to have heavier roots than others, and it is observed that this peculiarity is due entirely to the peculiarities in the growth of the tops of those sorts. If the whole top of a tree be removed the roots cease growing entirely. Now, there is a dist nctive feature of the seedling tree when young, which we find in the case of the apple, plum and pear, viz: The production of thorns and spurs in profusion. This feature belongs exclusively to the young seedling, and its use is to stimulate the production of roots in the young tree. But with the increased age and size of the tree this feature disappears, for it belongs to a particular period of the tree's life, and when that period is past, the phenomenon cannot be produced again.

A most convincing illustration of the superior hardiness and vigor of the young seedling is seen in nursery rows where the very hardiest grafted varieties are grown side by side with seedlings. It will be found that the seedling suffers the least damage from all those extremes of change so destructive to young trees. Now out of 100 of those seedlings when arrived at maturity not 12 will be found to be any more than ordinarily hardy trees. If, now, scions from the hardiest of those seedlings when they have become mature be used to propagate young trees of their sort, it will be found that the peculiar features of the originals i. e. of the young seedlings, have departed, viz.: The super-abundance of spurs, thorns and the corresponding development of roots. The reason is apparent. We have transferred the assimilative organs of maturity to take the place of those of youth.

Hence nature has bestowed such gifts on the young seedling tree that at eight or ten years of age we have the most perfect tree as regards its makeup for durability that can be produced.

The next important step is the grafting. By grafting on the trunk or splice-grafting on the limbs when small we are depriving ourselves of those gifts that nature has bestowed on the seedling tree. Grafting out on the limbs will secure early fruitfulness. Seedling apple trees shou'd be allowed to grow until the limbs are large enough to cleft-graft about two feet from the body. Of course, attention should have been paid to shaping the tops a year or two in advance. Now, good, healthy trees will stand grafting the whole of the top at one time, that is, if the limbs are cut one and one-half to two feet from the trunk. The greater part of the suckers should be allowed to grow, as this will give a better ripened scion and spare the tree a too severe shock.

In regard to bearing fruit, the question is often asked: Is there not a loss of time in setting the seedling and top-grafting? I answer that from my observation and experience with both, the top-grafted seedling comes in ahead.

In conclusion, I would say that the benefits to be derived from top-grafting the Baldwin are: With seedlings we can start an orchard at a great deal less expense and we shall have far more and better trees at eight or ten years of age, which is, perhaps, about the best age to top-graft; the limbs are less liable to split down, and the trunk less defective; the roots are better developed; thus securing trees possessing more of the elements of durability and productiveness than are to be found in the root-grafted Baldwin.

DISCUSSION.

Mr. Taylor: Whether it is not the custom to plant seedlings as they come in the nursery row, or to select seedlings that have been tested for hardiness? Whether it is the custom to select seed from the trees to start seedlings from?

I think it is a matter of considerable importance in this connection, whether you are breeding hardy stock, or simply taking seed from standard varieties, some of which may produce hardy seedlings and some may not, as they vary in character of hardiness as well as in character of fruit.

I would like to know to what extent Maine orchards are on seedling trunks.

Mr. Bowman: I would say here, that the practice in growing nursery trees is to grow one year's seedlings and take these trees up in the fall or in the spring and put them in nursery rows. Those not good, inferior in growth or diseased, we remove as fast as we notice a tree that is defective. In this way we get the best trees to put upon the market.

They are not all of equal hardiness. We grow them four or five years in the nursery.

Mr. T.: Do you select seed from seedlings known to be hardy, or do you sow your seed selected miscellaneously? Most of us understand just how they are raised in the nursery from seed planted, but is that seed selected from trees known to be hardy, or from a miscellaneous lot?

Mr. B.: We usually select our seed from our natural fruit. We consider that the seeds are better from natural fruit than from grafted trees. We select the very best apples. When we carry a lot of the best natural fruit to the cider mill, we select the best and smoothest natural fruit.

Ques. What proportion of the trees come up to be of marketable size; how much are they thinned out?

Ans. Perhaps we lose twenty or twenty-five per cent. They vary one year with another, some years we lose more than others; perhaps twenty-five per cent the average loss in the trees.

Mr. T. I would like to ask to what extent has been tried the practice of double working of the same varieties, as those that will not stand winters always, on trees that have been grown for the purpose of forming a hardy trunk on a seedling root? That practice has become quite prevalent in Wisconsin and Minnesota. The stock they are using is the Siberian and Virginia crab; they unite readily with the apple. That has become a valuable stock. They take common nursery seedlings grown from their hardiest varieties of apples and root graft with the Virginia or Concord crab and grow them vigorously three or four years, then set them out and top-graft immediately. It has been practiced in Western Minnesota and is apparently successful. This is double working to secure a uniform plant; establish hardy trunks. It sends out roots above the union of the scions. I would like to know if that has been tried in Maine?

Ans. We have never made a practice of doing that enough to make a test of the matter. I do not see any benefit in doing so, because I think the seedling tree is better than any grafted tree for the first two years, and the root is improved. The top of the tree affects the root, but the root does not affect the top.

Mr. T.: It secures a uniformity of growth of the orchard. The Concord trunk has been produced by using the root to start with, then grafting the trunk so it sends out roots from the scion and secures a uniform s'em. A hardy seedling stalk is without doubt the best stalk that can be secured.

Mr. POPE: I will say that we have not tested any length of time this double working. It has been our practice to set seedlings until within a few years. We find, no matter where we get them, they are not uniform. Frequently the tree does not have that vigor it should. We always remove it and put in a better one. A few years ago we tried in place of setting seedlings to set a good hardy tree and top work it. The trees were set in rows; one row of Tallman's and one row of Bellflowers and one row of seedlings. Every Bellflower looks nice; grand, good, vigorous trees. In the seedling row they were beautiful trees; the next one has no growth and we are obliged to put in another row. We have uniformity with the Bellflowers. The Tallman will stand our winters,—we are not sure of it in the seedlings.

THE REVERSE OF THE PICTURE.

By S. T. CANNON, Augusta.

A very incorrect or at least superficial idea of many is, that tree agents are a lazy, indolent set, uneducated and unrefined, with plenty of brass and some conceit in their makeup, who cannot earn a living at home, and so make it in their way to travel over the country invading the peaceful habitations of the would-be-let-alone kind, much to their annoyance and discomfort, living an easy life with a soft job in their possession. I am like the minister who was caught in Portland one Sunday, with only one sermon with him, and made to preach to a then, for that day, pastorless congregation. Of course he had to preach the only sermon he had, which gave them a real lively "dressing down," as we would say, and then at the conclusion added that the sermon was not written for that congregation, but for "the miserable sinners out to Saccarrappa," and so begged their excuses. So I beg your excuse to-day, as I have but this one paper to read, and I do not want to spoil your programme.

Those persons to which allusion has been made are full or their stories adverse to the tree solicitor.

Mr. A. ordered a Clingstone peach because he thought it would be more durable in his family, than a Freestone, and when it came to bear it bore Rhode Island Greenings. Mr. B., another, ordered a grape vine that was to be three feet and thirty-six inches long when delivered. And when it reached him only the root and two shoots came, with about eight or ten inches of wood on each, much to his disappointment. Mr. C. ordered trees that were to be every way superior to those growing in his neighbor's yard, with roots by the bushel. When they came there were roots, but to use his own language, there were no "vipers" on them, and he believed that all tree agents were cheats and swindlers. Another man, who lives in Massachusetts, ordered some shrubs that were to be delivered early in October, and when they came, it was the first of November, when, in his opinion, everything in Massachusetts is frozen solid, except the cheek of the tree drummer, which is always intact.

There are between 4,000 and 5,000 nurseries in the United States, giving employment to some fifty thousand persons, and having an invested capital of over fifty millions of dollars. The area covered by these nurseries is said to be something like 173,000 acres. This business has within the last ten or fifteen years grown enormously, and is now one of the largest enterprises in the country, with every indication of still greater expansion and ramification in years to come. The reasons for this conclusion are apparent to any who will take the pains to look into its history, and the causes that have made the industry what it is to-day. The large, unoccupied territory in the West, the increased demand for fruit, the growing interest in out-door adornment, with the fact that much of the nursery stock that is sold never matures, are some of the reasons adduced for its still greater future growth.

But as to present results,—those who own homes, whether modest ones in villages, large farms in the country, or attractive estates in town or city, have become deeply interested in the cultivation of trees and plants,—fruit trees taking a large share of their attention. That this is valuable to any state or territory, goes without the saying. Thousands of farms to-day depend upon their orchards for their principal year's income, where ten or fifteen years ago the yield was scarcely sufficient for home uses. Take a drive through town or country—beautiful lawns with shrubs and roses meet your gaze. You notice here and there the large flowering clematis, in various shades of color, climbing the trellis of the veranda, or covering some bare fence or wall,—charming in its masses of flowers. Then again the lawn will be smooth and vacant in the center (as it should be), with a few blooming shrubs in the corners, and perhaps a border by the roadway or front walk. And although there are a good many yards still needing combing out, great progress has been made in this direction. Men, as well as women are sensibly taking pride in matters of horticulture, as well as pomology. Pear and plum trees are noticed in gardens once barren of these necessities, and small fruits demanding more than your passing notice.

Now, while it is admitted this has not all come about through travelling salesmen, it has very largely. Were it not for the means thus used, the nursery interests would be nothing like what they are now. Business in these days is largely done through representatives of the business. Thus, the dry goods house, the grocery and the hardware trade, and other mercantile branches, have each found that their interests are better served, and their trade held more securely, by sending out their commercial drummers,—and nurserymen do the same way. Why not? The only difference is, while the goods of the former reaches the consumer through the retail trade, the latter deals directly with the planter. It is true, errors are sometimes made So there are in all kinds of business, and there is no reason why a man who buys fifty apple trees of a tree agent stands any greater chance of loss by errors, than the man who buys fifty pounds of sugar, or a ready-made overcoat.

Tree agents come from all the walks of life. A large per cent are farmers and farmers' sons. Then there are mechanics, teachers, students, and so on. And for the most part they are men not only of respectability, but men of education. They are not dudes, it is true, but men of sense and good judgment,—men you and I would like as neighbors.

Follow such an agent over his rounds, through cold or heat, rain or shine, as the case may be, meeting with all the rebuffs named, and many more during his year's toil. When his day's work is done he is ready for rest, but often it is nine o'clock before his day's work is done. You will agree with me that he has earned his money.

Friends, where would many of the profitable fruit orchards, the gardens of small fruit, the outside ornamentations of homes be to-day, had the much distrusted and ever under-rated tree man never called at your door?

After all that has been said, please do not misunderstand me. I do not say that all tree agents are what they should be, but I do say that a good, high-minded one, who is clear-headed and who understands his business, is a *missionary* in his line of labor, and every fruit-grower should encourage him.

Did the buyer study his own wants closer, learn to discriminate between what is real and true from what is false and harmful, encourage the earnest and honest endeavor wherever found, it would be very helpful in each direction. The doctrine of brotherly love is working its way along, but the country is still in need of it in many places. The doctrine of universal charity has not yet extended to all the recesses of our natures. Let us not forget that in humanity, all are friends, all are brothers.

As has before been stated, men in buying trees, do not always get what they order, and oftener do not take care of what they do get. Why, I have known bundles of trees after proper and accepted delivery, lay a week in the bundle unattended to, and then the owner complained of the stock. Many, ignorant themselves of the care and culture of trees do the best they can, however, sometimes even employing the services of a professional gardener, who like some religious sectarian, professes too much,—and this gardener goes and puts unsuitable dressing around the roots of the weeping birches, and when the proprietor comes to look at his trees, as the time draws near for them to be in leaf,—he weeps himself, for the money he has paid to that miserable tree-man for nothing: and too, after he has employed the services of a professional.

Well, we who love the study of Pomology and Horticulture, will, bye and bye become better acquainted with the culture of trees and plants, as well as the way in which to procure them; for whoever has a bit of sunshine in his heart, loves such care, next to the care of his family, and needy humanity.

THE PRESENT STATUS OF THE RUSSIAN APPLE QUESTION IN THE NORTHWEST.

By W. A. TAYLOR of the Department at Washington.

The report of the adaptation of Russian and other fruits to the extreme northern parts of the United States, issued by the Department of Agriculture in 1888, marked a distinct step in the progress of hardy fruit testing in this country. Though it dealt to some extent with all the leading fruits grown in the colder sections lying north of latitude 40°, more than half of the report was devoted to the apple, which as our most important fruit, both for home use and market, was deserving of special attention.

The search for varieties of good quality that would stand our northern winters, particularly in the northwest, had been carried on for years by private experimenters and in some cases had been aided by the states.

Concerning the decision reached by Mr Lyon, the special agent to whom the investigation was intrusted, it must be admitted that it was unfavorable to the claims of those experimenters who had advocated the widespread planting of the Russian varieties. Though many of them had proved sufficiently hardy to endure the winters in the intermediate prairie district. It must be said however, that at that time, not many of the later importations, from central Russia, which were expected to furnish true winter apples for the northwest, had been fruited sufficiently to determine their value.

During the autumn of 1892 a second investigation was made by the department;—Wisconsin, Minnesota, South Dakota and northern Iowa having been visited by a special agent, Mr. John S. Harris of Minnesota. The main object was to determine the progress made in that section during the four years since the report of 1888 was published in determining which of the many varieties were really valuable. Of this report, which will appear in the report of the Secretary of Agriculture for 1892 the following condensation is made: "The season was in many respects an unfavorable one, first, owing to a check in growth apparently caused by excessive rainfall and low temperature during the blooming season, preventing perfect fertilization of blossoms, and second, a very wide spread attack of a blight which was prevalent through all the states visited but which showed its worst effect in Wisconsin, eastern Iowa and Minnesota. This defoliated some varieties and caused them to drop their fruit and checked the growth of many others.

"It was most injurious, first, to Siberian crabs, Transcendent being one of the worst; second, to American varieties, such as have originated in this country, either as seedlings of European varieties or of the Siberian species; these were damaged in the following order: Fall Queen, Edgar Red Streak, Talman's Sweet, Fameuse, Golden Russet, Ben Davis, Willow, Perry Russet, Plumb Cider, Bailey Sweet, St. Lawrence, Malinda, Utter, McMahon and Wealthy. This list comprises all the American apples grown there; third, the Russians, including Oldenburgh and a number of seedlings from Oldenburgh." The larger part of the fruit produced this year in the northwest was of the Oldenburgh. Mr. Harris estimates that two-thirds of the home grown apples marketed in the region he visited were of that variety. Wealthy was next in quantity and perhaps equal in value, because of its later ripening season and longer keeping quality.

At the State and county fairs the Russians formed the most attractive and by far the largest part of the exhibits and were smooth and free from scab, while of the American varieties but few were shown and those were badly affected. But few of them are late keepers, however, and the nomenclature is very badly confused; so much so, as to prevent a full report on characteristics of varieties until the identity is better settled. A visit to the orchard of A. G. Tuttle at Baraboo, Wisconsin, who has about sixty varieties of Russians left, out of over 100 varieties planted, disclosed the fact that they were in much better condition than an orchard of mixed American varieties near by.

The most valuable of the new Russians here, seemed to be Glass Green, Yellow and White Transparent. Charlamoff, Hibernal, Antonovka, Vargul, Red Wine, Czar Thorn, Zusoff Winter, Longfield, Early Champagne and Beautiful Arcad. Repka Malenka also appears to be a good tree and the longest keeper of them all, but the fruit is too small to be valuable.

At Rochester, Minnesota, is the largest orchard in this State. It consists mainly of Oldenburgh, Wealthy and Longfield. The crop this year was over 3,500 bushels; 150 varieties have been tested in this orchard, but only a few have proved valuable. The Russians promising best there, are Longfield, Ostrakoff and Hibernal.

In Carver county, Minnesota, in the oldest orchard of the new Russians, about twenty varieties are doing reasonably well and are as free from blight as Oldenburgh. The list is Borovinka, Charlamoff, Cross, Good Peasant, Krimskoe, Anisovka, Jungfrau, Plikanoff, Hibernal, Lieby, Kluvskoe, Royal Table, Reinette, Red Repka and Numbers 502 and 469.

Brief notes on a few of the best of the new Russians, received at the Division of Pomology from various sources are appended, as follows:

ANISETIE. From Dr. Hoskins, similar to Oldenburgh, but two weeks earlier.

ANTONOVKA. Medium to large; of good quality; an early winter apple.

BLUE ANIS. Medium size; conical yellow, with stripes of crimson. A winter apple at Baraboo, Wisconsin, and of very good quality.

CHARLAMOFF. Large, handsome and of fair quality. Ripe early in September at Dr. Hoskins' place in Vermont.

CROSS OF THE VOLGA. Medium to large, clear yellow, and keeps till late winter at Ames, Iowa. One of the best, and a good keeper.

LONGFIELD. Now widely known and widely grown in the Northwest. Of medium quality and a fair keeper.

LUBSK REINETTE. Handsome, glossy white, with pink blush. An early cooking apple of too delicate texture for market.

RED QUEEN. Size medium, conical, cavity very small and full; color greenish yellow with faint stripes of dull red. Late winter at Baraboo, Wisconsin.

TITOVKA. Large, oblong, smooth, whitish yellow with splashes and stripes of bright carmine. Early autumn; of fair quality.

WHITE RUSSET. Large, roundish, smooth, white, with no trace of russet Ripens with Dr. Hoskins in early September and is a good sub-acid fall apple.

In the search for hardy varieties among Russians, the apple growers of Iowa, Minnesota and Wisconsin have not lost sight of the importance of growing seedlings from the hardier old varieties and of improving the size and quality of the native crab by hybridizing it with pollen of desirable sorts.

Thousands of seedlings have been grown and tested and some valuable varieties have been produced.

The work of Peter M. Gideon, the originator of the Wealthy and a number of other varieties now quite extensively grown, is too well known to northern apple growers to need more than a passing mention. Many others are engaged in the sam line of work with more or less indication of success. It is being carried on with much activity in Iowa where the State Horticultural Society has taken it in hand in a systematic way and is conducting some extensive exp riments in breeding and growing seedlings of the different fruits, with a view to securing varieties combining good quality and a desirable season of ripening, with hardiness. In the case of the apple, one line of work thus far begun has consisted in an attempt to grow from two or three selected wild crab tr es that have proved perfectly hardy during a long term of years, and which bear fruit of good size, a lot of hybrids resulting from the use of pollen of standard market and table varieties.

In 1891 about 10,000 hand pollinations were made, a large number of them on the apple. In the fall the fruit resulting from these was gathered and the seeds placed in the hands of skilled propagators for growing

This is so far as I know the most extensive and systematic effort made by a society in this line and its outcome will be watched with much interest.

Among the many new sorts which have proved successful and valuable over a large part of the intermediate prairie district, the Maine orchardist in search of hardy varieties will probably find some varieties that will succeed with him as well as Wealthy.

Some of the best are the following:

McMahon. This variety, which has now been widely test d, is found to be very hardy and a valuable fall apple. Its handsome appearance combined with fair quality have given it a wide spread popularity in the Northwest. It originated in Richland County, Wisconsin. It is said by its originator to be a seedl ng of Alexander, grown in 1860. It was named by the Richland County Horticultural Society in 1870. Size large; roundish oblate, conical; cavity large, regular. deep, flaring, russeted; stem medium to long, sometimes downy; basin large, angular, deep, abrupt; calyx segments short, green; eye medium, closed; surface smooth, shining, yellowish white often half covered with a beautiful carmine blush; flesh greenish white, rather coarse, juicy, firm, breaking; core medium broad, closed, clasping; seeds large, long, dark brown, numerous; flavor sprightly sub-acid to sour, excellent for cooking.

NORTHWESTERN GREENING. This variety is traced to a root sprout, from a grafted tree that had been winter killed in central Wisconsin. It has not yet been sufficiently tested during a severe winter to be safely recommended for planting on the cold, dry prairies but is hardy in the county where it first came to notice, and would probably stand almost anywhere along the northern fringe of the Maine apple region. Though not of high quality it is a good apple, of large size, nearly round, regular, slightly conical, changing to yellow with large, dark dots as it ripens; cavity large, round, abrupt, russetted; s em medium; basin large, round, wavy, deep; calyx segments long, narrow, reflexed; eye large open; core broad, large, closed, meeting the eye; seeds small to medium, plump, light brown, numerous; flesh yellowish, rather coarse, flavor mild, sub-acid, nearly sweet; season, winter, in Wisconsin. Can be kept till late spring but the flesh becomes dry and insipid after its time of maturity is past.

NEWELL. This variety, a seedling of Perry Russet, was for some years grown under the name Orange Winter, given it in honor of its originator, Mr. Orange Winter of Sauk Co, Wisconsin. It is a late fall or early winter apple of good quality. Prof. Goff regards it as the best apple in quality that is now grown in Wisconsin. Much confusion has been caused by the misapprehension concerning the meaning of its former name, and to avoid that in future, the Sauk County Horticultural Society has adopted the name Newell. It is a large, oblate, apple; cavity irregular, large, deep, abrupt, corrugated; stem medium, slender; basin large, deep, abrupt, regular, netted with russet; calyx segments short, converging; eye large, open; surface smooth, greenish yellow with small brown dots. Flesh yellowish white, fine grained; core large, broad, oval, clasping, open; seeds plump, medium size, dark brown, numerous; flavor mild sub-acid, almost sweet; quality good

PATTEN GREENING. A seedling of Oldenburgh grown about 1870 by C G. Patten, Charles City, Iowa. Medium to large, oblate conical; cavity round, large, shallow, flaring, thinly marked with rus et; stem very shor, quite stout; basin round, large, abrupt, slightly angled and downy; calyx segments broad, converging; eye large, closed; surface waxy, lustrous; color greenish white with numerous large dots. Flesh white, coarse, breaking, moderately juicy; core conical clasping closed; seeds medium size, plump, brown, few; flavor mild acid; quality good, especially for cooking; season early winter.

CRANBERRY CULTURE.

By Rev. N. H. Chamberlain, Monument Beach, Mass.

The laws of cranberry culture are immutable. You obey these laws and you make money. You disobey them, you lose what you might desire, but what you never had. There is money in it under right conditions; plenty of it. You know your own soil. You have one condition in your State — plenty of good, sandy ground; and wherever you find cranberries, you will find a light soil.

In the United States are three localities in which cranberry culture is followed to a large extent; Cape Cod, being just now the foremost, because it was the cradle of cranberry culture. The three are Cape Cod, New Jersey and Wisconsin.

There are three things cranberry culture require which I will put in the order of their value: three conditions *immutable* are, water first, sand second, and soil third. But they tell me in the State of Maine, that you have got about two or three feet of muck in your lowlands, and clay under it. I do not care for that, if you have soil with two feet of muck, that is all right; because if the muck food gave out you could supply, with fertilizers. Muck is the basis of the soil. The three things are water, sand and soil. Have those conditions in your possession and you can raise cranberries in almost any climate.

Now let us begin with the soil. Of course, you would say, you have got to have low land for cranberry culture, because you must have water. With us on Cape Cod, I will observe that all the advantage Cape Cod has is, that it has a latitude that somehow gives certain things which distinguish it from other sections of the country. Our berries will weigh more than your berries. I do not know why it is, but our berries will weigh more than New Jersey berries.

We have this land that never was worth a dollar to anybody, which has become the most valuable land on the Cape. These swamps, we have, not ravines like yours with your rivers. I suppose you have these swamps in Maine; two, three, or ten acres with a bottom of muck. They go in there wherever they can drain their bogs. If you cannot drain your bog down to from twelve to forty inches below the surface, you cannot get the body of water to apply to the vegetation in the cranberry bog and it will beat you.

I suppose you have swamps here that you can drain. I will take this room for a cranberry bog. If it is covered with bushes or trees,—for they sometimes cut down whole forests,—you must dig up the roots. You clear your bog in that way and your good sense would show you how to make a level surface of it. If you are going to have water you must have a dam on the stream Then after level ing your bog you dig a ditch from the upland about three rods wide; cut into sections of three or four rods wide, according to the amount of drainage you want. That divides the bog into sections.

Supposing, in these lowlands you have springs in the edges of your bogs; you must cut off the spring water by running an upland ditch. So far as the culture of cranberries is concerned, you must make the bog so you can raise a crop of corn on the soil, and so you can cover it with water for the reasons I have given you. So much for the ditches.

If the upland has no springs, it is an open question whether an upland ditch pays. If you do not dig up the grasses they will trouble you.

The next thing is *sand*. You have got to cover that whole bog with sand. Why? In the first place, I do not know anything about cranberry culture down below a certain point; but I know practically, you have got to have sand. It furnishes something to the vines that muck does not, nor loam; because you might go to work and try to avoid the expense of sanding your bog; then raise your cranberry vines. You would find your vines grew luxuriantly, but it would be all vines and no fruit. Sand gives warmth. Sand keeps in condition, in due proportions the vines and berries. Sand is to the cranberry vine, what right medicine is to the human body. Sand you must have in cranberry growth. Then it serves as a mulch to keep the moisture in a dry spell. You go into a side hill and dig your sand and but it on the bog all the way from five to eight inches. A bog that has eight inches of sand will last longer than with five. You do not know what power a bedding of sand on old vines will have on those vines the next year. They will come up like great American families. Everywhere there will be signs and promises of future growth and crops.

You must plant the vines. With a little wooden tool you mark out lines, both ways, longitudinal and crosswise. Where the lines cross it should be fourteen inches apart. When you get the vines set out, they must be twelve or fourteen inches apart. When we want to set out the vines we put a man on where the vines are vigorous and cut them off. You do not want them too short, cut them off all the way from six to seven inches and carry them upon the bog in a basket; if you put your own hands to the plow, then take an ordinary stick and make a hole down through the sand into the muck an inch or so and take three or four of these vines and make a little wisp of them and put them into the hole, the ends of the vine through the sand into the muck and push the sand about it and you have your hill planted. If you mass the vines together in too big a bunch, they don't do as well.

Now we have got one plant set out; we have got started. The first year after you begin, you get a few berries; the next year, a few more; the third year a fair crop; the fourth season is one of the best unless you lose the crop by frost or some other cause.

There are two divisions of the berries. The early blacks get ripe two or three weeks before the later berries get ripe. There would be this advantage to your Maine people. I think that Maine is colder than southern Massachusetts, but I am told that we are as liable to early frosts as you are here; for twice on that Cape, all have lost a large portion of our crop on the 13th of June. You can judge whether Nature is worse with us than with you. It is a fine looking berry and comes one or two weeks earlier than the late berry.

The largest berries are not as valuable, because they rot easily; more liable to indentation; because every time you handle cranberries with your hands they lose a certain value. The cranberry vine is a great mixture of eccentricities. The cranberry vine seems to have life like the life of a cat, but you take a wisp of hay and throw it down on a mat of cranberries, the chances are that it will kill your vines underneath.

One thing I want to say. You cannot raise cranberries in the shade of grass or shrubs. We sometimes raise 160 barrels to the acre; that is *business*. Then if you undertake cranberry culture, I advise you, if you have native vines, to plant a few of those vines and see how they do. You might strike a fine variety. We did that and found our native vines, grown from the beginning, that they were prolific producers, but tremendously late and we did not want them. Then there is this thing. If you fail in cranberries I do not see why you would not have a good English meadow left. If you have seen a cranberry bog in its growing time, it is simply a mass of mud covered entirely with vines. It is a sin in cranberry culture to have a root or shrub, a leaf or tuft of grass on that bog. You can measure your crop by the grass.

Innumerable things grow on a cranberry bog. If you know the slink weed or punk root, I can show you and affirm that punk root or slink weed, that grows in the water and throws out long flexible branches and blossoms about August, that it is the sum of vegetable villainies. It cost us $1000 in our bog. It goes through everything but an iron can or stone wall You will find it on the edges of your bogs. It is tough and will cut you if you take a limb. If you throw it into the water, into the stream, it will float down, take root and live.

An insect comes and lays eggs in the calyx of the cranberry blossom. This egg is to be seen only with a powerful microscope, right in the head where the flower is coming. Then when the egg hatches there is a worm right in the head of the flower and it develops with the new shoot; so you can tell. You look for your fire worm to come when you see the new shoots come in the spring. This fellow comes out into his life, into the vitality of the coming crop; he comes and eats and weaves his web In weaving his web, it draws together the leaf of the cranberry and that causes the lighter color on the under part of the leaf.

Now comes the matter of war. When you find he is there, shut down the flume boards and put the water on. Give him nine hours under water and your enemy is dead; dead like the pests of the Egyptians. But there are two crops of these fellows. The first crop is small. When the first crop comes, then you must kill your enemy, because, if you do not, when he passes into the miller condition he goes about multiplying himself, lays his eggs, then comes a second crop; and in three days after that second crop comes if you don't destroy the first, the cranberry plants look brown, red and dead as a door nail. The deadest thing I ever saw was a cranberry bog after the fire worm had been over it. Put the water back and you kill him.

The other great enemy of the cranberry is what is called the meadow worm. It is not fatal; it rarely destroys more than one-sixth of the crop, but it is no good to the cultivator.

The berry worm comes, and as the berry grows he grows inside of it and he eats the very heart of the berry and he eats himself to death there or crawls out to go into another berry. He disappears; then they have a variety of new worms coming. The Lord knows what they are sent for. The fire worm is the worst. If you undertake to kill the fire worm, the second crop of them, you see your flowers are open, you would wash the pollen out of them; you cannot put the water over the pollen. You must take the fellow when he begins; then if you can cover the bog with water you can kill him.

I consider that the bog that you can flow in six hours with water is worth 150 per cent more than one you cannot flow. You can fight the very heavens and earth, the frost, the worms; you can protect your crop. When you have early frosts you can flow your bog and save your crop; and your berries will bring more than if the market was flooded.

We can raise cranberries as cheaply as they can be raised on the face of the globe. We are going to get the English and French markets, and we have a big market at home. You cannot overproduce. The limitations are such; the climate and soil do not go to stupidity; it cannot be overdone. It will cost you $3 a barrel, the best you can do. Anything you make over $3 a barrel is in your pocket. The average price runs from $5.50 to $6.50. I do not get $7; but suppose I get $6.50, that gives me $3.50 a barrel. Supposing I get $8 a barrel, I make $5 a barrel. It costs us $3 a barrel to market our cranberries. If you keep your berries for a late market, I imagine they are worth $10 or $11.

DISCUSSION.

Ques. When is your planting season?

Ans. It has been in the spring. Anytime in the spring until July, when you would be liable to get too hot weather. Spring is better than fall; because I think they will live if you keep them moist, if you keep the vines under water till you take them up. It is better to plant in the spring.

If you let your vines stay out in the air through the winter, some fine winter, you will get a winter kill on them. You lose your vines; or the vines are alive to a certain extent at the roots, but it kills your crops for two years if you get a winter kill. Before the time of freezing up you put the gates down and flow the bog.

If you have frost coming on young berries in July, they begin to set about the first of July, if the water covers those berries, in that condition, nine hours it kills them, but when your crop is grown you can throw the water on and keep it on forty-eight hours,—I think a week, and it would not kill them. If the frost comes very early in the fall and has a pretty general spread, the man who can keep his berries will get a good price for them.

Ques. Is there any special benefit from flowing?

Ans. Only as it keeps up the temperature, no. If you keep up the temperature, you keep the frost off. More than fifty years ago I was a resident of the town of Barnstable. They have a tremendous beach separating the margin from the upland with great sand banks. The town ordered that the people should go there and pick cranberries. As I remember it, it seemed as if those cranberries were growing out of the sand. But I do not think you can get something out of nothing; it must have been the muck that was underneath the sand. Now they have got all these places turned into private cranberry bogs. They think close by the sea is better; but if you can control water and keep the frost away from your vines you are all right.

Mr. Pope. You think it is necessary in winter to have flowage if they keep the ice away from the plant. Would it do to have a foot of ice pressing upon the vines?

Ans. I don't know as it does any particular good; but I am sorry to say, I think that is the condition of my bog at this moment. We have had our vines in the ice a good many years and it did not seem to hurt them; but I do not think it would do them any good.

Mr. Knowlton. How long should the water flow over it in the fall? Whether you would cover as soon as the berries are off and keep flowed until spring?

Ans. I think it is better to leave it as late as you can, because the buds must be developing pretty late; I should say early flowage would put back the development. It should be kept flowed through the winter. As soon as you flow your bog you want to keep it flowed till spring.

SPRAYING EXPERIMENTS IN 1892.

At the meeting of this society which was held in Cornish, last winter, I gave some general notes regarding the importance of doing something to check the ravages of the Codling moth and the apple scab, at the same time presenting a statement of the work done by the Experiment Station in solving some of the problems connected with this work. It is unnecessary at the present time to repeat the statements then made, but I have been requested to present, so far as possible, the results obtained by ourselves and by the leading orchardists of the State, during the past season. The work relative to the control of the Codling moth, which I had planned for the past season, was only partially carried out. Consequently I shall present only the reports of those orchardists who have undertaken work in this direction.

In response to a letter sent to some twenty orchardists in different parts of the State, eight replies giving the results of experience were received. Several prominent fruit growers have had no experience, while others have just begun and are not ready to report, but will spray next year.

The following notes, condensed from replies received, speak for themselves:

S. R. Sweetser, Cumberland Centre: Sprayed once, June 10th, using one pound Paris Green to 150 gallons water. The foliage was not injured and the fruit was better than usual, but there were no checks for comparison. It was Mr. Sweetser's first experience in spraying.

S. C. Harlow, Bangor: Sprayed twice, June 25th and July 2nd, using one pound Paris Green to 360 gallons water. (Was unable to spray earlier, because of rain.) Mr. Harlow has sprayed for six years and is "more than satisfied with the results." The least tendency to injury of foliage has been found to occur in a bright, dry atmosphere, and the greatest in damp, cloudy weather.

D. J. Briggs, South Turner: Sprayed once, about June 10th, with London Purple, in the proportion of one pound to 150 gallons water. The cost of the application was about three cents per tree, and the foliage was not injured. Mr. Briggs thinks "if well done, spraying pays very well," and he will continue to spray.

Charles S. Pope, Manchester: Had such a large crop of fruit that the worms made no showing; so could not tell whether benefit was derived from spraying. In such a case as this, I should consider the codling larva a blessing rather than otherwise, for the reason that too many orchardists can not bring themselves to do necessary thinning of the fruit.

W. P. Atherton, Hallowell: Sprayed once, the latter part of June, with one pound Paris Green to 250 gallons water. The foliage was injured on some trees, from the fact that care was not used in rinsing the barrel each time after emptying, so in some cases the mixture was much too strong. Mr. Atherton is well pleased with results, and was greatly disappointed in being unable to spray but once, the past season, on account of breaking his pump.

Henry Smith, Monmouth: Sprayed once, using one pound Paris Green to 160 gallons water. In 1891 he used one pound to eighty gallons, and injured the foliage when the mixture was not constantly stirred. Mr. Smith is well satisfied with the results, and has used checks so that he has proved to his own satisfaction that spraying is effective. He has sprayed for several seasons, and when I was at his orchard in October, he informed me that spraying had ceased to be an experiment with him, as he was perfectly satisfied as to its value.

H. W. Brown, Newburg: Sprayed all of his trees once, and part of them twice, using one pound of Paris Green to 250 gallons water. The cost was about three cents per tree, and Mr. Brown expresses himself as well satisfied with the results. He also emphasizes the importance of using a *fine* spray, and keeping the mixture *thoroughly mixed.*

S. H. Dawes, Harrison: Sprayed twice, June 14 and July 11, using one pound of Paris Green to 300 gallons water, and to each fifty gallons was added one gallon lime whitewash, to prevent injury to foliage. The cost of spraying—including everything—was about three and one-third cents per tree. Regarding the effectiveness of the treatment, Mr. Dawes writes: "The ground under the row not sprayed was covered with wormy fruit, while from the sprayed rows on either side, scarcely a wormy apple was to be seen. Fully ninety per cent of the fruit on the sprayed trees was perfect, and there was no injury to the foliage when lime was used. My experience during the past two seasons has fully convinced me that spraying pays and I shall continue it as long as I continue in the fruit business. There is no labor that pays so well if the work is properly done."

One correspondent, whose orchard is very productive, has not been greatly troubled with wormy fruit. He has bought fruit from other orchards which had been sprayed, and found it worse than his own. This, however, is no criterion. As before noted, if the tree is heavily loaded, the presence of the codling larva is to be desired, unless the owner has sufficient courage to thin the fruit. It is nature's method of preventing too great a tax on the strength of the tree. It is also very evident that the amount of wormy fruit, though it might be actually the same in the two orchards, would appear much less in a large lot than in a small one, and of course the *per cent* of damage would be smaller.

Last winter the question as to the danger of eating fruit which had been sprayed was discussed, and from a theoretical consideration of the subject we concluded that there was absolutely no danger from eating the sprayed fruit;—that the highest probable amount of poison per fruit, on trees sprayed twice with Paris Green in the proportion of one pound to 200 gallons of water, was less than 3-1000 grain.* To assure ourselves in a practical way of the substantial correctness of this statement, a number of fruits were actually immersed in a preparation of Bordeaux mixture, to which Paris Green had been added in the proportion of one pound to 250 gallons of the mixture. The variety used was the Alexander. The fruits were dipped in the mixture July 20th and were left till maturity, when they were taken to the chemical laboratory and submitted to analysis. Result: *No trace of arsenic found.* I regard this as an important test from the fact that by immersing the fruit the greatest possible amount of the mixture was obtained, and the Bordeaux mixture being much more adhesive, would remain on the fruit much longer than would a simple mixture of Paris Green and water. Therefore I would repeat the statement made last year: There is no reason why fruit sprayed as directed should be unwholesome. But I would also add the caution that care must be used in making the application.

*Rep. Maine Pom. Soc. 1892, p. 78.

APPLE SCAB.

But one of our correspondents—Mr. Henry Smith of Monmouth - had attempted the use of any of the copper compounds to check the apple scab. Some have had little trouble from this source, and one thought he had derived benefit from the use of London Purple. I should question the accuracy of the last observation, however, as London Purple, being an impure arsenite of lime, does not contain the elements usually considered of value in this connection. Mr. Smith has sprayed for two or three seasons with Bordeaux mixture —four pounds lime, six pounds Copper Sulphate and thirty gallons water—and is fully convinced of the value of the treatment. From his former experience, Mr. Smith was so well satisfied with the effectiveness of the spraying, that he left few checks this year. In one orchard, however, two rows of Nodheads were sprayed, after bloom, with Bordeaux mixture and Paris Green. As to the result Mr. Smith writes: "From those two rows I gathered the finest specimens I ever raised—large, bright and free from scab and worms; while two trees not sprayed were, I think, as bad as any I ever saw—gnarly, scabby and almost worthless."

Our own work in connection with this subject was, in some respects, less satisfactory than last year; but in a general way the results are very encouraging. The work was conducted on the same general lines as last year, both Mr. Pope of Manchester and Mr. Moore of Winthrop co-operating. The season was very unfavorable. and it was difficult to find a suitable time for the work. In nearly every instance rain fell within twenty-four hours after the spraying was finished, and as a consequence the results were materially affected.

Mr. Moore's orchard is usually very badly attacked and would seem to be an excellent field for work. Many of the trees bore very heavily in 1891, however, and were not as well adapted for our use as they otherwise would have been, as trees bearing but little fruit are seldom attacked so badly as those which are heavily loaded.

Two solutions were used in Mr. Moore's orchard—the ammoniacal solution of copper carbonate, recommended last year, and the "improved" ammonia-copper carbonate solution suggested by Professor Galloway.

The first of these, which we will call solution A, consisted of five ounces carbonate of copper, three pints strong ammonia, fifty gallons water. The second, solution B, consisted of three ounces carbonate of copper, one pound carbonate of ammonia, fifty gallons water.

A number of trees were sprayed four times with each solution, while others in the same vicinity were left as checks. Rain followed soon after each application, and the results were not as striking as might be desired. The average results, however, are slightly in favor of the sprayed trees as compared with the unsprayed, while solution *A* gave slightly better results than did solution *B*. The percentage of fruit absolutely free from scab, was very low in every case. In a general way, however, the work is of value in that it confirms the results obtained in Mr. Pope's orchard.

The work carried on in the orchard belonging to our president, Mr. Pope of Manchester, was of sufficient extent to warrant very free conclusions, from a commercial point of view. The orchard is situated on a gravelly hill-side, having a northwestern exposure, and instead of single isolated trees being given different treatment, contiguous rows, extending down the hill-side were selected. In this way all of the rows presented essentially the same conditions, part of the trees being on high land and part on low.

In addition to the two solutions used in Mr. Moore's orchard, a third—the modified *eau celeste* described last year was used. The formula for this solution was as follows: Two pounds sulphate of copper ("Blue Stone"); two and one-half pounds carbonate of soda; one and one-half pints ammonia; thirty gallons water.

To be doubly sure of results, duplicate series were used. In this way we have two rows in different parts of the orchard sprayed with each solution; while for comparison three rows, alternately with these, were left without treatment.

The following diagram shows the relative location of the sprayed and unsprayed trees:

Solution A....	*	*	*	*	*	*	*	*	*
Check	*	*	*	*	*	*	*	*	*
Solution B ...	*	*	*	*	*	*	*	*	*
" C....	*	*	*	*	*	*	*	*	*
Check	*	*	*	*	*	*	*	*	*
Solution A....	*	*	*	*	*	*	*	*	*
" B....	*	*	*	*	*	*	*	*	*
Check	*	*	*	*	*	*	*	*	*
Solution C ...	*	*	*	*	*	*	*	*	*

Naturally all of the trees were not equally productive, and in counting the fruit only those trees which were under approximately the same conditions were selected.

In this connection, about one barrel of fruit from each of thirty-eight trees was counted, and without going into details, I will give, in the accompanying table, a general summary of the results obtained:

Solution.	Number examined (average per tree.)	Free from scab.	Slightly scabbed.	Badly scabbed.	Per cent free. (average.)	Per cent "No. 1" fruit (as regards scab.)	Remarks.
A....................	559	171	347	41	30.1	93.0	Average of 8 trees.
B....................	583	34	365	184	6.1	71.0	Average of 8 trees.
C....................	615	32	414	169	5.6	73.5	Average of 8 trees.
Check...............	628	5	239	384	0.9	41.2	Average of 14 trees.

As will be observed, the average proportion of "No. 1" fruit on unsprayed trees, considering fourteen trees in all parts of the orchard, was only 41.2 per cent of the crop, while the average proportion on the trees sprayed with the least effective solution was seventy-one per cent, a gain of nearly thirty per cent. With the most effective solution—the modified *eau celeste*—this difference was much more marked, amounting to nearly fifty-two per cent.

The amount of fruit absolutely free from scab is not as large as might be wished. The standard adopted in sorting the fruit, however, was very rigid, and much of that classed as "slightly scabbed" was in reality better fruit than that classed as "free."

With the above figures in view, and considering the fact that the results are in direct confirmation of those obtained last year, there would appear to be little doubt as to the effectiveness of the treatment when the work is properly conducted.

While the Experiment Station will continue its work of combating orchard pests of various descriptions, I hope that during the coming year more of the practical orchardists of the State will take the matter in hand, and make use of the knowledge already gained.

AGRICULTURE AND HORTICULTURE IN THE SCHOOLS.

Under this general subject a series of exercises were given by Miss M. L. Wilson and a class of her pupils from the East Auburn school. The general object was to illustrate the interest pupils take in the objects of nature, especially plant life, and the desirability of introducing the study of the elements of argiculture into the schools of the State. This school exercise is published in the Report of the Board of Agriculture and we take pleasure in referring our readers to it. It proved one of the most popular exercises of the meeting.

In connection with the general subject the following paper was read by Miss H. M. Merrill of Farmington:

STUDY OF PLANT LIFE IN SCHOOLS.

By Miss H. M. MERRILL, First Lady Assistant, Farmington Normal School.

In presenting a few points with reference to the study of plant life, I trust to be excused from looking at the subject from the teacher's stand-point, considering briefly what it is possible to accomplish in the remotest country school. A consideration that cannot be ignored is the present tendency to the over-crowding of school courses. Surely the period plainly intended for that of mental as well as bodily development is long enough for acquiring the essentials that will best fit the boy and girl for his and her work in the world. What these essentials shall be is the question that continually confronts the educator, and as new conditions shape themselves, the demands of the present are no longer satisfied with the requirements of the past.

It is no longer a question under discussion, that elementary science should have a place in the elementary schools. The teaching of science has worked its way from the high school to the primary grades, and has there found its proper beginning. That education is recognized as incomplete that does not introduce the child to the world of nature, as well as to the world of books, and it fails of its most practical results if the mind is not quickened to grasp knowledge through the senses and to investigate, to some degree, the great and silent forces that are working around him.

The child, when he enters school, is a little bundle of animated curiosity, bristling with interrogation points and putting out feelers in all directions. Yet how often this healthy activity, which should be the teacher's safest guide, is restrained and well-nigh paralyzed to his incalculable loss. In this nature study, no branch presents so wide a field as the study of plant life. But while admitting its unquestioned claims to a place in the school course, two questions naturally suggest themselves:

1. What are the results to be obtained in this as in other branches of science teaching?

2. What particular subjects may be touched upon and how?

Let us consider briefly these questions in their reverse order, finding in the answer to the second some light thrown upon the first. As just said no broader field presents itself in elementary science than the study of plant life. The material is every where accessible, and interest and enthusiasm cannot fail to be aroused under the skilful teacher. Two or three underlying principles should always be borne in mind in the teaching. Every lesson should have a definite purpose, otherwise the lessons soon become vague and disconnected. There should be real observation on the part of the pupil, not through the eye of the teacher, though directed and guided by her. And no other study gives wider scope for careful, skilful questioning.

The study of the plant may begin at any point, but the subject of germination naturally suggests itself among the first Pupils of all ages, but especially children, delight to learn by doing, and some simple experiments, such as are suggested in Prof. Goodall's little pamphlet, "Concerning a Few Common Plants," are easily performed and very helpful. Select a few seeds as the corn, bean and pea, and spend a little time in their examination. Let the pupil discover how a tiny plant with stem and leaves is folded away in the seed coats, and compare the three, noting differences and resemblances. In the meantime in a few deep plates or flower pots filled with clean sand, let him plant a few seeds of each kind half an inch deep, and others at intervals of two or three days so that when all have started three stages of growth will be represented. What changes have taken place in the transition from the hard, dry seed to the plant, now in possession of all the parts of the full grown tree? How has nourishment been supplied? Whence will it come henceforth? What conditions have been necessary to growth? How does the seedling of the corn differ from that of the pea and the bean from both? Some seedlings may also be raised in other ways. Lay upon a plate a moistened sheet of thick blotting paper, place some seeds of each kind upon it, and over these another sheet of paper, keeping the whole moist and warm. Place a layer of cotton batting upon a tumbler of water and lay a few seeds upon this. When a seedling has started suspend it by a thread over some water in a glass, so that the roots dip into the water while the seed-leaves remain above, and note in what part of the root growth takes place, but puncturing it at regular intervals with a needle dipped in India ink. By such means the growth of the root may be easily traced and compared with that of the stem. Such simple experiments all through the work add much to excite the interest and quicken the observation.

As we pass to the parts of the plants, their peculiar forms and their relations to each other, the facts are very numerous upon which the skilful teacher can draw. If the children have the great advantage of living in the country, encourage them to go for flowers to learn their haunts and habits. From what soil does the flower spring? What conditions does it require as regards sun and shade, dryness and moisture? What enables the delicate flowers of spring to follow so closely upon the frozen footsteps of winter? The peculiarities of different plants, their habits, as illustrated in the so-called sleep of flowers and their movements, visible and invisible, as shown in the coiling of tendrils, or the quick closing of the leaves of the sensitive plant, suggest subjects of which space permits mention only here.

As we come to the study of the flower, the variations of color, form and growth, in which may still be traced the simple, wonderful laws of development that are the same for the tiniest blossom as the most brilliant, we open to a chapter of which we may well despair of reaching the end. With certain principles the pupil should always, of course, become familiar. To one subject only I will call attention in this connection, the relation of insects to plants in the work of fertilization. This is strikingly illustrated in the little bluet or innocent that whitens the fields in early summer. In certain clumps of flowers the long stamens are found with the short pistils, in others, the long pistil but short stamens, so that the bee in his flight from flower to flower brushes the pollen from the long stamens of one flower to deposit it on the long pistil of another, and vice versa. Although as yet but imperfectly understood it is a subject too full of interest and importance to be left untouched.

It is a great pity that so little attention is given to the subject of fruits. The study of the plant often begun in the spring, frequently touches very briefly upon it, if at all, while without it no complete idea of plant development can be obtained. From the less prominent kinds, the winged fruit of the maple and elm, or the pod of the milkweed, to the apple, pear and grape the forms are varied and the study of them no less interesting than that of any other feature. The classification is simple and the child soon learns to distinguish between a dry fruit and a fleshy fruit, a stone fruit or a pome. It may be a discovery to learn that the strawberry is not a berry, but the orange is; that the raspberry and blackberry are clusters of stone fruits; and that the fig is a flower-stalk grown pulpy; and every such discovery is a healthy stimulant to further progress. The fruits of our own State should claim the first attention. What are they? What fruits are sent from the State? What are some of the means of obtaining new varieties? It is interesting to note in this connection how large a proportion of our fruits belong to the Rose family.

Two suggestions in regard to ways of working may not be out of place just here, the use of drawing and the value of school collections. Drawing should properly go hand in hand with the study of the plant from the first lessons. What the pupil has not seen he cannot represent, what he can express correctly by the simplest outline, he has made his own. No exercise serves like this to quicken observation, to fix impressions. The chief value of collections lies in the making. Collections of seeds, of different kinds of wood, of pressed flowers, of different forms of leaves, represent a large amount of knowledge that would be gained in no other way, and the encouragement of a most excellent habit.

To our first question then, for what results may we look in such a line of work as has been so hastily outlined, I answer:

1st. It affords the best training for the observation and the formation of careful habits of investigation and thoughtful judgment. That much is due to training is shown in the advantage that the child from the city school often has over the country boy or girl. Under the skilful teacher the pupil learns to observe, to compare, to verify, and to draw conclusions. He finds he must often go back to correct imperfect impressions and that his hasty conclusions must be exchanged for those resting upon a wider basis of fact.

2nd. It increases his capacity for enjoyment, Whether his after-work lies in this direction or leads him far from it, he can never forget the interest once fully awakened in the green and growing world around him. To know by name the flowers, shrubs and trees of his early home, is to feel an interest in every flower that grows by field or road side.

3d. It puts him into possession of facts of practical value. No true scientific knowledge ever comes amiss. He has laid a foundation that will be directly or indirectly useful to him, in proportion as he carries on his work in this direction.

No features in the educational progress of to-day compare in interest with the new departures in practical and scientific training. The cooking school has been tested and has not been found wanting. The manual training school has been found to fill a need long recognized, but which no line of work until this has supplied. But certain countries of Europe are in advance of us in this respect, and have put the practical study of plant life on a level with manual training. I think I am quoting correctly from a speech by Dr. Rounds, in saying that there are 20,000 school gardens in Austria, and that the experiment has been successfully tried in France.

From the study of the plant in the schoolroom to its actual care and cultivation in the garden is certainly a step at the thought of which we take breath. Such work requires specially trained teachers, appliances and funds. So have cooking schools and manual training schools required all these, and in other states, if not in our own, are permanent features of the school system. In the mean time a step has been taken in advance of merely schoolroom work, or more correctly speaking, the work has made some progress beyond the bounds of the schoolroom. I have been interested in reading the reports of the Massachusetts Horticultural Society and of some results secured in the direction of window gardening and the care of plants by children. But I have been more interested in the efforts of this society in our own State the past year in connection with the State Fair. Prizes were offered to the pupils of high schools for collections of pressed flowers and a window garden department was established for the purpose of interesting children in the care of flowers. Plants were furnished to the pupils in Auburn and Lewiston with directions for their care, which devolved wholly upon the children, and on Children's Day an exhibit was made with results that proved the plan practicable and satisfactory.

If we could realize at once the millennium in our schools we might possibly be the better for it. But such an experience is not in store for us, and in the meantime the day of small things is not that of unimportant ones. Are we who are teachers enthusiastic and wide awake to take advantage of every resource that may supplement our work? Are we interested in all lines of advance? Do we know what can be done and is done in other schools and other states? If we have under-estimated the importance of this work, surely it is worth our while to test its merits and it will be found the Book of Revelation indeed.

THE APPLE IN COOKERY.

By Miss ANNA BARROWS, Principal of the Cooking Department of the School of Domestic Science, Boston.

The cookery of the apple is interwoven with the principles of all cookery, therefore this subject might be expanded into a good-sized cook-book. As this is impossible we can take but a bird's eye view of the apple in its relation to human life. It has been truly said, "There is no fruit in temperate climates, so universally esteemed and so extensively cultivated, nor is there any which is so closely identified with the social habits of the human species as the apple."

We shall all agree, that even if the apple had no commercial value, it would have as good claim to existence as other ornamental trees. The masses of white petals, shading into pink, that deck the trees in May, make them worthy rivals of their cousins—the June roses.

"As the apple tree among the trees of the wood, so is my beloved among the sons," says the song of Solomon. Its fresh green foliage affords pleasant shade in midsummer, while the ripening fruit in autumn shows a greater variety and richness of color than that of the maple or any merely foliage tree. Even in the winter, when the foliage and fruit have departed, the knurled, crotched branches, with their snowy covering, make the apple tree a picturesque object in the landscape.

The apple probably boasts a more ancient lineage than any other fruit, though it is decidedly doubtful whether it was the

> "Primeval interdicted fruit that won
> Fond Eve, in hapless hour, to taste and die."

The word apple is often used to describe a round object, as the apple of the eye; Dickens mentions apple-faced children. The derivation of the word is uncertain, it may signify watery fruit, or a round body.

The apple tree, *Pyrus Malus*, flourishes in almost every country within the temperate zones, therefore it is conspicuous in the fables of every race and is the popular fruit in poems, proverbs, superstitions and pictures. There is much interesting literature connected with the apple, but this paper must be devoted to its practical aspect, its food value.

Wise was the Englishman who once said to some of his countrymen: "Had you but given to the improvement of your apples a tenth part of the pains it cost you to naturalize those four species of grapes, how much more substantial glory you would have won." So we might say, if American housekeepers had given half the attention to the apples that they have bestowed upon fancy dishes in which oranges, lemons and bananas figure, our country might have gained much in health. Is it not a reflection upon our New England orchards that oranges are often cheaper than apples even in winter? Because the apple is so abundant in our land it is within reach of the humblest family and it may appear in such varied forms that none need ever tire of it.

True there is a large percentage of water revealed in a chemical analysis of the apple, but it is also said to have a larger per cent of phosphorous than any other fruit; and there are other double distilled essences of the sunlight and glorious air in which the fruit has hung for months, combined with the forcegiving elements of mother earth drawn up by the roots of the sturdy tree.

And as for water—is it not by far the larger part of our bodies? we refuse to recognize this fact and persist in overloading them with too solid foods until we groan with rheumatism or some vital organ rebels.

May not the apple be as beneficial as the much lauded grape-cure? Some one has observed that apple lovers are usually people with healthy livers and therefore very amiable. An old proverb says: "It will beggar a doctor to live where orchards thrive." No other fruit is so deserving of the cook's good opinion, in that it is to be had at all seasons. From the early summer sweetings around to the hardy russet in the late spring and summer there is always some variety in prime condition. A fruit which has been in constant use for generations must have been quite thoroughly experimented upon and yet there is room for new combinations to be invented.

So many are the dishes in which the apple is a principal ingredient that they must here be described in groups rather than in detail. The cookery of the apple is dependent upon the fundamental laws of the art. Much depends upon our choice of apples, the so-called "cooking" apples cannot give the best results and are no more to be chosen than inferior, stale eggs or rancid butter. We have much to learn as to the varieties best suited to different culinary purposes; besides the flavor and degree of acidity of an apple its general texture is also to be considered. In general, for ordinary use it is best to select apples that are solid and heavy, not mealy but juicy and full of sparkle, neither very large nor the smallest in size. To attempt to use mean apples for cooking results in a loss of time and temper, sugar and spice.

The roasted or baked apple ranks highest in popular estimation.

"The apples sputtered in a row,
And close at hand the basket stood
With nuts from brown October's wood."

The modern fireplaces give an opportunity to revive the old fashion of hanging the apples by a string before the open fire, but this is oftener done for a luncheon than for table use.

A baked apple is delicious if properly prepared whether sweet or sour. It should be wiped, perhaps washed, the skin better not be cut. Earthen or granite ware baking dishes should be used as tin or iron injure the flavor of the fruit. The oven should be hot enough to change the apple juices into steam and puff out every cell till it forms a frothy, pulpy mass. If there is danger of the escaping juices burning on the baking dish, a little water should be added. The advantage of retaining the skin is that it holds the steam and thus really hastens the process. Sometimes, however, the skins are imperfect and we prefer to remove them and also the cores and to fill the centre with spiced sugar or baste them with butter and sugar which glazes the outside. Then very juicy, apples thus prepared may be placed on round pieces of bread which absorb the syrup and are to be served with the fruit.

Baked apples may be canned in a thin syrup and reheated when the jar is opened. The pulp of snowy baked apples beaten with whites of eggs may appear as apple snow or floating island combined with cream or soft custard. The 'lamb's wool' mentioned by old writers was a mixture of this frothy apple pulp with spiced ale.

Half way between the baked apple and apple sauce stands a simple, yet beautiful dish called by a French name, a compote. The apples are to be cored and pared without quartering, and cooked slowly in enough heavy sugar syrup until they are soft, but not broken; then drain and dry, slightly, in a moderate oven with the door open, occasionally basting with the syrup. The spaces where the cores were may then be filled with apple jelly and the whole sprinkled with granulated sugar. Thus prepared the apples may be served with any simple pudding or custard for dessert, or as preserves for tea, or with mushes for breakfast.

Quarters of large apples look well cooked in the same way. If well cleaned before paring, the best portions of skins and cores should be covered with cold water and cooked until the flavor and pink color may be strained off with the water. This is ready to use as the foundation for the syrup for preserving, or for a pink pudding sauce for the next apple pudding, or may be made into jelly. The skin in some form should be cooked with apples for canning, as it adds much to the flavor and nutritive value. The skin may be left on the fruit for mince or other pies where it is chopped or sliced, and it is not out of place in puddings.

There is no form of sauce much better than the baked apple sauce, where big quarters of fruit are packed in earthen jars with brown sugar or molasses, covered closely and baked slowly in a moderate heat like that of the old brick ovens or modern Aladdin, until the contents of the jar have shrunk to half their original bulk and are rich, red and luscious.

The white, pulpy apple sauce which is cooked quickly and made smooth by frequent stirring and beating is best suited for a meat sauce, if not too highly sweetened. An apple stuffing is excellent with any rich, fat meat like goose or pork; for this, the pulp of cooked apples is mixed with a few bread crumbs and seasoned with sage and onions. A leg of pork boned and filled with apple stuffing is suitably garnished with baked sour apples. Veal or beef stews are often improved by the acid flavor of the apple and it may be added to soups or sauces. Mrs. Mary H. Abel, author of the Lamb prize essay on "Sanitary and Economic Cooking," well says, "Fruits seasoned with meat juices and fat instead of with sugar are not enough known among us."

A dish of fried apples is an old-time dainty too good to be allowed to go out of fashion. The apples are cut in rings or thick slices and fried in the fat from sweet, fat salt pork, onions may be combined with them, a tough apple is best for this purpose. Or, the slices may be fried in butter, sprinkled with sugar and served on toast, or they may be broiled with beef steak or with bacon and thus seasoned with the fat of the meat. Apple fritters are but a variation of the fried apples; the apples should first be cored then pared and cut in four or five slices, then they are rolled in flour, dipped in batter and fried. They look very much like a doughnut with a hole in the centre.

W. M. Williams says in his chemistry of cookery, "When thin slices (of apple) are immersed in a bath of melted fat at a temperature of about 300° F. the water of their juice is suddenly boiled; and as this water is contained in a multitude of little bladder like cells, they burst and the whole structure is puffed out to a most delicate lightness, far more suitable for following solid meats than sodden fruit enveloped in heavy, indigestible pudding paste. Another advantage is that with proper apparatus the fritters can be prepared and cooked in about one-tenth of the time required for the preparation and cooking of an apple pudding or pie."

There are hundreds of recipes for apple puddings to be found in the cook-books, but we shall find that they may all be classified under a few general formulas.

1. Apples in combination with starchy foods as rice, tapioca, sago, macaroni, bread and cracker crumbs.
2. Apple doughs, such as dumplings, short cakes, pies, &c.
3. Apples combined with custards and creams.

These different types are also more or less united. There is a too common idea that there is no nourishment in puddings, on the contrary many of them are very substantial food. The pudding shall be chosen to supplement the rest of the meal, a light, delicate dessert with heavy meats and the richer puddings when the first course is less "filling."

For the apple sago or tapioca puddings the apples are cored and pared, placed in a buttered pudding dish and the centres filled with sugar in which has been mixed a little spice and salt. Then pour over the tapioca or sago which has already been cooked for a half hour, with five times its bulk of boiling water. Bake until the apples are perfectly soft, turning each one over in the tapioca when half done. Strained apple pulp or jelly may be put with tapioca cooked in less water and the whole moulded and served cold with cream. Cooked or chopped apples are also mixed with crumbs or slices of bread or cooked mushes.

There are many easy combinations possible between the ordinary quick biscuit dough and apples. The dough may be made light with cream of tartar and soda, or baking powder or with sour milk and soda. A pint of flour makes enough for a small family, one tablespoonful of shortening may be used with this quantity. The dough should be as soft as can be easily handled. Roll out till one-half inch thick. This is a suitable crust for apple dumplings, either steamed or baked, though the latter might be made richer. Or the dough may be spread with cooked or chopped apples sprinkled with spiced sugar and rolled like a jelly cake and steamed for an hour. When the time is limited, cut the roll in inch slices, stand on end and steam or bake for thirty minutes. The dough may be made softer, an egg added, the cut apples stirred in and the mixture steamed in cups or in one large pan.

Apples may be cooked in a pan with a layer of this crust over the top; when ready to serve, reverse on a plate so the crust will be at the bottom.

An apple shortcake is far better than strawberry shortcake out of season, and the same dough with a second tablespoonful of butter will serve for that.

A similar combination is the old-time pandowdy, where the apples, unsweetened, were baked in deep pans lined and covered with crust. When done, the top crust was removed, the apples spiced and sweetened and alternate layers of crust and apples piled high on a platter.

The shortcake and pandowdy are the connecting links between the apple puddings and apple pies, of which there are many varieties. There are pies with sliced apples, stewed apples, pies sweetened with molasses, mince pies, Marlboro pies, turnovers and fried pies. None of these puddings or pies can appear at their best unless wise heads and deft fingers have been used as well as good materials. Much depends on attention to apparently trifling details and too often these are ignored. A loyal American woman has said: "During years of foreign travel I have never met a dish so perfect as the American apple pie *can be*."

Some of the apple custards and creams have already been referred to. Apples preserved in syrup may be moulded with the help of gelatine and served with cream or custard. A custard may be poured over apples prepared as for the tapioca pudding and baked until the apples are soft and the custard firm. The apples may be partly steamed or baked before the custard is added.

Grated apples added to a thin frosting make an appetizing filling for a layer cake. Apple sherbet and apple ice cream are possible but the apples are not at their best when ices are most desirable.

While the best apples are self-flavored, if we must use crabbed or insipid fruit it is much improved by the addition of spices. Ginger root, whole cloves, allspice or cinnamon may be cooked with preserved apples; ground spice injures the appearance of the fruit. Clove was much used in the old recipes for apple cookery; salt is an important flavor for most fruits; butter is often used where a little salt would do as well; a hint of almond always harmonizes with apples since the same flavor is to be found in the seeds; lemon juice is especially useful in the spring when the apples have lost their life and sparkle.

A pleasant beverage for the invalid is made by pouring boiling water over raw apples cored but sliced without paring; when the water is cold strain, sweeten and flavor if desired. The pulp of a wasted apple can be used in the same way and the water in which dried apple is soaked is also agreeable. The expressed and fermented juice of the apple has doubtless been the means of ruining many orchards and their owners. Vinegar is a useful commodity but probably if we used more fruit we should want fewer pickles.

Hitherto cider has seemed to be the only use for the refuse or surplus of the apple crop. As the quality of the fruit is steadily improving, and our knowledge of cookery increasing, jellies and other delicacies will, ultimately, take the place of the fermented product of waste fruit.

Count Rumford, one of the pioneers in scientific cookery, said: "The number of inhabitants who may be supported in any country upon its internal produce depends about as much upon the state of the art of cookery as upon that of agriculture; but if cookery be of so much importance, it certainly should be studied with the greatest care; cookery and agriculture are arts of civilized nations, savages understand neither of them."

In these days of concentrated or condensed foods is it not advisable to put apples in a more convenient shape for transportation and immediate use than has yet been done? Dried apples have been prominent in the past but are now superseded by the evaporated fruit. In the Boston market the sales of sun-dried or string dried apples amount to practically nothing, while 15,000 to 20,000 cases of evaporated apples, or nearly one million pounds (1,000,000) are sold in a single year.

The canned apples are extensively used, from 15,000 to 20,000 cans with a dozen gallon cans in each case being sold in Boston yearly. There are but few quart cans in the market. Apples in this shape are used chiefly in restaurants and large establishments not yet having found their way into private houses to any extent. This is partially due to the careless fashion in which they are often put up and to the large size cans.

Is it not possible that a higher grade of canned apples would be more satisfactory to the general purchaser and more profitable to the packer? We have also much to learn as to the best method of developing the flavors of different varieties of apples. Some are better suited to canning, others would make a smooth, rich marmalade or apple butter, and yet others would be more satisfactory for jelly. Why should not apples be preserved or crystallized and made into dainty confections as well as plums or pineapples?

The apple is useful as a basis for more expensive and more highly flavored fruits. A single quince, for example, combined with half a dozen apples will give its distinctive flavor to the whole.

Is there not an opportunity here for women to earn more than a livelihood, provided they are equipped with suitable training and proper utensils? Would not such an occupation be more desirable than sale work? An increased manufacture of home made apple jelly, marmalade or apple butter might be a twofold benefit to this State, providing work for its people at home and putting the apple crop in convenient form for transportation. The State and county agricultural societies should encourage such industries by offering special premiums for exhibits in this work in the woman's department.

FLORICULTURE.

By Mrs. ALONZO TOWLE, Freedom, N. H.

I am very sorry that your wives are not represented here by large numbers, to-night. Am gratified that we have a goodly number of brothers. Almost the first query that will greet you at home will be: What have you to tell me? What of your meeting at Augusta? As I cannot speak to them face to face, from necessity I will talk with them by you and your yearly report. The first section will be a "special" to farmers' wives, or countrywomen. The second, to all whom it concerns. The most unsatisfactory part of flower gardening, as we have been accustomed to do it, has been the very short time we have had to enjoy the fruit of our labor, ere the frost has spoiled the beauty of our blossoms.

Only from about the middle of August until the last of September can we reckon on their brightness, as we may always be on the lookout for the frosts even at that early time. We have toiled and planned all the spring and early summer to have our pleasure snatched from us unceremoniously. To avoid this disappointment we should plan for flowers all the season around. We can begin in the autumn by preparing our beds. Fertilize them well with well pulverized domestic fertilizer, rake it well into the soil. Fix one bed exclusively for spring blooming bulbs, crocus, tulips, hyacinths, jonquils, snowdrops, etc. If we have not courage to start out with them all, we can begin with a dozen crocuses and the same number of tulips. If we are pleased with these we can enlarge our number and variety the following autumn. Crocuses will cost from ten to twenty cents per dozen. Tulips, by the dozen, from twenty-five cents upward as far as we care to go in fine varieties. Hyacinths range from five cents to thirty-five each. Freesias from thirty to seventy-five cents per dozen. Jonquils from twenty-five to fifty cents by the dozen. These would bloom in May in our climate, unless we should have a very early spring when they might come out in April. Thus we begin the season by having our bulb bed for May. In June we have roses, of which every farmer's wife should have a plenteous variety. The common, old fashioned sorts are pretty enough for any one,—the White, Blush, Damask, Cinnamon, Yellow and the climbers. If we have time and wish so to do, there is no reason why we should not deal with the hybrid perpetuals, as we may without fear of failure. To keep company with the roses and if you choose, to make a border for your rose bed, there is no herbaceous plant that will give so much lasting satisfaction as the Sweet William, in the variegated kinds. They grow with very little care and preserve their flowers for weeks in a state of perfection. The person who loves showy flowers would do well to have along with these, a bed of peonies. Their nodding brightness is very attractive to many.

These will hold their own very well until the pansies and petunias begin to blossom. Now we shall have to go back a little to consider our seedlings. The best way to get our plants is by sowing good seed, unless we wish particular varieties. If a plant has been crossed with some other, or hybridized as we may better say, the seed of that plant you cannot be sure of. It *may* produce what you want, so we are told by seedmen, but you can't get a Baldwin apple tree if you plant all the seeds you can find. The seed partakes of the vitalized and fertilizing qualities of the root and not of the branch. If a general variety of pansies, verbenas, petunias, etc., is wanted the better way is to sow good new seed each spring. Experience will teach us many things that we can not learn from any other source but perhaps one person's trials and attempts may help others over many little petty annoyances. The most of us like to have a part of our seedlings bloom early. If we do have them ready for blooming by the last of June or first of July we must either grow them in a hot bed or some other place where the temperature is kept high and they can be driven along the road to life and activity. I have what I call my forcing shelf. A shelf put up in a sunny window in the kitchen, up as high as it can be placed and catch the sun's warmth. The seeds germinate quickly as the elevated position and giving them a good draught of warm water every morning soon do the work. They must soon after coming up through the soil, be transferred to a place of lower temperature as they will grow so fast they will not be able to hold their own heads up in a short time if you do not. Pansies, petunias, zinnias, in fact anything that we wish early can be as nicely grown there as in a hot bed, the only precaution needful to mention is, don't try too many. Take just enough to give a collection for one flower bed for July. Sweet peas must be sown as soon as the snow is off. Dig a drill eight inches deep, fill in one inch or more of well rotted fertilizer, cover this with an inch of soil,sow a dozen and a half to a foot. If they all germinate they may be thinned out to a dozen. They need much moisture all the season through. Good, rich soil will root them well, as this is necessary if we have good plants. There is a class of plants which it will be of no avail to sow early, unless they can be kept at a high temperature. They are of tropical origin and need that the soil shall be thoroughly heated and kept so, for them to start at all. Last year I planted some seeds in May; concluded they were not good and gave up thinking about them. July's hot sun brought them all up, thriving and brilliant. In this class we find Portulacas, Balsams, Amaranths and Zinneas. The soil in which any and all seeds are sown should be light and well pulverized; cover thin to about their own depth. Boxes are better than pots for sowing seed. After they are sown and covered, press down lightly upon the soil in the same manner as you would if sowing vegetable seeds. This is to prevent the air from drying the seeds. If some particular variety of a class is desired, then we must take cuttings. For example: If we wish a Petunia of a certain kind and no other, we must take a slip. In taking a cutting, be sure that the plant is a healthy one. If the slip snaps off then it is all right to root readily, if it bends and does not break, it is too old, and although it may root it will not do as well as the younger growth. Among the Geraniums they recommend the Zonal as the easiest for us to manage in our climate as a summer bloomer. For winter, we should root new slips each spring and keep them pinched back until we wish them to bloom. There are some troubles coming to the flower grower in the sweet heaven sent odor of the country even. The rose slug is a great pest, they make an attack before we are aware of it and strip our bushes leaving them looking like so many brown sticks. The best of all insecticides, especially for these is powdered white hellebore, dust it over the leaves while wet. Mildew can be well treated with sulphur. In August we begin to pot bulbs for winter blooming. They are imported yearly. As soon as they can be gotten let us set one pot of Hyacinths and Chinese Lilies for Christmas. One, two, three or four bulbs can be potted together. Leave about one quarter of the bulb uncovered. Set them deep enough to keep them steady and firm as they root entirely from the bottom. Hyacinths potted in this way must be put in the cellar for three weeks to root and get started. Early

Narcissus put in pot the first of September will bloom in December, taking nearly five months for flowering. If we pot a few bulbs each month we shall have a succession of blooming plants the whole winter and spring. They are little or no trouble as they will stand more cold nights than any other we can deal with. The best and most beautiful among the Hyacinths are the early semi-double white and the rose, both of which I have at this time in January in full blossom, while the blues and yellows are full of buds. The last named are the Roman. I don't feel nearly as well pleased with them as the former. Tulips can be treated in the same manner and bloom for us all the long, dreary, dark winter.

If you choose you may add the Bermuda Easter lily. I have never had this kind of lily in blossom. In its place have had a Lillum Longiflorum forced, giving three beautiful flowers and one bud for Easter Sunday. This kind of lily is adapted to out door culture, yet it is forced nicely, is more hardy and we can depend upon it while we much doubt our ability always to manage our Bermuda lily. In all cases where the pot seems small for any plant and we do not wish to retard the growth by repotting, top dress heavily if the pot is decently large. By following this line of work we shall have flowers all the year through. It takes only a few minutes now and then, we scarcely miss the time, it gives us recreation diverts our thoughts bringing a pleasant change every day to break the monotony. They not only divert and please us but especially speaking are great and efficient helpers. For those of us who have searched diligently among nature's handiwork feel certain that we have found no thing so minute as to be without evidence of Divine thought, care and wisdom. So from these small teachers, the flowers, we may gain many valuable lessons. They are eloquent when interpreted aright. First, and superior to all other sentiments, is expressed the loving care and solicitude of the Good Father for His children's delight and comfort, for with lavish hand has he besprinkled the whole earth with their beauty and loveliness. No place is so poor and lowly, none too grand and lofty, for them to flourish; showing that He is not a partial Father, but one looking with as much delight upon the poor man's simple home, as the rich man's lordly palace. There are no conditions or circumstances where flowers seem to be out of place. They speak words of hope and of a happy future to the young bride at the altar, make bright halls of pleasure, are pleasant companions for the isolated, bring comfort and cheer to the suffering and give consolation to the mourner. But their best mission seems to be to the poor who do not have them. They are silent messages from truth's own hand, messages which cannot be evaded or contradicted, which lift, purify and strengthen for better thinking and living. They are gifts that do not cost a great deal. Nature furnishes sunshine, dewdrops, soil and rain, a little of our time and effort and it is done. Flowers have a mission as mementos. For when we place one of these "green things growing," bear it in mind that it may be for the years when we are not. Perhaps our children's children may point them out as grandpa's roses or grandma's lilies long after the hand that set them has crumbled to dust. They will therefore help to keep alive a memory of us in the minds of those who come after us. How many desolate, brown old farm houses have been made to look perfectly beautiful by the thoughtful, beauty-loving women of the household. How cool and delightful that south window with the grape vine running over it. How bright those hardy roses on either side the walk. Oh, flowers are so restful and helpful! On some warm afternoon, when our mothers begin our seams without a knot in the thread, it won't stay in the needle, the scissors hide and then the spool rolls off under the lounge, laying all aside let's go out for a visit in the garden, pull a few weeds here, break off a discolored leaf there, admire them, enjoy their fine coloring and tinting, then go back and we shall generally find all the other things in regulation order. They have a mission in helping to preserve to us great moral truths. It is said in legend, that underneath the cross at the crucifixion, all around were blooming pure white flowers. When He said "It is finished" one drop of blood fell upon one white flower. It instantly took on a purple hue and all the surrounding flowers as well. They called that one the Passion flower. Who can ever look again upon this flower without remembering the Passion of Christ and all it means to suffering humanity. Another beautiful legend says that one day the Heather was placed in the valley alone, and chancing to look upon the bleak and bare mountainside, was troubled, for in the valley there was so much brightness and none on the mountain. The Heather approached the Rose with words of persuasion, to the end that it go up there; but the Rose was too comfortable and would not; neither would the Lily, or any other flower. At last, in discouragement, the Heather exclaimed:

"I am only a pcor Heather; have no blossom or beauty, but will go and do what I can." With the expression of this resolution, from every leaf and branch sprang beautiful flowers, giving us our Scottish Heather Rose. This tells us that the buds of self-sacrifice always produce blossoms of sweet satisfaction. Flowers also are closely interwoven in the history of almost every country. The Rose of England represents many years of battle and bloodshed. The Shamrock of Ireland brings to our minds poverty, ignorance and superstition on the one hand, with zealous, patriotism and loyalty on the other. The Scottish thistle tells us of the self-reliant, hardy and staunch old Highlands with their Scotch plaids and bagpipes. The fair Lily of France is still the fair Lily, though reeking with blood and nourished by the güillotine. Why should we not have a National flower? Why not the Golden-rod, it's like many things in its surrounding. It is indigenous to our soil as are the everlasting hills; it looks so fragile with those large tufts of flowers on that slender stalk, but you try to break it off, you wish to know how much hidden strength and resistance there is stowed away in it. It's like the people who till the soil out of which it grows so carelessly. Of its past we know but little, may it represent to us, as a whole, and to all the generations following, peace, prosperity and happiness. Dear brothers, admonish the dear wives at home to remember,

> How akin flowers are to human things,—
> Emblems of our own great resurrection,
> Emblems of the bright and better land.

While they are emblematic of these future promises they are also emblems of sorrow and of woe. And although we cannot consider the yew and cypress without a dark and gloomy cloud for the instant passing before us, yet with the same glance we may behold the olive leaf of peace, the laurel wreath of victory. So it is all the way through, pleasure closely associated with pain. Is pain only exaggerated pleasure? Who knows? The juice of the Poppy in minimum doses alleviates, just beyond it means death. We weep for joy, we do the same in sorrow.

> And the poet, faithful and far-seeing
> Sees alike in stars and flowers, a part
> Of the self-same universal being,
> Which is throbbing in his brain and heart.

BULBS FOR THE WINDOW GARDEN.

By Mrs. B. T. Townsend, Freeport.

Change is delightful to a great many people. Though they are quick to recognize and appreciate all forms of beauty, they can never be satisfied to worship at one particular shrine. I am in sympathy with these changeful natures, for I can never content myself with the same flowers year after year, either in the window or the open ground. Bulbous plants are among the most showy and useful of our garden, greenhouse and window garden favorites, and with scarcely any exception, are easily managed, sure to bloom and require but little labor and care to enable them to produce their charming flowers.

Perhaps a few lines in the way of the early history and culture of the Hyacinth may be of interest. The Hyacinth was first introduced into England in 1596. At that time we find mention of only four varieties. In an old book on gardening published in 1629 we find there are mentioned and described eight different varieties of various colors, from pure white to deep purple. During the two hundred and sixty years that have passed since the above book was published there has been a steady improvement in the size form and color of the plant until the present time. More than four thousand varieties have been produced and catalogued but only about two hundred of the most desirable varieties are in general cultivation.

The Hyacinth is a universal favorite in the most extended application of the word. It is usually grown for forcing into flower during the dull, cheerless months of winter and early spring. The bulbs may be potted at any time during September, October or November in rich deep soil. Use pots from four to six inches in diameter, fill the pot rather loosely to the brim and press the bulb down into the soil so that only one-fourth of it appears above the soil. Then water sufficiently to settle the soil and place in a cool dark place where they may remain for several weeks to encourage a development of roots before the flower bud starts. They may be removed at any time after six weeks to a warm room in full light, when they will repay you for the little trouble with an abundance of bloom.

Daffodils. This charming class of bulbs is becoming quite popular, and why should it not? They are very desirable for winter blooming as they can easily be forced into bloom during winter months. The treatment of Hyacinths will apply to the Daffodils.

Lily of the Valley. This beautiful little plant is extensively grown for forcing in winter and early spring months. It is perfectly hardy, preferring a slightly shaded situation.

AMARYLLIS.

A formosissima, Jacobean Lily. This is a bulbous plant producing dark scarlet flowers, easily forced requiring the same treatment as hyacinths. They are natives of Guatemala and were introduced in 1658. It is called Jacobean on account of the brilliant scarlet of its flowers; which the Spaniards in Peru thought resembled the scarlet swords worn by the knights of the order of St. James, (Jacobeans) and is the only described species of this genus.

AGAPANTHUS.

From *agape*, love, and *anthos*, a flower. Linn. hexandria, tetragynia, natural order liliaceæ. Hexandria, having six stamens. Tetragynia, having four styles. Liliaceæ, a natural order of monocotyledonous plants belonging to the sub-class Petaloideæ and constituting the type of Lindley's lilial alliance of endogens.

The Blue African Lily, *A. umbellatus*, a noble plant with thick, fleshy roots and retains its leaves all the winter. There is a variety with striped leaves, *A. albidus*, has white flowers, but it does not differ from the common kind in any other respect. The African lilies all require a loamy soil, enriched. They should be fully exposed to the light; also plenty of water when they are in a growing state. The plants are always large before they flower, and when the flower stalks appear the plants should be in a large pot, so that the roots may have plenty of room. They should be abundantly supplied with water, taking care, however, not to let any remain in a stagnant state about the roots. Thus treated, this plant will frequently send up a flower-stock about three feet high crowned with twenty or thirty flowers, which will open in succession. It flowers in summer and forms a noble ornament to an architectural terrace, or a fine object on a lawn.

What a desolate place would be a world without a flower! It would be a face without a smile; a feast without a welcome. Flowers contain the language and sentiment of the heart, thus: Faith is represented to us in the blue Passion Flower; hope beams forth from the evergreen; peace from the olive branch; the cares of life are represented by the rosemary; the fair lily is an image of holy innocence; the victory of the spirit, by the palm.

MORE EDUCATION IN FLORICULTURE NECESSARY TO PROFITABLE ENJOYMENT THEREIN.

By Edward H. Goddard, Woodfords.

The citizens of this State are slow about embracing new ideas and novel fashions. We need something to quicken our pulses and enable our eyes to see further; and that something is a greater desire to keep abreast of the times, and in just that degree, that we acquire this desire in our different departments of business or social life, shall we see that people in other states and cities than our own are moving in advance of us. "We in this age, must live intensely to keep up with the moving throng."

The people of other places are ahead of us and in no way more so perhaps than in respect to plants and flowers.

Styles in these are all second-hand with us; Chicago, New York and Boston, each must have a hand before we are awake to the fact that we must have what they have enjoyed for a long time. American Beauty roses are grown extensively in other states but Maine gets along with very few, except for those people who visit our summer resorts.

It has been but a year or two that any interest could be drawn to Chrysanthemums, but we are beginning to realize their worth, and a Maine Chrysanthemum show is not far off. Orchids are grown in many places and meet ready sales, but a dozen flowers is a large stock for a Portland florist, and often one-half that quantity would glut the market. But after all our dullness we are quite alive to the fact that we *must have* plants and flowers.

It is now the proper thing for everybody to wear at least a solitary flower if any social is to be participated in. We work longest, without fatigue and execute better work, when in our happiest moods, and what, may I ask, lifts us out of our sordid, rutted ways of living and infuses inspiration, like gleams of something beautiful? Beauty is always restful and pleasing, wherever found, and in whatever form it may be found.

Almost every woman in our land will have plants indoors during the long winter months; she pets and cares for them to the best of her ability, while she watches anxiously for a flower, and it is often the case that a large amount of labor and love is required to pay for a few flowers. She does enjoy their company but needs to know more about plant culture to rightly enjoy them.

Children too, love to care for some plant, often displaying more real affection in doing it, than would be thought possible. Care for flowers brings out the finer senses, makes loving hearts more loving and many a lonely moment of later years is made tolerable by tender associations brought to mind by some flower cherished in childhood. Ladies and children are not alone in the cultivation of plants; the men are often admirers as well, but far too seldom. The subject doesn't seem grand enough for many of them. But a nickel or dime is spent for a chew or smoke and it's all right. In many cases if the wife or child had the pennies to buy seeds, plants or flowers, where the lord of the house spends dollars for what dulls his senses, the home would be far happier and more attractive.

Now, in order to enjoy the floral world *more* we must know *more* about it, and we are supplied with much good material for this needed knowledge, if we would grasp it. The plant, seed and implement catalogues that flood the country are a direct means of very reliable information and are good reading, containing as they do, cultural directions for nearly every variety offered for sale. The vast amount of information given the public in this way can never be estimated. Strictly first-class horticultural journals are a great help and some that may be gleaned from on the subject, in newspapers and magazines, but in many cases with the latter, it can be seen the writer knew very little about the subject under consideration, but for pay or glory has tried to say something and has only effected misleading statements.

Then nearly all can procure Gray's small botany "How Plants Grow," from this can be learned the general laws that govern plant growth and cannot help being beneficial. "Gardening for Pleasure," "Gardening for Profit," "Practical Floriculture," and "Hand book of Plants," by the late Peter Henderson, are invaluable aids.

Fairs and exhibitions, where greenhouse products form a part, are all aids in this line. Frequent visits to well ordered greenhouse establishments are educational. Florists are benefited this way as well as others. Then much more can be learned by putting in practice the ideas gained by reading. Our Agricultural Colleges, State Agricultural societies and Experiment Stations are all aiding to diffuse this knowledge, and right here our Pomological Society is the potent factor. And let me suggest that each one here expend one dollar this year to help the society (one dollar is the annual membership fee). It can then do better work and more of it, and *you* will receive the benefit.

Florists are professional men, or should be, just as much as physicians or surgeons, some of them being specialists in growing some particular varieties, just the same as aurists and occulists are specialists in their line, and some institution should furnish diplomas for the successful completion of a prescribed course in floriculture. As I have said before, florists ought to be teachers; but to become successful as such, they must get entirely rid of that old idea that gardeners have handed down to each other as a legacy, that theirs is a knowledge of mystery and to tell one solitary thing they knew, would simply be giving the thing away and this would soon make an empty pocket-book and they would lose their importance as well.

The late Peter Henderson realized the folly of this idea and taught the people how to cultivate plants and instead of becoming a pauper or losing position, see the immense business and wealth he accumulated and those who mourned his death reached from the Atlantic to the Pacific.

While our florists may realize the fallacy of this disposition they are at a disadvantage about overcoming it for in this State there are no florists' organizations; while in other states the florists' clubs are an invaluable aid for exchange of experience, ideas and socialities, furnishing as they do, seasons for debate, essays, lectures and exhibitions. In this State all the aid we get is from the management of State, county and town fairs. The benefit we derive is rather indirect and comes with long intervals and we are of little benefit to them, or at least, less by far than we would be, did we have an organization of our own to keep our enthusiasm up the year round.

Then, too, many of us disregard botanical names, this is wrong; but the mother of a dozen children would be just as sensible to say she'll raise them without names, because she can't remember what the minister christened them, as the florist to grow his plants without names.

It does very well for a pelargonium to be called Lady Mary, Martha Washington, Lady Washington, Pansy Geranium and more of a similar character in any certain locality, but, perhaps, outside that particular neighborhood people would be puzzled to know what was meant by them. Many people don't know that what we call a geranium is a pelargonium and not a geranium at all; geraniums being mere weeds. One, so called, geranium, is Pelargonium Zonale and the Martha Washingtons are *Pelargonium Grandiflora*. The English, or French names of these are simply the different varieties produced at different times. I have been asked the good of learning and trying to retain these Latin names, they are all in Latin, and Latin is yet the universal language, so that if in Germany, Italy, France, Austria or England you call for *Viola tricolor* you would invariably get the pansy, while, perhaps, you could neither speak the country's language or the gardener a word of yours.

Even in our own country it facilitates matters when sending away for plants. If you want a palm, there is no need of going into explicit descriptions, but ask for *Areca lutesceus*, if that is the variety, and you won't get *Latania boibonica* or *Cocos Weddeliaus*. Consequently it is well to know a little Latin, so that the learning of these names will be easier. Then again, usually the name is descriptive of some part, so some idea of the plant can be gotten from the Latin name. For instance, if *odorata* is connected with the name, we know it is fragrant; *crassilfolia* means thick-leaved, and so on.

If there is one place where florists need better education, it is in floral arrangements. There is much ignorance displayed here by people supposed to know something about it, and it is wonderful that the public tolerate such work as is in many cases put out. We are all at fault here, and because the general public, who see comparatively little of greenhouse flowers, pronounce anything beautiful that contains them, seems to be license enough to very often mangle the whole arrangement. There are scores of emblems that would never be recognized but for the frame on which they are made. The wire workers are sometimes at fault, but uniformity of surface without crowding, or bunching, with due regard to outline, are attainments all of us may acquire. The artist should be particular to follow all outlines and if the wire worker has failed to do his part, he should be familiar enough with the form he is filling, to make up the deficiencies of the mechanic.

The growth of floriculture in this country during the past few years has been perfectly marvelous. About fifteen years ago, I stood face to face with a structure that was to serve as my school-house where I should learn about plant culture. That building was 16x24 feet on the ground, two-thirds span roof, covered in by 450 feet glass and we were unable to dispose of the plants in that green house the first two years. To day 17,000 feet of glass worked to the best of our knowledge, isn't suffcient to supply the demand for this class of goods, on the very site of the first building. The business in the city of Portland was then a 16 x 24 affair as compared with the present. Now increase the knowledge of these things and more plants will still be used and more flowers called for. I would suggest that we interest the children in plant growth. Once impress a child's mind with a truth and it is fast, never to be shaken off. So I repeat, interest the children, teach them the principles of plant life and growth and the similarity of plants to the human family. They are very striking and one hour might be pleasantly spent discussing them. Let the little ones grow up with plants all around them, strew their paths with roses, for they will find the thorny bush far too soon. Let botany be taught in all the school grades, not simply a few weeks in the whole course. Let societies give children plants to grow, offering premiums for best grown specimens.

Our own society took a good step last season in this way, and although many plants returned were imperfect, still, good was done. An interest was aroused in some of the children, that will continue until they are men and women grown.

Much can be learned, too, by experimenting, trying to produce new varieties. We breed horses and stock, for points and records thus gained, make prodigies of new, their brains seeming active in no other place than where the deep furrows have been made by pedigrees. Just so can we breed plants for points with just as positive results. The pedigree of a variety produced by artificial fertilization may be just as correctly written as one for a trotter. The field is large, the work interesting, expense trifling, and the process can be accomplished by any careful person.

Hybridization of plants is an interesting study and much valuable information and pleasure as well may be gained by practicing the art. Expensive tools are not necessary, nor is fancy stock necessary. A pair of tweezers, a fine camel's hair brush, a tooth pick and a clean piece of well sized white paper being all the tools there is any need of possessing for ordinary work and all of these are not positively demanded. While best results crown the efforts of the most careful watcher, every one can derive pleasure and profit from it. We take Geraniums that differ widely in respect to color, growth or habit of bloom ; select one of them, usually the one of best style of growth, as the parent or seed plant. This one we are very particular to watch and almost before the flower bud opens we take the tweezers and pull off the anthers; we want these before the pollen is ripe so as to prevent the plant pollenating itself; then just as soon as the pistil shows itself to be at all gummy we are ready with the brush, pick up the pollen from the anthers of the other plant and place it on the pistil of the seed plant. We usually keep this up at intervals for several days; then the plant is set by itself and we wait. As soon as the seed ripens we plant it. Plants from this seed will be vigorous and under favorable conditions will bloom in from four to six months. The new plants will give many variations in color, perhaps none so good as either of the plants selected, perhaps nearly all will be good ones. If none are distinct enough to name, many will be good enough to place with the general collection and even here we have gained fresh stock. The process with the chrysanthemum is very much the same, only we never attempt to remove pollen parts from the seed flower, and do make use of the paper sheet, more, because it is easier to collect the pollen on this, and shake it into the flower, than to use the brush, on account of the large amount of petals in the way.

The seedlings are watched, yes, even coddled, to keep them growing finely and everyone is qui vive on the appearance of a bud, hardly waiting for nature to develop the flower in the anxiety and curiosity to know the color and form.

People would be more rational in their operations with plants if they knew only a little more about them. I have been disgusted during the plant season having so many ask questions similar to these. Shall I water this every day? How often ought I to water this? A good answer I think is, supply water to the plant as you take it yourself. We drink when we are dry only (i. e. if we are temperate) and do not wait until we are nearly famished before we slake our thirst. So generally water a plant when it is dry not waiting until there is a drought like Satara and then imposing a flood.

Many plants are killed by intended kindness in this way. Then, day after day rooms are heated hot and no air admitted to freshen it. Plants, of course, are placed in a sunny window; so on the sun's return in the spring, many times we can almost hear the poor things panting for breath and see their very tongues cling to their mouths, they are so dry. Again the receptacles used for pots are often simply ridiculous. Sizes all out of proportion to plants, vessels glazed inside and out with no vent to let surplus water escape. The perfect pot is a very porous cup with a large hole in the bottom. A large plant with lots of leaves may live and thrive in a tin can, because it takes up all the water supplied, but in the tub the small plant dies because the soil becomes sodden and sour, not being able to make use of so much fluid.

In the open, nature supplies trees and plants with a porous soil. The surplus water soaks away and the plant grows. To be the best cultivators we must closely imitate nature, and the more nearly we do so, the better success will crown our efforts.

Is there room for more florists and is there money to be made in the business? There is plenty of room and plenty of money, but the room and money are both at the top. Superior men are called for. Men of excellent, general education, willing to work with hand and brain, applying themselves 365 days every year are the sort we want and the kind to benefit the country. The time is not coming but is here, when there are enough men to do the menial work; the need is for leaders to set them to work and well trained men in any business can do that, and ours is no exception. We want men who not only know in theory but by actual practice, how to build homes, heat them, and grow the plants to fill them. Such men will be sought after in trade and in society and there will be the closest companionship between them and their patrons. Plant culture will be a pleasure and all because more is known about it. More education in floriculture is what we need to enjoy it more.

THE GROWING OF PLANTS.

By CHARLES. S. WALKER, Peru.

In discussing this subject I shall aim to offer suggestions for the benefit of, and cautions to guard the success of, the modest flower and vegetable gardens of the busy mechanic or tradesman who has but an hour or two a day to devote to their care, and also the garden of the farmer whose labor is so exhausting and whose leisure hours are so few. Again I think of the little flower garden or the few scattered flower beds of the farmer's wife or daughters which are too often so grudgingly "set off" for their benefit by the head of the family who sees beauty in nothing except in the greasy sides of his pigs and pocketbook.

Having a desire to economize your time which is so valuable at such a gathering as this where so many special interests in the wide field of horticulture are to be served, I shall speak of vegetable and flowering plants collectively whenever their treatment is so similar as to admit of so doing. Hence the arrangement of matter presented must be in a measure sacrificed to time and space. Again, as experience teaches that a few simple suggestions in connection with many cautions tend more certainly toward success than minute and exhaustive directions. I shall hope to make this paper more valuable for its "don'ts" than otherwise.

SEEDS.

A glance at a few of the many seed and plant catalogues that find their way to our homes each spring and fall, reveals the fact that there is a wide range of prices in the different lists for the same varieties of seeds and further inspection shows that a low figure is the chief inducement held out by many dealers to gain sale for their wares. Many undesirable species and many worthless varieties are advertised and sold because they can be furnished at a large profit at five cents per packet. It is safe to say that the paper packet containing most five cent, and a good many ten cent seeds, costs the seedsman more than the seeds found therein and it is equally safe to advise that in general cheap seeds are to be treated as you would treat an offer of an all wool suit of clothes for six dollars or of a barrel of flour for three dollars and a half.

As an illustration of what good seeds do and ought to cost, it may be stated that it required $3 worth of pansy seed at wholesale prices, to produce blooms sufficient to make a creditable exhibition and take the $1 premium at the last fair held by this society.

As a rule "store seeds" are unsafe to use, the temptation being too great to "re-issue" old shopworn seeds that ought to be "canceled" and burned.

Again, handle with care the goods offered by those Barnums among seedsmen, who advertise novelties for prices great or small, which, judging from their descriptions, seem so perfectly suited to act as advance agents of the millennium.

While it may be desirable to have seeds of some species grown as far north as practicable, as for instance peas and perhaps some others which require only a short season for maturity, it is a positive injury to the value of most seeds to have them grown in high latitude, even more than to have them grown very far south. The reasons for this are that very many species, the plants and fruit of which we can grow with perfect success, require a much longer season than ours for the full maturity of their seeds. Please note that I am talking for the State of Maine garden now. Most reliable seedsmen grow a comparatively few specialties in seeds suitable to their locality which they are careful to have of high grade and this class of seeds should be sought after for they are never too dear at any price. Buyers should try to fathom the dark mysteries of the catalogue if possible to decide what are the really valuable and trustworthy stock of that particular seedsman. A necessary conclusion to be reached is that if many species or varieties of seeds are to be used, more than one grower should be patronized.

PLANTING.

We next consider the subject of planting and in this operation the first thing to be called for is the seed box, and for this purpose we have no use for birch barks, tin cans, or salt boxes. We prefer seed boxes of half and quarter inch stuff, not less than 8x10 inches and from that size up to 12x16 inches, and for most flower seeds they should not be over two inches deep. For tomatoes and cabbages, a depth of three inches is desirable. Too much earth room about seeds planted indoors is a fruitful source of trouble. Caution against deep planting of small seeds has been too frequently repeated to require more than an allusion here. The earth of the seed-bed should be made very fine and well, but not very highly enriched with thoroughly decayed fertilizers.

TEMPERATURE.

The temperature which the seed box is to be given is an important matter and a mistake at this point may easily ruin the whole enterprise. As almost all seed packets have printed directions for treatment including temperature, etc., a little attention to those cannot fail to put one upon the right track in this matter. Of course we cannot expect to be very minute in our management in regard to temperature, but it will be sufficient to divide our seeds into two or three classes according to the degree of warmth required for healthy germination and then give them conditions accordingly.

Pansies germinate freely and vigorously only at a very moderate temperature. The aster and pink do well at medium degrees while the portulaca requires a very warm situation for germination. Situations favorable to each of these classes may be found in almost every kitchen or sitting room.

Seeds demanding little warmth may be placed remote from the fire and on or near the floor, while the highest available amount of heat may be found near the stove or register and near the ceiling. These positions are suggested only to secure proper germination and natural and quick germination insures vigorous and healthy plants from the start.

WATERING.

Many have experienced difficulty in properly watering their seed beds previous to germination when the seeds contained therein were so delicate and therefore so lightly covered that they were liable to be washed out by the most careful watering. To guard against this danger and also to save unnecessary watering it is suggested that pieces of cloth be cut exactly the size of the seed box inside and carefully laid over the earth after planting, and over this protection water may be quite carelessly turned and allowed to soak as it may. This serves to protect the seeds and also to check evaporation. We find for this purpose pieces of burlap such as may be obtained by cutting up bran sacks, just the thing for covering the boxes.

EXPOSURE.

As soon as the plants are up the question of exposure to the sun arises, and most likely the boxes will require a change of location, for of all things, the sun is a party to the transaction that cannot be ignored with very good success and the same may be said of a supply of fresh air for the seedlings. Pale, spindling or "drawn" plants are caused by a lack of sunlight or of air, or of both, and strict regard to these two elements must be paid, if any success is to be realized in growing either flower or vegetable plants indoors, for transplanting to the open ground at the proper season. Any properly ventilated living room is all right for plants, as far as air is concerned, provided the seedlings are not stiffled by being covered closely by glass as we sometimes see them. But as regards sunlight it cannot be said that every sitting room or kitchen is all that can be desired for the growing of plants, or that even moderate success is to be expected from the attempt to grow them under conditions found in many such rooms.

An unlimited amount of sunlight and a high temperature are indispensable for the production of good and early tomato plants, and the rooms that furnish these to a sufficient degree are extremely few, if indeed any are to be found. But if one is out of reach of a greenhouse where such plants can be purchased, the next best thing must be done.

TRANSPLANTING.

As soon as plants are large enough to stand being disturbed, transplanting must be at once attended to, for plants suffer much more by a delay of transplanting than by being handled when too tender. In general, all plants are ready for handling as soon as they have made from two to four leaves, beside the seed leaves.

Plants intended for pot growing should be removed from the seed bed to small pots and here it is necessary to caution against the use of other than small ones, i. e., from two to three inches in diameter, and never use the latter size when the smaller will answer. Too much pot room is capable of as much mischief as too little of the same, and is much more liable to occur. Potting earth and the bed for transplants should be richer than the seed bed.

Plants designed for the gardens should be transplanted to other and generally deeper boxes, or to the hot bed or cold frame. For the first transplanting I have in mind no kind of plant that requires a box more than three inches deep, except the cabbage, which demands four or four and a half inches. For transplanting either to boxes or to the open ground, a common steel table fork is a very good tool for making holes and packing earth firmly about the roots of the seedling. We, however, prefer a wooden dibble, which can be easily whittled from any hard or soft wood. Take a piece of wood six inches long and three-fourths inches square and from the middle taper it to a point at one end, smoothing off the other half for a handle.

HARDENING.

As the time draws near when the seedlings must be removed to the open ground the hardening off process must be employed which renders them capable of withstanding the vicissitudes and severities of open air growth,—the chill of night and the burning sun and drying winds of day—and all those variations incident to our New England climate, so well described by Mark Twain and which the State of Maine realizes to a superlative degree.

This operation consists of exposing the plants to sun, wind and cold air to as great an extent as safety to the plants will allow. A veranda is a good place for this work as is the lee of a fence or building. The cold frame is also a perfect place for the process.

From the first I have not expected to dwell at length on the special culture of different varieties, but it may be deemed proper to make an exception of celery, a luxury which is so fast finding its way into the home gardens, and the market demand for which is so rapidly increasing. In the first place the common error of exposing the seed box to the direct rays of the sun for any considerable portion of the day should be studiously avoided. The box may be placed in good light but much sun is quite sure to make mischief as the seeds must be covered with little earth and may very easily become what Peter Henderson has designated as "killing dry." After sowing the seed broadcast and covering lightly, a little water and a good deal of patience will be required of the planter, but if good seed has been used he may expect to see at the end of three or four weeks a good stand of half inch high celery.

As soon as these tiny plants have made three or four leaves the first transplanting must be done and this operation will present itself in a very unfavorable light to the bungling fingers of most men and the probabilities are that after a few dozen plants are pricked out the good lady of the house will have a cordial invitation to prove her superiority in that line of work which she can readily do. A forty penny wire spike slightly flattened at the point is the best tool to use in handling celery at this stage. After growing these transplants in boxes a month it would be well to transplant again to a cold frame or, if the weather will permit, to a bed out of doors, where they may be grown to stocky and well hardened plants for their final removal to rows in the garden.

HOT BEDS AND COLD FRAMES.

The hot-bed as an accessory to the household garden is becoming each year more common and as it is within the reach of most people and is perfectly available for all, it may not be amiss to give very brief directions for its construction and management.

First, choose a location if possible on the lee side of a building or board fence. If this cannot be done, make a wind-break on the side of the bed toward the prevailing winds. The ground chosen should be free from all danger of flooding by surface water in the spring. For the bed an excavation should be made eighteen inches deep, six feet wide and as long as the bed is desired. For ordinary gardens a two or three sash bed would be sufficient. Sashes are generally three feet wide. The excavation should be lined up with plank which should rise above the common level of the ground from two to four inches, and on the edges of these planks the plank frame of the hot-bed should rest. The frame should be made of inch and a half pine and be well painted. The end pieces I would cut six feet long and taper them from sixteen inches wide at one extremity to four or six inches at the other. This would give a pitch to the sash of ten or twelve inches. The high and low walls of course must correspond with the wide and narrow ends of the end pieces. The sash can probably be bought all glazed cheaper than they could be made by any one besides a carpenter. The heating material to be used will generally be strawy stable manure and it should be placed in a pile and allowed to warm up thoroughly and be forked over two or three times to secure an even heat before it is put in the bed. Enough of this should be used so that when it is well trodden down it will be at least twelve inches deep. On this should be spread nicely enriched garden soil to the depth of six or eight inches.

After the bed is set up it should not be planted until the fierce heat is out which will be in about five or six days. As to watering, the bed will speak for itself, but if the "fresh air fund" is not well sustained a lot of sappy, sickly plants will be the only reward the owner will receive for his labor and expense.

The hot-bed, though useful in growing some flower seedlings, and particularly in starting dahlias, is more especially profitable in forwarding the interests of lettuce, cabbage and tomato plants, and here allow me to remark that, aside from the greenhouse, the hot-bed I think is the only place where really early and good tomato plants can be grown.

The cold frame is simply the frame and sash of the hot-bed placed over a bed prepared in the open ground and therefore has no bottom heat. Its uses have already been indicated.

PROPAGATION BY CUTTINGS.

The ground included within the limits of my subject would not be covered were I to omit speaking of propagation by cuttings. Special processes of propagation requsite for special varieties of plants can not be given at this time, for I only have time to briefly refer to the treatment which is applicable to a number of the more common kinds in general cultivation as pot or bedding plants.

The propagating process that I would recommend as most practicable for home use is similar to what is called the "saucer system." To prepare for it I would obtain from the hardware dealer a sheet iron pan made about like an ordinary baking pan, only have it made water tight of galvanized iron if possible and about two and a half inches deep. To facilitate handling this pan which will be quite heavy when filled, it would be well to place it in a shallow box just large enough to hold it. The pan may then be filled nearly full of clear sand, fine, medium or coarse it does not matter which, and then thoroughly wet. In this sand you will stand your cuttings or "slips" always keeping the propagating pan as much in the the sun as possible and in a warm situation. Never let the sand be otherwise than filled with water, no matter if water stands on it some of the time. Perfect success in root cuttings demands that the cutting should be in the proper stage of growth when taken off and this must be learned by experience with different species: The only direction of much value that I have ever noted was, that the cutting should be taken when it will snap off readily and not bend or split. The time required for rooting varies greatly with different kinds of plants, but as soon as they have fairly struck root they should be potted or planted out in boxes. It is a mistake to let the roots get two or three inches long before planting; a half inch or less is better. This method may be successfully employed with Abutilons, Coleus, Geraniums, Carnations, Begonias, Petunias and Verbenas, and probably, to a greater or less degree, with some others.

GARDEN LITERATURE

I will close by referring to the fact that every branch of business or art has its literature which is almost indispensable to its success or proper and highest enjoyment, and floriculture and gardening are not exceptions. I am sorry to say that floral literature like some other is of two classes—good and bad. In general I would characterize as worthless those magazines and papers, so called, published by seedsmen, for they, as a rule, are only catalogues or advertising sheets with just enough reading matter of a cheap grade in them to enable the publisher to evade the postal laws and get them carried over the country for two cents per pound instead of sixteen cents. They contain too much of what it would be better to remain ignorant. In regard to them Josh Billings' remark is quite applicable, "that it is better not to know quite so much than to know so many things that hain't so." But aside from this class there are enough good floral and garden publications, and I will mention that the best coming to my notice is the American Gardening, published by the Rural Publishing Company, New York.

And now having occupied much more of your time than I intended when I commenced this paper, I will close with the earnest hope that among the many simple and common-place suggestions made here, some may serve to contribute to the success of those who realize and try to obtain the benefits and pleasures to be derived from horticultural pursuits.

ORCHARDS AND ORCHARDISTS IN MAINE.

COMPILED FROM THE SECRETARY'S CORRESPONDENCE.

Mr. Geo. A. Longfellow of Winthrop now has about 1200 trees, mostly Roxbury Russets. About two-thirds of the trees are in bearing. In 1891 he sold 318 barrels of apples for $600. In 1892 he raised about 600 barrels of apples. Mr. Longfellow reports that good orchard land in his town can be bought for $10 to $15 per acre.

There are several large orchards in Turner, the Rickers of that town having one of the largest in the State. The past year (1892) they had a large crop, and it was reported that the fruit was sold in the fall for $3,000. There are several other orchards of large extent in Turner—one of these being that owned by the late Hon. Rufus Prince. Mr. D. J. Briggs has an orchard containing 800 trees, of which some 300 are in bearing. In 1891 he reports that he marketed fruit to the value of $475 and the following year $375. Mr. Briggs writes that it would be a positive gain to fruit growers in Maine "not to sell any but No. 1 apples."

Mr. S. R. Sweetser of Cumberland Centre has 300 trees on his farm and about one-half of them are in bearing condition. He writes that his orchard is worth double the price per acre of his farm. He also states that his orchard pays him forty per cent on the investment above actual cost of cultivation, etc.

A short distance from the Kennebec and near the Bodwell granite quarries in Hallowell is one of the best orchards in the State. It is owned by W. P. Atherton and contains 1200 trees with about 800 in bearing. The orchard is very largely Baldwins. The 1891 crop was 600 barrels and sold for nearly $850. The last crop was 525 barrels. Mr. Atherton in the winter of 1892 sent some of his apples direct to Liverpool. He has generally sold in Boston, but does not feel fully satisfied with the manner in which our Maine fruit is generally sold. He believes that the publication and distribution of practical experience in orcharding would be of great value to fruit growers.

In recent years T. M. Merrill of New Gloucester has handled large quantities of Maine fruit. He also is an extensive orchardist, having nearly a thousand apple trees on his own farm. About one-half of these are in bearing condition and in 1892 bore 300 barrels of fruit. He writes:

"If the value of the land is fifty dollars before set to trees, the first year after being planted, the value is increased the cost of the trees and setting, from a business stand point. We will now estimate the value of that land five years hence. If it has been properly cared for, it is worth $300; but if it has had no care for the five years (quite a per cent of our Maine orchards do suffer from neglect) the land will decrease from its cost before planting, from the fact that it costs something to pull the shrubs up, so that the next practical orchard man can have a good start. I have some acres that I value at $1,000,—trees set out fifteen years ago.

"We should advise from our own experience. I think for the past fifteen years there have been more of my trees neglected than taken care of properly. We must first impress upon the minds of the amateur pomologist that to grow up a good orchard, so as to make it a profitable investment, it means a great deal of work and considerable money. We know that men who are now realizing good profits from their orchards have had the above experience.

"We must exercise good judgment where to hold our winter meetings. Maine is becoming a great fruit growing State, principally apples. The receipts are into the hundreds of thousands of dollars, and the magnitude of the orchards, with proper care, is sufficient to reach into the millions. The unoccupied land, well adapted to apple trees, is almost unlimited.

"It is important, I think, to hold our meetings in apple-growing sections, not in cities, and hold them for the special interest of fruit growing, not to accommodate some board of agriculture, and have the most of the time devoted to some impracticable papers, entirely foreign from our work. There was a time we were able to go alone, and now we think we must be lead by some other society.

"I well know that we have had help from the Board of Agriculture financially in holding our conventions, however, I think we had better come down to hard pan and hold our meetings in rural districts, and depend more upon home experience and talent, (although I regret very much that I have not the ability to aid the society as I recommend). The two or three days that are assigned to the feeble apple grower of Maine should be carefully considered and planned by the executive board, and plenty of time given for discussion after each paper.

"Many an orchard man in this country who is possessor of thousands of fruit trees, has received valuable information from others who have only one tree, therefore it is important to have time for discussion so as to swap experience."

David C. Averill in the town of Wilton, on the high land overlooking a beautiful valley, has an orchard of 800 trees, about 500 of which are in bearing condition, though a large part of the trees are young. For the 1891 crop he realized $250 and for the 1892 crop $340. He regards his orchard as the most profitable part of his farm.

Phineas Whittier of Chesterville has, we think, the largest orchard in Maine. He reports that he has about 5000 trees, with not far from two-thirds of them of bearing age. But of these many are young trees. He is still setting more trees. At last accounts he was unable to give the receipts of his orchard, as the inferior apples for 1891 and 1892 were evaporated and canned and sales had not been made. His green fruit is handled entirely by Hall & Cole of Boston, and he says they always do well by him.

S. H. Dawes of Harrison has a young orchard of 700 trees, about one-half coming into bearing. In 1891 he sold his apples for $263 and in 1892 for $450. He writes that his orchard pays him a net profit of fifty per cent on his investment. He also writes that more effort should be made to induce the fruit growers in the State to join our society, participate in our meetings and our fairs, so that the premiums will be more generally diffused then they are now.

Nestling among the hills in Carthage is an orchard containing 1800 young trees, about three-fourths of which are in bearing. It is owned by one of the oldest fruit growers in Maine. A neighboring farm on which the buildings cost $1500 is in the market for $1000, and this farm has quite an orchard, too. The price of this farm may mislead, if we do not state that Mr. Towle sold his apples in 1891 for $818 and in 1892 for $1060. He thinks our society should encourage the planting of nurseries. He writes that putting up his fruit costs him, for barrel thirty cents, picking, sorting and putting up, twenty-five cents, delivering at depot, fifteen cents. He adds, "If apples sell well it leaves a fair margin, otherwise the margin is small. If I should undertake to show you the profit of raising stock or farm produce I fear that the cost would more than equal the income. I am satisfied that there is nothing we can raise on our farms in this part of the State that will pay as well as apples."

D. P. True, Leeds Centre, has 1,000 apple trees on his farm, and about three-fourths of them are bearing fruit. He states that his trees pay him 100 per cent profit, and we would not be surprised if he told the truth, for in 1891 he received $250 for his apples and in 1892, $550. He believes it would be an advantage to hold two winter meetings instead of one.

Fred Wright of Bath has an orchard of 200 trees in which he finds pleasure and profit in cultivating.

M. W. Libby of North Gorham has a young orchard of 500 trees. Only about one third of the trees have begun to bear, but he reports a good crop and has shown nice fruit at our fairs.

F. E. Nowell, Fairfield, reports that his King and Spy apples sold for $4.50 per barrel; Fameuse, $4; Nodhead, $3.50; Baldwin, $3. He has 500 trees set, and 400 bearing. He estimates his orchard seventy-five per cent higher than the rest of his farm.

E. H. Keniston, Arnold, bought his farm five years ago. The trees were mostly natural fruit, and very wisely he has been working these over to better varieties. Farms containing good orchards may be bought for a low price.

Joseph H. Smiley, Vassalboro, writes that he has two hundred apple trees on two and one-half acres of land; seven-eighths are in bearing; 1889, 272 barrels, cash receipts $648.10; 1890, 218 barrels, $741.12; 1891, 232 barrels, $313.95; 1892, 260 barrels, $529.32. Land is worth from twenty-five to fifty dollars per acre and first-class trees in bearing from $500 to $800 per acre. I receive more net income from the orchard than I do from the remainder of the farm, which contains forty-two acres. The Society can do good work by encouraging the fruit growers to take better care of their trees and not to set more than they can keep in a high state of cultivation.

E. H. Cook of the same town has 1500 trees and about half of them are in bearing condition. The past two years the receipts from this orchard have been $300 and $450 respectively. Mr. Cook writes: "Orchard land in this town is worth $20 an acre. I think an orchard just set is worth $50 to $80, a bearing orchard $200 to $700. The great range depending on varieties and condition of trees. Some orchards yield nearly nothing on account of treatment. I know of one orchard of three acres, which has paid $15,000 in cash in the last thirty years. With interest, total amount in work to credit of this three acres of apple trees is $20,000. The Society should teach fruit growers how to market their own apples."

A. E. Andrews, Gardiner, has 300 trees and one-half are in bearing. "The Society should not recommend so many varieties," he writes.

M. C. Hobbs, West Farmington, has about 1,000 trees now set. Not more than 100 of them are in bearing. His last crop was 125 barrels, which he sold for $230.

J. M. Pike of Wayne writes: "I have 2,200 apple trees in all, about twenty acres, (all Baldwins and Northern Spy), three acres of them are twenty-five or thirty years old and the rest of them I have set within ten years; all New York trees, they produced last year about fifty barrels of very nice fruit. My three acres of bearing trees will have paid for the last ten years interest and taxes on $2,000. I have six acres set ten years in one lot that I would not sell for $3,000. Twelve years ago it was an old sheep pasture worth about $6 per acre, every tree Baldwins true to name. I have had very good success with fruit trees and am much interested in fruit culture."

Charles I. Perley of Cross Hill in the town of Vassalboro has a thrifty orchard of 600 trees. He enjoys his orchard and is sure it is paying him well for labor and capital.

J. B. Wheeler of Corinth tells an interesting story of fruit culture in the following words which need no comment:

"I now have four hundred apple trees, about half in bearing. Fifty of them I bought with my farm in 1850, and that year they bore about a peck of grafted fruit. About fifty that are seventy-five years old I have since bought with adjoining farms and think I did not pay a dollar more for the farms than I should had there been no apple trees on them. The other three hundred trees I raised and set myself during the last forty-three years and have no knowledge of what they cost me, but they kept me out of idleness, while some others were smoking their pipes; so I did not acquire the tobacco habit, which I consider quite an item saved. I make general farming my business and feed more apples to my horses, colts, cattle and sheep than I sell. I can raise good hogs with apples, the milk from my dairy and a little meal.

"Every creature on the farm likes apples, even the hens and the crows will steal my best apples with apparently as good taste and as much skill as the veteran apple-buyer. About all of my apples of good quality are sold by commission merchants in Boston, and if I have but a few barrels to sell I often divide them equally and send them to two men, they paying the freight from Bangor (twenty cents per barrel by boat) and taking out their commissions. I got net for them delivered in Bangor in 1891, $199.33 for 120 barrels, and I think it cost $60 to handle them and for barrels, leaving me net $59.33. In 1892 I sold 135 barrels in the same way for $311.55, and it cost $65 for barrels, and to handle them, leaving me net $246.55 for them delivered in Bangor. I think the apples used in the family, fed to stock and given away more than paid six per cent on the investment, taxes, labor, taking care of the trees, fertilizers, etc., so I cannot see but the above figures show the net income.

"From the foregoing I have on an average the two last years $102.94 from four acres of land being half my orchard which is $25.73 per acre, which is much more than any other four acres of my 340 acre farm averages. Good orchard land sells for $10 per acre, more or less as to locality, but good farms with much of the land fit for an orchard may be bought for the cost of the buildings. By a liberal supply of the Transactions of your Society showing the boys and young men just how to take care of the old apple trees and how to raise others you will do a great work. Inclosed is one dollar to constitute me a member of your Society the coming year."

E. A. Lapham of Pittston, one of our members and exhibitors, is an active orchardist and has 200 trees, from which he receives a good income, though many of the trees are young. He thinks the net profit is twenty-five per cent. His first trees were set twenty-three years ago and he thinks these pay him more profit than anything on his farm. He writes: "I am going to set some more trees this year. It is no use to set out trees unless they are looked after every year. Lots of people make mistakes here and set out more trees than they care for and the consequence is the orchard doesn't pay them "

Nathan W. Harris, Auburn, has about 600 trees in bearing, though the trees are young. As yet he has not received much profit. Last year his apples sold for $267.19. He believes the Society can help fruit growing interests by "keeping at it." "For precept must be upon precept, precept upon precept, line upon line; here a little and there a little."

IN MEMORIAM.

"Wisdom is the gray hair unto men, and an unpotted life is old age."

It may have been my own father's gray hairs that early taught me to respect the aged. There was more than respect in my sentiments, for when I looked upon his whitened locks and watched over him in the declining years of a long and useful life, many thoughts would come to me of the long life his old age represented. I never meet an old person but there arises within me a desire to know something of the life that has been crowned with age. The joys of childhood and the fickleness of youth have disappeared, and the stern realities of life have developed both stability and character. Idle fancies have long since passed away and the practical judgment of age has given settled convictions in morals, in religion, in politics, in business, yea, in all the affairs of life the aged are confirmed in practice, positive in opinion and sound in judgment.

These and similar thoughts ran through the writer's mind at our Bangor meeting in 1890, as he looked upon the venerable form of Elijah Low. It had not been our privilege to meet before, and through the efforts of Mr. B. A. Burr of Bangor, whose death occurred only a few weeks after our meeting, Mr. Low's name was placed upon our programme for a paper on "Plum Culture." It was a special pleasure to meet him, for of the many who had courageously undertaken the culture of plums in the eastern part of the State, he was about the only one who had been successful. Only a few weeks before his beloved wife had fallen sick and passed to the land beyond. While he did not look like an old man, he did appear, in many ways, to show the sorrows he bore. As he read his paper he was dignified in manner, and his words were terse, yet explicit and positive. There was not a particle of doubt in what he said. At the close of his paper, some one in the audience, who had evidently been beaten by the black-knot and curculio, called in question the possibility of vanquishing these foes of plum-culture. With the greatest composure and a repressed smile upon his face Captain Low said, "Come to my garden on Centre street, and I will show you healthy trees without black-knot"

His paper on plum culture had but one fault, and that was its brevity. But after listening to its reading in Bangor, and referring to it frequently since, I am very sure that it fully covers the subject. It is not embellished with unnecessary words, and there was no apparent effort either to elaborate his own knowledge or experience, and yet the plain facts of successful plum culture were clearly presented in this excellent paper. It was published in full in our Transactions for that year, and we commend it to the perusal of all who are interested in the subject or expect to make the culture of plums a success.

Only once since did I have the pleasure of meeting Captain Low. At our 1891 exhibition in Lewiston, he was present with an exhibition of the fruit grown on the trees of whose culture he had previously told us. His collection was the best and most complete of any we have seen at our fairs. It bore indisputable evidence of his success in plum culture. The same year he exhibited a collection of plums at an exhibition of the Massachusetts Horticultural Society in Boston. They were the wonder and envy of Massachusetts fruit growers, and that society awarded Captain Low a medal for his collection of plums. The following year he was intending to exhibit with us once more, but just before our fair he was stricken with apoplexy, and after an illness of only four days passed away August 18th, at the advanced age of eighty years.

Elijah Low was born in Bath, October 15, 1812. He was one of nine children and the last survivor of the family. The family removed to Bangor in 1831, and this city became the home of Mr. Low. He learned the carpenter's trade and in 1834 took part in building the Bangor House. A few years later he engaged with his father and brother in moving buildings of various kinds. He followed this business most successfully until a few days before his death. Mr. John O'Connell of Bangor, one of his employees, has worked for Mr. Low over fifty years. After the father's death, the two sons continued the business. This brother was S. S. Low, whose name appears among the life members of our Society.

Captain Low was a man of patriotic impulses, and in the settlement of the boundary questions involved in the Aroostook War, was an orderly sergeant of the old Bangor Rifle Corps. In 1863 he was appointed provost-marshal by President Lincoln, his district containing Penobscot, Piscataquis and Aroostook counties.

Captain Low was a good citizen. He was one of the original members of the fire department in Bangor, and for a long time was chief engineer. In this capacity he was very popular and has the credit of introducing several reforms that largely increased the efficiency of the department.

At the age of twelve years he became a member of the Baptist church in Bath and from that time on he was identified with church and Sunday-school affairs. At the time of his death he was a deacon of the First Baptist Church in Bangor and a teacher in the Sunday-school.

Mr. Low was one of the earlier members of our Society. So far as age goes, we have the impression that he was the oldest man among our members, at any rate not more than one or two exceeded his age. He was an enthusiastic plum grower. About the time when he became a member of our Society, Bangor and vicinity were growing plums and pears the most successfully of any portion of our State. Through the influence of the Bangor Horticultural Society, great interest was developed in fruit culture. It is much to be regretted that the society, for reasons with which we are not familiar, has permitted its former activity to languish in recent years. But the black-knot came, and the curculio came also, and one by one fruit growers were obliged to succumb. But Mr. Low intelligently cared for his trees and persistently fought the enemies of plum culture. He overcame them and had the pleasure of producing an abundance of this most luscious fruit. This tribute to his memory as a man and citizen also bears evidence that intelligent perseverance overcomes all difficulties in fruit culture

D. H. K.

JAMES NUTTING.

After having served three years in the War of the Rebellion, James Nutting, in 1865, settled in the wilds of Aroostook. Here he cleared the land and made his home in the town of Perham. Before the people of Aroostook supposed they could raise their own apples Mr. Nutting was planting his orchards. Guided by good judgment he selected varieties that were hardy, and then by growing seedlings he succeeded in growing probably the best orchard in northern Aroostook. This was not all, for he believed in fruit growing, and wherever he went he talked fruit growing to his neighbors and friends, he showed them the fruit he raised and the trees that bore it. Inspired by his example, others planted trees, and largely through his influence there are now many apple trees growing in the county. Mr. Nutting several times exhibited apples at our fairs and winter meetings, and it has been exceedingly gratifying to the members of our society to note the progress made, for we have claimed from the first that Aroostook ought and could raise her own fruit.

In order to determine the value of varieties for Aroostook, under the direction of Prof. Munson of the State Experiment Station, Mr Nutting was in charge of experimental work for that part of the State, his special work being with apples and plums. Prof. Munson was fortunate in having the work so well placed.

Mr. Nutting was present at our winter meeting in Augusta in January last, apparently in his usual health. Shortly after our meeting we were shocked to learn of his death of Bright's disease at his home February 20th. From the *Maine Farmer* we abridge the following:

Mr. Nutting was fifty-four years of age, dying on his birthday. He was born in Bethel, and attended the common school; was apprentice at the printing business to the late Wm. H. Waldron, in the *Lewiston Journal* office, in 1857, and afterward in the *Democratic Advocate* office, Auburn. In 1859 was publisher of the *Courier* at Bethel. Enlisted in the 10th Maine Infantry in August, 1862, discharged in 1865, at close of war from the 29th Maine, to which he had been transferred. In 1872 purchased the *North Star* newspaper, which he sold after one and a half years, and has since attended exclusively to farming and fruit raising, with good success.

Census enumerator in 1880 and 1890, public administrator, justice of the peace, assessor, treasurer, S S. committee of plantation. He was a member of the House of Representatives in 1885, and of the Senate in 1891. He was a brave soldier, a loving husband and father, a noble-hearted friend, and one of the county's best and most highly respected citizens. The deceased leaves a widow and two children, together with other relatives, and an unusually large circle of friends to mourn his loss. With a pure and stainless character, genial in his ways, he was such a man as Aroostook people delighted to honor, and whom the people of the State delighted to meet.

INDEX TO AGRICULTURAL REPORT.

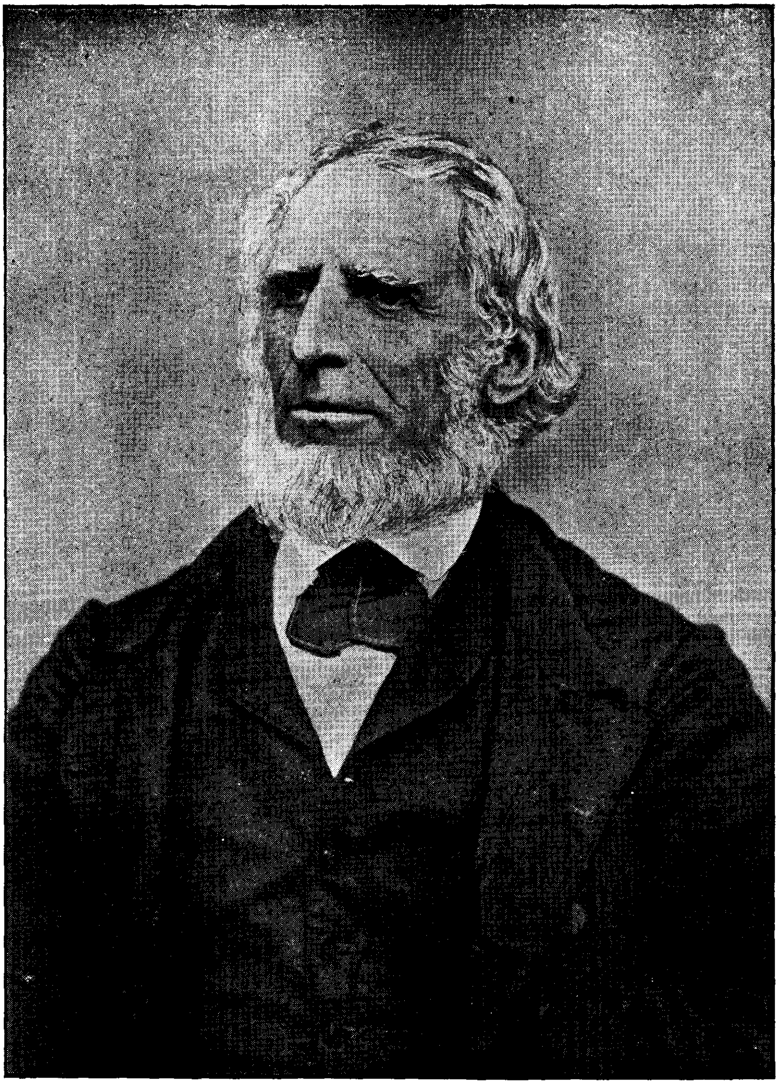
INDEX TO EXPERIMENT STATION REPORT.

INDEX TO POMOLOGICAL REPORT.

ERRATA.

On page 226, the first three lines under the year 1889 should be omitted. It was the unanimous vote of the Board at its annual meeting winter of 1888-9 to ask for such appropriations, but they failed to pass the legislature.

On page 227, under 1891, what is said of the cost of institutes for that year refers to the work of 1890 The whole number of institutes held in 1891 was thirty, the total cost was $3,867.86, making the average cost exclusive of expenses of secretary, $128.92.



EZEKIEL HOLMES,

FIRST SECRETARY OF THE MAINE BOARD OF AGRICULTURE;

AT THE AGE OF SIXTY-FOUR YEARS.

AGRICULTURAL BIBLIOGRAPHY

OF MAINE.

A LIST OF

MAINE WRITERS ON AGRICULTURE, WITH BIOGRAPHICAL SKETCHES AND A CATALOGUE OF THEIR WORKS. ALSO AN INDEX TO THE VOLUMES ON THE AGRICULTURE OF MAINE FROM 1850 TO 1892.

A CONTRIBUTION TO THE

AGRICULTURAL LITERATURE SECTION

OF THE

Columbian World's Fair.

PREPARED BY SAMUEL L. BOARDMAN, UNDER DIRECTION OF THE MAINE BOARD OF AGRICULTURE,

B. WALKER McKEEN, Secretary.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1893.

INTRODUCTION.

It is an interesting fact, especially to all intelligent Maine farmers, that while Arthur Young and Sir John Sinclair were engaged in their eminent services for the improvement of the agriculture of Great Britain, and leading citizens of Pennsylvania had established and were carrying on "The Philadelphia Society for Promoting Agriculture," (the first association of its kind formed in the United States), leading citizens in the then District of Maine had organized an agricultural society, the third in all North America at the time. So that the great "light stations" first established in this country for the improvement of agriculture and the diffusion of agricultural literature, were: Philadelphia, Pa., 1785; Charleston, S. C., 1785; Hallowell, Maine, 1787. It was not till five years after this, viz: March 7, 1792, that the "Massachusetts Society for Promoting Agriculture" was incorporated at Boston. The broad-minded men interested in the establishment of these societies, were convinced of the necessity and of the assistance which such associations would afford to the interests of agriculture. Their objects were at first confined to the diffusion of knowledge pertaining to rural economy through the publication of "Memoirs" or "Papers;" the offering of premiums for the elucidation of subjects upon which information was desired; the adoption of approved systems and methods of European culture suited to the conditions of this country, as well as for the improvement of certain articles of domestic manufacture. The holding of fairs or "cattle shows" was no part of the objects of these early societies, this feature not having been introduced till Oct. 1, 1810, when the Berkshire Agricultural Society, under the direction of Mr. Elkanah Watson, held a cattle show at Pittsfield, Mass., the first that ever took place in the United States.

The Kennebec Agricultural Society was established through the efforts of Dr. Benjamin Vaughan, and his brother, Mr. Charles Vaughan. Dr. Benjamin Vaughan was born in England, April 30, 1751, studied at Cambridge and received his medical degree at

Edinburgh. During the American Revolution Dr. Vaughan was a member of Parliament, but on account of his friendship for the American Colonies he was obliged to leave his country for France where he resided for several years. In Paris he formed an intimate acquaintance with Dr. Benjamin Franklin; and greatly admired the character of Washington. After the establishment of peace with England Dr. Vaughan came to the District of Maine and settled in Hallowell, "on the banks of the beautiful Kennebec." Charles Vaughan, who was born in London, June 30, 1759, soon followed his brother to this country, both settling upon a family property derived from their maternal grandfather, Benjamin Hallowell—a tract of land which extended along the Kennebec river for one mile, and westward to Cobbosseecontee lake—a distance of five miles. This land they improved and kept in a high state of cultivation, employing a large number of workmen upon it throughout the year. They had extensive gardens, established nurseries, planted orchards, imported stock, seeds, plants, cuttings and implements from England, and carried on model farming upon a large scale. They built miles of faced and bank wall upon their farms, laid out and built roads for the public use, and while they sold trees and plants from their nurseries, often to the value of a thousand dollars in a single year, they also freely gave to all who were unable to buy; sent stock, plants and seeds to leading farmers in the several new towns for them to propagate or test, and carried on correspondence with prominent farmers. The apple was not then so highly esteemed for fruit as it is now, but cider was made in large quantities. The Vaughans built the largest and most perfect cider mill and press in New England, employing a skilled mechanic from England to set up the machinery. In their gardens and orchards were apples, pears, peaches, cherries, and many kinds of nut-bearing trees. Doctor Vaughan was a distinguished student, a celebrated physician and an extensive writer upon agricultural subjects, passing a great part of his time in studies and scientific investigations. He carried on an extensive correspondence with learned men and savants both in America and abroad. Among his correspondents in this country were Washington, Franklin, and the elder Adams; in France Lafayette and Michaux the naturalist; in England, Sir John Sinclair, Arthur Young, Sir Humphrey Davy and many distinguished statesmen. Charles Vaughan had the immediate care of their large estates and the carrying out of their experiments and farming oper-

THE

RURAL SOCRATES;

OR

AN ACCOUNT OF A CELEBRATED

PHILOSOPHICAL FARMER,

LATELY LIVING IN *SWITZERLAND,*

AND

KNOWN BY THE NAME OF

KLIYOGG.

Seeſt thou a man diligent in buſineſs, he ſhall ſtand before kings.
Proverbs xxii. 29.

——Spiritus unus
Per cunctas habitat partes. *Manilii Aſtronomicon.* l. II.

HALLOWELL (DISTRICT OF MAINE).
Printed by PETER EDES; and *ſold* by the bookſellers in the principal towns of the United States.

A. D. 1800.

TITLE-PAGE OF FIRST BOOK RELATING TO AGRICULTURE PRINTED IN MAINE.

ations. These were very extensive, were performed at great cost of care and money, and had for their object the improvement of the agriculture of the state as much as they did the business of their owners. No breed of stock or variety of fruit, vegetable or seed was disseminated until it had been thoroughly tested and found to be valuable and well adapted to this country.

Dr. Vaughan had an extensive library and received from England the works on agriculture printed by Arthur Young, the "Communications to the English Board of Agriculture" and works of other writers, some of which are now to be found in the Hallowell public library. In 1800 he published an edition of "The Rural Socrates," which was printed at Hallowell by Peter Edes. There is nothing in the book to indicate that it was published under Dr. Vaughan's direction, but I had this fact many years ago from the late Mr. John Hesketh, a son of Mr. John Hesketh who came over from England with Dr. Vaughan as his head gardener, and the venerable Hallowell printer, Col. D. P. Livermore. Arthur Young had published an edition of this work in London, in 1770, under the title of: "Rural Economy; or Essays on the practical parts of Husbandry; to which is added The Rural Socrates, being memoirs of a [Swiss] Country Philosopher [M. Hirzel]." This work had been reprinted in Philadelphia in 1775, probably under the encouragement of the Philadelphia Society, and it is an interesting fact that the second American edition of this early treatise on agriculture should have been printed in the District of Maine. Hence it may be safely said that the interest in agricultural literature was as great at the commencement of the present century, in this new and wilderness state, as at any place in the United States. The Rural Socrates is an 8vo. volume of xiv, 203, xiii pages, the matter of which is divided into three sections and an appendix. It contains an account of a philosophical farmer known as Kliyogg, living in Switzerland, his farm methods, mode of life, and particulars as to his character and sentiments. This book is exceedingly rare. I do not know of but two copies, one of which is in the library of the State College at Orono, the other in the collection of the writer.

Dr. Vaughan's first contribution to the "Papers on Agriculture, consisting of Communications made to the Massachusetts Society for Promoting Agriculture," appears in the part for 1803, and is entitled: "On the Benefit of Stripping the Bark from the Trunks of Trees, etc. By a member of the Kennebec Agricultural Society."

It occupies pages 5–23, and is designed "to show the benefit of stripping the bark from the trunk of certain diseased or feeble orchard trees; confirmed by accounts respecting the periodical disbarking of the Spanish cork-trees; and of certain other operations which may be performed with advantage on the bark of fruit trees." The article is dated, "Kennebec, January, 1802."

His second contribution is published in the same number and is entitled: "Means for increasing the Strength, &c., of Timber. By a member of the Kennebec Agricultural Society." It occupies pages 23–43, and treats "of several cheap and brief operations which have been proposed for increasing the strength and durability of certain species of timber, and for giving an immense increase of the dimensions, to be employed while the timber is growing."

The third essay is contained in the "Papers on Agriculture" for 1804. It is: "Particulars respecting the history and the use of the species of Gypsum, called Plaster of Paris; especially as it concerns Agriculture. By a member of the Kennebec Agricultural Society." This occupies pages 11–24, and is dated, "Kennebec, April, 1804."

The fourth essay from his pen appears in the same part, pages 47–103, and is entitled: "Fruit Trees. A Letter to Judge Dwight Foster, respecting the methods in use for forming Dwarf Fruit Trees, with some detailed particulars respecting Fruit Trees in General; and Observations on the Supposed decline and extinction of Certain Fruits. By a member of the Kennebec Agricultural Society." This is dated, "Kennebec, April 28, 1804." This is one of the most ingenious and interesting of Dr. Vaughan's essays and its numerous references and quotations indicate the wide range of his reading and his close and accurate observation.

In the "Papers on Agriculture" for 1809, pages 9–14, appears an "Address of the Kennebec Agricultural Society," which is signed by John Merrick, and is prefaced with this note: "The following communication appeared in the Kennebec Gazette for June 19 and 26, 1807, which you will do a favor to the farmers of Massachusetts by publishing in your Agricultural Papers. Yours, B. V. November, 1807."

Dr. Benjamin Vaughan died in Hallowell, December 8, 1835. Charles Vaughan died in Hallowell, May 15, 1839. It is almost impossible to over-estimate the value of the efforts of these pioneers in the agricultural development of the State and country, and they should ever be held in grateful remembrance by the farmers of Maine for what they did in improving and perfecting the many branches of our agricultural operations. Their good influence is realized even to the present day.

One of the earliest writers on the physical resources of Maine, who did much to attract attention to the wealth of timber, manufacturing advantages and agricultural characteristics of the District and State, was Moses Greenleaf, who was the author of two important statistical and general works, and an atlas of maps of the State. Mr. Greenleaf was born at Newburyport, Mass., October 17, 1777, and came to New Gloucester with his father's family. Becoming of age and desiring to go into business he settled in Bangor and went into trade. In a brief sketch of Mr. Greenleaf, from the papers of the late William D. Williamson, published in the Bangor Historical Magazine, Vol. 4, 1888-'9, p. 75, Mr. Williamson who knew Mr. Greenleaf well, says: "Unable through misfortunes or changes in the times to sustain himself in mercantile business, about the year 1806 or 1807, he resigned his property into the hands of his creditors, and afterwards removing into the township where he died, prepared, in the midst of the wilderness, a habitation for himself and family. His mind was energetic and elastic. His education, which was acquired at the common schools, was greatly improved by reading and reflection, by business, and by the literary pursuits to which his mind and tastes so much inclined. Being a magistrate, a land-surveyor, and a ready writer, he was one of the most useful men among the settlers of a new country. At one time he was a Justice of the Court of Sessions. In 1816 he published a map and a 'Statistical View of Maine,' and in January of that year the Legislature of Massachusetts authorized a subscription of one thousand copies, at $3 for each map and 75 cents for each copy of the work. Encouraged by this patronage he revised and enlarged both and in 1829 published them at great expense. The new edition was called 'Survey of Maine,' and the maps were several. On application to the Legislature of Maine for aid, a resolve passed March 10, 1830, gave him $500, and a subscription on the part of the Government for four hundred copies of the maps and 'Survey' at $16 per set. These last works acquired him considerable credit, but they were too heavy to find a ready and extensive sale, and hence the remuneration for his labor was not adequate to his deserts, he never was fitly compensated for his time. Mr. Greenleaf was quick in thought, composition, action and speech. His stature was more than middling for height, and well proportioned; his complexion rather light; his manners easy, and himself always frank and accessible. He died at Williamsburg, March 20, 1834."

Mr. Greenleaf's first work has this title: "A Statistical View of the District of Maine; more especially with reference to the Value and Importance of its Interior. Addressed to the Consideration of the Legislators of Massachusetts. By Moses Greenleaf, Esq. *Salus publica mea merces.* Boston: Published by Cummings and Hilliard, at the Boston Bookstore, No. 1, Cornhill, 1816." It is an 8vo volume of 154 pages. Chapters in this work relating to its conditions for agriculture are on Climate, Soil and Products, Value of Land, Sales and Grants of Land, and General View of the Interior Vacant Territory. Regarding climate, Mr. Greenleaf thinks its greater coldness when compared with that of other countries under the same parallel of latitude, is the prevalence of its immense forests which cover the land, but he says: "As the population of Maine increases, the forests are cleared, and the soil becomes more fully exposed to the genial influence of the sun, the climate will continue to ameliorate until it shall arrive to the happy temperature of other countries similarly situated. We may, with a considerable degree of certainty, calculate on the time when the inhabitants of Maine will enjoy all that mild temperature of climate and rich variety of the bounties of nature, which are now in possession of the most favored countries under the sun." In his chapter on agriculture Mr. Greenleaf says that "to each 1000 acres in the settled part of Maine, there are, on an average, 838 acres of improvable land, 102 acres of waste land, 47 acres covered with water and used for roads." He says, further: "There are 48 persons to every ten acres, or four and eight tenths to every acre, annually employed in raising corn, grain and pulse; and there are 36 persons to every ten acres, or three and six tenths to every acre employed in tillage of all kinds." The following interesting statistics of agricultural products are given:

Counties.	Bushels of wheat raised annually.	Bushels of corn raised annually.	Aver. bushels of wheat per acre.
York	12,350	122,307	14
Oxford	14,508	42,346	18
Cumberland ...	16,993	93,887	15
Lincoln...... ..	20,188	82,564	18
Kennebec	29,003	73,559	19
Somerset.......	9,822	21,842	18

At that time there were only nine counties in the District of Maine, no returns being given from Hancock, Penobscot and Washington counties. Interesting facts and remarks are given in each of the above named chapters specially relating to agriculture, and in the last Mr. Greenleaf observes: "On the whole there is no vacant territory in the United States which affords so many advantages of communication with different markets already established and flourishing as are to be found in the unsettled part of Maine; and it may be considered as rich in point of soil, and containing as little waste land as any part of New England of equal extent. At its first settlement, its products for exportation will consist principally of lumber, potash and wheat. As it proceeds in improvement, flour, pork, beef, wool, flax, &c., will become its staple articles."

Mr. Greenleaf's second work is entitled: "A Survey of the State of Maine, in Reference to its Geographical Features, Statistics and Political Economy. Illustrated by Maps. Portland: Published by Shirley and Hyde, 1829." 8vo. pp. 470. This work may be regarded as a rewritten, enlarged and elaborated edition of his "Statistical View." There are chapters on Climate, Natural Products and Agriculture which are especially interesting. They are each more extended, more carefully written and more abundantly illustrated by references and statistics than those in his first work. Of our climate he says: "The staple productions which are found to succeed in the climate of Maine are Indian corn, wheat, rye, barley, oats, millet, pulse of various kinds, flax, hemp, grass and most of the plants of northern climates. It is not known that the most, if not all, of these do not succeed as well, and in general yield as great crops with the same cultivation, as in any part of New England. * * * The character of the summers of Maine is well adapted to all the necessary purposes of agriculture, and is favorable for the cultivation of all those plants in the production of which consists the true wealth and independence of a people." In the chapter on agriculture Mr. Greenleaf says: "The fertility of the soil in the State is, in general, equal to that of any part of the northern states, in proportion to its extent. That of the northern part of the State, on the Aroostook and St. John, is considered as far superior, unless it may be some portions of comparatively small extent." Regarding the yield of crops Mr. Greenleaf says: "The crops of Indian corn in different parts of the State, and different seasons, have varied from 30 to 50 bushels per acre; in some instances 80 bushels; wheat from 15 to 40; rye rather more; hay from 1 1-2 to 3 tons—other products in proportion." Several quite elaborate tables of agricultural statistics are presented in this chapter. The first gives the amount of agricultural capital and products in the several towns as exhibited in the returns made by order of the Legislature in the year 1820. These returns comprehend, 1. "Fixed capital," including acres of tillage, of upland, fresh meadow and salt marsh mowing; acres of pasturage, and number of barns. 2. "Active capital"—all kinds of farm stock. 3. "Annual products," including all crops and the number of cows the pasturage will keep. As these statistics are based on returns ordered by the Legislature in the first year that Maine was a State, when the authorities desired to know just what wealth the State possessed in this direction, they are without doubt correct. Returns are given from every town in the then ten counties of Maine a summary of which will be of interest as being the first agricultural census of Maine ever taken:

Tillage	78,964	acres.
Upland mowing	269,346	"
Fresh meadow	28,189	"
Salt marsh	8,859	"
Pasturage	272,717	"
Number of barns	31,019	
" " horses	17.849	
" " oxen	48,224	
" " cows	95,091	
" " swine	66,639	
Indian corn	508,143	bushels.
Wheat	202,161	"
Rye	45,679	"
Oats	102,605	"
Barley	74,972	"
Peas and beans	34,443	"
Hops	17,913	pounds.
Upland hay	215,805	tons.
Fresh meadow	18,476	"
Salt marsh	6,457	"
Number of cows the pasturage will keep	104,803	

From these statistics Mr. Greenleaf constructs a table of proportions from which he determines that there was a total of 15 9 acres of improved land to each person engaged in agriculture; that the average yield of hay was 0.79 per acre; that it required 2.6 acres of land to pasture one cow; that there was 2.7 horses, 7.3 oxen, 14.5 cows and steers under three years old, and 10.2 swine to each one hundred acres of improved land, and that to each one hundred persons engaged in agriculture there were 32 horses, 88 oxen, 173 cows and steers under three years old, and 121 swine. The total value of the fixed and active agricultural capital was $30,737,255. Commenting upon these tables Mr. Greenleaf makes many observations worthy of note. "It is miserable husbandry," he says "that does not produce at least one ton of hay to the acre on the average." Regarding agricultural exports he says: "The agriculture of the western and older counties of the State, including those of Kennebec river, produces not only a sufficiency for their own consumption, but a considerable quantity for foreign exportation, and also some for exportation coast-wise to other parts of the United States. In 1826, the exports of agricultural products from Maine to *foreign* ports—including beef, butter, cheese, pork, bacon, lard, flour, corn, candles, beans, potatoes and live stock, amounted to $409.561. An interesting feature of the agriculture of the State in 1827 was the number of cattle and sheep driven to the markets at Boston, Brighton, Salem and other points in New England. An account was kept at Haverhill bridge in that year, of all Maine cattle and sheep crossing it to western markets, and a careful estimate—in the absence of an exact account—was made at Piscataqua bridge. The former figures were 3766 horned cattle, and 1368 sheep; the latter were 1000 horned cattle and 2000 sheep. Taking those passing by other avenues, crossing the river at Newington and Exeter, it was estimated that a total of 10,000 neat cattle and 7000 sheep went annually from Maine to the western market. Cattle were averaged at $20 per head, and sheep at $1.50, bringing the value to $250,000, which added to the foreign exports made the total value of agricultural exports about half a million dollars annually.

The map accompanying Mr. Greenleaf's "Statistical View" of Maine, and the atlas of maps accompanying the "Survey," were, says the writer in Appleton's American Biographical Cyclopedia, "the best made to that date." The atlas embraced seven maps and charts, including a map of the State, a map showing the original grants of land, chart showing vertical projections of elevations from the sea to Canada, meteorological diagrams, etc. The engraving is finely executed and the artistic work highly creditable. A set of the maps is in the State Library, Augusta.

Mr. Greenleaf's writings rank very high as original and trustworthy sources of information regarding the physical resources of the State previous to and immediately following its formation. He was not an agriculturist, but he had a mind trained to a broad grasp of every question affecting the material prosperity of the State, and his views and observations upon our early agriculture and farm methods must ever be regarded as those of a trained and unbiased publicist, containing sound reflections, accurate statements and a wise forecast of the future importance of the agriculture of our State, which were long ago found to be correct.

The copy of Dr. Samuel Deane's New England Farmer—the first work of its kind published on this side of the Atlantic—which is before me, is that of the third edition published in 1822. As Dr. Deane was pastor of the First Parish church in Portland from October, 1764, to November, 1814, it is reasonable that this work must have had a considerable circulation in Maine and influenced to a large extent the character of our agriculture. The first edition was published at Worcester, Mass., in 1790, with no name of author upon the title page, but instead the words: "By a Fellow of the American Academy of Arts and Sciences." The second edition was issued in 1797, and the third in 1822. It has this title: "The New England Farmer; or Georgical Dictionary. Containing a Comprehensive account of the Ways and Methods in which the Important Art of Husbandry, in all its various branches, is, or may be, Practiced, to the Greatest Advantage in this Country. By Samuel Deane, D. D., Vice President of Bowdoin College, and Fellow of the American Academy of Arts of Sciences. Third edition: corrected, improved, greatly enlarged and adapted to the present state of the science of agriculture. Boston: Wells and Lilly, Court Street, 1822, 8 vo. pp. 532." Dr. Deane was born at Dedham, Mass., July 10, 1733; graduated at Harvard College in 1760, and died at Portland, November 12, 1814, aged 82 years. In the introduction to his edition of "Smith and Deane's Journals," Portland, 1849, the late Hon. William Willis, said: "In agriculture Dr. Deane pursued his labors zealously and scientifically, and was consequently more successful than any other person in this region of country. The results of his experiments and his experience, he embodied in that work, which was the first of the kind published on this side of the Atlantic, and was universally consulted by agriculturists."

The introduction to the History of Maine, by William D. Williamson, published at Hallowell in 1832, in two volumes, was devoted to the geography and natural history of the State, and had sections relating to the atmosphere, climate and seasons; natural productions, vegetables, trees, shrubs, plants, roots and vines—occupying pages 9–182 of the first volume. The information contained under these headings has a direct bearing upon the characteristics of Maine as an agricultural State, and must have had great influence in making still wider known, at the time of its publication, the physical basis of our agriculture. Mr. Williamson was born at Canterbury, Conn., July 31, 1779, and died at Bangor, October 10, 1822. His history of the State is a splendid monument to his rare scholarship and fine qualities as an accurate, impartial and able historian.

In February, 1834, an act was passed by the Legislature establishing a "Board of Internal Improvements," which was made up of three commissioners appointed by the Governor. Their duty was "to explore and examine the great water courses of the State, and also different parts of the State where it may be supposed that canals, roads, railroads or other important internal improvements may be made for the benefit of the State." It was under authority of this Board that Dr. E. Holmes made a survey of the then little known "Aroostook territory" in 1838. His report of this survey is entitled: "Report of an Exploration and Survey of the Territory of the Aroostook River, during the spring and autumn of 1838." It was printed in 1839 in a pamphlet of eighty pages, and is one of the scarcest of the earlier publications relating to the agriculture of the State. It is divided into two parts—part first embracing the results of a reconnoisance of the rivers and lakes in the territory; and part second, devoted to the situation and extent of the valley of the Aroostook, its climate, soil, natural growth, agricultural products, roads and geological formations. It is the very first account ever published on the physical characteristics of this now well known section of Maine, the "garden" of the State, and is of great value as coming from a man of such trained habits of observation as Dr. Holmes possessed, and moreover who was a thorough scientist and one having always before him the practical agricultural features of any section visited and studied.

Regarding the agricultural products of the territory Dr. Holmes says: "Wheat is and ever must be the great staple of the country. In 1837, on the farm of Fish and Wiggins in Township No. 4, on the Aroostook road, (now the town of Patten), was raised 1,250 bushels of wheat on fifty acres of burnt land, or 25 bushels per acre. The total number of bushels of wheat raised in that township in 1837 was 6,000, or an average of 300 bushels to each family, worth then $1.75 per bushel. Of potatoes he says: "They are equal in quantity and quality to any whatever—the climate and soil both seem particularly congenial to this root. Many assert that they have obtained 300 bushels per acre with common management. Nothing is wanting but greater facilities for getting them to market to make their culture one of the most profitable branches of agricultural operations that can be pursued here." Indian corn is not grown on account of frost, but when the climate is "ameliorated by the absence of forests," he thinks it will be raised. Rye is little cultivated. Oats are "extensively raised." Barley is little raised but always produces well. "Buckwheat," Dr. Holmes says, "takes the place of Indian corn in the older sections of the State." He records instances of fifty bushels being raised from one bushel sowing and in one case twenty-five bushels from a peck and a half of seed. "It shells out badly in harvesting, and the people put rugs and cloths on the bottom and sides of the carts when harvesting it to save that which scatters out." Beans and all garden vegetables do well. "Flax," says Dr. Holmes, "does better than further south, and most of the settlers have a small patch for the purpose of affording them thread." Of fruits he says: "Apple trees grow well at Houlton, but people must wait till the forests are cut away before they can be well grown and the fruit matured." The grasses he says are "the best in New England, and all the cultivated grasses flourish in great perfection. The average yield is one and one-fourth tons per acre worth $12 per ton on an average for loose hay, and $14 for screwed hay." The objections to the territory Dr. Holmes states to be: "lack of mills; early frosts; want of schools and religious privileges; want of roads."

Dr. Holmes recommended that a "State Experimental Farm" be established in the territory because an abundance of the best land could be had for such a purpose, and at a low price. "While such farms are almost unknown here, they are common in European countries." He states the object of such a farm to be: "To introduce the various breeds of cattle, sheep, hogs and other stock; to cultivate the various crops which it is desired to acclimate, and the properties of which it is wished to test in this latitude; to introduce the various fruits which would probably grow, and thus form a source whence the settler could look for a supply to commence his operations or to renovate his stock and crops when degenerated or exhausted. Another advantage of this location would be: it is the most northern section of our State, and we might be pretty well assured that whatever came to maturity here, would also mature in any other part of New England."

In concluding his report Dr. Holmes uses these effective and forcible words: "Are you a young man just starting in life, but with no capital save a strong arm, good courage and a narrow axe? Go to the Aroostook; attend assiduously and carefully to your business; select a lot suitable for your purpose and with the common blessings of Providence you will, in a few years, find yourself an independent free-holder, with a farm of your own subduing and with a capital of your own creating." Well may Dr. Holmes be called the "father of Aroostook," for it was this report which gave to the people of the State their first real knowledge of the fertility of its soil, the marvelous production of crops of which it was capable, and the comparatively small cost at which they could there obtain a farm and home and become "independent free-holders." Fifty-four years ago Dr. Holmes saw clearly the great natural wealth and abundant agricultural possibilities of the Aroostook territory, which are even yet in their infancy of development and just ready to receive the impetus of a new life through the opening of the Aroostook Railroad, a half century after Dr. Holmes wrote that "greater facilities for getting their agricultural products to market" was the greatest obstacle to the development of the country.

In connection with the work of diffusing agricultural literature carried on by the agricultural societies of Maine, it is noticeable that the first agricultural and industrial college in North America was established in this State, the personal honor of which is due to the first Robert Hallowell Gardiner of Gardiner. In a petition to the Legislature the year after Maine became a state, viz.: 1821, asking for a grant of one thousand dollars for aid in establishing an institution "to give mechanics and farmers such a scientific education as would enable them to become skilled in their professions," this distinguished and far-seeing philanthropist said: "It is an object of very great importance to any state, but especially one possessing fine views and a fertile soil, numerous mill seats and a coast indented with many and capacious harbors—to a state rapidly increasing in commerce, agriculture and manufactures, that its artisans should possess an education adapted to make them skilful and able to improve the advantages which nature has so lavishly bestowed upon them. The State of Maine is in possession of these numerous privileges yet while she has liberally fostered her colleges for educating young men for the learned professions, and possesses numerous academies for preparing youth to enter these colleges, and for making useful schoolmasters, she has hitherto omitted to make provisions for giving instruction to her seamen, her mechanics and her farmers upon whom the wealth and prosperity of the State mainly depends. The recent improvements in chemistry which give the knowledge of the nature of fertile and barren soils and the best mode of improving them, render the importance of a scientific education to her farmers much greater than at any other period." This, copied from the petition written by Mr. Gardiner, shows the idea which he had of the class of college or school so much needed in his time for giving a "liberal" education to farmers. It foreshadows exactly the colleges of agriculture and the mechanic arts now existing in all the states, under the endowment of the Morrill Land Grant bill of 1862; and Mr. Gardiner in pleading with the state to establish such a school, was actually a whole generation in advance of his time, as it was not till more than forty years later that these colleges were established under the patronage of the general government.

Mr. Gardiner succeeded in obtaining a yearly grant of $1,000 from the state, and the "Gardiner Lyceum" was incorporated in 1821. A stone building for its use was erected in 1822, and on January 1, 1823, the Lyceum was formally opened to pupils, Rev. Benjamin Hale, born in Newbury, Mass., November 23, 1797, and once a tutor in Bowdoin College, being president of the Lyceum from 1823 to 1827. After leaving Gardiner, Mr. Hale was professor of chemistry in Dartmouth College from 1827 to 1835, and from 1836 to 1858 president of Geneva College, New York. He died July 15, 1863. The course of study at the Lyceum was arranged for two years, and there were twenty students the first year. The courses may be generally described as a chemical, and a mechanical one. The former comprised lectures on the principles of chemical science, on agricultural chemistry, on dying, bleaching, pottery, porcelain, cements and tanning. The latter course embraced lectures on mechanical principles, dynamics, hydrostatics, hydraulics and carpentry. Later a course in minerology was included In 1824 Dr. Ezekiel Holmes was engaged as "permanent professor in agriculture," and in connection with this professorship the trustees undertook the management of a practical farm in connection with the Lyceum, where experiments in agriculture were tried, where the students were allowed to work to diminish the expense of board, and "to give the future agriculturalist the knowledge of those principles of science upon which his future success depends, and an opportunity to see them reduced to practice." In order to accommodate those students whose business during the summer months made it impossible for them to join the regular classes, winter classes were established in surveying, navigation, chemistry, carpentry and civil architecture. These "winter classes" corresponded to the "short courses" in special branches now given at many of our agricultural colleges.

This outline shows the general scope and character of the institution. After Mr. Hale's resignation of the office of president the Lyceum was severally in charge of Edmund L. Cushing, Dr. Ezekiel Holmes, Mr. Whitman and Jason Winnett, as presidents or principles. Its classes were well kept up for many years, at one time the scholars numbering fifty-three. The Lyceum had a good library and creditable collections, and the students were encouraged to make collections of specimens illustrating the geology and flora of the section, which were deposited in the museum. Finally the state withdrew its yearly appropriations, and for two or three years subsequently it was maintained almost entirely at the expense of Mr. Gardiner himself. The property of the Lyceum, after having remained unused in the hands of the trustees for several years, was sold to the city of Gardiner in 1857, and the building occupied as a high school. The proceeds were divided *pro rata* among the original stockholders, and the first agricultural and industrial college in the United States ceased to exist.

But few of the publications of the Lyceum have been preserved. Among those to which the writer has had access are: the "Inaugural

Address, delivered at Gardiner, Me., Jan. 1, 1823, by Benjamin Hale, principal of the Gardiner Lyceum and Lecturer on Natural Philosophy," a pamphlet of 16 pages printed by S. K Gilman, Hallowell; and a pamphlet of 24 pages, the title page of which is wanting, but containing the "Laws of Gardiner Lyceum, and Regulations for the Government of the Lyceum." In his inaugural address Mr. Hale gave the key-note in the design of the institution in these words: "It will not be said that the founders of this institution have assisted in unnecessarily multiplying seminaries of education for it is new in character, and it is designed to supply the wants of a large portion of the community, for which no provision had hitherto been made. Nor will it be said that these wants are not real. The education of the advocate or divine is scarcely more necessary to his success than that of the mechanic or the farmer. If the professions of the former are themselves branches of science, those of the latter are founded in science. And as we expect empiricism from those who enter the learned professions without a suitable preparatory education, so we can expect nothing but deficiency of skill in mechanics who have been taught only the manual exercise of their arts. There surely can be no reason why mechanics and agriculturists should not be instructed in that science which will enable them to follow their pursuits, not blindly, but from rational views. Those who have not this education, may indeed copy faithfully the practices of their fathers, but we cannot expect from them improvements which shall enrich their country and benefit the world." The government of the Lyceum was vested in the students.

As progress was made in our agricultural operations and the semi-occasional or yearly publications of the "papers" and "memoirs" of the agricultural societies became inadequate to the intellectual needs of farmers, agricultural journals took the place of these official publications. Thus the New England Farmer grew out of the "Papers on Agriculture" published by the Massachusetts Society for Promoting Agriculture; and it was at the annual dinner of the Kennebec Agricultural Society in 1831, that Samuel Wood, Esq., read a proposition from Dr. Holmes in regard to the establishment of the Kennebec Farmer, "which proposition was received with much enthusiasm." Previous to this, however, "The New England Farmers' and Mechanics' Journal" had been published for one year, 1828, at Gardiner, "conducted by E. Holmes, M. D., Professor of

Chemistry, Natural History and Agriculture in Gardiner Lyceum." It was a monthly journal published by Parker Sheldon, each number containing a lithographed plate, the magazine being very creditable in typographical appearance and containing useful articles relating to agriculture and mechanics. The first number of the "Kennebec Farmer and Journal of the Useful Arts," was issued January 21, 1833, but the title was changed to "Maine Farmer" with the number for March 18, of that year. In making this change, the editor, Dr. Holmes, said: "This is our first and last change,"—and the paper is still published under this title although in the course of its history many changes in proprietorship and editors have been made. "The Yankee Farmer" was established at Cornish in 1835, by S. W. Cole, was removed to Portland at the close of its first year, and subsequently removed to Boston where it was merged in the New England Farmer. "Drew's Rural Intelligencer" was first published at Augusta, January 6, 1855, was removed to Gardiner in 1857 and discontinued in 1859. The publisher and editor, Rev. William A. Drew, was born in Kingston, Mass., December 11, 1798, and died in Augusta, December 2, 1879. He was a true lover of nature, had great fondness for all agricultural and horticultural pursuits, and his writings upon these subjects were not only picturesque and interesting but thoroughly practical. The "Dirigo Rural" a weekly agricutlural journal was first issued at Bangor, July 4, 1874, and was published till August 6, 1887, when it was discontinued. Its proprietor and editor throughout the entire course of its publication was Daniel M. Hall, who was born in Hermon, September 17, 1836. Mr. Hall was Secretary of the Maine State Grange from 1881 to 1885, inclusive. He now holds an important position in connection with the Department of Agriculture, Washington, D. C. "The Home Farm" was published at Augusta from 1880 to 1887, when it was removed to Waterville and its name changed to "The Eastern Farmer." It was discontinued in April 1888. Its editor during this entire period was Samuel L. Boardman. These comprise the leading agricultural journals that have been published in Maine, although a few others devoted to general farming, stock breeding and bee-keeping have from time to time appeared in different places and been published for short intervals. Although somewhat ephemeral in their nature, the influence of agricultural papers for the wide diffusion of agricultural knowledge has been immense, and this brief recognition of their service and value, at least, ought to find a place in any survey of the agricultural literature of the State. Aside from the above named distinctively agricultural journals, many of the state and local papers maintain departments of farming and grange intelligence and information, demanded by their readers, which furnish a great aid to intelligent agriculture.

The Board of State Assessors, established by act of the Legislature in 1891 publishes an annual report which contains many statistics of interest relating to the movable capital of our farms. In the report for 1892 the following statistics and values of live stock are given: number of horses in the state, 117,332; number of three year old colts, 9,600; number of two year old colts, 8,645; number of one year old colts, 9,125; number of oxen, 26 609; number of three year old steers, 26,304; number of two year old steers, 40,867; number of yearling steers, 44,821; number of cows, 138,994; number of sheep, 370,602; number of swine, 33,445; total values as returned, $15,747,468.

This survey of the agricultural literature of Maine, embraces a glance at all that has been published, either privately or officially, with the exception of the various reports and transactions of our Board of Agriculture, State Pomological Society, State College and Experiment Station, which are fully described and indexed in the following pages.

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ABBOTT, LYMAN F. Born in Wilton, October 12, 1830. Agricultural editor of Lewiston Journal since 1882. A leading writer for many agricultural journals. Address: Lewiston.

1. Small Fruits and their Culture. Transactions Maine State Pomological Society, 1875, page 83–93.
2. Culture of the Gooseberry for Market. Transactions Maine State Pomological Society, 1876, page 123–127.
3. The Future of Orcharding in Maine. Transactions Maine State Pomological Society, 1885, page 118–124.
4. Fruit Growing in Maine compared with other Agricultural Industries. Transactions Maine State Pomological Society, 1891, page 95–104.

ABBOTT, THEOPHILUS CAPEN. Born in Vassalboro in 1826, and graduated from Waterville College, now Colby University, in the class of 1845. Immediately upon leaving college, Mr. Abbott engaged in teaching for many years, going first to Vermont where he taught two years at Townshend. He then returned to Maine and was principal of the school in Augusta in 1847. In 1848 he was principal of the school in Thomaston; at Bath in 1849; Portland in 1849-50, and Houlton in 1851. During 1852 and 1853 he was an instructor at Waterville College. In 1854 he went to Michigan, and for one year taught an academy at Berrien, in that state, and in 1856 and 1857 was an assistant professor at Ann Arbor. In 1857 he was ordained to the ministry of the Congregational church but did not preach as he liked teaching better. The Michigan Agricultural College was established in 1855, in accordance with a provision in the State constitution which said that "The Legislature shall, as soon as practicable, provide for the establishment of an agricultural school"—this being the first agricultural school or college, established by constitutional provision in any state in the United States. In this college, which was opened to students in May, 1857, Dr. Abbott was appointed to the chair of English Literature, and held the position from 1858 to 1862; and on December 4, 1862, he was chosen president continuing in this office till July 1, 1885, his voluntary resignation having been placed before the trustees November 24, 1884. On retiring from the presidency of the college, after a service of twenty-two years, the trustees induced him to accept the chair of Mental Philosophy and Logic, which position he held till his death. In 1862 and 1863 he was acting secretary of the State Board of Agriculture of Michigan. In 1871 the University of Michigan conferred upon Dr. Abbott the degree of LL D. Upon his resignation of the presidency of the Agricultural College the trustees in a vote of thanks said: "Dr. Abbott's labors have been largely instrumental in bringing this college to its present high position among institutions of its kind in this country." He died at Lansing, Michigan, November, 1892. [Portrait: Report Michigan Board of Agriculture, 1884, p. 255.]

1. Agricultural Education and Agricultural Colleges. Report Maine Board of Agriculture, 1869, page 383–392.
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3. Student Labor at Agricultural Colleges. Report Michigan Board of Agriculture, 1874, page 98–105.
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6. Social Rank of Farmers. Michigan Board of Agriculture, 1880, page 258–265.
7. Early History of Michigan State Agricultural College. Report Michigan Board of Agriculture, 1881, page 358–379.
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9. Reports as President of the Michigan Agricultural College. 1862–1885.

"A modest, mild-mannered, noble man, cultured and broad in mind, genial in social intercourse, beloved by all. In all the time of Dr. Abbott's presidency of the Michigan college, he enjoyed the most abundant confidence of the legislators and people of that state. Earnest, straightforward, sincere and conscientious in the discharge of his duties, he never appealed to the Legislature in behalf of its agricultural college, in vain. Indeed it was said of him at this time that the successive Legislatures of that state had so high an opinion of his character and such unbounded confidence in his plans and his ability to carry them out, that they would give him any amount of money he asked for any purpose whatsoever; and that is why the agricultural college of Michigan is so noble an institution today; why Dr. Abbott will always live in it, and why the people of Maine and of the country should never forget him. His memory and fame are secure in the splendid institution of which he was the real father."—Kennebec Journal, November, 16, 1892.

"Dr. Abbott's death has reminded every alumnus of the Michigan Agricultural College, of the kind, fatherly man whom every student loved and respected; the man who was ever thoughtfully attentive to every interest of the college, and who always found time to exercise a personal care for each and every student. He came to the college as a professor at an early day, and while still a young man was appointed president. In this capacity he skilfully conducted the institution through its darkest days and finally saw it firmly established in a successful and popular career. A man of studious habits and not very robust physique, he was, nevertheless, an indefatigable worker. When, some years ago, he became unable to continue the duties of president, from the results of a serious injury, he was continued as professor of mental philosophy and logic, and when his injuries rendered him unable to perform further active duty at the college, he was honorably retired with the title of Emeritus Professor. He well deserved the name given him by the graduates--'The Father of the College.'"—New York Tribune, March 6, 1893.

AGRICULTURE OF MAINE. A complete set of the volumes under this general title comprises thirty-nine volumes, from 1850, to and including 1891. The volume for 1850–'52, is entitled "Transactions of the Agricultural Societies in the State of Maine," and contains 862 pages. This volume was "arranged from official returns" by E. Holmes, Secretary of the Board of Agriculture. It comprises many able addresses, historical notes, essays on agricultural subjects and fruit lists for different parts of the State. The volume for 1853 contains 421 pages, "arranged from official returns" by E. Holmes, Secretary of the Board of Agriculture. It embraces addresses, description of fruits, statements of exhibitors in various classes at fairs and historical notes which make it a valuable work. The volume for 1854 contains 310 pages, and was printed in 1854. It was "arranged from official returns" by E. Holmes, Secretary of the Board of Agriculture. On the establishment of the Board of Agriculture in 1852 the duty of collecting and publishing the transactions of the several county agricultural societies devolved upon the secretary of the board. The Legislature made no provision for compiling the transactions for the year 1855. In 1855 it incorporated the Maine State Agricultural Society, which act of incorporation authorized the secretary to prepare and publish the doings of the several societies. Before all the returns from these county societies had been sent in a change was made in the law by which the duty of preparing these reports for the press devolved upon the secretary of the Board, Stephen L. Goodale, who commenced his services with the year 1856. The volume for 1855 is entitled: "Agriculture of Maine; Report of the Secretary of the Maine State Agricultural Society and Transactions of the several county Agricultural Societies." It was not printed till 1859, and comprises

240 pages. It embraces important historical data relative to the different breeds of horses, cattle and sheep that have been introduced into Maine, with the dates imported and by whom brought, from the pen of Dr. E. Holmes. The volume for 1856 is the "First Annual Report of the second Secretary of the Board of Agriculture, together with an abstract from the returns of the Agricultural Societies in the State. This is the first volume compiled by Stephen L. Goodale as secretary, who edited seventeen volumes, viz: 1856-72. The plan of publishing the yearly volume in two parts; part first the report of the secretary; part second, abstract of returns from the county agricultural societies with miscellaneous papers, was continued throughout Mr. Goodale's term of office. The volumes edited by Mr. Goodale are all lettered, "Second Series," with the exception of the first report, 1856, which was not bound in cloth. Two editions of this report were published, the only instance in which a second edition of this work was issued. The volumes for the years 1861 and 1862 contain the reports on the scientific survey of the State, hence the agricultural portion of these volumes is limited. For 1861 it embraces 212 pages: for 1862, 223 pages. The six volumes for 1873-4 to 1878-9 were edited by Samuel L. Boardman, third secretary of the Board, the words "Second Series" having been omitted from the lettering of the volumes. Upon the resignation of Mr. Boardman in 1879, Mr. Goodale was re-appointed secretary and held the office for about six months. The volumes of the "Agriculture of Maine" from and including 1880 to 1890, were edited by Z. A. Gilbert, the fifth secretary. The publishing of the "Abstract," or second part of the annual volume, was discontinued with the year 1879. In the report for 1882 appeared the report of the State Board of Cattle Commissioners, Inspector of Fertilizers, Report of Experiments at the State College and Transactions of the State Pomological Society; and these reports together with those of the Fertilizer Control Station, and the Agricultural Experiment Station of the State College have since been published in the annual agricultural volume. Since 1891 the volumes have been edited by B. Walker McKeen, Secretary of the Board of Agriculture; that for 1891 embracing also a compilation of the laws of Maine relating to agriculture.

ALLEN, CHARLES F. Born in Norridgewock, January 28, 1816. Graduated at Bowdoin College, class of 1839. President of the

Maine State College of Agriculture and the Mechanic Arts, 1871-'79; member Maine Board of Agriculture, 1871-'79. Received the degree of D. D., from Bowdoin College, and also from Wesleyan University, Middletown, Conn., 1872. An eminent clergyman of the Methodist church; an eloquent speaker; a profound scholar. Address: Kennebunk.

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ATKINS, CHARLES GRANDISON. Born in Augusta, January 19, 1841. Graduated at Bowdoin College, 1861. United States Fish Commissioner, Bucksport.

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BALENTINE, WALTER. Born in Waterville. Graduated at the Maine State College in 1874. Was a post graduate student at Wesleyan University, Middletown, Conn., and an assistant in chemistry in the Connecticut Agricultural Experiment Station, Middletown, Conn., for two years. Was employed four months in teaching chemistry at Lawrence University, Lawrence, Kansas. Studied one year at the University of Greifswald, Germany, and one year at the University of Halla, Germany, in which place was also employed as assistant in the Agricultural Experiment Station. In the summer and fall of 1880 chemist in the Department of Agriculture, Washington, D. C. In 1881 was elected to the chair of Agriculture in the Maine State College. Acting Director Maine Experiment Station, April-July, 1885. From 1881 to 1892, member of the Maine Board of Agriculture. Has contributed largely to the agricultural and scientific press of this country and Germany. Address: Orono.

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BARKER, NOAH.

1. Report of the Commissioner on the Variations of the Magnetic Needle. Augusta, 1868, 8 vo., pp. 83.

BARTLETT, JAMES M. Born in Litchfield, September 25, 1854. Graduated at Maine State College with degree of B S., 1880. Chemist to Fertilizer Control Station at Pennsylvania State College, 1882–'84; Chemist to the Maine Experiment Station, 1885–'92. Received the degree of M. S., from Maine State College in 1883. Address: Orono.

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The greater part of the analytical work of Mr. Bartlett at the Station has been published in the several annual reports of the Director.

BARNES, PHINEHAS. Born in Orland, January 26, 1811. Fitted for college at Phillips Academy, Andover, Mass., having as a seat mate Oliver Wendell Holmes. Graduated at Bowdoin College, at the age of 18, at the head of his class in 1829. In early life he was engaged in teaching and editorial work, having been editor of a paper in Bangor in 1833; and from 1836 to 1839, professor of Latin and Greek in Waterville College In 1841 he assumed editorial charge of the Portland Advertiser, remaining in that position for many years. During this time he became greatly interested in railroads and had much to do in devising and constructing the early railway system of the State. After this he entered the profession of the law to which his whole future life was devoted. He always had a great love for botanical studies and for the practical working of the land, and made a close study of agricultural science and practice for the pure love which he had for it. He always had a fine garden the care of which was a constant delight. At a meeting of the trustees of the State College of Agriculture and the Mechanic Arts held January 22, 1867, he was elected first president of that Institution. He died in Portland, August 25, 1871.

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BATCHELDER, T. P. Secretary West Penobscot Agricultural Society. Has published since 1867 an annual report of this society, with list of premiums and members, occasional addresses, and interesting notes and reports on premium crops. Address: Kenduskeag.

BAILEY, GEORGE HENRY. Born in Portland, December 25, 1832. Served as Lieutenant Co. D , First Maine Regiment throughout full term of enlistment, mustered in May 3, 1861. Graduated at the American Veterinary College, New York, 1879. State Veterinary Surgeon 1884-'92. Represented the State at the National Convention of Cattle Commissioners at Springfield, Ill., in 1889. Address: Westbrook Junction, Deering.

1. Report of the Commissioners on the Contagious Diseases of Animals for 1887, Augusta, 1888, pp. 16.
2. Second Report, 1889, pp. 27.
3. Third Report, 1890, pp. 55.
4. Fourth Report, 1891, pp. 98.
5. Fifth Report, 1892, pp. 95.
6. Sixth Report, 1893, pp. 36.

BAYLEY, W. S., Ph. D., and King, F. P.

1. Catalogue of the Maine Geological Collection, with a Brief Outline History of the Two Surveys of the State. Waterville, 1890, 8 vo. pp. 32.

A Catalogue of the collections made by the two State Geological Surveys of Maine, now in the custody of Colby University, Waterville.

BLAKE, JOSEPH. Born in Otisfield, Jan. 21, 1814. He graduated at Bowdoin College in the class of 1835, and from the Bangor Theological Seminary in 1840. In 1872 he received the degree of D. D. from Bowdoin College. He contributed to various periodicals during his life and published a few sermons. He was ordained pastor of the Congregational church in the town of Cumberland in 1841, and remained there eighteen years. A year or more after graduating from college, November, 1836, he went to Natchez, Miss., remaining as a teacher till May, 1838. His botanical studies began at that time and were continued to the very close of his life; he being a most enthusiastic collector of plants. During the eighteen years of his preaching at Cumberland, he made several trips through the State, for the purpose of obtaining plants. In June and July, 1856 he went to Mt. Ktaadn where he collected some alpine plants, mosses and lichens. Perhaps the larger part of his Maine plants were obtained in Harrison and Wells, where he passed his summers for a number of years. He made one or more journeys to the very northern part of the State collecting some plants along the St. John river. In May, 1860 he moved to Gilmanton, N. H., and was installed pastor of the Congregational church at that place. During the eighteen years of his pastorate in New Hampshire he collected in the vicinity of his home and in the White Mountains, keeping up his collecting in Maine during the summers. In December, 1878, he moved to Andover, Mass., where he remained for a period of ten years. He preached there occasionally, and still continued his botanizing. During all these years he exchanged plants with nearly all the prominent botanists in the United States, including Dr. Asa Gray, William Booth, M. S. Bebb, Spencer F. Baird, A. P. Chute, W. M Canby, J. W. Chickering, M. A. Curtis, Geo. L. Goodale, E. Hall, Thos. C Porter, Chas J. Sprague, H. P. Sortwell, F. Scammon, John Torrey, Geo. Vasey, A. E. Verrill, J. M. Holtzroger, C. S. Sheldon, I. Macoun, L. M. Underwood, M. E. Jones, C. G. Pringle, H. N. Patterson, L. C. Cleveland, S. B. Mead, C. H. Peck, Dr. Dewey, J. A. Paine, J. C. Martindale, A. P. Garba, Judge Clinton, C. F. Parker, J. Fowler, A. H. Curtis and E Durand. His correspondence is preserved in the herbarium of the State College, Orono. Mr. Blake was a member of the Portland Society of Natural History, the Buffalo Society of Natural History and the American Academy of Natural Sciences, Philadelphia. A valuable herbarium collected by Mr. Blake enriches the collections of Bowdoin College. The "Blake Herbarium" in the State College of Agriculture and the Mechanic Arts, Orono, contains between three and four thousand species of Phenogams collected in the United States, and four or five thousand duplicates. About two thousand species of foreign plants, with numerous duplicates, from Switzerland, Germany, England, Hungary and South Africa. A considerable part of the mosses, lichens, fungi and other cryptogams of North America, amounting with duplicates to several thousand. He died at Andover, Mass., May 26, 1888

1. The Portland Catalogue of Maine Plants. Adapted for Marking Desiderata in exchange of Specimens. Portland, 1868, 8vo., pp. 12.

Mr. Blake was led to the study of botany by his great love of Nature and the refreshment he found in out of door life. To study the works of the Creator he held to be the noble and eternal joy of man. He took great pleasure in interesting others in the Natural Sciences and especially in his later years was able to give much assistance to younger botanists. The purity, sincerity, and modesty of his character impressed all who knew him. He was delicately honorable in all the conduct of life, accurate in speech, careful in judgment, loyal in friendship, of strong and tender feelings, with refined and scholarly tastes, and, above all, a profound sense of the beauty of Holiness as manifested in the character of God.

Boardman, Samuel Lane. Born in Bloomfield, (now Skowhegan), March 30, 1836. Assistant editor Country Gentleman, Albany, N. Y., 1859; editor Maine Farmer, Augusta, 1861 to 1878;

editor American Cultivater, Boston, 1878; editor and publisher The Home Farm, Augusta, 1880–'88; agricultural editor Kennebec Journal, 1889–'92; Secretary Maine State Agricultural Society, 1855–'74; Member of Maine Board of Agriculture, 1872–'74; Secretary Maine Board of Agriculture and Trustee Maine State College of Agriculture and the Mechanic Arts, 1874–'79; Secretary Maine State Pomological Society, 1885–'86; Member Board of Managers Maine Experiment Station, 1885–'87; Member of various agricultural, historical and scientific societies.

1. Agricultural Survey of Somerset County, Maine. Augusta, 1860, 8vo., pp. 75.
2. The Agriculture and Industry of Kennebec County, Maine. With notes upon its History and Natural History. Augusta, 1867, 8vo., pp. 200.
3. Maine State Agricultural Society: Report of the Exhibition at Portland, Oct. 6-9, 1868. Augusta, 1869, 8vo., pp. 16.
   Contains history of the Society from 1855 to 1868.
4. Power and Influence of the Agricultural Press. A Lecture before the Maine Board of Agriculture at Skowhegan, Oct. 9, 1872. Augusta, 1873, 8vo., pp. 15.
5. Something about Foods. A Lecture before the Board of Agriculture at Etna, Dec. 29, 1874. Augusta, 1875, 8vo., pp. 19.
6. Maine Cattle. Some Materials towards a History of the Cattle of Maine; with Facts Concerning Early Breeders, and Notices of the Thoroughbred Herds at Present kept in the State. Augusta, 1875, 8vo., pp. 48.
7. The Menhaden and Herring Fisheries of Maine as Sources of Fertilization. Augusta, 1875, 8vo., pp. 67. [With one plate.]
   Mr. G. Brown Goode, in his "Natural and Economical History of the American Menhaden," published in the Report of the United States Commissioner of Fish and Fisheries for 1877, says: "From Mr. Boardman's work I have derived much information and quoted freely. * * The account of the agricultural uses of fish is the most complete which has yet been published."
8. A General Index to the Principal Articles and Leading Subjects in the Volumes on the Agriculture of Maine, from 1850 to 1875. Augusta, 1876, 8vo., pp. 24.
9. Some Notes on the History, Varieties and Statistics of Indian Corn. Augusta, 1877, 8vo., pp. 23. [With one plate.]
10. The Laws of Maine relating to Agriculture, or of Special Interest to Farmers. [Editor of.] Augusta, 1878, 8vo., pp. 78.
11. The Development of our Agriculture as a means for The Improvement of Business. A Lecture before the Farmers' Convention at Warren, Feb. 19, 1878. Augusta, 1878, 8vo., pp. 21.

12. The Climate, Soil, Physical Resources and Agricultural Capabilities of the State of Maine; with Special Reference to the Occupation of Its New Lands. Washington, D. C., 1884, 8vo., pp. 60. [Miscellaneous Reports of the Department of Agriculture, No. 4.]
13. The Agriculture of Maine. Introduction to the Atlas of the State of Maine, Houlton, 1884. [The equivalent of twelve 8vo. pages.]
14. The Tidal Lands and Diked Marshes of Nova Scotia and New Brunswick. Washington, D. C., 1885. 8 vo., pp. 31, Illustrated. Forming, chapter vii, pages 33-61, of "Tide Marshes of the United States." Being Miscellaneous Reports of the Department of Agriculture, No. 7.
15. History of the Agriculture of Kennebec County, Maine. New York, 1892. Large octavo, pp. 40. [With one plate.] Being a reprint of chapter viii of the "Illustrated History of Kennebec County."
16. Editor of Agriculture of Maine, 1873-79, 6 vols.
17. Editor of Pomolgy of Maine, 1885-86, 2 vols.
18. Some outlines of the Agriculture of Maine. Report of the Commissioner of Agriculture, Washington, D. C., 1862, page 39-59.
19. The Horse at Agricultural Exhibitions. Report Maine Board of Agriculture, 1876, page 120-132.
20. Historical Sketch of the State College. Report Maine Board of Agriculture, 1876, page 208-220.
21. An Apple: How to Pick It and What to Do with It. Transactions Maine State Pomological Society, 1885, page 105-115.
22. Memoir of Hon. Robert Hallowell, Gardiner. Transactions Maine State Pomological Society, 1886, page 27-34. [With portrait.]
23. Trees and their Uses in Rural Embelishment. Transactions Maine State Pomological Society, 1887, page 51-59.

Brackett, George E. Born in Belfast, January 28, 1838. Member of the State Board of Agriculture from 1869 to 1879, and from 1881 to 1883; register of deeds, Waldo county, five years; assistant secretary, Maine senate, 1880; secretary Grand Lodge of Maine Good Templars for a period of twenty years; secretary of Waldo County Trotting Horse Breeders' Association, 1890-1891; trustee State Agricultural Society; assistant editor of Maine Farmer, 1860. Address, Belfast.

1. Farm Talk: A Series of Articles in the Colloquical Style, illustrating various common Farm Topics. Boston, 1868, 16 mo., pp. 130.
2. Farm Talk: A Series of Papers Written in Colloquial Style, illustrating various Farming Subjects. [With portrait of the author.] Belfast, 1881, 16 mo., pp. 144.
3. Practical Entomology. Report Maine Board of Agriculture, 1860, Abstract, page 151-167. [With one plate.]

4. Parasitic Insects Injurious to Farm Stock. Report Maine Board of Agriculture, 1871, page 116-123.
5. On the Keeping of Fruit. Transactions Maine State Pomological Society, 1873, page 117-119.
6. Associated Dairying in Maine. Report Maine Board of Agriculture 1874, page 37-43.
7. Associated Dairying in Maine. Report Maine Board of Agriculture, 1875, page 84-93.
8. Commercial Failures—and After. Report Maine Board of Agriculture, 1875, page 158-160.
9. Beet Sugar. Report Maine Board of Agriculture, 1876, page 80-84.
10. Muck, Its Value and Use. Report Maine Board of Agriculture, 1878, page 129-133.

Cole, Samuel W. Born in Cornish, in 1796. When about twenty years of age he left Maine and taught school for two years in New Jersey and Pennsylvania. Soon after his return he published the "Columbian Spelling Book," and a collection of poems entitled "The Muse." On January 5, 1835, he published at Cornish the first number of the Yankee Farmer, an eight page paper, "Devoted to Farming and Gardening, Rural and Domestic Economy, Arts, Trades &c." The size of the page was 8x9 1 2 inches, three columns to the page. It was issued semi-weekly. The building in which this paper was printed, and in which was also Mr. Cole's book-bindery, is now standing—or was a few years since—on the farm of the late Gowen Wilson Guptill, some two and a half or three miles from Cornish village. Here Mr. Cole had his seed gardens and experimental orchard. At the end of its first volume the paper was moved to Portland, and published in connection with a seed store and agricultural warehouse. Its publication was discontinued in 1838. In 1839 Mr. Cole moved to Boston and was connected editorially with different papers. He appears to have begun his editorial work on the New England Farmer, Saturday, December 9, 1848, with the first number of a "new series," which is called, Vol. 1, No. 1. In his opening editorial Mr. Cole says: "We recently offered a valedictory in another journal, and we are now happy in greeting the agricultural community under circumstances so auspicious, in a new and more acceptable manner." Mr. Cole continued editor of the New England Farmer till his death which occured at his home in Chelsea, Mass., December 3, 1851. I regret that so little is known regarding the personality of this noble man, and his good work as an agricultural editor and writer. But repeated letters written for the purpose of obtaining facts of this kind, fail to reach their destination or to receive attention. Mr. A. W. Cheever, editor of the New England Farmer, writes me under date of Nov. 23, 1892: "Mr. Cole was a devoted admirer of Nature and among his last words were these: 'Lay me in some quiet nook, under some shrub or tree and I shall repose in peace.' I find the above in the December 20, 1851, number of the New England Farmer."

1. The American Veterinarian, or Diseases of Domestic Animals, showing the Causes, Symptoms and Remedies; and Rules for Restoring and Preserving Health by Good Management; with Directions for Training and Breeding, Boston, 1847, 16 mo, pp. 288.

Upon the title page of this volume the author is said to be: "Editor Agricultural Department Boston Cultivater, formerly editor Yankee Farmer and Farmer's Journal." Many editions of this work have been published—how many I cannot say. The preface to the edition dated: "New England Farmer Office, Quincy Hall, Boston, 1850," says "Fourteenth Edition or Thirtieth Thousand." It is a work that now finds a large yearly sale.

2. The American Fruit-Book: containing Directions for Raising, Propagating and Managing Fruit Trees, Shrubs and Plants, with a Description of the Best Varieties of Fruit, including New and Valuable Kinds, Embellished and Illustrated with numerous engravings of Fruits, Trees, Insects, Grafting, Budding, Training, &c., &c. Boston, 1849, 16 mo., pp. 288.

Upon the title page of this volume the author is said to be: "Editor of the New England Farmer, late editor of the Boston Cultivator, author of the American Veterinarian, and formerly editor of the Yankee Farmer, and Farmer's Journal." Acknowledgements are made by the author for aid received in its preparation from Stephen L. Goodale, Saco; Dr. E. Holmes, Winthrop; Henry Little, Bangor, and D. Taber, Vassalboro. Many editions of this work have been published.

Mr. Cole was one of the founders of our agricultural literature, and deserves to be held in honorable and grateful recognition for his intelligent labors in promoting early agricultural journalism in Maine—that great agency for the education of farmers.

Emerson, George B. Born at Wells, September 12, 1797. A teacher for forty years, and one of the foremost lecturers in the sciences which our country has produced. Said to have been more familiar with the agricultural and botanical products of New England than any other man. Harvard University conferred upon him the degree of LL.D., in 1859. Died, March 4, 1881. [Portrait: Maine Historical and Geneological Recorder, October, 1889; Vol. vi, No. 4.]

1. A Report on the Trees and Shrubs growing Naturally in the Forests of Massachusetts. Originally published agreeably to an order of the Legislature by the Commissioners on the Zoological and Botanical Survey of the State. Second Edition. In two volumes. Boston, 1875, 8 vo. pp. 624. [With one hundred and fifty-three plates.]

The first edition of the above work was published by the State of Massachusetts in 1846.

"One of the last labors of Mr. Emerson's life was to carefully revise the whole work, sparing no expense to have its information complete down to that time, and its illustrations such as should reflect honor upon his country. These volumes, for exactness of knowledge, thoroughness of detail, artistic skill and consummate genius in the illustrative drawings, with a perfect adaptation to the purpose for which the work was prepared, render it a fitting monument to the memory of the writer." Memoir by R. C. Watterson.

EMERY, FRANK EDWIN. Born in Fairfield, May 31, 1855, and graduated at Maine State College, class of 1883. Assistant in Experimental Department, Houghton Farm, Mountainville, N. Y., 1884–'86; Superintendent Houghton Farm, 1886; Superintendent Maplecroft Stock Farm, Powling, N. Y., 1887; Farm Superintendent New York State Experiment Station, Geneva, 1888–'90; Agriculturist to North Carolina Experiment Station, since 1890. Address: Raleigh, N. C.

1. Report as Farm Superintendent. New York Agricultural Experiment Station, 1888, page 316-403. [With two plates.]

Contains: Soil and rotation of crops; forage crops; silos and silage; fertilizer experiments on grass; grass experiments on small plats; fertilizer experiments on grass; fertilizer experiments on corn.

2. Report of Farm Superintendent. New York Agricultural Experiment Station, 1889, page 215-297. [With two plates.]

Contains: Grass plats and forage crops; potato experiments; experiments with corn; nitrogen test plats; warming water for milch cows.

3. Report of Farm Superintendent. New York Agricultural Experiment Station, 1890, page 352-471.

Contains: Experiments with grasses and forage crops; on wheat; report on lysimeters; food of dairy animals; meteorology.

4. Silos and Ensilage. Bulletin North Carolina Experiment Station, No. 80.

5. Cotton Seed Hulls and Meal for Production of Beef. Bulletin North Carolina Experiment Station, No. 81.

6. Comparative Field Tests for 1891 and 1892. Bulletin North Carolina Experiment Station, No. 89.
7. Experiments with oats, corn, potatoes, sorghum and grass. Bulletin New York Agricultural Experiment Station, New Series, No. 13, September, 1888, 8vo. page 59-73.
8. Comparative Test of Cows; Loss in Keeping Manure. Bulletin New York Agricultural Experiment Station, New Series, No. 23, September, 1890, 8vo., pp. 297-325.

Mr. Emery is also author of the following articles as "Press Bulletins of the North Carolina Experiment Station," viz: No. 12, cost of feeding working teams; No. 14, rear calves only from the best cows; No. 21, peavine manuring for wheat; No. 22, tile-draining farm lands; No. 25, will stock fatten faster loose or tied up; No. 26, cost of feed in working farm teams; No. 29, a test of cows in one dairy; No. 32, cheese-making; No. 38, marketing stock for beef; special co-operative creameries. In addition to the above, twelve other "press bulletins" upon more general subjects are from Prof. Emery's hand. In connection with Prof. Kilgore, assistant chemist to the North Carolina station, Prof. Emery has prepared Technical Bulletins of the station, Nos. 80c, and 87d; has delivered many addresses at farmers' conventions in New York and North Carolina, and coniributed largely to American agricultural journals.

FERNALD, MERRITT C. Born in South Levant, May 26, 1838; and graduated at Bowdoin College, 1861. Principal of Gould's Academy, 1863-'4; Houlton Academy, 1865-'6; Foxcroft Academy, 1866-'8. Professor of Mathematics and Physics, Maine State College, 1868-'79; acting President Maine State College, 1868-'71; President Maine State College from March, 1879. During his college presidency Dr. Fernald held the chair of Physics and Mental and Moral Philosophy, 1879 to 1891, and since 1891 that of Mental and Moral Philosophy. Received from Bowdoin College in 1861 the degree of A. B.; in 1864 that of A. M. and in 1881 that of Ph. D. Address: Orono.

1. Table of Azimuths for the Latitude of Maine, from 1868 to 1900 [See Barker's Report on the Variation of the Magnetic Needle, 1868.]
2. Register of Meteorological Observations, taken at Orono, Lat. 44 degrees, 53 minutes, 10 seconds; Long. 8 degrees, 24 minutes, 3 seconds E of Washington, Elevation above the Sea 134 feet. From 1869 to 1892. [See Reports of Maine State College.]
3. Meteorological Reports of Maine Experiment Station, 1889-'92.
4. The Distribution of Rains. Agriculture of Maine, 1870, page 126-142.
5. On Plant Growth. Agriculture of Maine, 1871, page 40-56.
6. Protection from Lightning. Agriculture of Maine, 1872, page 38-58.
7. Agriculture compared with other Industries. Agriculture of Maine, 1873, page 331-351.

8. Education and Labor. Agriculture of Maine, 1875, page 72-84.
9. Taxation. Agriculture of Maine, 1876, page 48-70.
10. The Margin of Profit in Farming and Farm Crops. Agriculture of Maine, 1877, page 114-131.
11. Lightning and the Means of Averting Its Destructive effects. Report Maine Board of Agriculture, 1872, page 38-57

FERNALD, CHARLES H. Born in Mt. Desert, March 16, 1838. Fitted for college at Maine Wesleyan Seminary, but entered the Navy in August, 1862, where he remained till the close of the Rebellion having reached the rank of Ensign, when he resigned and came to Maine, July, 1865. Principal of Litchfield Academy; of Houlton Academy 1866–'71; professor of Natural History, Maine State College, 1871--'86. Was with the United States Fish Commission at Eastport in the summer of 1872; at the Agassiz School at Penekese, summer of 1873, and at Museum of Comparative Zoology, Cambridge, Mass., during several summer vacations. Travelled in Europe and studied in the Continental Museums in the winter of 1878--'9 and summer of 1890. Since 1887 professor of Zoology, Massachusetts Agricultnral College; and from August 1891 to January, 1892, acting President of the same. Entomological Adviser to the Massachusetts Gypsy Moth Commission. Received degree of A. M., from Bowdoin College, 1865, and Ph. D. from Maine State College, 1885. In addition to his works enumerated below, Prof. Fernald has written a large number of articles upon entomological subjects which have been published in the North American Entomologist; Canadian Entomologist; Psyche; American Naturalist; Bulletin of the Brooklyn Entomological Club; Papilio; Entomologica Americana; Transactions of the American Entomological Society, Philadelphia; Entomologist, London; Entomologist's Monthly Magazine, London; Transactions of the Entomological Society, London and other publications. In recognition of his contributions to science, Prof. Fernald had a genus of insects named for him, *Fernaldia*, by Prof. A. R. Grote, *F. anatomella*; one of the small moths, *Agrotis fernaldi* by Morrison; *Conchylis fernaldana* by Lord Walsingham; *Setiostoma fernaldella* by Prof. Riley; *Nephopteryx fernaldi* by Mons. Ragonot of Paris; *Melitara fernadalis* by Dr. Hulst; *Acallis fernaldi* by Mons. Ragonot; *Teras fernaldi* by Prof. Butler of the British Museum. Several other insects have also been named for Prof. Fernald. Address: Amherst, Mass.

1. Tuberculosis. Hatch Experiment Station, Massachusetts Agricultural College, Bulletin No 3, 1889, 8 vo., pp. 20.
2. A Dangerous Insect Pest in Medford. Hatch Experiment Station, Massachusetts Agricultural College, Special Bulletin, November, 1889, 8 vo. pp. 8.
First description of the Gypsy Moth in this country.
3. Report on Insects. Hatch Experiment Station, Massachusetts Agricultural College, Bulletin No. 19, May, 1892. [With one colored plate, one map and four full page plates.]
Describes gypsy moth; Paris green on tent caterpillars; cranberry insects; vine worm; fruit worm.
4. Tuberculosis, with Special Reference to the Disease as seen in Cattle and other Domesticated Animals. Report Massachusetts Agricultural College, 1892, page 81-100.
5. Report on Insects. Hatch Experiment Station, Massachusetts Agricultural College, Bulletin No. 20, pp. 16.
Describes Canker worms; Apple-tree tent caterpillars; Fall Webworm; Tussock moths.
6. The Grasses of Maine. Designed for the Use of Students of the Maine State College and the Farmers of the State. Augusta, 1885, 8 vo., pp. 70. [With forty-two full page plates.]
Also, Maine Board of Agriculture, 1884, page 194.
7. The Butterflies of Maine. Described for the Use of Students of the Maine State College, and the Farmers of the State. Augusta, 1884, 8 vo., pp. 104. Illustrated.
8. On Some of our Injurious Insects. Augusta, 1877, 8 vo., pp. 14. One plate. [Also Maine Board of Agriculture, 1877, p. 56-69.]
Describes the Wheat midge and Oyster-shell bark louse.
9. A Synonymical Catalogue of the Described Tortricidæ of North America north of Mexico. Philadelphia, 1882, 8vo., pp. 72.
Reprinted from Transactions of American Entomological Society, May, 1882.
10. The Sphingidæ of New England. Augusta, 1886, 8vo., pp. 87. [With six full page plates.]
11. Moths. [Heterocera.] In Standard Natural History, Boston, 1884. Vol. II, page 435-469. [With one full page plate and thirty-nine illustrations.]
12. Natural History of the Potato-Rot Fungus. Maine Board of Agriculture, 1882, p. 210-213. [With one plate.]
13. Destructive Insects—Their Habits and the Means of Preventing their Depredations. Transactions Maine State Pomological Society, 1875, p. 17-31.
14. The Orthoptera of New England. Designed for the Use of the Students in the Massachusetts Agricultural College and the Farmers of the State. Boston, 1888, 8vo., pp. 61. Illustrated.

FERNALD, MERRITT LYNDON. Born in Orono, October 5, 1873. Assistant in the Herbarium and Botanical Laboratory of Harvard University, 1892. Address: Cambridge, Mass.

1. Plants of Special Interest Collected at Orono, Maine. Bulletin of the Torrey Botanical Club. New York, 1891.
2. The Portland Catalogue of Maine Plants. Second Edition. Portland, 1892, 8 vo., pp. 40–72.

GETCHELL, IRA E.

1. Tables showing the Magnetic Declination in the State of Maine from 1609 to 1880. With notes on the Variation of the Compass, the Secular, the Annual and the Diurnal Change. North Vassalboro, 1880, 12 mo, pp. 13.

GILBERT, Z. A. Born in Greene, November 4, 1832. Member of Maine Board of Agriculture, 1869--'77; President Maine State Pomological Society, 1874--'78; Trustee State College of Agriculture and the Mechanic Arts, 1880--'88; President Maine State Jersey Cattle Association, 1886--'92; State Inspector of Fertilizers, 1883--'84; President Board of Managers Maine Fertilizer Control and Agricultural Experiment Station, 1885–'87; Chairman of Council Maine State College Agricultural Experiment Station, 1888; President Board Commissioners on Contagious Diseases of Cattle, 1882 -'6; Secretary Maine Board of Agriculture, 1880--'91; Agricultural Editor Maine Farmer. Address: North Greene.

1. Editor, Agriculture of Maine, 1880-'90, 10 vols.
2. The Culture of the Potato. Report Maine Board of Agriculture, 1869, p. 425-433.
3. Plows and Plowing. Report Maine Board of Agriculture, 1870, p. 275-293.
4. The Cooking of Food for Farm Stock. Report Maine Board of Agriculture, 1871, p. 245-263.
5. Changes in Our Farming. Report Maine Board of Agriculture, 1873, p. 6-29.
6. Special Farming. Report Maine Board of Agriculture, 1873, p. 393-402.
7. Planting an Orchard. Report Maine Board of Agriculture, 1875, p. 65-71.
8. Fences and Fencing. Report Maine Board of Agriculture, 1876, p. 1-7.
9. The Compost Heap. Report Maine Board of Agriculture, 1877, p. 193-202.
10. Silos and Ensilage, Report Maine Board of Agriculture, 1880, p. 12-25.

11. Co-operative Butter Making. Report Maine Board of Agriculture, 1881, p. 8-21.
12. Principles of Fertility. Report Maine Board of Agriculture, 1882, p. 131-140.
13. Associated Dairying. Report Maine Board of Agriculture, 1883, p. 71-86.
14. The Grass Crop and What to Do with It. Report Maine Board of Agriculture, 1883, p. 13-23.
15. Machinery in Corn Growing. Report Maine Board of Agriculture, 1883, p. 115-127.
16. Comparative Profits of Butter Making and Selling Milk. Report Maine Board of Agriculture, 1883, p. 177-187.
17. The Red Russet. Transactions Maine Pomological Society, 1887, p. 89-93.
18. Practices in Private Dairying. Report Maine Board of Agriculture, 1888, p. 50-72.
19. Work of the Cream Separator. Report Maine Board of Agriculture, 1890, p. 148-153.
20. Products of the Dairy and How to Secure Them. Report Maine Board of Agriculture, 1890, p. 172-181.
21. Shrinkage in Value of Farm Real Estate. Lecture before Maine Board of Agriculture at Augusta, January 15, 1890, Augusta, 1890, 8 vo., pp. 6.

Goodale, Stephen L. Born in South Berwick, August 14, 1815. Was educated in the public schools and at Thornton Academy, Saco. Elected Secretary of the Maine Board of Agriculture in 1856, and continued in that position till 1872. Trustee Maine State College of Agriculture and the Mechanic Arts, 1870-'73. For many years general manager and chemist of the Cumberland Bone Company. Trustee of the Saco and Biddeford Savings Institution, 1847-'57; Vice President, 1857-'67; President, 1867-'87. One of the most eminent agricultural chemists in the country. Address: Saco.

1. Editor, Agriculture of Maine, 1856-'72, 17 vols.
2. The Principles of Breeding; or, Glimpses at the Physiological Laws involved in the Reproduction and Improvement of Domestic Animals. Boston, 1861, 12 mo., pp. 164.

One of the earliest treatises published on this subject, which has received high praise from the agriculturists of the whole country and is today regarded as a standard work.

3. Dairy Husbandry. Report Maine Board of Agriculture, 1858, p. 57-124.
4. The Grasses of Maine. Report Maine Board of Agriculture, 1859, p. 61-152.

5. Principles of Breeding Domestic Animals. Report Maine Board of Agriculture, 1860, p. 57-142.
6. On the Manufacture of Cheese as an article of Export, by means of Associated Dairies. 1863, p. 111-132.
7. Fruit Culture. Report Maine Board of Agriculture, 1863, p. 133-267. [The Apple and Pear.]

A careful and elaborate general treatise on this subject, and one of permanent value.

8. Fruit Culture. Report Maine Board of Agriculture, 1864, p. 136-167. [The Plum, Cherry, Grape and Currant.]
9. On the Beet Root as a Source of Sugar. Report Maine Board of Agriculture, 1864, p. 168-171.
10. Influence of the Forest on Climate. Report Maine Board of Agriculture, 1868, p. 71-103.
11. The Rinderpest or Cattle Plague. Report Maine Board of Agriculture, 1868, p. 104-119.
12. On the Cultivation of the Hop. Report Maine Board of Agriculture, 1866, p. 54-80.
13. Structure, Functions and Diseases of the Udder of the Cow. Report Maine Board of Agriculture, 1866, p. 184-198.
14. On the Chemistry of Manures. Report Maine Board of Agriculture, 1867, p. 83-113.
15. Wheat Culture in Maine. Report Maine Board of Agriculture, 1868, p. 121-159.
16. On Some Points in Potato Culture. Report Maine Board of Agriculture, 1868, p. 160-180.
17. Rinderpest. Report Maine Board of Agriculture, 1868, page 181-235.
18. Valuation of Manures. Report Maine Board of Agriculture, 1869, p. 360-381.
19. Foot and Mouth Disease in Cattle. Report Maine Board of Agriculture, 1870, p. 431-440.
20. The Changes in Farming which have taken place, and which should be made. Report Maine Board of Agriculture, 1872, p. 334-354.
21. Shall the State of Maine grow her own Fruit Trees, or buy them from Other States. Transactions Maine State Pomological Society, 1873, p. 49-56.

GOODALE, GEORGE LINCOLN. Born in Saco, August 3, 1839. During his preparation for college, he served as apprentice in an apothecary store, his grandfather's business, and acquired a good knowledge of the pharmacy of that day. He entered Amherst College in 1856, and graduated in 1860 in the class with Prof. Estey and President Francis A. Walker. After graduation, he remained for a year connected with the college as assistant in chemistry and botany. His teacher in the latter department was the late Prof. Tuckerman. In Tuckerman's Catalogue of the Plants of

Amherst and Vicinity the author refers to the excursions made with Mr. Goodale during the years from 1856 to 1861. Among the other teachers then in Amherst College who exerted a marked influence upon the tastes and work of Mr. Goodale should be mentioned the late President Edward Hitchcock and his son Charles, now of Dartmouth, Prof. C. U. Shepard, the mineralogist, President Seelye, and the venerable Prof. William S. Tyler. Being a rapid short-hand writer, he was at one period in his college course amanuensis to the late President William A. Stearns, with whom to the very last he maintained close relations. In his senior year he began the study of medicine with the well-known and beloved physician, Dr. A. Smith, of Amherst, but toward the end of 1861 joined the Portland School for Medical Instruction as a pupil, attending courses of medical lectures in the Medical School of Maine and at Harvard. He received his medical degree at Harvard University in 1863, reading at graduation, a thesis on *Anthrax maligna.* Later in the same year he was given the same degree by Bowdoin College. From this date until 1865 he practiced medicine in Portland, served as City Physician, and gave lectures in the medical school on anatomy, and afterward on surgery and materia medica. During the winter of that year he attended as private pupil, in New York, the special classes of Dr. Frank Hamilton, Austin Flint the elder, and Dr. Shrady; but in February of 1866 his health was so much impaired that he relinquished practice and study, and went by the way of Panama to California. After having executed certain commissions in the inspection of mining property, he visited the principal points of botanical interest in the State, ascending Mount Shasta with a party in August. In the following year Dr. Goodale visited Europe with his life-long friend, Prof. Brackett, formerly of Bowdoin College, and now of Princeton University. He accepted, in 1868, an instructorship in Bowdoin College and the Medical School of Maine. His connection with those two institutions lasted until 1871, during which period he held the chair of Materia Medica in the Medical School, and of Applied Chemistry and Natural Science in the college. At the invitation of Prof. Asa Gray, he became assistant in botany in the Summer School of 1871, and later in that year was appointed university lecturer in Harvard. In 1872 he was promoted to the Assistant Professorship of Vegetable Physiology, and in 1877 to the Professorship of Botany. On the death of his teacher, the late Asa Gray, he was appointed to the vacant Fisher Professorship of Natural History. Many of his vacations have been passed in Europe in the study of economic and physiological botany, the vacation year of 1881-1882 in the laboratory of Pfeffer, in Tübingen, and in Paris. In addition to the degrees already mentioned, Prof. Goodale has received that of Master of Arts from Bowdoin and from Amherst; from the latter also that of Doctor of Laws. Among the societies to which he belongs may be mentioned: Phi Beta Kappa, of Amherst; American Society of Naturalists (of which he has been president;) American Physiological Society; Society of American Anatomists; the German Botanical Society; the Academies of Philadelphia and of New York; the American Academy of Arts and Sciences; and the National Academy, Washington. He was President of the American Association for the Advancement of Science in 1891. Prof. Goodale's contributions to science have been chiefly physiological and botanical. In addition to these publications, reference may be made to his work as associate editor of the American Journal of Science, and to his three series of lectures before the Lowell Institute in Boston. One of these courses, that on forest trees and forestry, is especially valuable to all having the care of woodlands or forest trees, and to farmers generally. Reference is made to a few of his published treatises of more direct economic value to farmers. [Portrait: Popular Science Monthly, September, 1891.] Address: Cambridge, Mass.

1. Prize Essay on Underdraining and Deep Tillage. Report Maine Board of Agriculture, 1860. Part II, p. 122-138.
2. Botanical Report on Maine Plants. Preliminary Report upon the Natural History and Geology of Maine. Report Maine Board of Agriculture, 1861, p. 125-129.
3. Botanical Notes on the New Lands of Maine. Report Maine Board of Agriculture, 1861, p. 361-372.
4. Mineral Waters of Maine. Report Maine Board of Agriculture, 1861. p. 443-456.
5. The Vegetation of Aroostook County. Report Maine Board of Agriculture, 1862, p. 120-128. [With a map.]
6. On the diseases of Plants. Report Maine Board of Agriculture, 1869, p. 129-149.
7. Some of the Conditions of Successful Experimenting. Report Maine Board of Agriculture, 1869, p. 310-325.
8. Analytical Researches on the Food of Cows. Report Maine Board of Agriculture, 1871, p. 96-104.
9. American Wild Flowers. Fifty-one beautiful colored plates. Boston, Mass., 1892, 4 to.

10. Several editions of the works of Dr. Asa Gray, on American botany, with revisions and additions.

HAMLIN, CHARLES EDWARD. Born in Augusta February 4, 1825. He graduated at Waterville College (now Colby University) class of 1847, and received the degree of A. M. in 1850. The University of Lewisburg in 1873, conferred the degree of LL. D. He was Professor of Chemistry and Natural History at Colby University, 1853--1873 ; Member of the Maine Board of Agriculture in 1870--'71 ; was elected a Member of the Board of Trustees of Colby University in 1880 ; Fellow of the American Academy, 1876 ; Curator of Conchology and Palæontology, Museum Comparative Zoology, from 1873, and Instructor in Geography and Geology, Harvard University, 1875--1877. He died at Cambridge, Mass., January 3, 1886.

1. Birds of Kennebec County. Report Maine Board of Agriculture, 1865, p. 168-173.
2. Observations upon the Physical Geography and Geology of Mount Ktaadn and the Adjacent District. Bulletin of the Museum of Comparative Zoology of Harvard College, No. v of vol. vii, pp. 189-223. [With one folded heliotype, and one map.]

In this work Prof. Hamlin describes the geological features of the surrounding region, the lakes in the vicinity, a Kame at Gordon's Landing, the granite area, reaching the conclusion that the country south of Ktaadn is part of the great region of stratified rocks which surround it on all sides. Incidentally mentions the geological features of Kennebec valley.

Prof. Hamlin's beautiful character and worthy life find fitting eulogy in the Memorial discourse delivered in the chapel of Colby University, July 5, 1887, by Rev. Francis W. Bakeman, D. D. [Portland, 1887, 8 vo. pp. 32.] "Sincere, modest, kind; pure in thought and expression; charitable in judgment, loyal to his convictions, yet human and reasonable; full of most generous sentiment and winning in his friendliness, he was as near the perfect Christian gentleman as we may hope to see in an imperfect world."

HARVEY, FRANCIS LEROY. Born April 22nd, 1850, near Ithaca, Thompkins Co., New York. Early education in public schools of Ithaca. Moved with parents to Iowa in 1865. Taught fourteen terms in the public schools of Iowa between 1867 and 1874. Entered the Iowa Agricultural College in 1868. Graduated in 1872, degree B. Sc. Student Assistant in Chemistry for two and a half years. Curator in Entomology for Natural History Society of Alma Mater three years, and President two years. Took post-graduate in Botany at Alma Mater 1874, Harvard Summer Course in Mineralogy and Geology 1877. Principal Graded Schools in Iowa 1873. Chair of Natural Sciences, Humboldt College, Iowa, 1874. From 1875-'81

Chair of Theoretical and Applied Chemistry in the Arkansas Industrial University. From 1881–'5 Chair Biology, Mineralogy and Geology, same institution. In 1886 in charge of Dr. A. E. Foote's Natural History and Mineral Establishment in Philadelphia, Pa. From 1887 to date chair Natural History, Maine State College. From 1888 to date, also Botanist and Entomologist to the Maine Agricultural Experiment Station. Received the degree of Ph. D. in 1890 from Arkansas Indus'rial University. Thesis for degree "The Apple Maggot—*Trypeta pomonella*, Walsh" Corresponding member Academy Natural Sciences, Philadelphia, Pa.; Corresponding member Portland Society Natural History; Corresponding member Torrey Botanical Club, New York; Corresponding member Washington Entomological Society, and active member American Association of Economic Botanists and Entomologists. Address: Orono.

1. First Report as Botanist and Entomologist to the Maine Experiment Station. Report Maine Experiment Station, 1888, p. 136-195.
2. Second Report, 1889. Report Maine Experiment Station, 188, p. 148-254. Contains: Life History of the Apple Maggot, p. 190-237. [With three plates.]
3. Third Report, 1890. Report Maine Experiment Station, 1890, p. 105-139. Fourth Report, 1891. Report Maine Experiment Station, 1891, p. 175-207.
4. Preservation of Our Forests. A Paper read at the Maine Forestry Convention at Bangor, December 18, 1888. 12mo. pp. 8. [See also First Annual Report of Maine Forest Commissioner. Augusta, 1891, p. 29-41.]
5. Some Fungous Diseases of Fruits. Transactions Maine State Pomological Society, 1889, p. 88-107. [With one plate.]
6. What and How Much Science Teaching in Common Schools. Thirty-Fourth Report State Superintendent of Common Schools of Maine, 1887, p. 145-153.

Has contributed many agricultural, botanical and zoological articles to public journals and periodicals.

"One of the best pieces of work which has been done by the experiment station entomologists in the past year has been performed by Prof. Harvey in his studies upon the apple maggot. He has outlined a careful investigation and carried it through successfully, and has presented his results in a straightforward, scientific and readable way. He gives for the first time accurate observations upon the eggs, careful studies of the reproductive system, observations upon the act of oviposition, and a list of sixty-six varieties of apples infested by the maggot, with comparative statements as to damage. His summary of the life history is very careful, and his consideration of the remedies includes an account of the useless methods, the preventive measures, and the direct methods, He follows with some critical remarks upon the anatomy of Trypete, and a summary of the previous writings upon this insect, correcting the numerous errors which have occurred in print. He rightly claims for himself the credit of recording for the first time, *a*, the discovery and history of the eggs; *b*, that the larva becomes full grown in from four to six weeks; *c*, that the flies are on the wing larger than before recorded, that the later races of flies affect the later fruit."—Prof. C. V. Riley, in Insect Life, Vol. III, p. 253-254; March, 1891.

HAYES, JOHN LORD. Born in South Berwick, April 13, 1812. Graduated at Dartmouth College, 1831. From 1865 to his death, a period of twenty-two years, Secretary of the National Association of Wool Manufacturers; Judge at the Centennial Exhibition, 1876, on Wool and woolen fabrics, and Silk and silk fabrics; received the degree of LL. D. from Dartmouth College in 1878; appointed President of the Tariff Commission by President Arthur in 1882 Died at his home in Cambridge, Mass., April 18, 1887. Mr. Hayes was a voluminous writer on subjects pertaining to the wool industry and related questions. He edited eighteen annual volumes of the quarterly "Bulletin," published by the Wool Manufacturers' Association, which is an authority, the woild over, on matters pertaining to sheep husbandry, the wool industry and legislation affecting it. A memoir of Mr. Hayes, and tributes to his memory and character appear in the "Bulletin," Vol. 17, p. 98–115, which contains a portrait of Mr. Hayes as a frontispiece. A biblography of his writings will be found in the "Bulletin," Vol. 17, p. 101–104, extending to fifty-eight titles. A few of the more important of these are given below:

1. The Angora Goat. Its Origin, Culture and Products, Boston, 1868, 8vo., pp. 38.
2. Address before the National Association of Wool Manufacturers, at the First Annual Meeting in Philadelphia, September 6, 1865. Cambridge, 1865, 8vo., pp. 80.
3. Report upon Wool and Manufactures of Wool at the Paris Universal Exposition, 1867, Washington, 1868, 8vo., pp. 143.
4. The Wool Industry in our National Economy. Report Maine Board of Agriculture, 1876, p. 179-207.
5. The Awards and Claims of Exhibitors at the International Exhibition at Philadelphia, 1876, in the Departments of Textile Materials, Fabrics and Machinery, Boston, 1877, 8vo., pp. 631.

This volume contains Mr. Hayes' remarkable reports on wool and woolen fabrics, and on silk and silk fabrics, p. 277-458.

6. Wool Production and Sheep Husbandry. Report Maine Board of Agriculture, 1877, p. 132-156.

An address delivered before the Maine Board of Agriculture at Newport, February 22, 1877; full of interesting personal and auto-biographical reminiscences, and equally so of the most valuable and important matters on sheep husbandry for Maine farmers to consider. They are as applicable to our conditions now as when first spoken.

7. Sheep Husbandry in the South. Boston, 1878, 8vo., pp. 108.
8. The Resources of the United States for Sheep Husbandry and the Wool Manufacture. Boston, 1878, 8vo., pp. 43.

"In his paper on sheep culture, on wool as an article of commerce, and on its manufacture, he has manifested not only his thorough knowledge of the business and his accuracy in statistics and details, but, equally, a literary taste and ability, a purity of style and an elegance of diction, which, employed on themes of a less technical and limited interest, would have won for him commanding reputation as a master of English composition."—Dr. Andrew P. Peabody, Wool Manufacturers' Bulletin, Vol. 17, p. 96.

"But John L. Hayes' great work in life, that for which his memory will for many years be most honored, is his able, consistent, intense and thoroughly patriotic advocacy of the policy of protection to home industry. In the earnestness and zeal with which he advocated this policy, he had no superiors; in the fulness of his knowledge of his subject, he had few equals. The wool tariff of 1877, which gave such general satisf.ction, and assisted so greatly to develop both our wool growing and wool manufacturing industries, was chiefly the work of his skilful hand, and its enactment into a law was chiefly due to his personal influence with leading members of both branches of Congress."—James M. Swank, Editor Bulletin of the Iron and Steel Manufacturers' Association, April 20, 1877.

"In all the relations of domestic and social life, Mr. Hayes has been true, faithful and kind, loving and tenderly beloved, incapable of enmity or ill-will, deeming it his happiness to make others happy, and filling a large and unspeakably dear place in the affection of very many beyond the inner circle of family and kindred."—Dr. Andrew P. Peabody.

HOLMES, EZEKIEL. Born in Kingston, Mass., August 24, 1801. Graduated from Brown University in 1821, and from the Maine Medical School in 1824. His health being inadequate to the hard service of a country physician's life, he became a teacher for the next five years in the Gardiner Lyceum. In 1828 he edited for a single year the New England Farmers' and Mechanics' Journal. He was professor of natural science in Waterville College from 1833 to 1837. From its establishment, in 1833, Doctor Holmes ably edited the Maine Farmer until his death—a period of thirty-two years. Before 1840 he advocated the establishment of a Board of Agriculture, which was finally done in 1852, he being its first secretary and holding that position for three years. A State Agricultural Society was also incorporated by the legislature in 1855, largely through the efforts of Doctor Holmes, who drafted its constitution and was its secretery until his death. In 1838 he made a survey of Aroostook county for the State Board of Internal Improvement; and in 1861--2 was chief and naturalist of the scientific survey of Maine, authorized by the Legislature. These leading dates in the active and useful life of Doctor Holmes give but a very imperfect idea of the great work he accomplished for the agriculture of Maine—the influence of which is still potent and fruitful. As editor of the Maine Farmer for more than thirty years, the work of Doctor Holmes was such that had he done nothing more for Maine agriculture his memory would forever be held in grateful remembrance. Doctor Holmes was the first person in Maine to introduce Shorthorns into the state; the first Southdown and Cotswold sheep, and the first of the Jersey breed of cattle. The last public act of his life was that of securing from the Legislature in February, 1865—but a week before his death—an act which established the State College of Agriculture and the Mechanic Arts as a separate and independent institution. The natural history cabinet in this college is named the "Holmes Museum" in his honor. He died at his home in Winthrop, February 9, 1865. [Portrait: Frontispiece to Agriculture of Maine, 1865.]

1. Culture of Hemp. Report of a Committee of the Legislature. Maine Documents, [Council], 1829, p. 479-486.

2. Annual Report of the Corresponding Secretary of the Kennebec County Agricultural Society, for 1834, pp. 11. [Maine Documents, 1835.]

3. Editor of Transactions of the Agricultural Societies of Maine, 1850-55, 4 vols.

4. The Northern Shepherd, being a Report of a Committee of the Kennebec County Agricultural Society upon the Diseases and Management ot Sheep. Winthrop, 1835, 12mo, pp. 132.

The first distinctively original treatise on agriculture printed in Maine. A rare volume.

5. Report of an Exploration and Survey of the Territory of the Aroostook River, during the Spring and Autumn of 1838. Augusta, 1839, 8vo, pp. 80.

6. Birds Injurious to Agriculture. Agricultural Report of the Commissioner of Patents. Washington, 1857, p. 110-160. [With thirty-two plates.]

7. Introductory Report as Naturalist to the Scientific Survey of Maine. Preliminary Report upon the Natural History and Geology of Maine. Report Maine Board of Agriculture, 1861, p. 97-124. [Contains notes on the physical geography of Maine, and List of Birds ot Maine.]

8. On the Fishes of Maine, including some of the Elementary Principles of Ichthyology. Report Maine Board of Agriculture, 1862, p. 9-117.

9. Notes on the Geology of a Portion of Aroostook County. Report Maine Board of Agriculture, 1862, p. 359-376.

10. Aquæculture. Report Maine Board of Agriculture, 1864, p. 99-135.

11. Numerous agricultural, scientific and literary addresses and lectures published in pamphlet form from 1830 to 1865.

For biographical sketch of Doctor Holmes see Agriculture of Maine, 1865, p. 205-226.

"Dr. Holmes was unwearied in his efforts to promote the public interests of the State. Everything pertaining to its natural resources—from the humblest plant to the giant tree of the forest, from the soil to the mountain, from the bottom of the small stream to that of the neighboring ocean—bore testimony to his zeal and knowledge. Nothing escaped his eye that might render service to the wants of his fellow man. His influence in promoting emigration to the Aroostook was of a far greater value in erecting a barrier against foreign encroachments, than a line of forts in an unbroken forest from Canada to the Atlantic."—Dr. N. T. True, Agriculture of Maine, 1865, p. 215.

"He was the true conservator of the industrial and domestic interests of Maine, and watched their progress and development with all the solicitude and care of one whose vital concerns were at stake. To the farmers whom he so often met in the midst of his labors, he was emphatically a father, and in the many homes in his own and other states lived a numerous family. When he went forth he moved as a patriarch of old among his children, their herds and their flocks; all were ready to bid him welcome, and thousands rose up to do him reverance. His sympathies were emphatically with the masses. Man was his brother, and in whatever state or condition he met him he was ever ready to extend the right hand of friendship to his equals and comrades in life, or relieve the wants of the mendicant that sought his charity."—Eulogy delivered in Representatives' Hall, State House, Jan. 29, 1866, by Hon. E. R. French, Agriculture of Maine, 1866, p. 46-47.

HITCHCOCK, CHARLES HENRY. Born in Amherst, Mass., August 23, 1836. Graduated from Amherst College, 1856; Andover Seminary, 1861. Assistant State Geologist, Vermont, 1857; Geologist to Natural History Survey of Maine 1861–'62; Geologist New Hampshire, 1868--'72. In 1869 received degree of Ph. D. from Lafayette College, Indiana. Has published important reports on geological surveys of Vermont, Maine and New Hampshire; several geological maps of authority; treatise on geology in Report of Ninth Census; Elementary Geology, 1860; Mount Washington in Winter, 1871, and has made more than one hundred and fifty contributions to scientific literature. Has in late years made extensive explorations in Florida and the Windward Carribee islands, the last trip in the interest of the Cumberland Bone Company, Portland. Discovered that the phosphate of Redonda was of mineral origin. Was one of the principal geologists connected in the formation of the Geological Society of America, 1888. Has recently presented extensive geological collections to Dartmouth College. Professor of Geology, Dartmouth College. Address: Hanover, N. H.

1. General Report upon the Geology of Maine. Preliminary Report upon the Natural History and Geology of the State of Maine. Report Maine Board of Agriculture, 1861, p. 146-328.
2. Geology of the Wild Lands. Report Board of Agriculture, 1861, p. 377-442. [With a geological map of Northern Maine.]
3. Geology of Maine. Report Maine Board of Agriculture, 1862, p. 221-430. [With a map.]

HOSKINS, THOMAS H. Born in Gardiner, May 14, 1828. Graduated from Medical Department of the University of Louisville, Ky., 1860. From 1849 to 1854 in the wholesale drug business in Louisville. Editor Vermont Farmer, 1872; Agricultural Editor Vermont Watchman and State Journal; Member Vermont Board of Agriculture. Since 1865 has resided at Newport, Vt., near the head of Lake Memphremagog. The extreme severity of the winter climate in this elevated locality led him into an ardent study of the "iron-clad" tree fruits, which he has now pursued for over twenty-five years. His orchard contains more than twelve hundred fruit trees, embracing every variety capable of enduring the climate, collected from our northern border, from Canada and from Russia; and Dr. Hoskins appears to have solved the problem of tree fruits—especially of apples, pears, cherries and plums—for all Northern New England and lower Canada. He is an enthusiastic gardener and hybridist, and has produced a considerable number of valuable new varieties of garden vegetables. His experimental gardens and grounds have become a sort of horticultural Mecca for those seeking an example of success in these specialties. Dr. Hoskins is one of the most distinguished and best known horticultural writers in the country and has contributed largely to the agricultural and horticultural journals and magazines, and the Agricultural reports and horticultural transactions of many states. Among the journals to which he has constantly and frequently contributed are the Maine Farmer, The Home Farm, New England Farmer, Massachusetts Ploughman, Rural New Yorker, The Gardener's Monthly, American Gardening and Garden and Forest. In addition to this Dr. Hoskins has prepared valuable reports on the fruits of Vermont which have appeared in the Transaction of the American Pomological Society, viz: 1881, p. 118; 1885, p. 108. The catalogue below comprises only some of his more important lectures and papers furnished to the reports and transactions named. Address: Newport, Vt.

1. Fruit Raising in Vermont. Vermont Board of Agriculture, 1872, p. 50-61.
2. Vermont as an Agricultural State. Vermont Board of Agriculture, 1872, p. 568-578.
3. Science and Practice of Manuring. Vermont Board of Agriculture, 1874, p. 158-176.
4. Why does Education Draw Young Men from the Farm. Vermont Board of Agriculture, 1875-'76, p. 489-504.
5. List of Fruits for Vermont. Vermont Board of Agriculture, 1878, p. 216-217. [Equally valuable as a guide to varieties for cultivation in Maine.]

6. Apples for Aroostook County. Maine Board of Agriculture, 1880, p. 105-115. [An exceedingly important contribution to Maine pomology.]
7. Small Fruits and Apples on the Farm. Vermont Board of Agriculture, 1881-'2, p. 169-174.
8. Hardy Winter Apples. Transactions Maine State Pomological Society, 1882, p. 29-34.
9. Nomenclature of Russets. Transactions Maine State Pomological Society, 1882, p. 86-38.
10. Setting out an Apple Orchard. Vermont Board of Agriculture, 1883-'4, p. 123-126.
11. The Iron-Clad Tree Fruits. Maine Board of Agriculture, 1885, p. 10-31. [Illustrated with thirteen outlines and portraits of fruits.]
12. Truck Farming. Vermont Board of Agriculture, 1885-'6, p. 103-116.
13. The Bleeding of Apple Trees. Transactions Maine State Pomological Society, 1886, p. 158-160.
14. Russian Fruits. Transactions Maine State Pomological Society, 1889, p. 126-128.

JACKSON, CHARLES THOMAS. Born in Plymouth, Mass., June 21, 1805; died in Somerville, Mass., August 28, 1880 Graduated at the Harvard Medical School in 1829; studied in Europe; discovered the magnetic telegraph in 1832, claiming priority over that of Samuel F. B. Morse; State Geologist of Maine 1837–'39; of Rhode Island, 1839; of New Hampshire 1841–'44; published Report on Mineral Lands of United States in Michigan, 1849; discovered the anæsthetic properties of ether, 1841–'2; received decorations, orders and honors on this discovery from many foreign nations and learned societies. Made numerous contributions to scientific transactions and journals.

1. First Report on the Geology of the State of Maine. August, 1837, 8vo., pp. 128. [Accompanied by an atlas of twenty-four plates and views.]
2. Second Report on the Geology of the State of Maine. Augusta, 1838, 8vo., pp. 168. [This contains a treatise on Agricultural Geology; embracing the geograhhical origin, distribution, chemical composition and capabilities of soils, p. 140-168.]
3. Third Report on the Geology of the State of Maine. Augusta, 1839, 8vo., pp. 276. [Contains: Catalogue of geographical specimens in the State Cabinet, Maine; collected in the years 1836, 1837 and 1838, p. i-lxiv; and a chapter on agricultural geology, p. 123-183.]
4. Dr. Jackson also issued two reports on the "Geology of the Public Lands" belonging to the states of Maine and Massachusetts, the matter in which was, in part, a duplicate of some portions of the reports of the geological survey. The second report, published in 1838, contained 100 pages, nine plates, and an appendix of xxxvii pages.

A copy of the atlas of plates, and also the portfolio of original sketches from which the plates were made is in the State Library, Augusta. In addition to the above works, Dr. Jackson published reports on the geology of Rhode Island and Vermont, besides other important scientific works.

JORDAN, WHITMAN H. Born in Raymond, October 27, 1851. Graduated from the Maine State College in 1875, with the degree of B. S. Principal Dennysville High School 1876–77. Post-graduate student at Cornell University in Chemistry and Physics in 1877–'8. Assistant in Experimental and Analytical Chemistry at Wesleyan University, Middletown, Conn., 1878–'9. During 1879–'80 instructor at the Maine State College. From 1881 to 1885 professor of Agriculture and Agricultural Chemistry, at the Pennsylvania State College; Chemist to Pennsylvania State Board of Agriculture, 1883–'5. Since April, 1885, Director Maine Agricultural Experiment Station. Address: Orono.

1. Value, Production and Use of Manures. Report Maine Board of Agriculture, 1880, p. 42-74.
2. Experiments and Investigations conducted at the Pennsylvania State College, 1881-'2. Harrisburg, Pa., 1892, 8vo., pp. 29.
3. Agricultural Experiment work. Annual Report, Pennsylvania State College, 1883, pp. 29.
4. Agricultural work for 1884. Report Pennsylvania State College, 1884; pp. 34.
5. On non-albuminoid nitrogen of Timothy at different stages of growth. Report Society for the Promotion of Agricultural Science, Vol. I, 1882, p. 68-71.
6. The changes that occur in the albuminoids of silage. Proceedings of the Society for the Promotion of Agricultural Science, Philadelphia, Pa., 1884, p. 39-42.
7. Annual Report Experiment Station. Report Pennsylvania Board of Agriculture, 1881.
8. Field Experiments with Fertilizers. Report Pennsylvania Board of Agriculture, 1881.
9. The Maintenance of Fertility. Report Pennsylvania Board of Agriculture, 1882.
10. Relations of Soils and Crops to Moisture. Report Pennsylvania Board of Agriculture, 1882.
11. Report as Chemist to the Board of Agriculture. Report Pennsylvania Board of Agriculture, 1883.
12. How can our Cereal Crops be most Economically Increased. Report Pennsylvania Board of Agriculture, 1884.
13. Fertility, Soil Exhaustion and Fertilizers. Report Pennsylvania Board of Agriculture, 1884.

14. Plant Food. Report Maine Board of Agriculture, 1885, p. 52-53.
15. The Chemistry of the Silo. Report Maine Board of Agriculture, 1885, p. 125-130.
16. Clover in Agriculture. Report Maine Board of Agriculture, 1887, p. 132-155.
17. The Determination of the Digestibility of Feeding Stuffs. Agricultural Science, Vol. I, 1887.
18. Further Remarks upon Foods and Feeding Problems. Agricultural Science, Vol. 1, No. 12, 1887.
19. The Necessity of Caution in Agricultural Research. Agricultural Science, Vol. 2, No. 10, 1888.
20. The Composition and Digestibility of Certain Cattle Foods with some observations on the determination of the digestibility of protein and carbohydrates. [With J. M. Bartlett and L. H. Merrill]. Agricultural Science, Vol. 2, No. 11, 1888.
21. Annual Report of the Maine Fertilizer Control and Agricultural Experiment Station, 1885-'6; pp. 78.
22. Annual Report of the Maine Fertilizer Control and Agricultural Experiment Station, 1886-'7; pp. 136.
23. Annual Report of the Maine State College Experiment Station, 1888, pp. 1-134 and 195-203.
24. Annual Report Maine State College Experiment Station, 1890, pp. 1-78. Report of same for 1891.
25. Pennsylvania State College Bulletins, Nos. 1-6-8-11, 1882-1885.
26. Bulletins of the Maine Agricultural Experiment Station, Nos. 2-26; Second Series, No. 1, 1885-'90.
27. Feeding Value of Skim Milk. Report Maine Board of Agriculture, 1888, p. 102-111.

Miscellaneous articles in the Maine Farmer, Germantown Telegraph and Philadelphia Press. Numerous addresses at farmers' institutes in Maine and Pennsylvania, which are not fully reported in the published annals.

KNOWLTON, DAVID H. Born in Farmington, December 21, 1844. Graduated from Bowdoin College, 1869. Secretary Maine State Pomological Society, 1887–'92. Address: Farmington.

1. Editor Transactions Maine State Pomological Society, 1887-'92, 6 vols.
2. "What Man hath Done, Man may Do." Transactions Maine State Pomological Society, 1885, p. 83-85.
3. Essay on Pomology. Transactions Maine State Pomological Society, 1886, p. 61-72.
4. Arbor Day and Its Observance. Transactions Maine State Pomological Society, 1887, p. 59-70.
5. Field Work among the Fruits. Transactions Maine State Pomological Society, 1888, p. 36-43.
6. The Experiment Station and Its Work. Transactions Maine State Pomological Society, 1889. p. 108-115.

7. Fruit Culture—Its Possibilities in Maine. Transactions Maine State Pomological Society, 1890, p. 65-73.

8. Fruit Exhibitions. Transactions Maine State Pomological Society, 1891, p. 47-51.

LADD, EDWIN F. Born in Starks, December 13, 1859. Graduated from Maine State College, 1884, with degree of B. S. Assistant Chemist to New York Agricultural Experiment at Geneva, 1884–'88; Chief Chemist to New York Experiment Station, 1888–'90. Professor of Chemistry North Dakota Agricultural College, and Chemist to the North Dakota Experiment Station, 1890–'92. Secretary North Dakota State Dairymen's Association. Fellow of the American Association for the Advancement of Science; member of the Society for the Promotion of Agricultural Science; of the Amercan Chemical Society; of the American Academy of Political and Social Science; of the Scientific Society of the Maine State College, and of the New York State Dairymen's Association. Address: Fargo, N. D.

1. Composition and Relative Digestibility of Feeding Stuffs. American Chemical Journal, Vol. 8, p. 1.

2. Pepsin vs. Animal Digestion. American Chemical Journal, Vol. 7, p. 6.

3. Sugars and Starch in Fodders and their Determination. American Chemical Journal, Vol. 10, p. 1.

4. The Influence of Food on the Composition of Butter. Agricultural Science, 1880, p. 251.

5. Cooked vs. Raw Food for Stock. Bulletin No. 5, (New Series), New York Agricultural Experiment Station, October, 1885, pp. 3.

6. Hay vs. Damaged Hay. Bulletin No. 6, (New Series.) New York Agricultural Experiment Station. November 5, 1885, pp. 2.

7. Influence of Fertilizers on the Chemical Composition of Plants; Analysis of Feeding Stuffs; Feeding and Digestion Experiments. Bulletin No. 10, (New Series). New York Agricultural Experiment Station, August, 1888, pp. 8.

8. Chemical Composition of Some Feeding Stuffs. Bulletin No. 14, (New Series). New York Agricultural Experiment Station, October, 1888, pp. 30. [With one plate.]

9. Cattle Foods and Feeding Rations. Bulletin No. 17, (New Series). New York Agricnltural Experiment Station, October, 1889, pp. 28.

10. A Method for the Determination of Fat in Milk and Cream. Bulletin No. 19, (New Series). New York Agricultural Experiment Station, June, 1890, pp. 12. [With two plates, and two folding tables.]

11. The Relative Digestibility of Feeding Stuffs. Report New York Agricultural Experiment Station, 1885, p. 312-319.

12. Action of Phosphoric Acid in the Soil. Report New York Agricultural Experiment Station, 1885, p. 321-325.

13. Feeds—Raw and Cooked. Report New York Agricultural Experiment Station, 1885, p. 320-321.
14. An Examination of Feeding Stuffs. Report New York Agricultural Experiment Station, 1886, p. 358-366.
15. Albuminoid and Non-Albubuioid Nitrogen. Report New York Agricultural Experiment Station, 1886, p. 366-374.
16. Variations in the Composition of Grasses in Two Years. Report New York Agricultural Experiment Station, 1887, p. 406-411.
17. Early and Late Cut Timothy. Report New York Agricultural Experiment Station, 1887, p. 411-417.
18. Analysis of Hays from Different Localities. Report New York Agricultural Experiment Station, 1887, p. 417-419.

Samples of Timothy from Wisconsin and Maine; the latter from the farm of the State College, Orono.

19. Composition of Forage Plants. Report New York Agricultural Experiment Station, 1887, p. 419-431.

The cactus of the genus *Opuntia* known as "Prickly Pear," Prickly Comfrey, and various grasses.

20. Wheat and Its Products. Report New York Agricultural Experiment Station, 1887, p. 431-437.

Analysis of wheat straw, wheat bran, flour, middlings, shipstuff, bran.

21. Per cent. of Water in Some Farm Products. Report New York Agricultural Experiment Station, 1887, p. 437-440.

Amount of water in grasses when in full bloom; in hay; in fodder corn; in corn stover; in corn meal.

22. Influence of Fertilizers upon the composition of Timothy and Clover. Report New York Agricultural Experiment Station, 1887, p. 441-454.
23. Amount of Nitrogen, Phosphoric Acid and Potash removed from the soil by Farm Crops. Report New York Agricultural Experiment Station, 1887, p. 455-464.
24. Fodder Analyses. Report New York Agricultural Experiment Station, 1888, p. 235-244.
25. Amount of Fertility Removed from the Soil by Crops. Report New York Agricultural Experiment Station, 1888, p. 244-250.
26. Influence of Fertilizers upon the Chemical Composition of Grass. Report New York Agricultural Experiment Station, 1888, p. 250-262. [With two plates.]
27. Results of Special Fertilizers upon Oats. Report New York Agricultural Experiment Station, 1888, p. 262-264.
28. Changes in Maize as it Approaches Maturity. Report New York Agricultural Experiment Station, 1888, p. 264-265.
29. Analyses of Hays from Different Localities. Report New York Agricultural Experiment Station, 1888, p. 265-267.

Hays from Wisconsin, Maine (farm of Maine State College, Orono), New Hampshire and New York; the growth of 1885, 1886, 1887. "The variation in the composition of hays from different localities is quite marked for different years, and shows that often the meteoralogical

influences are a more potent factor in determining the quality, (not the quantity), of a hay crop than are the fertilizers."

30. Nitrogen-free Extract of Fodders. Report New York Agricultural Experiment Station, 1888, p. 267-270.
31. Feeding Experiments with Dairy Cows. Report New York Agricultural Experiment Station, 1888, p. 270-284.

Experiments with orchard grass, corn meal, Linseed meal and wheat bran; with the amount of nitrogen supplied and recovered, and the amount of dung and fertilizing matter contained in the same voided by the cows during the experiment.

32. Influence of Food on Milk and Butter. Report New York Agricultural Experiment Station, 1888, p. 284-292.
33. Feeding Experiments. Report New York Agricultural Experiment Station, 1888, p. 292-297.
34. Corn Fodder vs. Ensilage. Report New York Agricultural Experiment Station, 1888, p. 297-299.
35. Sheep Feeding Experiment for Fat and for Lean Meat. Report New York Agricultural Experiment Station, 1888, p. 300-302.
36. Artificial vs. Animal Digestion. Report New York Agricultural Experiment Station, 1888. p. 304-307.
37. Analyses of Fertilizers. Report New York Agricultural Experiment Station, 1888, p. 307-315.
38. Analyses of Foods. Report New York Agricultural Experiment Station, 1889, p. 73-79.

Nitrogen free extract of foods, its composition and digestibility.

39. A Study of the Maize Plant. New York Agricultural Experiment Station, 1889, p. 79-91.

The chemistry of the Maize plant through its periods of growth.

40. Cattle Foods and Feeding Rations. Report New York Agricultural Experiment Station, 1889, p. 91-153.

The nitrogenous and carbonaceous rations, digestibility of alfalfa hay, of hay-mixed grasses, of a compound ration, and influence of roots on the digestibility of a ration.

41. Influence of certain Grain Foods on the Chemical Composition of Milk. Report New York Agricultural Experiment Station, 1889, p. 153-205.
42. Dairy Notes. Report New York Agricultural Experiment Station, 1889, p. 206-214.

Sweet vs. ripened cream for butter; temperature for churning; ash constituents of milk and cream; pounds of cream for one pound of butter; influence of food on the butter; rations fed by New York dairy farmers.

43. Artificial vs. Animal Digestion. American Chemical Journal, Vol. xi, 1889, p. 169.
44. Estimation of Sugar, Starch and Ash constituents in Fodder. Journal Analytical Chemistry, Vol. ii, 1888, p. 145.
45. Some Changes in Timothy Grass as it approaches Maturity. Agricultural Science, Vol. i, 1887, p. 221.

46. Need for more thorough Meteorological and Climatic Studies. Agricultural Science, 1890, Vol. x, p. 36.
47. Silage vs. Dry Fodder. Society for the Promotion of Agricultural Science, 1890, p. 29.
48. Digestion Experiments. Society for the Promotion of Agricultural Science, 1888, p. 96.
49. Rational System of Stock Feeding. Report New York State Agricultural Society, 1888.
50. Investigations upon Maize. Journal of American Chemical Society, Vol. 12, No. 8, 1890.
51. Sugar Beets. Bulletin No. 5, North Dakota Experiment Station, February 1892, pp. 50.
52. Wheat Growing and Dairying for North Dakota. Bulletin No. 8, North Dakota Experiment Station, December, 1892, pp. 14.

LANG, JOHN WILSON. Born in Brooks, September 23, 1840. Educated in common schools. Served in Ninth Maine Regiment 1864–'5, in Virginia and North Carolina. Agricultural editor Republican Journal, Belfast, 1869–'72; of Dirigo Rural, Bangor, 1875; of Eastern State, Dexter, 1383–'5, of American Sentinel, Bath, 1887--'89. One of the editors of Maine Journal of Education, Portland, 1873. Published the Farmers' Exchange, Brooks, for six months, 1873. Member of Maine Board of Agriculture, 1871--'74. Secretary Maine Dairymen's Association, 1874--'79. Address: Bowdoinham.

1. Survey of Waldo County: Historical, Physical, Agricultural. Augusta, 1873, 8vo., pp. 131.
2. Wants and Resources of Maine Agriculture. Report Maine Board of Agriculture, 1873, p. 62-74.
3. Dairy Interests of Maine. Report Maine Board of Agriculture, 1873, p. 354-361. Same, Part II, 1874, p. 169-'74. Same, Part II, 1875, p. 190-203.
4. Farming as a Profession. Report Maine Board of Agriculture, 1874, p. 94-103.
5. Adaptability of Maine to Dairying. Report Maine Board of Agriculture, 1876, Part II, p. 259-267.
6. Feeding Dairy Cows. Report Maine Board of Agriculture, 1877, Part II, p. 130-135.
7. Dairy Interests of Waldo County. Report Maine Board of Agriculture, 1882, p. 162-166.
8. Our Worn Lands. Report Maine Board of Agriculture, 1883, p. 199-207.
9. Fruit Culture in Maine. Transactions Maine State Pomological Society, 1884, p. 30-36.
10. Practical Co-operation. Report Maine Board of Agriculture, 1886, p. 81-94.

11. Fruit Culture in Sagadahoc County. Transactions Maine State Pomological Society, 1886, p. 119-121.
12. History and Culture of the Potato. Report New Hampshire Board of Agriculture, 1872, p. 303-323.
13. Value of Insect-Eating Birds. Report New Hampshire Board of Agriculture, 1873, p. 297-314.
14. Sheep, Wool and Mutton. Report New Hampshire Board of Agriculture, 1874, p. 179-192.

Edited First, Second, Third and Fourth Reports of Maine Dairymen's Association, published in Report of Maine Board of Agriculture for the years 1874, 1875 and 1877.

In addition to the above the agricultural reports of Maine contain many shorter articles from Mr. Lang's pen, while he has been a contributor to the leading agricultural journals of the State and country, for many years.

MATTHEWS, S. W. Born in Hampden, May 31, 1832. Graduated from Waterville College, (now Colby University), 1854. Assistant Assessor of Internal Revenue; Deputy Collector of Customs; editor of newspapers nine years; member of the House of Representatives in 1873; Commissioner of Maine Bureau of Industrial and Labor Statistics, 1885--'92. Address: Augusta.

1. Our Abandoned Farms. Report Bureau of Industrial and Labor Statistics, 1890, p. 93-135.
2. The Canning Industry of Maine. Report Bureau of Industrial and Labor Statistics, 1892, pp. 32-35.

More canned goods are packed in the State of Maine than in any other state of the Union. Corn, beans, squash, pumpkin, apple,berries, jellies, condensed milk, are among the products of the canning industry of the State. Returns from 64 corn packing factories in 1891 show that they packed the product of 9312 acres of sweet corn, and employed eight thousand persons. The total pack of these factories was 13,161,028 cans.

MATTOCKS, CHARLES P. Born in Danville, Vt., October 11, 1840, and has lived in Maine since he was ten years old. Graduated from Bowdoin College in 1862, and from the Harvard Law School, 1867. Immediately upon graduating from Bowdoin he entered the 17th Maine Regiment as First Lieutenant and participated in all the battles of the Army of the Potomac from the first battle of Fredericksburg until the surrender of Lee, with the exception of nine months spent in rebel prison. For gallantry brevetted through all grades to Brigadier General. County Attorney of Cumberland 1870-'73. Colonel of State Militia, 1879. Member of House of Representatives, 1883-'85. A lawyer having a large practice. Proprietor of

"Riverside Farm," East Baldwin, one of the most celebrated breeding farms of thoroughbred live stock, Jerseys, Cotswolds and Berkshires, in the State. President of Winslow Packing Company, operating in some years as many as fifteen corn packing factories. Executive Commissioner of Board of Columbian World's Fair Managers for Maine. Address: Portland.

1. Cotswold Sheep: Their History, Breeding and Management. Chicago, 1878. Large 4vo, pp. 9. Illustrated.

Indroductory essay to American Cotswold Record, Vol. I.

Regarded as an authority on the history and characteristics of this breed of sheep, by all American and Canadian breeders.

MAINE.

Present Condition of the State. Its Agricultural, Financial, Commercial and Manufacturing Development. Advantages of the State as a Summer Resort. Augusta, 1885, 8vo., pp. 40.

The chapter on agricultural condition, pages 7-11.

MAINE EXPERIMENT STATION. The Maine Fertilizer Control and Agricultural Experiment Station was established by act of the Legislature approved March 3, 1885. It contemplated two lines of work: First, in reference to the inspection and analysis of fertilizers; second, that of experiment and investigation. From the organization of the Station in April, till July 1st, 1885, Prof. Walter Balentine was acting Director. Prof. W. H Jordan was elected Director and assumed the duties in July, 1885, and has continued in that position to the present time. The Station existed as a State institution till the Hatch Bill, passed by Congress March 2, 1887, became a law, viz: October 1, 1887, when a state law went into effect repealing the law creating the Station. From that time it has existed as the "Maine State College Agricultural Experiment Station," under the provisions, and by virtue of the apptopriations, authorized by the Hatch Bill of 1887. As a State institution the Station published three reports, and twenty bulletins, the latter having been published only in the agricultural journals of the State.

1. Report of the Maine Fertilizer Control and Agricultural Experiment Station, 1885. Augusta, 1885, 8vo., pp. 23.

Contains: Analysis of Fertilizers for the months of April-June, 1885, and law establishing the station.

2. Annual Report, 1885-'6. Augusta, 1886, 8vo., pp. 87.

Contains: Report on Inspection and Valuation of Fertilizers, p. 9-41. The Manure Residue of Corn Meal and of Cotton-Seed Meal, p. 42-46. Composition of Cattle Foods, p. 47-53.

THE

NORTHERN SHEPHERD,

BEING

A REPORT OF A COMMITTEE

OF THE

KENNEBEC COUNTY AGRICULTURAL SOCIETY,

UPON THE

DISEASES AND MANAGEMENT OF SHEEP.

———— To rear the tender flock,
A labor this. ————
Virgil.

WINTHROP,
William Noyes—Printer.
1835.

TITLE-PAGE OF FIRST ORIGINAL TREATISE ON MAINE AGRICULTURE.

Digestion Experiments, p. 53-64.

Digestibility of Timothy Hay and the Maize Kernel.

Feeding Cotton-Seed Meal for Milk and Butter Production, p. 65-72.

On Feeding Steers for Growth, p. 73-78.

3. Annual Report, 1886-'7. Augusta, 1887, 8vo., pp. 145.

Contains: History and Analyses of Samples of Fertilizers collected in 1887, p. 8-40.

Relative Manurial Value of Cotton-Seed Meal and Linseed Meal, p. 40-41.

Experiments with Fertilizers at the Station. Field experiments with fertilizers at the Station, showing the comparative production from different forms of phosphoric acid; the profitable quantity of commercial fertilizers to use, and results of field trials of fertilizers by farmers in different parts of the State, p. 41-64.

Analyses of Feeding Stuffs, Analyses of Timothy hay, clovor hay, oat straw, potatoes, cottonseed meal, linseed meal, patent cotton food, beef scraps, pork scraps, dried blood, whole corn and meal, corn meal and corn-and-cob meal, rations for poultry raising, p. 64-100.

Dairy Products. The effect of the temperature at which the milk is set upon the volume of cream; upon quantities of cream; upon the composition of the cream; upon the amount of cream for a pound of butter; to the residue of fat left in the skimmed milk after different periods of setting, and comparative weights of night's and morning's milk, p. 107-119.

Analytical and Experimental Methods at the Station. p. 123-136.

4. Annual Report of the Maine State College Experiment Station, 1888. Augusta, 1889, 8vo., pp. 223. Contains:

Report on Inspection of Fertilizers offered for Sale in 1888, p. 27-60.

Analyses of Muck, p. 61-63.

Box Experiments with Fertilizers, p. 64-66.

Field Experiments with Fertilizers by Farmers, p. 67-81.

Foods, p. 81-90.

Digestion Experiments, p. 90-100.

Whole Corn vs. Corn Meal, p. 101.

The Compounding of Rations for the Different Classes of Farm Animals, p. 102-110.

Composition of American Feeding Stuffs, p. 111-122.

Experiments with Potatoes, Oats, Barley and Peas, p. 123-134.

Experiments in the Improvement of Plants by Seed-Selection, p. 135-147.

Potato Scab, p. 148-149.

The Apple Scab, p. 149-151.

Injurious Insects, p. 151-195.

Describes the round-headed apple tree borer; flat-headed apple tree borer; oyster-shell bark-louse; apple tree tent caterpillar; forest tent caterpillar; fall canker worm; eye-spotted bud-moth; apple tree aphis; codling moth; apple maggot; ash-gray pinion; pear tree slug; plum curcalio; cherry tree plant louse; imported currant worm; white scale;

black swallow tail; eyed elator; hawthorn tingis; mourning cloak butterfly; meal worm; spraying trees. [With thirty-four figures.]

Protein Digestion, p. 195-203.

5. Annual Report of Maine State College Experiment Station for 1889. Bangor, 1890, 8vo., pp. 294. Contains:

Inspection of Fertilizers, p. 1-35.

Experiments with Cattle Foods, p. 37-68.

Feeding Experiments, p. 69-84.

Feeding Experiments with Swine, p. 85-105.

A study of Dairy Products, p. 106-134.

Being the results of tests with several different breeds of dairy cows.

Experiments with Fertilizers, p. 135-144.

Being the results of both pot experiments and field experiments by farmers in different parts of the State.

Germination Experiments, p. 149-160.

Experiments with Forage Plants, p. 161-169.

Injurious Plants, p. 170-187.

The potato rot; apple scab; false flax; rib-grass. [With two plates.]

The Apple Maggot. [With three plates, embracing twenty figures.] p. 190-241.

Insecticides, p. 242-254.

Fruit Tests, p. 255-256.

Report of Veterinarian, Dr. F. L. Russell, p. 257-266, contains:

Hog Cholera; parturient apoplexy.

6. Report for 1890. Bangor, 1891, 8 vo. pp. 162, contains:

Inspection of Fertilizers, p. 1-16.

Tests of Dairy Cows, p. 17-51.

Relates to cost of food; yield of milk solids; cost of milk; composition of milk; food value of waste products of the dairy; loss of fat in waste products; mechanical loss of butter fat; effect of a delay in setting milk; mineral ingredients of milk.

Relative Yield of Digestible Material in Early Cut and Late Cut Timothy Hay, p. 65-67.

Feeding Experiments with Colts, p. 68-70.

Feeding Experiments with Steers, p. 71-74.

Feeding Experiments with Different Breeds of Swine, p. 75-78.

Fertilizer Experiments, p. 71-106.

Relates to the effect of different forms and mixtures of fertilizers; systems of manuring, and field tests of fertilizers by farmers in different parts of the State.

Tests of Varieties of Beans, Sweet Corn, Peas, Beets, Squash and Pumpkins, p. 102-103.

Report of Botanist and Entomologist, Prof. F. L. Harvey, p. 105-139. [With two plates and twelve illustrations.]

Embraces germination experiments; experiments with corrosive sublimate; spraying for apple scob; Paris green for potato beetles; causes of potato scab; strawberries; rib grass, or English plaintain; fall dandelion; the cecropia emperor moth; the white-marked tussock-moth; fall webb-worm; eye-spotted bud moth; woolly-louse of the apple tree; red-humped apple tree caterpillar; fall canker-worm; forest caterpillar.

Fruit Tests, p. 140.

Report of Meteorologist, Dr. M. C. Fernald, p. 141-157.

7. Report for 1891. Bangor, 1892, 8vo., pp. 213. [With thirteen plates.] Contains:

Results of Inspection of Fertilizer, p. 1-20.

Description of the Station Equipment, p. 21-28.

Digestion experiments, p. 29-40. [Appendix, p. 3-9.]

Embraces the tests of digestibility of Hungarian grass; Hungarian hay; corn fodder; Timothy hay; various roots; gluten meal; wheat bran.

The production of Food Material by Various Fodder and Root Crops, p. 41-46.

Turnips as Food for Sheep, p. 47-52.

An Experiment in Producing Growth in Lambs, p. 53-57.

Feeding Experiment with Colts, p. 58-61.

Influence of Food upon the Quality of Butter, p. 62-69.

The Babcock Milk Test adapted to Cream, p. 71-80.

Report of the Horticulturist, Prof. W. M. Munson, p. 81-122.

Embraces notes on cabbages; on tomatoes; on egg-plants; fruit tests; spraying for codling moth; spraying for apple scab, [with three figures]; spraying apparatus; [formulas and modes of application.]

Fertilizer Experiments, p. 123-144.

Growing Mixed Grains compared with growing Grains Separately, p. 144-145.

Trials of Spring and Fall Manuring, p. 146.

Field Trials of Fertilizers by Farmers in different parts of the State, p. 146-153.

Report of Meteorologist, Dr. M. C. Fernald, p. 155-174.

Report of Botanist and Entomologist, Prof. F. L. Harvey, p. 175-207. [With one plate and thirteen figures.]

Embraces report on plants received for examination; hawk moths; cut-worms; goldsmith beetle; remedies for borers.

Bulletins Nos. 1 to 20 were published in the agricultural journals of the State from May 18, 1885, to May 13, 1887. Nos. 1 to 5, inclusive, of this series were reprinted in a pamphlet of 15 pages, 8vo. Nos. 6 to 20 inclusive were issued on slips.

Bulletin No. 21 is out of print.

Bulletin No. 22, March, 1888, [Organization of the Station], pp. 8.

Bulletin No. 23, April, 1888, [analysis and valuation of fertilizers], pp. 16.

Bulletin No. 24, May, 1888, [tests of potatoes, oats, barley and peas; and germination and purity of seed], pp. 10.

Bulletin No. 25, August, 1888, [analyses of commercial fertilizers], pp. 8.

Bulletin No. 26, October, 1888, [composition and digestibility of certain cattle foods], pp. 16.

Bulletin No. 1, Second Series, May, 1889, [analyses of fertilizers for 1889], pp. 4.

Bulletin No. 2, Second Series, [the apple maggot and potato rot, by Prof. F. L. Harvey], pp. 7.

Bulletin No. 3, Second Series, September, 1891, [the Babcock milk test adapted to testing cream], pp. 8. [With one plate.]

MAINE STATE GRANGE. The Maine State Grange, Patrons of Husbandry was organized at Lewiston, April 21–22, 1874. Its secretaries have been: J. M. Jackson, Lewiston, 1874–'80; Daniel M. Hall, Bangor, 1881–'85; Frederick A. Allen, Auburn Plains, 1886–'92.

1. Journal of Proceedings, First Annual Session, Lewiston, 1874; and Second Annual Session, Bangor, 1875. Lewiston, 1876, 8vo. pp. 51.
2. Third Annual Session, Waterville, 1876. Lewiston, 1877, 8vo. pp. 45.
3. Fourth Annual Session, Saco, 1877. Bangor, 1878, pp. 36.
4. Fifth Annual Session, Gardiner, 1878. Bangor, 1879, 8vo. pp. 40.
5. Sixth Annual Session, Portland, 1879. Bangor, 1880, 8vo. pp. 40.
6. Seventh Annual Session, Waterville, 1880. Bangor, 1881, 8vo. pp. 38.
7. Eighth Annual Session, Augusta, 1881. Bangor, 1882, 12 mo. pp. 52.
8. Ninth Annual Session, Lewiston, 1882. Bangor, 1883, 12 mo. pp. 44.
9. Tenth Annual Session, Bangor, 1883. Bangor, 1884, 12 mo. pp. 88.
10. Eleventh Annual Session, Houlton, 1884. Augusta, 1885, 12 mo. pp. 80.
11. Twelfth Annual Session. Augusta, 1885. Farmington, 1886. 12mo., pp. 72.
12. Thirteenth Annual Session. Augusta, 1886. Lewiston, 1887. 12mo., 74.
13. Fourteenth Annual Session. Skowhegan, 1887. Lewiston, 1888. 12mo., pp. 84,
14. Fifteenth Annual Session. Bangor, 1888. Lewiston, 1889. 12mo., pp. 72.
15. Sixteenth Annual Session. Belfast, 1889. Lewiston, 1890. 12mo., pp. 72.
16. Seventeenth Annual Session. Lewiston, 1890. Lewiston, 1891. 12mo., pp. 70.
17. Eighteenth Annual Session. Skowhegan, 1891. Lewiston, 1892. 12mo., pp. 72.
18. Nineteenth Annual Session. Lewiston, 1892. Lewiston, 1893. 12mo., pp. 82.

At the close of the year 1892, there were 214 subordinate granges in Maine having a membership of 16,330. There were also seventeen County or Pomona Granges. The published Journal of Proceedings contain many important annual addresses by the State Masters, Nelson Ham, D. H. Thing, Frederick Robie, Rufus Prince, M. B. Hunt; and valuable reports on grange work, agricultural education, taxation, general agricultural work of the State and matters of domestic economy. The State Grange also publishes an annual Register of Granges with a list of officers, and has issued several circulars and reports relating to grange principles and work, for general circulation.

Maine State Pomological Society. The Maine State Pomological Society was incorporated by the Legislature of Maine in 1873, its act of incorporation having been approved February 17, of that year. Its first annual report was published in 1874 and contained an important and interesting historical introduction from the pen of its first secretary, Hon. Geo. B. Sawyer of Wiscasset. This embraced a history of the fruits indigenous to Maine; history of orcharding in Maine; a fac simile of the first catalogue of nursery trees issued in this State, (by Ephriam Goodale of Buckstown now Orrington, as early as 1804), history of the old Maine Pomological and Horticultural Society organized in 1847, and of other associated efforts in behalf of pomology in this State. The six annual reports, 1873 to 1878, inclusive, are usually found bound up in one volume, although all were issued for separate years and a few copies of each were bound in cloth. For the years 1879, 1880 and 1881 no reports were published. The State having refused the publication of the reports for those years the society sought to procure the printing of the transactions by private means. Copy was furnished to a printer in Biddeford, and 128 pages of a volume embracing the above named three years' work of the society were printed; but the volume was never completed or distributed. This report so far as printed embraced the following lectures and papers:

The Apple Tree Borer. By John E. Bennoch of Orono, p. 30-39.

Orcharding in Washington County. By H. A. Sprague of Charlotte, p. 39-44.

Cranberry Culture. By Alfred Smith of Monmouth, p. 45-46.

Apples in their Commercial Aspect. By R. H. Gardiner of Gardiner, p. 46-48.

Orchard Management. By Joseph Taylor of Belgrade, p. 48-55.

The Codling Moth. By S. C. Harlow of Bangor, p. 55-60.

Tree Fruits for Northern Maine. By T. H. Hoskins, Newport, Vt., p. 60-64.

The Profits of Orcharding as Compared with General Farming. By W. P. Atherton of Hallowell, p. 69-77.

Varieties of Apples for Maine. By W. P. Atherton, p. 99-117.

In 1883 the publications of the society were again resumed as formerly, the title of the volume being changed from "Report" to "Transactions" which has since been uniformly followed. A yearly volume has been issued from 1882 to 1892. The Secretaries of the society have been as follows:

1873-'84: George B. Sawyer, Wiscasset.

1885-'86: Samuel L. Boardman, Augusta.

1887-'92: D. H. Knowlton, Farmington.

Below is given a list of the volumes with plates of Maine fruits and reference to the more important contents not catalogued in the general bibliography:

1873: pp. 127, contains:

Manure for Orchards. By Washington Gilbert, p. 69-91.

1874: pp. 146, Plate of the Goodale Pear, originated in Saco. Contains:

Catalogue of Fruits of the State of Maine, p. 108-138.

1875: pp. 176, contains:

Orcharding as a Business. By Alfred Smith, p. 40-54.

Cherries in Maine. By Granville Fernald, p. 64-93.

Maine Fruits at the Centennial Exposition, 1876, p. 104-116.

1876: pp. 165. Plates of residence and grounds of the late Dr. J. C. Weston, Bangor. Contains:

Fruit Growing in Monmouth. By G. H. Andrews, p. 89-92.

Fruit Growing in Connection with General Farming. By Joseph Taylor, p. 92-104.

1877: pp. 112. Plate of the Starkey apple, originated in Vassalboro. Contains:

The Renovation of Old Orchards. By W. P. Atherton, p. 45-56.

Nurseries in Maine, p. 74-80.

1878: pp. 28.

1882: pp. 120. Contains:

Report on Russian Fruits. By Charles Gibb.

1883: pp. 112. Contains:

Experience in Orcharding and Its Lessons. By Rufus Prince, p. 32-38.

Orcharding in Franklin County. By S. R. Leland, p. 45-47.

Growing Apples for Profit. By D. J. Briggs, p. 48-52.

Fruit Growing in Piscataquis County. By H. L. Leland, p. 52-54.

1884: pp. 100. Contains:

The Nursery Business in Maine. By W. P. Atherton, p. 45-56.

Maine Fruits at the Cotton Centennial Exposition, New Orleans. p. 59-63.

1885: pp. 167. Contains:

The Climatic Line of Fruit Culture in Maine. By W. P. Atherton, p. 85-91.

Can the Codling Moth be Trapped? By S. C. Harlow, p. 97-100.

1886: pp. 186. Portrait of the Hon. Robert Hallowell Gardiner, formerly President of the Society; Portrait of Marshall P. Wilder; plate of the Boardman apple, originated in Farmington. Contains:

Experience in Orcharding and Marketing the Fruit. By P. Whittier, p. 35-40.

Twenty years' Experience and what I have Learned. By W. P. Atherton, p. 81-85.

Propagation and Culture of the Plum. By J. E. Bennoch, p. 128-130.

1887: pp. 164. Plate of Dudley's Winter Apple, originated in Castle Hill, Aroostook County. Contains:

Notes on Plum Culture. By D. P. True, p. 40-50.

Insects Injurious to Fruits. By Carl Braun, p. 77-87.

Small Fruits and their Culture. By P. M. Augur, p. 105-120.

1888: pp. 148. Plate of the Rolfe Apple, originated in Guilford. Contains:

Diseases attacking our Fruits. By S. T. Maynard, p. 48-59.

Money in Small Fruits. By J. H. Hale, p. 70-90.

Revised Fruit List for Maine, p. 113-126.

1889: pp. 172. Colored plate of the Russell apple, originated in Farmington. Portrait of Peter Henderson. Contains:

Pear Culture. By C. M. Weston, p. 48-51.

The Dietetics of Fruit. By C. D. Smith, M. D., p. 58-77.

Some Fungous Diseases of Fruits. By Prof. F. L. Harvey, p. 88-107. [With one plate]

Maine Fruit at the Bay State Fair, p. 129-130.

1890: pp. 152. Contains:

Results of Spraying. By S. C. Harlow, p. 58-63.

Fruit Raising in Aroostook County. By James Nutting, p. 73-74.

Strawberry and Small Fruit Culture. By S. H. Dawes, p. 81-90.

Varieties of Strawberries and Marketing. By Willis A. Luce, p. 91-92.

Horticultural work at the Maine Experiment Station. By Prof. W. M. Munson, p. 115-116.

1891: pp. 137. Contains.

Pear Culture. By S. H. Dawes, p. 64-70.

Experiments in Spraying. By Prof. W. M. Munson, p. 71-85.

Maine Apples in the English Market. By Edward Peake, p. 92-94.

McKEEN, B. WALKER. Born in Fryeburg, March 9, 1849. A teacher of experience and largely interested in educational progress. Agricultural editor of the Oxford Democrat from January 8, 1884 to March 9, 1886. Secretary of the West Oxford Agricultural Society from October 6, 1886 to December 8, 1892. Member of the Maine

Board of Agriculture, 1888 to 1892; president of the Board, 1891; elected Secretary of the Board, January, 1892. Address: Augusta.

1. Editor, Agriculture of Maine 1891-'92, 2 vols.
2. Sweet Corn Culture. Report Maine Board of Agriculture, 1887, p. 53-62.
3. Stock Feeding and Its Relations to the Fertility of the Farm. Report Maine Board of Agriculture, 1888, p. 169-178.
4. Importance of Specialties in Farming. Report Maine Board of Agriculture, 1889, p. 121-135.
5. Business Farming. Report Maine Board of Agriculture, 1890, p. 96-108.

MEMORIAL of the Maine State Agricultural Society for the adoption of Measures for the Settlement and Sale of the Public Lands of Maine. Augusta, 1858, 8vo., pp. 27.

MERRILL, LUCIUS H. Born in Aubnrn, October 11, 1857. Graduated at Maine State College, 1883. For two years assistant in the United States National Museum; since 1886 Chemist at Maine Experiment Station. Address: Orono.

1. Fodder analysis, artificial digestion, loss of nitrogen from nitrogenous Superphosphates, Method for Phosphoric Acid. Report Maine Experiment Station, 1888, p. 210-213.
2. Co-efficients of Digestibility for Protein. Report Maine Experiment Station, 1889, p. 282-285.
3. The Mineral Ingredients of Milk. Report Maine Experiment Station, 1890, p. 52-57.
4. The Fat Globules of Milk. Report Maine Experiment Station, 1890, p. 58.

The greater part of the work of Prof. Merrill performed at the Station, appears in the general report of the Director.

MERRITT, E. W. Has published at Houlton an annual "Guide to Fruit Culture," from 1876 to 1892. Later numbers contain lists of fruits adapted to Aroostook County and similar high latitudes, with much information specially useful to fruit growers in that section. The Massachusetts Horticultural Society regards this little annual guide and catalogue of so important a nature as to be preserved in a full set in its library.

MUNSON, WELTON MARKS, M. S. Graduated at Michigan Agricultural College in class of 1888. Assistant Horticulturist Experiment Station of Cornell University, 1888–'90; Professor of Horticulture, Maine State College, and Horticulturist to the Maine State College Experiment Station, since 1891. Address: Orono.

1. Horticultural Work at the Maine Experiment Station. Transactions Maine State Pomological Society, 1890, p. 115-116.
2. Experiments in Spraying. Transactions Maine State Pomological Society, 1891, p. 71-85.
[See also, Report Maine State College Experiment Station, 1891, p. 99-121.]
3. Report as Horticulturist to Maine State College Experiment Station, 1891, p. 81-122. Contains: Equipment of the Station; Notes on Cabbages; Notes on Tomatoes, Notes on Egg Plants; Fruit Tests; Experiments in Spraying.
4. Preliminary Notes on the Secondary Effects of Pollination. Report Maine State College Experiment Station, 1892, p. 29-58. [With one plate and sixteen illustrations.]
5. Report as Horticulturist to Maine State College Experiment Station, 1892, p. 59-98. [With one plate and seventeen illustrations.]

Contains: Notes on Cabbages; Notes on Tomatoes; Notes on Egg Plants; Fruit Tests; Spraying Experiments.

PACKARD, CYRUS A. Born in Hebron, December 22, 1822. Graduated at Foxcroft Academy, 1840. Address: Blanchard.

1. Reports as Land Agent of Maine from 1880 to 1891, pp. 232.
2. First Annual Report of the Forest Commissioner of the State of Maine. Augusta, 1891, 8vo. pp. 78. Contains:

Act Creating Forest Commissioner of Maine for the Protection of Forests.

Importance of Protecting our Forests.

Returns of Selectmen, County Commissioners and Fire Wardens.

Preservation of our Forests. By Prof. F. L. Harvey, p. 29-41.

The Relation and Importance of our Forests to Summer Tourists and Sportsmen. By George F. Godfrey. p. 42-44.

Economical Cutting of our Forests. By Wilson Crosby. p. 45-50.

Forest Planting and Municipal Ownership of Forest Lands. By George F. Talbot. p. 51-60.

The Depreciation of our Forest Growth and its Effects upon our Various Industries. By John E. Hobbs. p. 61-78.

PACKARD, ALPHEUS SPRING. Born in Brunswick, February 19, 1839. Graduated at Bowdoin College, 1861. On leaving college he at once became a volunteer assistant in the Maine Geological Survey. Meanwhile his interest in entomology, which has since become his life work, had already manifested itself, and during August and September, 1861, he collected insects on the Penobscot and Alleguash rivers, a description of which he furnished to the "Report of the Maine Board of Agriculture." This and other writings, including one on "How to Observe and Collect Insects," must have attracted Agassiz's attention, for Packard was sent for, and to Cambridge he went. For three years he studied natural history, and during 1863–4 he was Agassiz's private assistant. He also studied medicine, and in 1864 was graduated at the Maine Medical College, and in October went with the First Maine Veteran Volunteers to the front, and served with the Sixth Corps in Army of the Potomac until mustered out in July, 1865. Turning to science, he became acting custodian and librarian of the Boston Society of Natural History, which place he relinquished in 1867 to join Putnam, Hyatt, and Morse in Salem. There he was one of the founders of the Peabody Academy of Sciences, and one of its curators, also aiding in the establishment of the American Naturalist, of which he was editor-in-chief until 1886. He founded a summer school of biology in Salem, and was one of the instructors in Agassiz's Science School at Penekese in 1873–4. For eleven years he continued in Salem, but in 1878 he accepted the chair of zoology and geology in Brown University, Providence, where he has since remained. He had, however, previovsly lectured on entomology at the Massachusetts Agricultural College and at Bowdoin College, besides having had charge of the entomology of the United States Geological and Geographical Survey when under Dr. Ferdinand V. Hayden; and during 1871–3 he was State Entomologist of Massachusetts. Dr. Packard was a member of the United States Entomological Commission during its existence in 1877–82, and made for it in the earlier years extensive excursions in the Western and Pacific States and Territories, while in the latter years he contributed largely to the three volumes of its reports. As early as 1863 he proposed a new classification of insects, which has since been generally adopted both in Europe and America. He discovered the morphology and mode of development of the ovipositor and sting of insects, and has studied their external anatomy. His contributions to the natural history of the limulus, including the development and anatomy of the brain and nervous system of crustacea and insects, have received the highest praise Like his associates, he became a prominent advocate of the evolution theory, accepting the views both of Lamarck and Darwin, but not to the exclusion of either. In the introduction to the Standard Natural History, in 1883, he proposed the term Neo-lamarckism to cover the views of those who, like himself, did not accept all of Darwin's ideas. In this expression he includes the more fundamental factors of organic evolution, as changes of circumstance, reaction against external stimuli, the effects of use and disuse by which he accounts for the origin of variation, thus affording a foundation for natural selection to act on. In other words, "natural selection is not a *vera causa*, but rather expresses the effects of the co-operation of a number of factors in organic evolution." In this modified theory of evolution he has received the support of some of the best naturalists of Europe, and he has many followers in this country. His latest work is an extended memoir on Cave Animals of North America, which has been issued by the National Academy. He is a member of many scientific societies, both at home and abroad. In 1889 he was chosen one of the eight honorary presidents of the Zoological Congress held in Paris, and was made an honory president of the section of zoology of the French Association for the Advancement of Science; and also the British Association for the Advancement of Science announced his election in 1890 as a corresponding member of that body. In 1872 he was chosen to the National Academy of Sciences in this country. Dr. Packard received the degree of M. D. from the Maine Medical School in 1864; and Ph. D., from Bowdoin College. Entomological editor of Garden and Forest since its foundation. Professor of Zoology in Brown University. In 1887 a list of the entemological writings of Dr. Packard, compiled by Mr. Samuel Henshaw, was published by the Department of Agriculture as Bulletin No. 16 of the Division of Entomology. It embraced 339 titles, many of which were those of large volumes and elaborate treatises. Below are given only those titles which are of economic importance, or which refer in general to insects injurious or beneficial to crops, and are of special intesest to agriculturists. [Portrait: Harper's Weekly, November 29, 1890.] Address: Providence, R. I.

1. Entomological report on the Army-worm and Grain Aphis. Sixth Annual Report Maine Board of Agriculture, 1861, pp. 130-145.
2. Report on the Insects collected on the Penobscot and Alleguash rivers during August and September, 1861. Sixth Annual Report Maine Board of Agriculture, 1861, pp. 373-376.
3. How to observe and collect Insects. Second Annual Report Natural History and Geology of Maine, 1862, pp. 143-219, figures. Separate: Augusta, 1863, pp. 79; figures.
4. Increasing distribution of the Canker-worm. Proceedings Boston Society of Natural History, 1867, Vol xi, p. 88.
5. Are Bees Injurious to Fruit? American Naturalist, 1868, Vol. ii, p. 52.
6. Guide to the study of Insects, and a treatise on those injurious and beneficial to crops. Salem, 1869, pp. 8+702, pl. 1-11; illustrated.

a. 2nd edition, Salem, 1870.
b. 3d edition, Salem, 1872.
c. 4th edition, Salem, 1874.
d. 5th edition, New York, 1876.
e. 6th edition, New York, 1878.
f. 7th edition, New York, 1880.
g. 8th edition, New York, 1884, pp. 8+715, pl. 1+15; illustrated.

7. The borers of certain shade-trees. Amer. Nat., 1870, v. 4, pp. 588-594, figs.
8. New or little known injurious Insects. 17th Ann. Rept. Sec. Mass. Bd. Agric., 1870, pp. 235-263, pl. 1, figs. Separate: 1870, pp. 31, pl. 1, figs. See Amer. Nat., 1871, v. 4, pp. 684-687, pl. 6, figs.
9. Parthenogenesis in Bees. Ann. Bee Cult., 1872.
10. Injurious Insects in Essex County. Bull. Essex Inst., 1872, v. 4, pp. 5-9, figs.
11. Second annual report on the injurious and beneficial Insects of Massachusetts. 19th Ann. Rept. Sec. Mass. Bd. Agric., 1872, pp. 331-347, figs. Separate: Boston: 1872, pp. 19, figs. (See Amer. Nat., 1873, v. 7, p. 241-244, figs.)
12. Third annual report on the injurious and beneficial effects of Insects. 20th Ann. Rept. Sec. Mass. Bd. Agric., 1873, p. 237-265, figs. (Reprinted with corrections in Amer. Nat., 1873, v. 7, p. 524-548, figs.)
13. Life histories of animals, including man, or outlines of comparative embryology. New York, 1876, pp. 243, pl., figs.
14. The migrations of the destructive Locust of the West. Amer. Nat., 1877, v. 11, pp. 22-29.
15. The Hessian-fly, Joint-worm, and Wheat-midge. Ca. Ent., 1877, v. 9, p. 100.
16. Report on the Rocky Mountain Locust and other Insects now injuring or likely to injure field and garden crops in the western states and territories. Report United States Geological Survey for 1875, 1877, pp. 589-810, pls. 62-70, maps 1-5, figures.
17. Half-Hours with Insects. Boston: 1877, pp. 8+384, pl., figures.
18. Insects affecting the Cranberry, with remarks on other injurious Insects. Report United States Geological Survey for 1876, 1878, pp. 521-531, figures.
19. Insects of the West: An account of the Rocky Mountain Locust, the Colorado Potato-beetle, the Canker-worm, Currant Saw-fly, and other Insects which devastate the crops of the country. London, 1878.
20. Parthenogenesis of the Honey-bee. American Naturalist, 1879, Vol. xiii, p. 394.
21. Cotton-worm investigation. American Naturalist, 1879, Vol. xiii, p. 535.
22. The Rocky Mountain Locust in New Mexico. American Naturalist, 1879, Vol. xiii, p. 586.

23. The Hessian Fly, its ravages, habits, enemies, and means of preventing its increase. Bulletin, United States Entomological Commission, No. 4, 1880, pp. 43, pls. 1-2, map, figure. (See American Naturalist, 1880, Vol. xiv, pp. 586-587; American Entomologist, 1880, Vol. 3, pp. 118-121, 140-141, figures.)

24. Second Report of the United States Entomological Commission. Washington, 1880, pp. 18+322+80, pls. 1-17, maps, figures.

25. Insects injurious to Forest and Shade Trees. Bulletin United States Entomological Commission, No. 7, 1881, pp. 275, figures.

26. Note on Forest-tree Insects. Bulletin Div. Ent. United States Department of Agriculture, No. 3, 1883, pp. 24-30.

27. Decay of the Spruce in the Adirondacks and northern New England. Nation, New York, 1883, Vol. xxxvii, p. 525.

28. Report on the Causes of Destruction of Evergreen Forests in northern New England and New York. Report Department Agriculture for 1883 [part of Riley's report as Entomologist], 1883, pp. 138-151, pl. 9, figures.

29. Egg-laying Habits of the Egg Parasite of the Canker-worm. American Naturalist, 1884, Vol. xviii, pp. 292-293.

30. The Larch-worm. American Naturalist, 1884, Vol. v, 18, pp. 293-296, figures.

31. The Hemlock Gelechia. American Naturalist, 1884, Vol. v, 18 p. 296.

32. The Spruce-bud Tortrix. American Naturalist, 1884, Vol. xviii, pp. 424-426, figures.

33. Egg-laying Habits of the Maple-tree borer. American Naturalist, 1884, Vol. xviii, pp. 1151-1152.

34. Second Report on the Causes of the Destruction of the Evergreen and other Forest Trees in northern New England and New York. Report Department Agriculture for 1884, [part of Riley's Report as Entomologist,] 1885, pp. 374-383, figures. Separate: 1885, pp. 12, figures.

35. Third Report on the Causes of Destruction of the Evergreen and other Forest Trees in northern New England. Report Department Agriculture for 1885, [part of Riley's report as Entomologist,] 1886, pp. 319-333, figures.

36. Additions to the Third Report on the Causes of the Destruction of the Evergreen and other Forest Trees in northern New England. Bulletin Div. Ent. United States, Department Agriculture, No. 12, 1886, pp. 17-23.

37. Fourth Report on Insects injurious to Forest and Shade Trees. Bulletin Div. Ent. United States Department Agriculture, No. 13, 1887, pp. 21-32, figures.

38. Value of Honey-bees in Fruit Culture. Western Pomologist, 1871, Vol. ii, pp. 133-134.

39. The Colorado Potato-beetle and Army-worm. The Currant-worm. New England Farmer, 1875, Vol. liv, No. 35, p. 1.

40. The Canker-worm. Scientific Farmer, 1876.

41. Insects injurious to the Maple. Scientific Farmer, 1878.
42. Fifth Report of the United States Entomological Commission. Report on the Insects injurious to Forest and Shade Trees. Washington, 1890, 8v. pp. 1-955.
43. Certain Cone-eating Insects. Garden and Forest, April 25, 1888, p. 100-101.
44. The Red Mite on Verbenas. Garden and Forest, March 7, 1888.
45. Life-history of Calothysanis amaturaria Walk. A geometric moth. Insect Life, iv, August, 1892, pp. 382-384.
46. Occurrence of Bucculatrix canadensisella Chamb. on birches in Rhode Island. Insect Life, V, No. 1, September, 1892, pp. 14-16.

PIKE, N. R. Born in Fayette, December, 8, 1315. Secretary of the Maine State Jersey Cattle Association from its organization to the present time. Address: Winthrop.

1. Herd Book of the Maine State Pure Blood Jersey Cattle Association. Together with Extracts from the Constitution and By-Laws of the Association; also Some Practical Hints on Dairying, Dairy Stock, etc. Vol. I, Augusta, 1876, 8vo. pp. 80. Illustrated.
   Contain: Scale of Points for judging Jerseys adopted by the Royal Jersey Agricultural Society of the Jersey Islands.
2. Herd Book of the Maine State Jersey Cattle Association. Compiled from Official Entries, Vol. II, Portland, 1880, 8vo. pp. 75. Illustrated.
   Contain: History of Jersey Island Cattle.
3. [Same.] Vol. III, Portland, 1883, 8vo. pp. 96.
4. [Same.] Vol. IV, Portland, 1886, 8vo. pp. 137.
5. [Same.] Vol. V, Augusta, 1889, 8vo. pp. 139.
   Contain: Constitution, transfers and list of members.
6. [Same.] Vol. VI, Augusta, 1892, 8vo. pp. 127.

One of the most important sets of agricultural books ever published in Maine, and one of the earliest state or local herd books issued in this country. The "Winthrop Jersey Cattle Association" was organized as a town society March 7, 1870, and a local herd book was kept in manuscript for several years. The Association was incorporated by the Legislature in 1875. The six volumes record a total of 3335 animals—880 bulls, and 2455 cows and heifers. The Association has a membership of 267; the states of Maine, Nebraska, Iowa, Indiana and Vermont, and the Provinces of New Brunswick and Nova Scotia being represented. The Society has done a great work for the Jersey cattle interests of Maine, and the Association and its herd books are a monument to the fidelity and integrity of its veteran secretary.

POOR, JOHN A.

1. Maine as a Field for Immigration. A Memorial of the European and North American Railway Company, and for a State Policy favorable to Immigration and the Encouragement of Manufactures. Augusta, 1861, 8vo, pp. 52.

Contains important facts relating to Maine Agriculture.

PROCEEDINGS of the meeting of Stockholders of the Presumpscot Park Association, holden January 22, 1876. With the charter prefixed. Portland, 1876, 8vo., pp. 27.

REPORTS of the Secretary and Treasurer of the Maine State Agricultural Society for the year 1868, with the address of His Excellency, J. L. Chamberlain, Reports of Discussions, &c. Augusta, 1869, 8vo., pp. 47.

RUSSELL, FREMONT L , V. S. Graduated at Maine State College in class of 1885 ; Inspector of Live Stock, Vanceboro ; Veterinarian to the Maine State College Experiment Station. Address : Orono.

1. Report as Veterinarian. Report Maine State College Experiment Station, 1889, p. 257–266. Contains: essays on hog cholera, and parturient apoplexy.
2. Report on Tuberculosis. Report Maine State College Experiment Station, 1890, p. 59–64.

SAWYER, GRORGE B. Secretary of the Maine State Pomological Society, 1873 to 1884, and editor of its volumes of Transactions for that period. Address : Wiscasset.

SCRIBNER, FRANK LAMSON. Born in Salem, Mass , in 1851. His father died when he was three years old and very soon after he was adopted by a family, whose name he bears, living near Augusta, Me. Living on a farm, where work was the order of the day, he had little time for intellectual pursuits, but, happily, the mother of his adoption encouraged and fostered his inclination to study, and to her christian guidance he claims to owe all that he has ever accomplished. At the age of fifteen he began to interest himself in botany, analysing his first flower—the trailing arbutus —April 19, 1866, and from that time until his connection with the Department of Agriculture, in 1885, the greater share of his leisure moments was devoted to this, his favorite pursuit. His first botanical collections, made in 1866–'7 were acquired by Bowdoin College. At the age of eighteen, while yet on the farm, he prepared a treatise on the "Weeds of Maine" an illustrated paper of 62 pages., written for the State Board of Agriculture and published separately in pamphlet form. In 1874 he prepared for the same report, a similar paper on the "Ornamental and Useful Plants of Maine," published separately, making a pamphlet of 85 pages. After spending a term at Hebron Academy, another at Kent's Hill and two terms at the Waterville Classical Institution, he entered the State College of Agriculture and the Mechanic Arts, at Orono, in the spring of 1870, from which institution he graduated in 1873, receiving the degree of B. S. While at Orono he spent much time in collecting plants for the college. During vacations he taught schools to assist in defraying college expenses. After leaving college he continued to teach, and was for some time connected with the works of the Government Fish Commission, located at Bucksport and at Grand Lake stream. In the summer of 1876 he taught botany to private classes, chiefly teachers in the public schools in Bangor, Me. In the same year he conducted the classes in botany in the Bowdoin college Summer School of Science. In January, 1877, Mr. Scribner went to Girard college, Philadelphia, as an officer of discipline, where he remained eight years. Soon after coming to Philadelphia, he was elected a member of the Academy of Natural Sciences of Philadelphia and for a number of years served as recording secretary of the Botanical Section of the Society. Such time as he could now command, he began to devote to the study of grasses and soon became one of the recognized authorities in this difficult but important order of plants. One of his first published papers on this subject "A list of the Grasses collected by Mr. C. G. Pringle in Arizona and California," which appeared in the Bulletin of the Torrey Botanical Club, brought him prominently before the botanists of the country and indicated his ability in discriminating forms and care in looking up authorities. It also led to his recognition abroad and brought him into correspondence with foreign botanists. He has since been honored by having a new genus of grasses—Scribneria—dedicated to him by the celebrated Austrian botanist, Prof. E. Hackel. Since the publication of the paper just referred to, he has been a frequent contributor to our leading botanical journals and has published descriptions of many new species of plants which he has often illustrated with his own hands. "A Revision of the North American species of the genus Melicae" is the title of one of Mr. Scribner's more important scientific papers, which was communicated to the Academy of Natural Sciences of Philadelphia and published in their proceedings. His second, and only other published communication to this society was an illustrated paper entitled "Observations on the genus Cinna, with descriptions of a new Species." In the summer of 1883, he was connected with the

Northern Transcontinental Survey, in the department of Economic Botany, and spent several months in Central Montana, making general collections, but paying special attention to the forage plants in order to determine their general prevalence and the actual or probable values of the several species for pasturage or for hay. The result of these observations was given in an illustrated paper entitled "Agricultural Grasses of Central Montana," read before the society for the promotion of agricultural science, and published in their proceedings for 1883. Two years later, he presented to the same Society a similar paper on the Grasses of Arizona. In 1883-'4 he prepared two long chapters for the American Supplement to the Encycl. Brit. published in Philadelphia, one on "Cereals" under agriculture; the other under Forage Plants, on the "Grasses of the United States." He made "A Contribution to the Flora of Kansas—Gramineae" illustrated by three plates and published in the proceedings of the Kansas Academy of Sciences, for 1885. In May, 1885, Mr. Scribner was appointed Assistant Botanist in the United States Department of Agriculture, and in July, 1886, he was made special agent to have charge of the Mycological Section of the Botanical Division—a section devoted to the study of the diseases of plants, a new branch of work in the Department. A year later he was appointed Chief of the Section of Vegetable Pathology, in continuance of his former duties, but then officially recognized by Congress. As assistant botanist, Mr. Scribner made a report on the "Fungus Diseases of Plants," which was published in the annual report of the Department for 1885. In December, 1886, his report on the "Fungus Diseases of the Grape Vine" appeared as a Special Bulletin. His report as Mycologist, published in the Annual Report of the Department for 1886, embraced a discussion of a number of fungus diseases of plants and their remedies. A number of papers relating to subjects connected with his official duties have appeared from time to time in various scientific and horticultural publications. One on "Greeneria fuliginea, a new disease of the Grape," was published conjointly with M. P. Viala of the National School of Agriculture, at Montpelier, France, in "Comptes Rendus," September 12, 1887. Mr. Scribner is a member of the Academy of Natural Sciences of Philadelphia; American Association for the Advancement of Science; a Fellow of the American Association for the Advancement of Science; a corresponding member of the Buffalo Academy of Science; of the

Torrey Botanical Club; of the New Jersey State Horticultural Society, and the Pennsylvania State Horticultural Society. In January, 1889, the Croix de Chevalier du Merite Agricole, was conferred upon him by the French Minister of Agriculture for his services to the French Government in matters pertaining to viticulture and the diseases of the vine. Mr. Scribner is Director of the Agricultural Experiment Station of the University of Knoxville, Tennessee. His collection of grasses which numbers nearly five thousand specimens embracing nearly all the known North American specimens, is one of the largest private collections in the country. [Portrait: Frontspiece to his work on Fungous Diseases. Little Silver, N. J., 1890.]

1. The Weeds of Maine. Augusta, Me., 1869, 8vo, pp. 62. Illustrated.
2. The Ornamental and Useful Plants of Maine. Part I, Augusta, Me., 1874, 8vo, pp. 85. Illustrated. [Part II was never published.]
3. A List of Grasses Collected by Mr. C. G. Pringle in Arizona and California, during the summer of 1881, with descriptions of those species not already described in American publications. Bulletin Torrey Botanical Club, 1882-1883.
4. New North American Grasses. Bulletin Torrey Botanical Club, 1884.
5. Observations on the Genus Cinna, with description of a New Species. Illustrated. Proceedings Academy Natural Science. Philadelphia, 1884.
6. A List of the Grasses from Washington Territory. Bulletin Torrey Botanical Club, 1883. Illustrated.
7. Agricultural Grasses of Central Montana. Proc. Socy. Prom. Agri. Sci., 1883, 12 pp., illustrated.
8. Agricultural Grasses of Arizona. Proc. Soc. Prom. Agr. Sci., 1886, 5 pp.
9. A Revision of the North American Melicae. Proceedings Academy Natural Science, Philadelphia, 1885, 10 pp. [With one plate.]
10. A Contribution to the Flora of Kansas—Gramineæ. Proceedings Kansas Academy of Sciences, 1885, 5 pp., 3 plates.
11. Grasses of Yellowstone National Park, I. Botanical Gazette, 1886, 9 pp.
12. Notes on a Hybrid Grass. Botanical Gazette, 1884, 2 pp. [With [figures.
13. A New Eriochloa. By Vasey & Scribner. Botanical Gazette, 1884. [With one plate.]
14. Arizona Plants. Botanical Gazette, 1885.
15. Some Arctic Grasses. [With plate.] Botanical Gazette, 1886.
16. Notes on Andropogon. Botanical Gazette, Vol. XIII.
17. List of North American Andropogoneæ. Bulletin Torrey Botanical Club, Vol. XVI, 9 pp.

18. New or Little Known Grssses. I. (Four species described and figured.) Bulletin Torrey Botanical Club, 1888.
19. New or Little Known Grasses. II. Bulletin Torrey Botanical Club, Vol. XVII, 10 pp. [With four plates.]
20. The Grasses of Roane Mountain. Botanical Gazette, Vol. XIV. Illustrated.
21. Mexican Grasses. Proc. Acad. Nat. Sci. Phila. 1891, 18 pp. [With one plate.]
22. Grasses of Mountain Meadows and Deer Parks. Proc. Soc. Prom. Agr. Science, 1889. (Reprinted with illustrations in Bulletin Tennessee Agricultural Experiment Station.)
23. Index to Grass Names. Proc. Soc. Prom. Agr. Sci. pp. 18, 1890.
24. The Grasses of Tennessee. Part I. Bulletin Tennessee Agricultural Experiment Station, Vol. V, No. 2. Illustrated.
25. Mt. Kataadn and its Flora. Botanical Gazette, 1892, 8 pp.
26. Weeds of the Farm. Bulletin Tennessee Agricultural Experiment Station, Vol. I, No. 3.
27. The True Grasses. By E. Hackel, translated from *die Naturlichen Pflanzen familien*, by F. Lamson Scribner and Effie A. Southworth, 8vo. pp. 227. New York, 1890.
28. Fungous Diseases of the Grape and other Plants, and their Treatment. 12 mo. pp. 136. Illustrated. Little Silver, N. J., 1890.
29. Report on the Fungous Diseases of the Grape Vine. Bulletin No. 2, Botanical Division United States Department Agriculture 1886, pp. 136. [With seven plates.]
30. Black Rot. *Physalospora Bidwellii.* Proc. 7th Annual Meeting Socy. Prom. Agr. Sci. 1886, pp. 7.
31. Botanical Characters of Black-rot. *Physalospora Bidwellii* Sacc. Botanical Gazette, Vol. XI, pp. 5. [With one plate.]
32. New Observations on the Fungus of Black Rot of Grapes. Proc. 9th Ann. Meeting Soc'y Prom. Agr. Sci., 1888.
33. Successful Treatment of Black Rot. (The Same.)
34. Report on the Extent, Severity and Treatment of Black Rot and Brown-rot in Northern Ohio, in 1889. Bulletin No. 11, Botanical Division, United States Department Agriculture, 1890, pp. 76-83.
35. Black-Rot. Scribner and Viala. Bulletin 7, Botanical Division, United States Department Agriculture, 1888, pp. 29. [With one plate.]
36. Report on the Experiments made in 1887 in the Treatment of the Downy Mildew and Black-rot of the Grape-vine. Bulletin No. 5, Botanical Division, United States Department Agriculture, 1888, pp. 110. Illustrated.
37. Report on Experiments made in 1888 in the Treatment of the Downy Mildew and Black-rot of the Grape-vine. Bulletin No. 10 of the Botanical Division, United States Department of Agriculture, 1889, pp. 6.

38. On a New Fungus Disease of the Vine, *Greeneria fuliginea.* Scribner and Viala. Proceedings Eighth Annual Meeting Society Prom. Agricultural Science, 1887.
39. Fungicides. Circular No. 5 of the Section of Vegetable Pathology, United States Department of Agriculture, 1887.
40. Notes on Orange Leaf-scab. Bulletin Torrey Botanical Club, October, 1886.
41. Fungus Diseases of the Vine and their Remedies. Proceedings New Jersey State Horticultural Society, 1886.
42. Observations the Past Season on Grape-rot and Mildew. Proceedings New Jersey State Horticultural Society, 1887.
43. Fungous Diseases of Plants. An address delivered before the East Tennessee Farmers' Convention at the 16th annual meeting, 1891.
44. In Annual Reports of United States Department of Agriculture:

1885. Report as Assistant Botanist on the Fungous Diseases of Plants, 10 pp.

1886. Report as Special Agent in charge of the Mycological Section, 31 pp., 8 plates, 3 maps.

1887. Report as Chief of the Section of Vegetable Pathology, 74 pp., 17 plates.

In American Supplement to The Encyclopaedia Britannica:

1. Article on "Cereals."
2. Article on "Grasses."

In addition to the above, contributions to horticultural and agricultural papers may be noted; especially to Colman's Rural World, Maine Farmer, The Home Farm, and Orchard and Garden. In the last named paper appeared a series of illustrated articles on the fungous diseases of plants.

"In many departments of botany Prof. Scribner is one of the leading authorities, but his great specialty is the grasses and foreign plants, in which he easily stands foremost and of which his knowledge is greater than that of any other man in this country today. Collections are sent to him from botanists in all parts of the country for classification and name. Fungus diseases of plants have also received a great deal of attention and study from him, and he will be remembered as the first in this country io recommend and use the Bordeaux mixture and other sulphate of copper compounds in cheir treatment, especially his successful treatment of black rot with these preparations."—Orchard and Garden, August, 1890, p. 149.

SHALER, NATHANIEL SOUTHGATE.

1. The Geology of Mount Desert. Eighth Annual Report of the United States Geological Survey, Washington, 1889. Part Second. Quarto p. 987-1063. [With two geological maps in colors, eleven full page plates and twenty-three illustrations in the text.]

SPRINGER, JOHN S.

1. Forest Life and Forest Trees. Comprising Winter Camp-life among the Loggers, and Wild-wood Adventure, With Descriptions of Lumbering Operations on the Various Rivers of Maine and New Brunswick. Illustrated. New York: 1956, 12mo, pp. 259.

Many of the illustrations in this volume are the same as those used in Jackson's reports on the geology of Maine, and are from the same plate s.

State College of Agriculture and the Mechanic Arts. The annual reports of the trustees, officers and faculty of the Maine State College, form a series from 1886 to the present time, issued annually. The several numbers contain the usual reports of the President of the Board of Trustees, treasurer, and heads of the various departments of instruction. They also embrace a summary of the meteorological observations for each year and the annual catalogue, thus forming a complete history of the institution and marking its successive stages of growth and development. In the notes given below only the more important contents of the reports are referred to, and no reference whatever is made of the catalogues and scheme of the different courses of study which accompany each annual report. Located at Orono.

1866: [No title page.] pp. 31. Contains:

Report of the Architect, Fred Law Olmstead.

1867: [No title page.] pp. 12.

1868: [Title page used for first time.] pp. 20.

1869: pp. 32. Register of Meteorolgical Observations, with tables, first appears in this report.

1870: pp. 40.

1871: pp. 36.

1872. pp, 44

1873: pp. 60.

1874: pp. 68.

1875: pp. 60. This report contains the first frontispiece ever used. It gives a view of the campus, with the Dormitory, Boarding House, White Hall and Laboratory.

1876: pp. 76. Contains:

Report of Experiments in Feeding Cooked and Raw Food to Swine, p. 35–40.

1877: pp. 79. Contains:

Reports of pig-feeding experiments, p. 30–34.

1878: pp. 87. Contains:

Report of pig-feeding experiments, p. 39–43.

1879: pp. 103.

1880: pp. 96.

1881: pp. 100. Contains: Laws relating to the College, p. 49-56.

1882: pp. 143. Contains:

Microscopic examination and Determination of the Building Stones of Maine. By G. P. Merrill, M. S., p. 89-100.

Field experiments with Artificial Manures, p. 71-74.

Fish Scraps as Food for Domestic Animals, p. 75-78.

1883: pp. 208. Contains:

Artificial Digestion, and the Estimation of Protein Compounds by Stutzer's Method. By J. M. Bartlett, B. S., p. 25-29.

Experiments on the Feeding Values of Early and Late Cut Hay, p. 40-44.

The Butterflies of Maine. By C. H. Fernald, A. M. [Appendix.] p. 1-106.

1884: pp. 140. Contains:

[Appendix.] Laws Pertaining to the College, p. 3-10.

Notes on the Character of the Rock Formations in the vicinity of Auburn, Maine. By G. P. Merrill, M. S., p. 11-13.

The Precipation of Casein. By H. L. Merrill, p. 14-15.

On the Volumetric Determination of Fixed Fatty Acids in Butter and Other Fats. By H. W. Powers, p. 16-17.

1885: pp. 175, contains:

Experiment in Beef Production, p. 31-36.

The Sphingidæ of New England. By C. H. Fernald, A.M., [Appendix.] pp. 89-175. [With six plates.]

1886: pp. 118. Has a new plate as a frontispiece, giving a view of Brick Hall and Boarding House; White Hall; Chemical Laboratory, and Work Shop. Contains a reference to the $100,000 endowment of the College from the late Ex-Governor Abner Coburn.

1887: pp. 98. Has new plate: View of Coburn Hall.

1888: pp. 126. Contains:

Dedication of Coburn Hall.

Bulletin of the Maine State College Laboratory of Natural History. Vol. I, No. 1.

A Catalogue of the Minerals and Rocks in the Museum.

1889: pp. 100.

1890: pp. 185. Has plate: "Design for Engineering Building." Contains:

The Land Mammals of New England. A Thesis for an Advanced Degree. By Alice A. Hicks, B. S., (Mrs. George F. Black,) '87. Portland. With five full page plates.

1891: pp. 107. Embraces eleven beautiful plates of views of the grounds, buildings, interiors, etc., and a map of college campus.

1892: pp. 155. With ten new plates of buildings, view of campus and interiors. Contains Law of Congress of 1890 relating to the more complete endowment and support of agricultural colleges.

Report of the Evidence and Conclusions of the Committee to Investigate the Sale of the Agricultural College Script. Made to the Fifty-Ffth Legislature. Augusta, 1876, 8vo, pp. 130.

Report of the Joint Special Committee to Investigate the Cause of the Outbreak of Disease among the Cattle at the State College Farm, the Loss and Disposal of Cattle Therefrom, and the Doings and Correspondence of the Commissioners on Contagious Diseases among Cattle in Relation to the Same. Together with the Testimony taken Before the Committee. Augusta, 1887, 8vo. pp. 257.

Dedication of Coburn Hall, June 26, 1888. Augusta, 1888, 8vo, pp. 71.

Contains Ode by Mrs. M. C. Fernald; Address of Welcome by President M. C. Fernald; Historical Address by Hon. Lyndon Oak; record of all officers of the College and members of the Faculty; report of building committee, and speeches by Prof. F. L. Harvey, Hon. Samuel Libbey, Hon. Herbert M. Heath and Dr. John T. Cushing.

Bulletin of the Maine State College Laboratory of Natural History. Vol. I; No. 1. A Catalogue of the Minerals and Rocks in the Museum. Augusta, 1888, 8vo, pp. 28.

Circular of Information. Orono, 1892. Oblong, pp. 32. [With thirty plates and engravings.]

Annual Catalogues, 1868-1892.

Souvenir of the Twentieth Annual Commencement, June 20-26, 1891. By Edward H. Kelley, '90. Contains plates, views, Historical Reminiscences, Fraternity Directory, etc.

College journals have been the College Reporter, 1875, published for a few years; The Cadet, 1886 to 1892, and occasional annual numbers of The Pendulum.

STONE, GEORGE H., A. B., A. M. Born in Colamer, Onondaga County, N. Y., Nov. 22, 1841. Graduated at Wesleyan University, Middletown, Conn., 1868. Professor of Mathematics, Genesee Wesleyan Seminary, Lima, N. Y., 1869-'72. Professor of Natural Science, Maine Wesleyan Seminary and Female College, Kent's Hill, 1874-'81. Professor of Geology, Colorado College, Colorado Springs, Col., 1881-'89. Mining Expert, Colorado Springs, Col. In addition to the works enumerated below Prof. Stone has prepared a report on "The Glacial Gravels of Maine and their Associated Deposits," making eleven hundred large manuscript pages, accompanied with maps and engravings which is soon to be published by the United States Geological Survey. It is a general review of the glacial geology of Maine, the origin of its soils, etc. In a letter to the author under date of March 22, 1893, Prof. Stone says: "My studies in the mountains during the last four years have quite revolutionized my views as to matters of interpretation." Address: Colorado Springs, Colorado.

1. The Kames of Maine. [From Proceedings of the Boston Society of Natural History. Vol. XX, March 3, 1880, pp. 430-469.] 8vo, pp. 430-469. The pamphlet is published in separate form and paged continuously.
2. Geology and Paleontology. Note on the Androscoggin Glaciers. [From the American Naturalist, April 1880.] 8vo, pp. 244-362.
3. The Kames or Eskers of Maine. [From the Proceedings of the American Association for the Advancement of Science, Vol. 29. Boston Meeting, August, 1880.] 8vo pp. 510-514. [With a map.]

4. Lecture upon Glacial Deposits in Eastern North America. 1881. See Portland Natural Hist. Soc. Proc. Glacial Erosion in Maine. Portland Natural Hist. Soc. Proc., Nov. 21, 1881, pp. 11.
5. The Kame Rivers of Maine. From the Proceedings of the American Association for the Advancement of Science, Vol. 32. Minneapolis Meeting, August, 1883. Salem, Mass., 1884, 8vo, pp. 234-237.
6. Local Deflections of the Drift Scratches in Maine. American Journal of Science, 130-146. 1885.
7. Terminal Moraines in Maine. [From the American Journal of Science, Vol. 33, May, 1887. 8vo, pp. 378-385.]
8. Classification of the Glacial Sediments of Maine. American Journal of Science, 40-122. 1890.
9. The same. New Haven, 1890, 8vo, pp. (1), 122-124.

"Prof. Stone, by devoting the time of his vacation for three years to an examination of those peculiar formations of our surface geology known as 'horsebacks', which he mapped out for the Boston Society of Natural History, has done more for the interpretation of geological science in our State, than has been done by the work of both our State surveys put together."—The Home Farm, August 14, 1884.

STURTEVANT, EDWARD LEWIS. Born in Boston, Mass., January 23, 1842. Moved to Maine, "on the old hill in Winthrop," in the "fifties." Entered Bowdoin College in the class of 1863. Enlisted in the Twenty-fourth Maine Regiment in 1862. Was with the 19th Army Corps, on the lower Mississippi and at the seige of Port Hudson. Was First Lieutenant and Captain, and also attached to the staff of Gen Nickerson, 3d Brigade, 2d Division, with the rank of Captain. Received the degrees of B. A., and M. A., from Bowdoin College. Graduated at Harvard Medical School, 1866. Proprietor (with his brother) of Waushakum Farm, South Framingham, Mass.,—a farm famous for its herd of Ayrshires, seed-corn and experimental work—from 1860 to 1882. Editor of The Scientific Farmer, (in conjunction with E. H. Libby), from February, 1876, to April, 1878; and sole editor of the same journal from May, 1878, to October, 1879. Director New York Agricultural Experiment Station, Geneva, 1882–'87. Fellow of the American Association for the Advancement of Science. Formed one of the largest and finest private libraries on subjects pertaining to agriculture, horticulture and botany ever collected, which was presented to the Missouri Botanic Garden, St. Louis, Mo., in 1892. Author of an "Agricultural Bibliography," the manuscript of which was presented to the library of the Massachusetts Agricultural College, Amherst, Mass. Address: South Framingham, Mass.

1. The Dairy Cow. A Monograph on the Ayrshire Breed of Cattle. With an Appendix on Ayrshire, Jersey and Dutch Milks; Their Formation and Peculiarities. Boston, 1875, 12 mo., pp. 252. Illustrated.

The authorship of this work was in conjunction with his brother, Joseph N. Sturtevant.

2. Editor of Reports of the New York Agricultural Experiment Station, 1882-'87, 6 vols. Contents:

First Report, 1882. Organization of Station work; experiments with wheat, barley and oats; studies on Maize; experiments with Potatoes; Forage Crops.

Second Report, 1883. Botanical Notes; Studies on Maize; Station grown Seeds; Weight of Seeds; Relations of Feed to Milk; Experiments with Potatoes; Experiments with Corn; Experiments with Grasses.

Third Report, 1884. Feeding Experiments and Milk Analysis; Study of Milk; Experiments with Potatoes; Wheat Improvement; Experiments with Corn; Germinations of Seeds; Study of Maize, including Sweet, Pop and Dent Corn.

Fourth Report, 1885. Starch Waste as Cattle Foods; Ensilage and Forage Crops; Studies on Corn; Fertilizers on Potatoes; Tests on Germination of Maize and other Seeds; The Sweet Corns.

Fifth Report, 1886. Cattle Feeding Experiments; Temperature and Crops; Vitality of Seeds as Influenced by Age; Experiments with Cabbage; Studies of Indian Corn.

Sixth Report, 1887. Feeding for Beef; Experiments with Potatoes; Seed Germinations.

3. Physiological Considerations concerning Feeding for Butter and Cheese. Hartford, Conn., 1874, 8vo, pp. 67.

4. The Wild White Cattle of Scotland, or White Forest Breed. [Reprinted from American Naturalist, Vol. 8, 1874, pp. 135-145.] pp.11.

5. Milk: Its Typical Relations. A Lecture before the Vermont Dairymen's Association, January 21, 1874. South Framingham, Mass., 1874, 8vo, pp. 20.

6. Chemical Corn Growing. [Reprinted from Transactions South Middlesex Agricultural Society.] Framingham, Mass., 1875, 8vo, pp. 32.

7. The Law of Inheritance; or The Philosophy of Breeding. Boston, 1875, 8vo, pp. 48.

8. Plant Food and Agriculture. Hartford, Conn., 1876, 8vo, pp. 14.

9. Intercultural Tillage. Hartford, Conn., 1877, 8vo, pp. 42.

10. Indian Corn. Albany, N. Y., 1880, 8vo, pp. 31.

11. Some Thoughts and Facts Concerning the Food of Man. [Reprinted from the Report of the Connecticut Board of Agriculture, 1880.] Pages 114-155.

12. Thoughts on Agricultural Education. Hartford, Conn., 1881, 8vo, pp. 19.

13. Agriculture of Massachusetts. A Report prepared for the Massachusetts State Commission to the Centennial Exposition, 1876. Boston, 1876.
14. The Growing of Corn. [From the 28th Annual Report of the Secretary of the State Board of Agriculture.] Boston, 1881, 8vo, pp. 77-130.
15. Maize. An Attempt at Classification. [Printed for private distribution only.] Rochester, N. Y., 1884, 8vo, pp. 9.
16. The Dairy Cow—What She Is, and whence She Came. Report Maine Board of Agriculture, 1875, p. 112-125.
17. American Agricultural Literature. Proceedings of Fifth Annual Session of National Agricultural Congress, Philadelphia, 1876.
18. Milk: Physiological and Miscellaneous. Trans. N. Y. State Agri cultural Society. Vol. 32, Albany, N. Y., 1878, p. 91-124. [With three plates.]
19. Seed Breeding. Agriculture of Connecticut, 1878, p. 149-187. [Reprinted in Monthly Journal of Science, August, 1879.]
20. Seed Corn. Report Maine Board of Agriculture, 1878, p. 30-47.
21. Fertility. Journal of American Agricultural Association, Vol. I.
22. Seedless Fruits. Trans. Mass. Hort. Society, 1880, p. 133-161.
23. Relation between Seeding and Quality in Certain Vegetables and Fruits. Proceedings Society for the Promotion of Agricultural Science, Vol. I, 1883, p. 40-49.
24. Different Modes of Cutting Potatoes for Planting. Proceedings of Society for the Promotion of Agricultural Science, Vol. I, 1883, p. 77-78.
25. Dairying vs. Thoroughbred Bulls. Transactions Vermont Dairymen's Association, 1876, p. 60.
26. Philosophy of Dairying. Transactions American Dairymen's Association, 1876, p. 90.
27. Why the Ayrshire Cow Should be the Dairymen's Choice. Transactions Vermont Dairymen's Association, 1872, p. 150-159.
28. Fertilizer Laws. Agriculture of Pennsylvania, 1877, p. 108.
29. Cost of a Crop of Corn to the Massachusetts Farmer. Agriculture of Massachusetts, 1872-'3, part II, p. 80-89.
30. Ayrshire Points. Ohio Agricultural Report, 1872, p. 261-270

Reprinted in Mark Lane Express, London, England, February 3, 1873; in Farmer's Magazine, London, May, 1873, p. 230, and in North British Agriculturist, Edinburgh, Scotland, July 16, 1873.

31. Hungarian Grass. Trans. New York State Agricultural Society- Vol. 33, 1884, p. 208-220.
32. Experiment Stations. Trans. New York State Agricultural Society. Vol. 33, 1884, p. 235-243.
33. Experimental Observations on the Potato. Trans. New York State Agricultural Society. Vol. 33, 1884, p. 261-265.
34. Lysimeter Records. Proceedings American Association for the Advancement of Science, 1881.

35. The Need of a Better Seed Supply. Trans. New York State Agricultural Society, Vol. 33, 1884, p. 286-289.
36. Corn Culture at Waushakum Farm. Transactions New York State Agricultural Society, Vol. 32, 1878, p. 170-176.
37. The Claims of the Ayrshire Cow upon the Dairy Farmer. Transactions New York State Agricultural Society, Vol. 32, 1878, p. 266-279.
38. Ensilage Experiments in 1884 and 1885 at the New York State Agricultural Experiment Station. Transactions New York State Agricultural Society, Vol. 34, 1889, p. 116-120.
39. Forage Crops: Maize and Sorghum. Transactions New York State Agricultural Society, Vol. 34, 1889, p. 135-143.
40. Agricultural Botany. Transactions New York State Agricultural Society, Vol. 34, 1889, p. 335-338.
41. Morphology of Milk. Agriculture of Massachusetts, 1873-'4, p. 374-388.
42. Deerfoot Farm Centrifugal Dairy. Report Department of Agriculture, Washington, D. C., 1880, p. 629-651. [With three plates.] Reprinted in Journal of the Royal Agricultural Society of England. Second Series, Vol. 18, 1882, p. 475-495.
43. Conditions Necessary to Success in Dairying. Report New York State Dairymen's Association, 1883.
44. The Feeding of Spoiled Brewers' Grains. Report New York State Dairymen's Association, 1884.
45. Agricultural Botany. Proceedings Society for Promotion of Agricultural Science, Vol. 2, 1885, p. 9-15.
46. Cultivated Food Plants. Proceedings Society for the Promotion of Agricultural Science, Vol. 2, 1885, p. 59-72.
47. An Observation of the Hybridization and Cross-breeding of Plants. Proceedings of American Association for the Advancement of Science. 1885.
48. Germination Studies. Proceedings of American Association for the Advancement of Science. 1885.
49. Influence of Insulation upon Vegetation. Proceedings of American Association for the Advancement of Science. 1884.
50. Horticultural Botany. Proceedings of Western New York Horticultural Society, 1886.
51. Inidan Corn. Transactions New York State Agricultural Society, 1879, p. 37-74.
52. History of Indian Corn. Sibley's Grain and Farm Seeds Annual, 1883.
53. Notes on the History of the Strawberry. Transactions Massachusetts Horticultural Society, 1888, p. 191-204.
54. Edible Plants of the World. Agricultural Science, Vol. 3, No. 7.
55. The Tomato. Report Maryland Experiment Station, 1889, p. 18.
56. Concerning Some Names for Cucurbitæ. Bulletin Torrey Botanical Club, October 1891.

57. The Dandelion and the Lettuce. Proceedings Society for the Promotion of Agricultural Science, Vol. 3, 1886, p. 40-44.

58. A Study in Agricultural Botany. Proceedings Society for the Promotion of Agricultural Science, Vol. 4, 1886, p. 68-73.

59. Atavism the Result of Cross-breeding in Lettuce. Proceedings of Society for the Promotion of Agricultural Science, Vol. 4, 1886, p. 73-74.

60. History of the Currant. Proceedings Western New York Horticultural Society, 1887.

61. Capsicum pasciculatum. Bulletin Torrey Botanical Club, May, 1888.

62. Capsicum umbillicatum. Bulletin Torrey Botanical Club, April, 1888.

63. Seedless Fruits. Memoirs Torrey Botanical Club, Vol. I, part 4.

64. Huckleberries and Blueberries. Transactions Massachusetts Horticultural Society, 1890, p. 17-38.

What is the Ayrshire Cow. Country Gentleman, Albany, N. Y., Sept. 18, 1873; Live Stock Journal, Buffalo, N. Y., Oct., 1873.

Dairy Cattle. Country Gentleman, Oct. 30; Nov. 6; Nov. 13; Nov. 20, 1873.

Adulteration of Milk. An Address. Massachusetts Ploughman, Boston, March 7, 1874.

Adaptation in Farming. An Address. Massachusetts Ploughman, April 4, 1874.

The Points of Ayrshires. An Open Letter. Country Gentleman, Dec. 16, 1875.

Sex in Breeding. Scientific Farmer, Aug., Sept., Oct., 1876.

A New Theory of Tillage. Scientific Farmer, Jan. 1877.

Epizootic Abortion. Scientific Farmer, May, 1877.

Agricultural Plant Feeding. An Address. American Cultivator, October 5, 1878.

Fertilizers on Brains. Land and Home, Feb. 5, 1880.

Milk. National Live Stock Journal, July, August, September, October, November, 1880.

Concerning Sex. National Live Stock Journal, February, March, 1881.

Thorougebred Seed. Indiana Farmer, Dec. 25, 1880.

Thoughts on Breeding. National Live Stock Journal, April, June, 1881.

Lowest Germination of Maize. Botanical Gazette, April, 1885.

Glimpses of Old Herbals. American Garden, May, 1891.

Seed Germination. A Study. Agricultural Science, February, 1887.

Acid Food. National Live Stock Journal, January, 1889.

Sweet Corn. Rural New Yorker, July 12, 8881. Illustrated.

Evaporation. New England Farmer, May 20, 1882.

CONTRIBUTIONS TO AMERICAN NATURALIST. Agricultural Botany. Illustrated. Vol. 18, 1884, p. 573-577.

Indian Corn and the Indian. Vol. 19, 1885, p. 225-234.

Kitchen Garden Esculents of American Origin. Vol. 19, 1885, p. 444-457; 542-553; 658-669.

A Study of the Dandelion. Illustrated. Vol. 20, 1886, p. 5-9; A Study of Garden Lettuce, p. 230-233; History of Celery, p. 599-606.

History of Garden Vegetables. Vol. 21, p. 49-59; 125-133; 321-333; 433-444; 701-712; 826-833; 903-912; 975-985. Vol. 22, p. 420-433; 802-808; 979-987. Vol. 24, p. 30-48; 143-157; 629-646; 719-744.

An important series of articles on the history of our cultivated garden vegetables, arranged alphabetically, but unfortunately terminating at "Gourd." Remarkable for its careful descriptions, synonymy, and voluminous references to the old herbals and the entire range of gardening literature ancient and modern, American and foreign.

In his report on the presentation of Dr. Sturtevant's library to the Missouri Botanic Garden, Dr. William Trelease, Director of the Garden, in his Fourth Report, [1893, p. 14-15], says: "The library is undoubtedly the most complete and valuable American collection of pre-Linnæan botanical books, and represents the expenditure of a great amount of time and money on Dr. Sturtevant's part, since he has for many years been interested in bringing together the early literature of the science of botany, especially in its application to economic plants. * * * It will be kept in a separate alcove, to be known as the 'E. Lewis Sturtevant Library of pre-Linnæan Botany.' A catalogue of its contents will be published in order that students of botany may know where a collection of books of this character can be consulted."

THOMPSON, JOHN WALLACE. Born in Turner, February 4, 1844. Enlisted in band of Fifth Maine Regiment at 17 years of age in 1861, and was mustered out in 1862 by the law discharging regimental bands. Enlisted again in 32d Maine Regiment, in March, 1864, and served till close of the Rebellion. Address: Canton.

1. Sketches, Historical and Descriptive, of Noted Maine Horses, Past and Present, their Ancestors and Descendants. Portland, 1874, 12 mo. pp. 228. Illustrated.
2. Sketches of Noted Maine Horses. Vol. II. Canton, 1887, 12 mo. pp. 348. Illustrated.

   The most important works ever published on the horse breeding interests of Maine. Volume I contains historical sketches of the Messenger, Morgan, Drew, Eaton, Rising Sun, Flying Eaton, Brandywine, Knox, Black Hawk, Morrill, Hampton, Patchen, Cadmus, Annfield, Fearnaught and Hambletonian families of horses in Maine; and pedigrees of 1061 horses. Volume II contains historical sketches of the Brandywines; Drew Horse, 114; Eaton Horse, 122; Gen. Knox, 140; Rising Sun, 429; Winthrop Morrill, 373; biographical sketches of the drivers, Edwin D. Bither and James Dustin, and pedigrees of 1711 horses.
3. The Maine Horse Breeders' Monthly.

A full set of this valuable magazine comprises thirteen volumes and three numbers, it having been published from June, 1879, to March, 1892, when it was discontinued. It is a mine of information on the pedigrees, history and performances of Maine bred horses, but unfortunately the several volumes are without title pages or indexes. Volume 1, embraces ten numbers; volume 2, nine numbers, but all subsequent volumes, twelve numbers each, beginning with January of each year. Some one will do a service to Maine agricultural literature by preparing an index to this work.

THOREAU, HRNRY D.

1. The Maine Woods. Boston, 1892, 12mo, pp. 328. [Many Editions.]

The sections of this work relate to Ktaadn, Chesuncook and the Allegash and East Branch. Appendix contains the following: 1. Trees. 2. Flowers and Shrubs. 3. List of Plants. 4. List of Birds. 5. Quadrupeds. 6. Outfit for an Excursion. 7. A List of Indian Words.

This work has long been, and will long continue to be, a classic of the Maine forests.

TRANSACTIONS of the Cumberland County Agricultural and Horticultural Society, for the year 1861. With an Address by Hon. Samuel F. Perley. Portland, 1861, 8vo, pp. 83.

TRANSACTIONS of the York County Agricultural Society for the years, 1847, '48, '49. Together with the by-laws and laws of the State relating to Agricultural Societies. Saco, 1850, 8vo, pp. 144.

Contains Address of Hon. Rufus McIntire of Parsonsfield; Address of Ralph R. Philips of Manchester, Conn.; Address of Dr. Ezekiel Holmes of Winthrop; Harvest Home and Farmer's Rest, two poems by Charles H. Granger, Saco; Remarks on the different breeds of Sheep that have been introduced into Maine, by E. Holmes; On the Cultivation of the Pear on the Quince, by S. L. Goodale, and a Select List of Fruits for Maine.

TRUE, NATHANIEL TUCKERMAN. Born in North Yarmouth, (now Pownal), March 15, 1812. After studying for two years at Bowdoin College he relinguished his college course and attended the Maine Medical School from which he graduated in 1846. He abandoned the practice of medicine for the profession of teaching which he made his life work, having been principal of Gould's Academy, Bethel, for a long term of years; also a professor in a normal school in western New York, and principal of schools and academies in Gorham and Milan, N. H., and Litchfield, Maine. Member of Maine Board of Agriculture, 1858-'61. Received the honorary degree of A. M., from Colby University, (Waterville College), in 1868, and Bowdoin College, in 1841. Founder of the Bethel Farmers' Club, one of the best known and most influential of the earlier farmers' clubs of Maine. Senior editor of the Maine Farmer from 1865 to 1869, for which he wrote two series of very popular short articles, viz.: "Chemistry by the Fireside," and "Geology by the Fireside." President of the Maine Board of Education; member of Portland Society of Natural History; American Association for the Advancement of Science; Wisconsin Historical Society; Maine Historical Society. He died in Bethel, May 18, 1887. [For sketches of his life see History of Bethel, 1891, p. 144-147; Collections and Proceedings of the Maine Historical Society, 1892, p. 225-231. Portrait: History of Bethel, p. 144.]

1. Address. Transactions of Agricultural Societies of Maine, 1853, p. 3-23.
2. Address on the Soils of Oxford County. Report Maine Board of Agriculture, 1856, Abstract, p. 88-102.
3. Address. Report Maine Board of Agriculture, Abstract, 1857, p. 179-203.
4. Address on Progressive Farming. Report Maine Board of Agriculture, Abstract, 1858, 77-105.
5. Insects Injurious to Vegetation. Report Maine Board of Agriculture, 1858, p. 167-176.
6. Renovation of Orchards. Report Maine Board of Agriculture, 1859, p. 205-209.
7. Biographical Sketch of Ezekiel Holmes, M. D. Report Maine Board of Agriculture, 1865, p. 207-226.
8. The Soil and Its Preparation for an Orchard. Transactions Maine Maine State Pomological Society, 1876, p. 71-77.
9. Planding an Orchard. Transactions Maine State Pomological Society, 1877, p. 23-29.
10. Pear Culture. Transactions Maine State Pomological Society, 1883, p. 79-81.

"It was his delight to take his spring and summer classes in botany through the fields, pastures and woods, gathering and classifying the various wild flowers in their season; or his pupils interested in mineralogy and geology to the summit of Paradise Hill, and sometimes even to the tops of the surrounding mountains where he pointed out and described diluvial markings and other signs of glacial action, and gathered minerals of various kinds. Dr. True's studies embraced a very wide range, and he was able to impart instruction in almost every department of useful knowledge. They embraced languages, both ancient, including Latin, Greek and Hebrew, and modern, including French, Spanish, Italian and German, the natural sciences, practical surveying and engineering, scientific agriculture, navigation, astronomy and the higher mathematics."—Maine Historical Collections, 1892, p. 228-229.

"He was one of the most industrious of men, never losing any time, and ever an early riser. He was a kind-hearted, genial man and full of sympathy for those working for self-education with limited means. Of his writings but little was ever published in permanent form, and most of them will soon be forgotten unless gleaned from the various newspaper files and reprinted."—Lapham's History of Bethel, p. 147.

TWITCHELL, G. M. Born in Bethel, Sept. 17, 1847. Lecturer Maine State Grange, 1889-'91; Overseer Maine State Grange, 1891-'92; Secretary Maine State Agricultural Society, 1891-'92. Assistant Editor Maine Farmer. Address: Augusta.

1. How to Make Poultry Profitable. Report Maine Board of Agriculture, 1883, p. 127-136.
2. Poultry for Profit. Report Maine Board of Agriculture, 1884, p. 39-47.
3. On Poultry. Report Maine Board of Agriculture, 1885, p. 224-229.
4. The Necessities of Today. Report Maine Board of Agriculture, 1887, p. 123-131.
5. The Percheron Horse. Report Maine Board of Agriculture, 1888, p. 198-208.
6. Intensive Poultry Culture. Report Maine Board of Agriculture, 1889, p. 172-185.
7. Inexpensive Sources of Fertility for the Orchard—Poultry. Transactions Maine State Pomological Society, 1890, p. 53-56.
8. How to Make Poultry Keeping Profitable. Report Massachusetts Board of Agriculture, 1889, p. 238-268.
9. Some Conditions for Success in New England Agriculture. Report Massachusetts Board of Agriculture, 1890, p. 90-104.

In addition to the above list, Dr. Twitchell has delivered many lectures before farmers' institutes and agricultural conventions in New Hampshire, Vermont, Rhode Island, New Brunswick and Nova Scotia, which have been published in full or by abstract in the agricultural reports of the several states and provinces named.

WASSON, SAMUEL. Born in Brooksville, August 15, 1819. Member of the State Board of Agriculture, 1860-1879; President Maine State Agricultural Society, 1873-'74; Secretary State Agricultural Society, 1875; trustee State Agricultural Society, fourteen years; member of the Maine Senate, 1857-'58; member of the Maine House of Representatives, 1865-'70, also in 1874. Editor and publisher of Eastern Farmer, Ellsworth. For many years a prominent contributor to the agricultural press. Address: East Surry.

1. Transactions of the Maine State Agricultural Society; for the State Fair Year, 1875. Portland, 1875, 8vo, pp. 101. [All published.]
2. A Survey of Hancock County, Maine. Augusta, 1878, 8vo, pp. 91.
3. Marine Manures. Report Maine Board of Agriculture, 1859, p. 180-182.
4. Use of Artificial Fertilizers. Report Maine Board of Agriculture, 1867, p. 74-77.
5. The Ideal Farmer. Report Maine Board of Agriculture, 1868, p. 56-65.

6. History of the Potato. Report Maine Board of Agriculture, 1969, p. 90-100.
7. Water as an Agricultural Agent. Report Maine Board of Agriculture, 1870, p. 359-370.
8. Green Crops as a Ready and Available Means for Enriching the Soil. Report Maine Board of Agriculture, 1873, p. 134-150.
9. Conditions Requisite for the Elevation of Farming. Report Maine Board of Agriculture, 1874, p. 19-30.
10. "No Cattle, no Crops." Report Maine Board of Agriculture, 1874, p. 283-294.
11. Specialties in Farming.—Mutton Rather than Wool. Report Maine Board of Agriculture, 1875, p. 161-176.
12. Muscle Beds. Report Maine Board of Agriculture, 1877, p. 211-216.
13. The Grasses of Maine. Report Maine Board of Agriculture, 1878, p. 1-24.

WIGGIN, EDWARD. Born in Bangor, November 14, 1837. Educated in the public Schools. Enlisted in Sixth Maine Battery, December, 1861, of which he was First Lieutenant, and was for some time acting assistant adjutant general on staff of Second Brigade, Artillery Division, Army of the Potomac. President of North Aroostook Agricultural Society; member of Maine Board of Agriculture, 1883-'85; President of the Maine Board of Agriculture, 1885; member of of the Maine Senate 1893. A teacher of experience and writer of ability for the public press. Address: Maysville centre.

1. Aroostook. Address delivered at Boothbay, December 14, 1885. Also opinions of others with reference to that county. Portland, 1887, 8vo, pp. 26.
2. A Series of Articles giving a history and description of each town in Aroostook county, with special reference to their agricultural features and capabilities. [Published in Weekly Kennebec Journal, Augusta, 1890-'91.]
3. The Agriculture of Aroostook County. [In Report of Industrial and Labor Statistics of Maine, 1890, p. 68-79.]
4. Soil Exhaustion and How to Prevent It. Report Maine Board of Agriculture, 1883, p. 37-47.
5. Advantages of Aroostook County. Report Maine Board of Agriculture, 1883, p. 137-158.
6. Intellectual and Social Culture among Farmers. Report Maine Board of Agriculture, 1884, p. 131-149.
7. Progress in Agriculture. Report Maine Board of Agriculture, 1885, p. 186-202.

Mr. Wiggin is also the author of "Maine: Its History, Development, Resources and Industries," to be published as a contribution to the literature of the Columbian World's Fair, one chapter of which is devoted to the agriculture of the State.

WILSON, NATHANIEL E. Born in Orono, October 15, 1867. Graduated from Maine State College, with degree of B. S. in 1888. Assistant Chemist Vermont Experiment Station; chemist Bergenport Chemical Company, Bayonne, N. J.; now Chemist to the Nevada State Experiment Station, Reno, Nevada.

1. Sugar Beet Experiments. Bulletin No. 13, Agricultural Experiment Station, University of Nevada, October, 1891, 8vo , pp. 40.
2. Potato Experiments. Bulletin No. 14, Agricultural Experiment Station, University of Nevada, December, 1891, 8vo., pp. 18.
3. The Creamery Industry. Bulletin No. 16, Agricultural Experiment Station, University of Nevada, April, 1892, 8vo., pp. 66.
4. Cheese and its Manufacture. Bulletin No. 18, Agricultural Experiment Station, University of Nevada, November, 1892, 8vo., pp. 27.

WINSLOW, ISAAC O. Born in Fairfield, January 30, 1856; graduated at Brown University, Providence, R. I., 1878; degree of Master of Arts conferred upon him by his alma mater, 1887. Master of a public school in Providence for six years; member of Council of Maine Experiment Station, 1889-'92; Lecturer of Maine State Grange, 1891-'2; member of Maine Senate, 1893. Has contributed largely to the agricultural press of the State. Address: St. Albans.

1. The Principles of Agriculture for Common Schools. New York, 1891, 12mo, pp. 152.
2. Market for Dairy Products. Report Maine Board of Agriculture, 1890, p 138-145.
3. Home Grown Products for Dairy Cows. Report Maine Board of Agriculture, 1891, p. 108-117.
4. Education for Farmers. Report Maine Board of Agriculture, 1890, p. 55-66.

GENERAL INDEX.

A general index to the twenty-three volumes of the Agriculture of Maine, embracing the transactions and reports from 1850, to and including 1875, was published in 1876, the year of the Centennial Exposition at Philadelphia. In his introduction to that index the Secretary of the Board of Agriculture, said: "The twenty-three volumes on the agriculture of Maine here indexed present to the farmer a record of facts and observations which embody almost every varied duty of his vocation, and nearly every principle which governs those duties and assists in their accomplishment." Since that index was published, sixteen additional volumes have been added to this long set of reports, one of the most important series of volumes ever published relating to the material interests of the State. During this period remarkable advancement, improvement and discoveries have characterized all agricultural operations, and the results of such improvements have been fully recorded in these volumes. They contain so many valuable essays, papers and lectures, recording the experience and practices of the best farmers, in our own State and in other states and countries, in regard to methods and results; as well as the light which science has thrown upon agriculture, that it has been deemed fitting—now that the nations of the world are uniting with the United States in celebrating the four-hundredth anniversary of the discovery of this Continent, and contributions of all kinds are being made to the literature, science and art of the world—that this general index should be revised to date, in order that the wealth of information embraced in these volumes may be made available to all desiring to consult them. Hence, whenever the farmer, wishing to ascertain the best practice, or the student in pursuit of science connected with agriculture may desire to ascertain how far the volumes on the Agriculture of Maine may aid him in his investigation, a few moments devoted to the following index will point out its chief contents and the pages to be consulted. Generally only the more important subjects and papers have been indicated, but it is believed they are sufficient to direct a clear and satisfactory examination of the complete series. Each contributor will find his name in the index, with the title of his work; while the index of subjects is so complete as to leave little to be desired. The volumes are numbered by years, and where a reference is given, as "1874, ab. 127," the "Abstract," or second part of the volume is to be understood.

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CHAPTERS

OF THE

LAWS OF MAINE

Enacted in 1891-3,

RELATING TO

Agriculture and Kindred Subjects,

TOGETHER WITH THE SEVERAL AMENDMENTS TO THOSE PUBLISHED IN THE REPORT OF THE BOARD OF AGRICULTURE FOR 1891.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1893.

Chapters of the laws of Maine enacted in 1891-3, relating to agriculture and kindred subjects, together with the several amendments to those published in the Report of the Board for 1891.

CHAPTER 165.

An Act for the prevention of Cruelty to Animals.

SECTION 1. Section twenty-nine of chapter one hundred twenty-four of the revised statutes is hereby amended, so that said section shall read as follows:

'SECT. 29. Every person who cruelly over-drives, over-loads, or over-works, who torments, tortures, maims, wounds, or deprives of necessary sustenance, or who cruelly beats, mutilates or kills any horse or other animal, or causes the same to be done, or having the charge or custody thereof, as owner or otherwise, unnecessarily fails to provide such animal with proper food, drink, shelter and protection from the weather; every person, owning or having the charge or custody of any animal, who knowingly and willfully authorizes or permits the same to suffer tortures or cruelty; and every owner, driver, possessor or person having the custody of an old, maimed, disabled or diseased animal, who cruelly works the same when unfit for labor, or who cruelly abandons such animal; and every person who carries or causes to be carried, or has the care of, in or upon a car or other vehicle or otherwise, any animal in a cruel or inhuman manner, shall for every such offense be punished by imprisonment in jail not exceeding one year, or by fine not less than five dollars and not exceeding two hundred dollars, or both.'

SECT. 2. Section thirty-five, chapter one hundred twenty-four of the revised statutes, as amended by chapter twenty-five of the laws of eighteen hundred ninety-one, and section thirty-six of chapter one hundred twenty-four of the revised statutes, shall apply to the owners, shippers, charterer of cars, or other person having the care, custody or charge of animals loaded into any car, or transported upon any railroad; and such owner, shipper, charterer of cars, or other person having the care, custody or charge of animals, loaded into cars, or transported over any railroads for a violation of any of the provisions of said sections thirty-five and thirty-six, shall be subject to the same penalties as are imposed upon railroad companies for a like violation, by section thirty-seven of said chapter.

SECT. 3. Section thirty-seven of chapter one hundred twenty-four of the revised statutes, is hereby amended by striking out all of said section after the word "offense" in the third line.

SECT. 4. Section forty-two of chapter one hundred twenty-four of the revised statutes, as amended by chapter two hundred eighty-nine of the laws of eighteen hundred eighty-nine, is hereby amended, so that said section shall read as follows:

'SECT. 42. Such officer or agent may take possession of any old, maimed, disabled, diseased or injured animal, and apply to any municipal or police court or trial justice for process to cause the same to be destroyed. If the owner is known, a copy of such application shall be served upon him in hand with an order of court to appear at a time and place named, to show cause why such animal should not be destroyed, and its value fixed. If the owner is not known, then the court shall order notices to be posted in two public and conspicuous places in the town, stating the case in substance, and giving a forty-eight hours' notice of a hearing thereon. At such hearing if it appears that such animal is old, maimed, disabled, diseased or injured, and is unfit for use, the court shall determine the value of such animal, and shall issue process directing the officer to destroy the same. The defendant may appeal as in civil action, but before such appeal shall be allowed, the defendant shall give sufficient security to said officer, to be approved by the court, to pay all the expenses for the care and support of such animal pending such appeal.'

SECT. 5. Section forty-seven of chapter one hundred twenty-four of the revised statutes, as amended by chapter three hundred sixty-four of the laws of eighteen hundred eighty-five, is hereby amended, so as to read as follows:

'SECT. 47. Municipal and police courts and trial justices shall on complaint cause to be arrested any person charged with the commission in their counties of any of the offenses described in the eighteen preceding sections; the offense may be deemed to have been committed in any county where such animal may be found; and when such offenses are not of a high and aggravated nature, may try and punish by fine not less than five dollars nor exceeding twenty dollars, and by imprisonment not exceeding thirty days; but when on examination the offense appears to be one not within their jurisdiction for trial, they may cause the person or persons charged with the commission of the same to recognize with sureties to appear before the supreme judicial or superior courts, and in default thereof to be committed to jail.'

[Approved February 23.]

CHAPTER 175.

An Act for the protection of Horses.

SECTION 1. Whoever cuts the solid part of the tail of any horse in the operation known as docking, or by any other operation performed for the purpose of shortening the tail, and whoever shall cause the same to be done, or assist in doing such cutting, unless the same is proved to be a benefit to the horse, shall be punished by fine not exceeding one hundred dollars. All fines collected under this act upon, or resulting from, the complaint or information of an officer, or agent of the Maine state society for the protection of animals, shall be paid over to said society in aid of the benevolent objects for which it was incorporated.

SECT. 2. Municipal and police courts and trial justices shall on complaint, cause to be arrested persons charged with the commission in their counties, of any offense described in this act, and when such offense is not of a high and aggravated nature, may try and punish by fine not less than five dollars nor more than twenty dollars, and by imprisonment not exceeding thirty days; but when, on examination, the offense appears to be one not within their jurisdiction for trial, they may cause the person charged with the commission of the same to recognize with sureties to appear before the supreme judicial or superior court, and in default thereof to be committed to jail.

[Approved March 1.]

CHAPTER 192.

An Act to amend Section four of Chapter one hundred of the Public Laws of eighteen hundred and ninety-one, relating to the creation of a Forest Commission.

SECTION 1. Section four of chapter one hundred of the public laws of eighteen hundred and ninety-one, is hereby amended by striking out the words "when they deem it necessary," in the second and third lines thereof so that said section, as amended, shall read as follows:

'SECT. 4. County commissioners of each county in which there are unorganized places shall annually appoint one or more fire wardens as they deem necessary not exceeding ten, for all such unorganized places in any county, whose duties and powers shall be the same with respect to such unorganized places as those of fire wardens of towns, and they shall also have the same authority to call out citizens of the county to aid them in extinguishing fires that town fire wardens have to call out citizens of the town. The compensation of such fire wardens shall be paid by the county, and the compensation of persons called upon by them as aforesaid to render aid, shall be the same as that provided in the case of towns, and shall be paid one-half by the county and one-half by the owners of the lands on which said fires occur.'

SECT. 2. This act shall take effect when approved.

[Approved March 9.]

CHAPTER 194.

An Act to amend an act entitled "An Act to extirpate Contagious Diseases among Cattle."

SECTION 1. Section one of chapter one hundred and seventy-seven of public laws of eighteen hundred and eighty-nine, is hereby amended by striking out the words "and other live stock" in the fourth line, and inserting instead the words 'horses and sheep,' so that said section as amended, shall read as follows:

'SECT. 1. That for the purpose of facilitating and encouraging the live stock interests of Maine, and for extirpating all insidious, infectious and contagious diseases, now or that may be among cattle, horses and sheep, and especially tuberculosis, the governor of the state is hereby authorized and required, immediately after the passage of this act, to appoint a board of cattle commissioners consisting of three persons of known executive ability, who shall be charged with the execution of the provisions of this act, and who shall be known and designated as the State of Maine Cattle Commission, and whose powers and duties shall be those provided for in this act, and whose tenure of office shall be at the option of the governor. The compensation of said commissioners shall be at the rate of three dollars per day during the time they are actually engaged in the discharge of their duties as commissioners. The said commissioners shall respectively take an oath to faithfully perform the duties of their office, and shall immediately organize as such commission by the election of one of their number as president thereof, and proceed forthwith to the discharge of the duties devolved upon them by the provisions of this act.'

SECT. 2. Section two of said act is hereby amended by striking out the word "two" in the twenty-ninth line and inserting instead thereof the word 'one;' and by striking out the words "one hundred" in the thirtieth and thirty-first lines and inserting instead thereof the word 'fifty;' also by striking out the word "one" in the thirty-sixth line, and inserting instead thereof the word 'three;' also by inserting after the word "disease" in the thirty-seventh line, the words 'and the owner or owners shall furnish satisfactory evidence as to the time such animal or animals shall have been owned in the state,' so that said section two as amended, shall read as follows:

'SECT. 2. That it shall be the duties of the said commissioners to cause investigation to be made as to the existence of tuberculosis, pleuro-pneumonia, foot and mouth disease, and any other infectious or contagious diseases. And such commissioners or their duly constituted agent are hereby authorized to enter any premises or places, including stock yards, cars and vessels, within any county or part of the state in or at which they have reason to believe there exists any such diseases, and to make search, investigation and inquiry, in regard to the existence thereof. Upon the discovery of the existence of any of the said diseases, the said commissioners are hereby authorized to give notice, by publication, of the existence of such disease, and the locality thereof, in such newspapers as they may select, and to notify in writing, the officials or agents of any railroad, steamboat, or any other transportation company doing business in or through such infected locality, of the existence of such disease; and are hereby authorized and required to establish and maintain such quarantine of animals, places, premises or localities, as they may deem necessary to prevent the spread of any such disease, and also to cause the appraisal of the animal or animals affected with the said disease, in accordance with such rules and regulations by them, as hereinafter authorized and provided, and also to cause the same to be destroyed, and to pay the owner or owners thereof one-half of their value, as determined upon the basis of health before infection, out of any moneys appropriated by the legislature for that purpose; provided, however, that no appraised value shall be more than one hundred dollars for an animal with pedigree recorded or recordable in the recognized herd books of the breed in which the animal destroyed may belong, nor more than fifty dollars for an animal which has no recordable pedigree; provided further, that in no case shall compensation be allowed for an animal destroyed under the provisions of this act, which may have contracted or been exposed to such disease in a foreign country, or on the high seas, or that may have been bought into this state within three years previous to such animal's showing evidence of such disease; and the owner or owners shall furnish satisfactory evidence as to the time such animal or animals shall have been owned in the state; nor shall compensation be allowed to any owner who in person, or by agent, knowingly and willfully conceals the existence of such disease, or the fact of exposure thereto in animals of which the person making such concealment by himself or agent, is in whole or part owner.'

[Approved March 10.]

CHAPTER 255.

An Act in relation to the inspection of Milk.

SECTION 1. Section forty-four of chapter thirty-eight of the revised statutes is hereby amended by striking out the first two lines of said section and inserting in place thereof the following: 'the municipal officers of cities and towns containing not less than three thousand inhabitants shall annually appoint, and the municipal officers of all other towns shall on application of ten voters therein' so that said section as amended, shall read as follows:

'SECT. 44. The municipal officers of cities and towns containing not less than three thousand inhabitants shall annually appoint, and the municipal officers of all other towns shall on application of ten voters therein, annually appoint one or more persons to be inspectors of milk, who shall, before entering upon their duties, be sworn, and give notice of their appointment by publishing the same for two weeks in a newspaper published in their towns, if any, otherwise by posting such notice in two or more public places therein.'

SECT. 2. Section forty-seven of chapter thirty-eight of the revised statutes, is hereby amended by inserting after the words "has been added" in the fifth line, the words 'or sells or offers for sale as pure milk any milk from which cream has been taken;' and also by adding, after the word "indictment" in the last line of said section, the words 'when milk shall, by the gravimetric analysis, be found to contain over eighty-eight per cent of water, it shall be deemed prima facie evidence that said milk has been watered; and when milk, by the analysis aforesaid, shall be found to contain less than twelve per cent of solids and less than three per cent of fat, it shall be deemed, prima facie, milk from which cream has been taken, and any milk which by the analysis aforesaid, shall be found to contain any foreign substance, shall be deemed milk to which a foreign substance has been added,' so that said section, as amended, shall read as follows:

'SECT. 47. Whoever acting for himself, or as the employe of another, knowingly or willfully sells or offers for sale, milk from cows diseased, sick, or fed upon the refuse of breweries or distilleries, or upon any substance deleterious to its quality, or milk to which water or any foreign substance has been added, or sells or offers for sale as pure milk, any milk from which cream has been taken, forfeits twenty dollars for the first, and fifty dollars for every subsequent offense, to be recovered for the town where the offense is committed by complaint and indictment. When milk shall, by the gravimetric analysis be found to contain over eighty-eight per cent of water, it shall be deemed prima facie evidence that said milk has been watered, and when milk by the analysis aforesaid, shall be found to contain less than twelve per cent of solids, and less than three per cent of fat, it shall be deemed, prima facie, milk from which cream has been taken, and any milk which, by the analysis aforesaid, shall be found to contain any foreign substance, shall be deemed milk to which a foreign substance has been added.'

SECT. 3. This act shall take effect when approved.

[Approved March 24.]

CHAPTER 256.

An Act to regulate the sale and analysis of Commercial Fertilizers.

SECTION 1. Every manufacturer, company or person who shall sell, offer or expose for sale in this state any commercial fertilizer or any material used for fertilizing purposes the price of which exceeds ten dollars per ton, shall affix to every package of such fertilizer in a conspicuous place on the outside thereof, a plainly printed statement clearly and truly certifying the number of net pounds in the package sold or offered for sale, the name or trade mark under which the article is sold, the name of the manufacturer or shipper, the place of manufacture, the place of business and a chemical analysis stating the percentage of nitrogen, or its equivalent in ammonia in available form, of potash soluble in water, and of phosphoric acid in available form, soluble and reverted as well as the total phosphoric acid.

SECT. 2. Every manufacturer, company or person who shall sell, offer or expose for sale in this state, any commercial fertilizer or material used for fertilizing purposes, the price of which exceeds ten dollars per ton, shall for each and every fertilizer bearing a distinguishing name or trade mark, file annually with the director of the Maine Agricultural Experiment Station, between the fifteenth day of November and the fifteenth day of December, a certified copy of the statement, named in section one of this act, said certified copy to be accompanied when required, by a sealed glass jar or bottle containing at least one pound of the fertilizer to be sold or offered for sale, and the company or person filing said certified copy with its accompanying sample of fertilizer shall thereupon make affidavit that said samples corresponds within reasonable limits to the fertilizer which it represents in the percentage of nitrogen, total and available phosphoric acid, and potash soluble in water, which it contains. Such affidavit shall apply to the entire calendar year next succeeding the date upon which said affidavit is made, unless the person or persons making said affidavit shall give notice to the director of the Maine Experiment Station that a change is to be made during the year in the percentages of the above named ingredients contained in the fertilizer, in which case he shall, before selling or offering for sale such fertilizer, file another certified statement with an accompanying sample of fertilizer and an affidavit as hereinbefore required. The deposit of a sample of fertilizer as herein provided shall be required by said director unless the company, manufacturer or person selling or offering for sale a fertilizer coming within the provisions of this act, shall certify that its composition for the succeeding year is to be the same as given in the last previously certified statement, in which case the requiring of said sample shall be at the discretion of said director.

SECT. 3. The director of the Maine Experiment Station shall analyze or cause to be analyzed, all the samples of fertilizers which come into his possession under the provisions of section two of this act, and shall publish the results thereof in a bulletin or report on or before the fifteenth of March next succeeding.

SECT. 4. Any manufacturer, importer, agent or seller of any commercial fertilizer who shall deposit with the director of the Maine Experimental Station a sample or samples of fertilizer under the provisions of section two of this act, shall pay annually to said director an analysis fee as follows: Five dollars for the phosphoric acid and five dollars each for the nitrogen and potash, contained or said to be contained in the fertilizer, this fee to be assessed on any brand of which thirty tons or more are sold in the state, and upon receipt of such fee and of the certified statement named in section two of this act, said director shall issue a certificate of compliance with this act. Whenever the manufacturer or importer of a fertilizer shall have filed the statement made in section two of this act and paid the analysis fee, no agent or seller of said manufacturer, importer or shipper shall be required to file such statement or pay such fee. The analysis fees received by said director shall be paid immediately by him into the treasury of said experiment station.

SECT. 5. Any manufacturer, importer or person who shall sell, offer or expose for sale in this state any commercial fertilizer without complying with the requirements of section one, two and four of this act, or any fertilizer which contains substantially a smaller percentage of constituents than are certified to be contained, shall, on conviction in a court of competent jurisdiction, be fined one hundred dollars for the first offense, and two hundred dollars for each subsequent offense.

SECT. 6. The director of the Maine Experiment Station shall annually analyze, or cause to be analyzed, at least one sample of every fertilizer sold or offered for sale under the provisions of this act. Said director is hereby authorized and directed in person or by deputy to take a sample, not exceeding two pounds in weight, for said analysis, from any lot or package of fertilizer, or any material used for manurial purposes which may be in the possession of any manufacturer, importer, agent or dealer in this state; but said sample shall be drawn in the presence of said party or parties in interest, or their representative, and taken from a parcel or a number of packages which shall not be less than ten per cent of the whole lot sampled, and shall be thoroughly mixed and then divided into two equal samples and placed in glass vessels and carefully sealed and a label placed on each, stating the name or brand of the fertilizer or material sampled, the name of the party from whose stock the sample was drawn, and the time and place of drawing, and said label shall also be signed by the director or his deputy and by the party or parties in interest or their representatives at the drawing and sealing of said samples; one of said duplicate samples shall be retained by the director and the other by the party whose stock was sampled; and the sample or samples retained by the director shall be for comparison with the certified statement named in section two of this act. The result of analysis of the sample or samples so procured shall be reported to the person or persons requesting the analysis, and shall also be published in a report or bulletin within a reasonable time.

SECT. 7. Whenever the director becomes cognizant of the violation of any of the provisions of this act he shall report such violation to the secretary of the board of agriculture, and said secretary shall prosecute the party or parties thus reported; but it shall be the duty of said secretary upon thus ascertaining any violation of this act, to forthwith notify the manufacturer or importer in writing, and give him not less than thirty days thereafter in which to comply with the requirements of this act, but there shall be no prosecution in relation to the quality of any fertilizer or fertilizing material if the same shall be found substantially equivalent to the certified statement named in section two of this act.

SECT. 8. All acts and parts of acts inconsistent with this act, are hereby repealed.

SECT. 9. This act shall take effect September one, eighteen hundred and ninety-three.

Approved March 24.

CHAPTER 287.

An Act for the better protection of Sheep.

SECTION 1. Assessors of cities, towns and plantations shall include in their inventories lists of all dogs owned by or in possession of any inhabitant on the first day of April, setting the number and sex thereof opposite the names of their respective owners or persons in whose possession the same are found.

SECT. 2. Every owner or keeper of a dog more than four months old shall annually, before the first day of April, cause it to be registered, numbered, described and licensed for one year from the first day of April, in the office of the clerk of the city, town or plantation where said dog is kept, and shall keep around its neck a collar, distinctly marked with the owner's name and its registered number, and shall pay to said clerk for a license the sum of one dollar and fifteen cents for each male dog, and three dollars and fifteen cents for each female dog, and a person becoming the owner or keeper of a dog after the first day of April, not duly licensed, shall cause it to be registered, numbered, described and licensed as provided above. Every owner or keeper of dogs, kept for breeding purposes, may receive annually a special kennel license authorizing him to keep such dogs for said purpose. When the number of dogs so kept does not exceed ten, the fee for such license shall be ten dollars, when the number of dogs so kept exceeds ten, the fee for such license shall be twenty dollars, and no fee shall be required for the dogs of such owner or keeper under the age of six months. Dogs covered by the kennel license shall be excepted from the provisions of this section, requiring registration, numbering or collaring.

SECT. 3. The clerks of cities, towns and plantations shall issue said license and receive the money therefor, and pay the same to the treasurer of their respective cities, towns and plantations, within thirty days thereafter, retaining to their own use fifteen cents for each license issued; and the said treasurer shall pay the money so received to the state treasurer on or before September first of each year. Clerks of cities, towns and plantations shall keep a record of all licenses issued by them, with the names of the owners or keepers of dogs licensed, and the sex, registered numbers and description of all such dogs; provided, however, that the sex, registered numbers and description shall not be required of dogs covered by a kennel license.

SECT. 4. Each city, town and plantation treasurer shall keep an accurate and separate account of all moneys received and expended by him under the provisions of this act.

SECT. 5. Whoever keeps a dog contrary to the provisions of this act shall forfeit ten dollars, five of which shall be paid to the complainant and five to the treasurer of the city, town or plantation in which such dog is kept.

SECT. 6. The mayor of each city, the selectmen of towns and the assessors of plantations shall annually, within ten days from the first day of May issue a warrant to one or more police officers or constables directing them to proceed forthwith either to kill or cause to be killed all dogs within such city, town or plantation not licensed and collared according to the provisions of this act, and to enter complaint against the owners or keepers thereof. Such officers shall receive from the city, town or plantation, one dollar for each dog so killed. All bills for such services shall be approved by the mayors of cities, and municipal officers of towns and plantations.

SECT. 7. Each police officer or constable to whom the warrant named in section six of this act is issued, shall return the same on or before the first day of July following, to the officer or officers issuing the same, and shall state in said return the number of dogs killed and the names of the owners or keepers thereof, and whether all unlicensed dogs therein have been killed and the names of persons against whom complaint has been made under the provisions of this act.

SECT. 8. Any city or town officer who refuses or willfully neglects to perform the duties imposed by this act shall be punished by fine not less than ten dollars nor exceeding fifty dollars by an action at law, the same to be paid into the town treasury.

SECT. 9. When any person, resident of this state, shall sustain any damage to his sheep, lambs or other domestic animals, by reason of their being killed or injured by dogs, he shall give information thereof to the mayor of cities or to one of the municipal officers of towns or plantations where such damage was done within twenty-four hours after he has knowledge of the same, and thereupon said mayor or municipal officers shall estimate the amount of such damage and all damage done by dogs to sheep, lambs or other domestic animals proved to the satisfaction of the above officers, to have been committed in their city, town or plantation, shall be paid by said officers and any city, town or plantation paying such damages may maintain an action on the case against the owner or keeper of such dog or dogs, to recover such amount as may be adjudged to be the actual damage committed.

SECT. 10. The mayor of each city and the municipal officers of each town or plantation shall annually at least twenty days before the first day of April, post a notice in the usual place of posting notices, of their annual meetings in their respective cities, towns and plantations, setting forth all the requirements of this chapter with the penalties for non-compliance with the same; which notices shall be forwarded annually to the several cities, towns and plantations by the secretary of state.

SECT. 11. Any person who shall steal or confine and secrete any registered dog, or shall kill any such dog, unless such killing be justifiable in the protection of person or property, shall be liable to the owner in a civil action for the full value of such dog.

SECT. 12. When any sheep, lambs or other domestic animals shall have been damaged by two or more dogs at the same time, kept by two or more persons, the owners or keepers of such dogs shall be jointly and severally liable for such damage.

SECT. 13. When any town shall have paid damages to the owners of sheep, lambs or other domestic animals for losses incurred from dogs, as provided in section nine of this act, and are unable to identify the dog or dogs doing such damage, or to collect the amount of said damages from the owners of said dogs when identified, the municipal officers of such cities, towns and plantations shall make a statement of facts in the case, together with the amount of damages so paid, and shall transmit the same to the state treasurer, who shall reimburse to the city, town or plantation paying such damage, the amount of damage so paid; provided, however, the amount paid by the state treasurer to reimburse said cities, towns and plantations, as aforesaid, shall in no case exceed the amount received from licenses aforesaid.

SECT. 14. All moneys received by the state treasurer as provided in section three of this act, and remaining unexpended at the end of the year, shall be credited to the several cities, towns and plantations upon their state tax, in proportion to the amount each has paid into the treasury under the provisions of this act.

SECT. 15. All acts or parts of acts inconsistent with this act, including chapter one hundred forty-one of the public laws of eighteen hundred ninety-one, are hereby repealed.

SECT. 16. This act shall take effect when approved.

[Approved March 29.]

CHAPTER 391.

An Act amending the act incorporating the Maine State Pomological Society.

Section two of chapter two hundred and ninety-seventy of the public laws of eighteen hundred and seventy-three, incorporating the Maine Pomological Society, is hereby amended by striking out the words "five hundred" and inserting the words 'one thousand,' so that said section two when amended, shall read as follows:

'SECTION 2. Said society shall have all the rights, privileges and powers conferred by the laws of this state upon county and local agricultural societies, and shall be subject to all liabilities imposed by existing laws upon such societies, so far as the same are applicable to the objects of this society; but the bounty to be paid by the state to said society shall not exceed the sum of one thousand dollars in one year.'

Approved Febuary 15, 1893.

CHAPTER 436.

An Act to make the Riverside Agricultural Society a beneficiary under the laws, paying stipends to agricultural societies.

SECTION 1. The Riverside Agricultural Society of Oxford county, shall be paid the fair share of the annual stipends provided by law for agricultural societies, subject to the conditions imposed by law.

SECTION 2. This act shall take effect when approved.

Approved March 1, 1893.

CHAPTER 445.

An Act to incorporate the Bridgton Farmers' and Mechanics' Club.

SECTION 1. Isaiah S. Webb, Samuel S. Fuller, Robert A. Barnard, Eben A. Cross, Frank A. Libby, Ruel A. Dodge, Albert A. Ingalls, Charles O. Kilborn, Frank D. Moulton, Benjamin F. Milliken, Albert B. Kilborn, Thomas Smith, William A. Richardson, Alvin G. Morrison, Thomas Miller, Cyrus C. Johnson, Austin Brigham, Albert J. Roes, Lyman Bradstreet and their associates, successors and assigns, be and hereby are made a body politic and corporate by the name of Bridgton Farmers' and Mechanics' Club, with its principal place of business located at Bridgton, in the county of Cumberland, and State of Maine, for the purpose of promoting and improving generally, agriculture, horticulture, stock raising, breeding and raising of all animals, the mechanic arts and manufactures connected therewith. Said corporation shall have the power to make such by-laws and regulations, not inconsistent with the constitution and laws of the State of Maine, as it may deem necessary for the management of its affairs, and in general shall have and exercise all the powers and privileges incident and generally granted to similar corporations.

SECT. 2. The capital stock of said corporation shall not exceed the sum of fifteen thousand dollars, and shall be fixed at the first meeting of the corporation, and may be thereafter increased to a sum not exceeding said sum of fifteen thousand dollars, and shall be divided into shares of five dollars each.

SECT. 3. Said corporation shall have power to hold by purchase, lease, devise, bequest or gift, real estate not exceeding in value, exclusive of improvements, the sum of ten thousand dollars, and personal property, not exceeding in value the sum of five thousand dollars.

SECT. 4. Said corporation shall have all the police powers together with all other powers and privileges, at all its exhibitions of whatever kind, which are conferred upon agricultural societies by sections sixteen, seventeen and eighteen of chapter fifty-eight of the revised statutes, and any amendments thereof and additions thereto, and the prohibitions, restrictions, forfeitures and penalties provided by section nineteen of said chapter fifty-eight, shall be applicable to all exhibitions of this corporation.

SECT. 5. The first meeting of said corporation may be called by written notice thereof, signed by any corporator therein named, served upon each corporator by giving him the same in hand, or by leaving the same at his last and usual place of abode, seven days, at least, before the time of meeting.

SECT. 6. This act shall take effect when approved.

Approved March 2, 1893.

CHAPTER 465.

An Act to make the Gray Park Association a beneficiary, under the law paying stipends to agricultural societies.

SECTION 1. The Gray Park Association of Cumberland county, shall be paid the fair share of the annual stipends provided by law for agricultural societies, subject to the conditions imposed by law.

SECT. 2. This act shall take effect when approved.

Approved March 7, 1893.

CHAPTER 497.

An Act to confirm the organization of the Hancock County Fair Association and entitle it to share in the stipend for agricultural societies.

SECTION 1. The organization of the Hancock County Fair Association is hereby confirmed and it is hereby expressly declared and made to be a beneficiary under the law paying annual stipends to agricultural societies, so that it shall receive its share of such stipend under the conditions imposed by law.

SECT. 2. This act shall take effect when approved.

Approved March 14, 1893.

CHAPTER 619.

An Act to confirm the organization of the Cumberland Farmers' Club and entitle it to share in the stipend for Agricultural Societies.

SECTION 1. The organization of the Cumberland Farmers' Club is hereby confirmed and it is hereby expressly declared and made to be a beneficiary under the law paying annual stipends to agricultural societies, so that it shall receive its share of such stipend under the conditions imposed by law.

SECT. 2. This act shall take effect when approved.

Approved March 28, 1893.

RESOLVES.

CHAPTER 187.

Resolved to encourage Pomology.

Resolved, That the sum of seven hundred and fifty dollars be and hereby is appropriated annually to the Eastern Maine State Fair, for the purpose of encouraging pomology in the eastern section of the state. The whole of said sum of seven hundred and fifty dollars shall be paid out each year by said Eastern Maine State Fair in premiums on apples, pears, plums, grapes and other fruits, and other industrial exhibits, and said society may draw said appropriation from the state treasury upon its voucher that said amount has been paid out each year.

Approved March 21, 1893.

Chapter 194.

Resolve in favor of Industrial Exhibits.

Resolved, That the sum of one thousand dollars be and hereby is appropriated to the Maine State Agricultural Society in addition to the sum heretofore appropriated for the purpose of encouraging the exhibition of the industrial products of Maine, as well as increasing the premiums in stock and agricultural classes, and also to provide further for pomological exhibits, apples, pears, plums, grapes and canned goods; and said society may draw said appropriation from the state treasury upon its voucher that such amount has been paid out each year for said purposes.

Approved March 22, 1893.

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