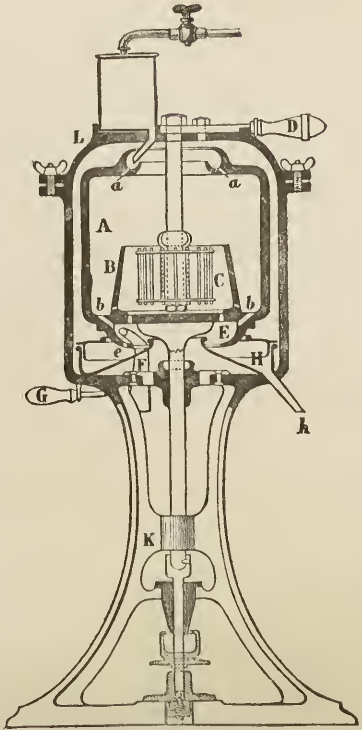
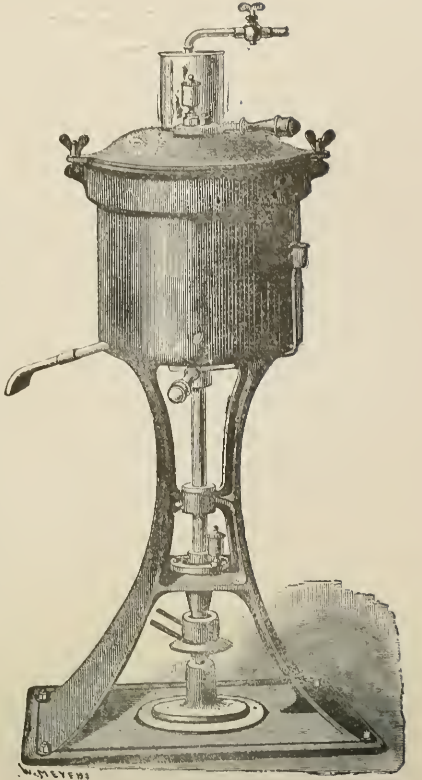
BUTTER EXTRACTOR.



SECTIONAL VIEW.

Invented by C. A. Johansson, Stockholm, Sweden, for extracting butter directly from fresh milk by centrifugal force. In the cut A is the revolving drum into which the milk is admitted through faucet shown at top and inlet D. As the cream is separated by the rapid revolution of drum, it drops to B, and the butter globules coming together at wall B, pass over into the receptacle C, where is centered a trundle-wheel which is revolved by the general mixture in the drum. The butter as it is extracted sinks down through an opening in bottom of drum, and passes off through pipe F, while the skim milk flows out through pipe H.



COMPLETE VIEW.

AGRICULTURE OF MAINE.

THIRTY-SECOND ANNUAL REPORT

OF THE

SECRETARY

OF THE

Maine Board of Agriculture,

FOR THE YEAR

1888-9.

Printed by Order of the Legislature.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1889.

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 ending June 1, 1889.

Z. A. GILBERT, *Secretary.*

AUGUSTA, June 1, 1889.

MAINE BOARD OF AGRICULTURE—1888.

OFFICERS.

B. A. BURR, PRESIDENT.

*A. O. PIKE, VICE PRESIDENT.

Z. A. GILBERT, SECRETARY.

MEMBERS CHOSEN BY COUNTY SOCIETIES.

				Term expires Dec. 31,
Aroostook	County,	Francis Barnes,	Houlton,	1888
Piscataquis	"	Thomas Daggett,	Foxcroft,	1888
Penobscot	"	B. A. Burr,	Bangor,	1888
Franklin	"	E. J. Gilkey,	Strong,	1888
Knox	"	A. J. Tolman,	Rockland,	1888
Androscoggin	"	L. H. Blossom,	Turner Center,	1889
Waldo	"	R. W. Ellis,	Belfast,	1889
Kennebec	"	S. C. Watson,	Oakland,	1889
Lincoln	"	E. W. Stetson,	Damariscotta,	1889
Washington	"	D. W. Campbell,	Cherryfield,	1889
Cumberland	"	W. W Harris,	Portland,	1890
Oxford	"	*A. O. Pike,	Fryeburg,	1890
York	"	J. W. Deering,	Saco,	1890
Somerset	"	G. J. Shaw,	Hartland,	1890
Sagadahoc	"	F. S. Adams,	Bowdoin,	1890
Hancock	"	Vacancy.		

MEMBERS FROM STATE COLLEGE.

President, M. C. Fernald, Orono.

Professor of Agriculture, Walter Balentine, Orono.

ELECTED BY THE BOARD.

Z. A. Gilbert, North Greene, Secretary.

*Deceased.

MAINE BOARD OF AGRICULTURE—1889.

OFFICERS.

R. W. ELLIS, President.

D. W. CAMPBELL, Vice President.

Z. A. GILBERT, Secretary.

Members Chosen by County Societies.

				Term expires Dec. 31.
Androscoggin	County,	L. H. Blossom,	Turner Center,	1889
Waldo	"	R. W. Ellis,	Belfast,	1889
Kennebec	"	S. C. Watson,	Oakland,	1889
Lincoln	"	E. W. Stetson,	Damariscotta,	1889
Washington	"	D. W. Campbell,	Cherryfield,	1889
Cumberland	"	W. W. Harris,	Portland,	1890
Oxford	"	B. W. McKeen,	West Fryeburg,	1890
York	"	J. W. Deering,	Saco,	1890
Somerset	"	G. J. Shaw,	Hartland,	1890
Sagadahoc	"	F. S. Adams,	Bowdoin,	1890
Piscataquis	"	Thomas Daggett,	Foxcroft,	1891
Penobscot	"	B. A. Burr.	Bangor,	1891
Franklin	"	S. R. Leland,	Farmington,	1891
Knox	"	F. L. Mansfield,	Hope,	1891
Aroostook	"	A. L. Haines,	Maple Grove,	1891
Hancock	"	Vacancy.		

Members from State College.

President, M. C. Fernald, Orono.
Professor of Agriculture, Walter Balentine, Orono.

Elected by the Board.

Z. A. Gilbert, North Greene, Secretary.

REPORT.

ANNUAL MEETING, 1889.

The annual meeting of the Maine Board of Agriculture was held at the office of the Secretary, at the State House, agreeably to the provisions of the statutes, January 16 and 17, 1889. The meeting was called to order by the Secretary at 11 o'clock. The published call for the meeting was read, after which the Secretary called upon the member from Lincoln, E. W. Stetson, to act as temporary chairman.

The chair announced the first business in order to be the raising of a committee on credentials, and on motion of the member from Washington the committee was appointed by the chair, as follows:

D. W. Campbell,
R. W. Ellis, — *Committee on Credentials.*
W. W. Harris,

The committee subsequently reported the following new members duly elected: Aroostook county, A. L. Haines, Maple Grove; Piscataquis county, Thomas Daggett, Foxcroft; Penobscot county, B. A. Burr, Bangor; Franklin county, S. R. Leland, Farmington; Knox county, F. L. Mansfield, Hope; and B. W. McKeen, West Fryeburg, elected to fill the vacancy occasioned by the death of A. O. Pike, the member from Oxford.

The report was accepted and the above-named individuals were declared elected and entitled to seats.

On motion of J. W. Deering of York, R. W. Ellis of Waldo and S. C. Watson of Kennebec were appointed a committee to receive, sort and count votes for officers, and the following were elected:

R. W. Ellis, *President.*

D. W. Campbell, *Vice President.*

Z. A. Gilbert, *Secretary.*

The same committee were authorized to receive votes for messenger and A. H. Whitmore was declared elected. The organization being completed the temporary chairman conducted the President elect to the chair, who, on assuming the duties addressed the Board as follows:

Brother Members of the Maine Board of Agriculture: I sincerely thank you for the honor conferred by electing me president of your Board for the coming year; and when I say honor I say it meaning all that that word conveys, for if any body of men are engaged in an honorable business those who are honestly trying to elevate and improve the condition and business interests of the tillers of the soil are surely that class. I firmly believe that the Maine Board of Agriculture is filling that mission to a marked degree. I believe the succession of institutes held through the different counties can be traced by the evidences of increased interest and the better practices which follow in almost every case. I believe money was never better expended in promoting the cause of agriculture in our State. Again thanking you for this mark of your confidence, I am ready to proceed to the business of the Board.

On motion, a committee on Pay Roll was appointed by the chair as follows:

F. S. Adams,
J. M. Deering, } *Committee on Pay Roll.*
S. C. Watson,

Also, the following advisory Committee was appointed.

R. W. Ellis,
D. W. Campbell, } *Advisory Committee.*

The member from Washington communicated to the Board an invitation from His Excellency, Governor Burleigh, for the Board to visit him in a body at the Executive Chamber at 12 o'clock.

The invitation was accepted and Messrs. Campbell, Ballantine and Shaw were designated as a committee to inform the Governor that his invitation was accepted and that the Board would visit him at the time named.

After returning from the call on the Governor the Board adjourned to 2 o'clock in the afternoon.

WEDNESDAY AFTERNOON.

Met at the hour of adjournment, the President in the chair.

Mr. Daggett from the committee of last year to whom was entrusted the matter of inquiry into, and considering the matter of the printing and binding of the agricultural reports made the following report:

The committee on printing and binding have attended to their duties and beg leave to report.

The State printers during the last year have performed the work of printing the Agricultural Reports and all other matters placed in their hands by the Secretary, with a promptness and dispatch entirely satisfactory to him and to members of the Board, and we hereby compliment them on their efforts in this direction and extend thanks foi the same.

In relation to the State binders your committee report a like dispatch on their part, and that their work in all respects has been fully satisfactory.

Thomas Daggett, *for the Committee.*

The report was accepted without discussion.

The committee from last year, R. W. Ellis, chairman, to whom was given the duty of investigating the injustice of the apportionment of the state aid to agricultural societies as provided by law, made verbal report recommending changes in the apportionment, and supported the proposition with explanation in full of its action.

The matter was fully discussed, every member taking part. On motion of the member from Oxford it was

Voted, That the committee be requested to reduce their proposition to writing and present the same for further consideration on Thursday at 10 o'clock.

The report of the committee appointed at the annual meeting a year ago to draft amendments to the law relating to contagious diseases of cattle was read by the member from Oxford, and the same was tabled to be printed and Thursday at 11 o'clock assigned for its consideration.

Adjourned to Thursday at 10 o'clock.

THURSDAY.

The Board met at the hour of adjournment and the journal of the proceedings of Wednesday was read by the Secretary.

The Secretary read a letter from C. M. Conant, agent of Monroe Creamery, in regard to the withholding of a portion of the awards made on creamery butter at the last Eastern Maine Fair. By vote the matter was referred to a committee with instructions to report conclusions, and Blossom of Androscoggin, Deering of York and Shaw of Somerset were appointed that committee.

The member from York presented the following resolutions:

Whereas, On account of the growing demand by the farmers of the State for more institute work, and

Whereas, The present appropriation is inadequate to meet the demand for such work, therefore

Resolved, That this board of agriculture recommend to the legislature the following appropriations: that the sum of $3,000 be appropriated for the purpose of holding farmers' institutes in the several counties of the State; and that the salary of the Secretary of the Board be increased to $1000 to compensate for the increased labor called for.

The resolution was amended by changing the sum asked for the institute work to $2,500, and was then passed unanimously.

President Ellis from the committee to present draft of bill providing for a more equitable apportionment of the bounty to agricultural societies made report in the following form which was accepted and adopted:

[The bill was subsequently passed by the legislature and is now a law.]

AN ACT to amend Chapter 58 of the Revised Statutes, relating to State aid to Agricultural Societies.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

SECTION 1. Section eleven of chapter fifty-eight Revised Statutes is hereby amended by striking out the first nine lines and inserting the following: There shall be appropriated annually from the State Treasurer a sum of money not exceeding one cent to each inhabitant of the State, which shall be divided among the legally incorporated agricultural societies of the State not provided for by special enactment according to the amount of premiums and gratuities awarded by said societies; provided that no society shall receive from the State a sum greater than that actually raised and paid by the societies for said purposes. This section is further amended by striking out all between the word "dollars" in the fourteenth line and "societies" in the sixteenth line, and all after the word "dollars" in the eighteenth line, so that said section as amended shall read as follows :

'SECT. 11. There shall be appropriated annually from the State Treasurer a sum of money not exceeding one cent to each inhabitant of the State, which shall be divided among the legally incorporated agricultural societies of the State, not provided for by special enactment, according to the amount of premiums and gratuities awarded by said societies ; provided that no society shall receive from the State a sum greater than that actually raised and paid by the society for said purposes. But the Penobscot and Aroostook Union Agricultural society may annually receive as much as is raised by it not exceeding one hundred dollars without regard to population, and the Waldo and Penobscot Agricultural society as much as is raised by it not exceeding one hundred and thirty dollars, and the Ossipee Valley Union Agricultural society not exceeding two hundred dollars.'

The member from York moved that a committee be appointed to present the resolutions relating to an increase of the institute work of the Board to the committee on agriculture of the legislature, and Deering of York, Adams of Sagadahoc, and President Ellis were appointed that committee.

On motion of the member from Piscataquis the committee having in charge the matter of a more equitable distribution of State aid to agricultural societies be constituted a committee to present the same before the legislature.

The member from York presented the following:

WHEREAS,—The organization of the Farmers' National Congress and the National Cattle Growers' Association, is a movement of importance and at the convention held by which the State of Maine should be represented, and

WHEREAS,—The delegates who attend are acting in the interests of the agricultural industries of the whole State, therefore,

Resolved,—That this Board recommend to the legislature assembled that the sum of four hundred dollars be appropriated to meet the railroad fares of such delegates as may attend said convention. The resolution received a passage.

AFTERNOON.

The revision of the cattle disease law was taken up and on motion was recommitted to the committee for amendment.

Prof. Balentine, member from State College, presented the following:

WHEREAS,—In the inscrutable wisdom of the Almighty, our late associate on the Board of Agriculture, A O. Pike, has been removed from the duties of this life, be it

Resolved, That in his death the Maine Board of Agriculture has lost an able an efficient member, the cause of agriculture an active worker, and the State an honored citizen. Be it further resolved, that a copy of these resolutions be spread upon the records and printed in the proceedings of the Boaid, and a copy sent to the family of the deceased.

Mr. Harris, member from Cumberland, feelingly seconded the motion, referring to the deceased as a life-long friend, whose memory will long linger with him.

Mr. McKeen, member from Oxford, in some impressive remarks, referred to Mr. Pike as a friend whom he greatly respected, whose judgment always had great weight, and who always honored every position in which he was placed. He would cordially second the motion.

The resolutions were unanimously passed by a rising vote.

Mr. Blossom from the committee to which was referred the communication of Mr. Conant in regard to the Eastern Maine Fair withholding certain premiums reported as follows:

Whereas, The State of Maine appropriated the sum of $1,000 per annum to each of the State societies to be used as special premiums for specified purposes, and whereas the dairy interests are included among the leading interests to compete for a certain portion of said appropriation, and whereas, the Eastern Maine Fair Association have refused to pay in full certain first class premiums upon dairy products on account of there being no competition in said class, therefore,

Resolved, That the action taken on the part of said society is detrimental to the interest shown in competing for the several premiums, and that as the appropriation by the State is special, it should be regarded as not subject to the general rules of said society, but that all premiums based on the same should be paid in full and all unexpended balances from said appropriation should revert to the State treasury.

And we recommend that a copy of these resolutions be placed in the hands of the Committee on Agriculture.

The report was accepted and the Secretary was directed to forward a copy to the officers of the Eastern Maine Fair and present a copy to the Committee on Agriculture of the legislature.

The committee on amendments to the cattle disease law presented their report recommending certain important amendments to the law, and the same was accepted, and on motion of Prof. Balentine it was voted that the new draft be presented to the committee on agriculture.

Adjourned to meet in the hall of the House of Representatives at 7.30 o'clock, to attend a lecture on dairy instruction.

STATE AID TO DAIRY INSTRUCTION.

By Prof. JAMES CHEESMAN, Secretary New England Creameries Association.

In the first great international exhibition of forty years ago, all nations beheld, as in a mirror, their successes and defeats as rivals in the great industries of the world. The impress of crudeness, or highly developed skill, were plainly visible on all the exhibits. From that time till now, a keen struggle has been going on among the great peoples of the earth for supremacy and power in the markets of the world. It requires no argument to obtain your agreement that the greatest success attained in any one of the manufacturing industries has fallen to that people whose citizens have been most carefully trained in the sciences and arts applied to their special trade. Then, Germany was known for the excellence of some lines of textile fabrics; France for the beauty of its designs and her proficiency in the art of dyeing; England had won distinction in those industries where her coal and iron could be worked up into the most useful products. No one looked for light and guidance in technical education in those days, outside of France and Germany, and so it became the fashion to regard Germany as the best place to send boys desiring training in technical knowledge. France came to be looked upon as the fine art workshop of the world. All this was very discomforting to England, but her statesmen were fully equal to her need, and from that time forward she has been steadily improving in all the sciences which we apply in our industries, through the medium of the excellent colleges and schools distributed over the land. In ship building, in the iron, chemical and textile fabrics, her products of to-day are as far removed from those of 1851, as it is possible for them to be. This widespread disturbance in European industries had its counterpart in the United States, although it remained to the great centennial of 1876 to accomplish the great awakening of the people all over this land to the need of science applied to industry. In our day, we are not content to buy goods which are merely useful and substantial in character—we require that they shall possess beauty, appeal to our ideas of form and color, and harmonize with their associations.

It must be quite clear to us all that these great changes could not have taken place without disturbing very seriously the farm industries of the world. It has always been admitted, in a general and somewhat vague way, that knowledge was of importance to the farmer; but only within the last thirty years has this claim compelled the recognition of statesmen. The growing population of Denmark and Sweden, and their peculiar adaptation for the production of butter for the export market, obliged the rulers of those countries to improve their educational systems, that farm lands might be made more productive, that cows be made to double their capacity, and the butter makers improve their skill in the light of applied science which has since been shed abroad in the technical schools and farm institutes scattered broadcast over the country. Denmark and Sweden are now known for the uniformity and permanence of character imprinted on their butter exports, rather than for the magnitude of trade, great as that is. To enable them to study with even greater accuracy the special wants of the markets of England, the governments of Denmark and Sweden have appointed resident agents in the great cities of London and Manchester. These agents furnish weekly reports on the butter supply received at the great centres, indicating whatever defects of flavor, body, salt and package the goods possess. In this way it has been possible to cultivate very close relations with the customer. The general aim of the education of these countries has been to elevate farm labor, to quicken the intelligence of the man who cultivates the soil, feeds the cows, and supplies the raw material of the dairy manufacturies. The success of this system of instruction has enabled the butter industry of the country to *control* the feeding of the cows to an extent unknown elsewhere. Wherever great excellence in butter productions has been won, this control is an essential. Slowly the idea of technical education for farmers began to disseminate, and very early in the sixties liberal provision was made for it in the United States. At this time, however, the country was struggling with its period of reconstruction. Boys and young men had grown up in the New England homes, weary and half sick of farms which refused to yield the same crops as in earlier days, and from this time forth your agriculture has been face to face with a double warfare against the allurements of the railroad agent and real estate men of the west, and the many seductions of eastern cities.

Within the last ten years, the fruits of the agricultural colleges and experiment stations have become more manifest, and western men have vied with their eastern brothers in perfecting the equipment of these educational institutions. The eastern farmer meets the finer products of manufacturing skill from the west in his own markets. The older men of the State understand that westward journeys bring no relief. There, too much pioneer effort is needed to establish the same home life which prevails here. The pioneer must wait for his markets, which may be long in coming; and then, after years of hardship, he realizes that the brother who remained on the farm, to apply the principles of science taught in the college and institute, has, after all, made life more enjoyable than he.

The restless ambition of our American citizenship, and the active competition which it engenders, forces every man to make the best of his talents and resources. To assist him in the strife, the State legislature has long provided for his educational needs. The great improvements in modern dairying, stimulated by conventions and State exhibitions of dairy products, have quickened and intensified the desire of every section of the country to excel, and to retain their own local markets if they could not export, or send goods to other States. The money invested in the State by State people is much more promising of fruitful returns than the millions spent on western railroads and mortgages. The shrinkage in the value of the great Southwestern road should be a lesson to New England men, that the greatest need is the duty which lies nearest home.

If the people of New England are to retain their love of home and wish to cherish the memory of their already historic past, her statesmen and farmers must see that the occupations and industries which have developed slowly are not handicapped for lack of suitable educational training.

The "West" which will yield the greatest return for your faith, energy and courage, is this and the adjoining counties. Here you know the soil, peculiarities of climate, and have around you local markets in the manufacturing towns and cities, whose needs you should know infinitely better than the man who is one or two thousand miles west.

The West can only outdo you in your own markets in proportion to their success in educational effort. Wisconsin, Illinois, Iowa and other States never made their influence in your market felt till their dairymen became educated The work of to-day is enough for twenty-four hours, but not more. Continual vigilance in educational effort is the price we must pay to retain our positions in the race for life. Your agriculture is in a transition state. The transition period is always with us, but in your case it is changing rapidly to that of dairying. The occupation of grain growing is not what it once was, and the meat maker is not as common among you as formerly. Your people are looking to dairying for a living, and this industry seems to promise more than any other feature of the farm. You have voted funds freely for instruction in the past. Experience tells you that improvement and change of base are needed from time to time to increase the efficiency of existing means of education. Will you strengthen your work in this State by still further encouraging those who remain to develop the unrevealed riches of your soil and climate? Wherever the lumberman's axe is heard, wherever the pioneer farmer is found, there you will see the stalwart frame, the rugged constitution, and the unfaltering faith of Maine's best manhood. Will you keep some of the best of this priceless raw material for this State? Will you encourage them to believe that of all the fair domains of this great nation, Maine occupies no second place? If there is a spot on this earth worth working for, and worthy of our lives, it is home. Will you supplement your votes, that those who now toil in the dark between hope and fear, lest they be on the wrong track, may be guided by sound principles, and receive the same instruction which has made their rivals in business such keen competitors?

Since 1880 the rivalry of States in the manufacture of dairy goods has been very marked and pronounced. These same States have laid deep and broad foundation for their success in the kind and manner of instruction provided for their people. The early promoters of State education in dairying saw clearly that any provision made for the mass of the people must be carried to them. Only a small number of the whole will or can come to a common center to be instructed. In Sweden, Denmark and Ireland the college and school were supplemented by the itinerant method, and this, perhaps, has shown the most decided and rapid change in the minds and work of the people affected by it. The progess made in dairying in Ireland and Wisconsin during the past four years is truly amazing. And yet these successes have resulted mainly from the wise use of the itinerant method of instruction. In addition to the State dairy schools, Ireland supports travelling dairies, which are operated by skilled young men and women trained in her schools. In the schools, and from the lips of the itinerant teacher, the farmer's boys and girls are taught the principles of food, feeding, and stock management which produce the best and most economical results.

Formerly, we used to hear a great deal about dairy belts, and the traditions of dairy families born in sections known to raise good dairy products. To-day, Georgia and Mississippi, Texas and Colorado are part of this fanciful belt, because thay have become interested in the work, and have in their midst some of the dairy skill of the old dairy State. The dairy belt is where the dairyman is found. The modern dairyman differs from the dairyman of the past only in this. Then he was subject to conditions, now the conditions are subject to him in so far as he can control them. The prizes of the modern dairyman are soils capable of growing abundance of pasture and supplementary fodders, plenty of cool water, and a reasonably regular climate. No State in the union has greater natural advantages than this, and few have done so little to foster, by State aid, the education of the dairyman.

Besides a grant of $12,000 for farmers' institutes, a liberal vote for a short course in agriculture at Madison, the State Dairy Association of Wisconsin receives a large grant of money. The total amount spent in Wisconsin on itinerant education is about $20,000 a year. To Wisconsin belongs the honor of having elected a dairyman for its Governor. New York has long voted generously to its educational institutions. Of late years it has felt most keenly the competition of Canada in its great cheese market at Liverpool. Until last year she felt compelled to supplement the already large votes by an additional appropriation of $5000 for itinerant instruction. Thus the direct and indirect votes for the encouragement of dairying in New York State are nearly $100,000 a year.

If you attend the cheese markets of New York, Montreal and Liverpool or London, you may learn that the excellence of Canadian cheese is due primarily to her system of instruction which was inaugurated there some eight years ago. In the Province of Ontario there are about 750 cheese factories and 55 creameries. The value of the cheese exports of Canada in 1887 was about $9,000,000. I think the value of the total dairy product of Wisconsin is about $10,000,000. In Canada there are several dairy associations each employing itinerant instructors at an annual expenditure of about $11,000.

Timid and discouraged, the old State of Vermont quite recently approached its legislature for an appropriation for dairy educational work. One thousand dollars were voted. Other New England States are in the list of applicants, while the middle States are rallying their forces for increased appropriations for their dairy educational work. Ohio is getting ready for an appeal for $10,000 for a dairy school and itinerant instruction. Michigan and Indiana are also knocking at the treasury doors.

Never was there a time in the history of this country when emulation and rivalry were as strong as to-day. If there are any natural advantages in point of nearness to market, these should surely belong to the farmers living nearest to their customers. Complaint of the wrongs of our condition avails nothing since we can determine these ourselves. Whether we live on the banks of the Kennebec, the Hudson, Mississippi, St. Lawrence, or the Yellowstone, we must have faith in intelligence, in labor, and courage enough to pursue our task till we win. To those who believe, salvation is possible and immediate.

Does this legislature believe in its resources? Do you still trust your people? Will you not, therefore, encourage the men who are nursing the agricultural industries of your State? Will you not strengthen their voices, and hold up their hands in staying the tide of emigration, by making the lives of the young people more hopeful, and the future more attractive to those who labor in your fields, to perpetuate the good name of this State as a stock raising country?

A few years ago Governor Hoard of Wisconsin sketched out an educational chart of the North-western States. The chart indicated that where educational influence had been most felt, there the dairy industry was most flourishing. This was true also of Ireland, whose best makers of butter have, during the last three years, won a prominent place at the dairy exhibitions of London in the fall of the year. It is a curious and most interesting fact, that the premiums fell to students trained in the dairy schools, and under the itinerant method, and who were also found to support the agricultural press and special dairy literature. Governor Hoard's chart shows that the best dairy districts give the largest number of subscribers to the agricultural press.

In the increasing battle for existence we find a large fringe of men always ready to invite the aid of the State against large accumulations of wealth, against organization, and consolidated business houses. Is there any advantage enjoyed by railroads and trusts which are not equally possible to men of intelligence if only they will co-operate? Co-operation is a protest against waste, ignorance, distrust, favor and disintegration. Co-operative organization and consolidation of interest among the farmers is the only effective means of resisting the inroad of excessive competition and the ill-used power of monopoly. Control of your industry should be a stronger motive for organization than the possible increase of profit, however great. In the coming years the habits of our people must change. Less meat and more dairy products will be used. As the art of cookery improves you will witness a larger consumption of both butter and cheese. The cheese of the future will be more palatable and digestible than the cheese which we eat to-day. All the domestic customs are changing, and dairy goods are consumed in greater quantities every year.

Let no one imagine that the market will be flooded. There is of course a limit to consumption, but when and where it will be reached is unknown. The need of the hour is immediate action. The field is a large one; the harvest promises much to the faithful who will sow and cultivate. Shall we hold a Thanksgiving next year, and if so, how much shall we give thanks for?

Following the close of the lecture the usual courtesies were observed, after which the board adjourned finally.

Z. A. GILBERT, *Secretary.*

REVIEW OF THE YEAR.

The time covered by the record given herein began with June 1, 1888, and ends June 1, 1889. The public work of the Board has been conducted in the usual manner. There is an increasing call, from year to year, for Farmers' Institutes, and which the limited means provided by the State for the purpose falls far short of meeting. The result of an attempt to carry on a large number of institutes with limited means inevitably is that the quality of the work will, in a measure, depreciate. So much of this work is now being done in this and the neighboring States that the services of experts command an increasing compensation. The means in the hands of the Board limits the employment of expert authorities, and leaves many desirable lecturers entirely out of reach.

Institutes have been held as follows:

Somerset,	at Solon, October 25.
	Skowheghan, January 23.
Hancock,	at Sedgwick, November 1.
Aroostook,	at Island Falls, November 8.
	Houlton, (stormy) November 9.
Piscataquis,	at East Sangerville, November 14.
	Sebec, November 15.
Kennebec,	at Oakland, November 20.
	Readfield, March 12.
Penobscot,	at Exeter, November 22.
	Dexter, January 22.
Washington,	at Cherryfield, December 4.
	Machias, December 5.
	Pembroke, December 6.
Franklin,	at East Wilton, December 10.
Androscoggin,	at Livermore, December 29.
	Leeds, February 26.
	Lisbon, February 27.
Sagadahoc,	at Bowdoinham, January 24.
York,	at Biddeford, January 25.
Oxford,	at Peru, February 5.
	Norway, February 7.

Lincoln,	at Damariscotta, in connection with Pomological Society, February 14–16.
Waldo,	at South Montville, February 20.
Knox,	at Burketville, February 21.
Cumberland,	at Naples, February 27.
	New Gloucester, March 15.

Twenty-seven institutes have been held during the year at a cost of $1634.98, an average of $60.55 each. Only a single institute has been interrupted by storm. The following experts from other States have been employed at one or more institutes: Hon. F. D. Douglass, President of the Vermont Dairymen's Association, Prof. S. T. Maynard of the Massachusetts Agricultural College, Prof. Geo. H. Whitchers of the New Hampshire Agriculture College, Prof. James Cheesman, President of the New England Creameries Association, Dr. George Austin Bowen, member of the Connecticut Board of Agriculture and Hon. J. H. Hale of the same State, Hon. P. M. Harwood, Barre, Massachusetts; and Hon. E. F. Bowditch, Secretary of the Massachusetts Society for Promoting Agriculture. Within the State, but not members of the Board, the following lecturers have been employed: Edward Wiggin, Esq., Presque Isle; A. I. Brown, Esq., Belfast; Hon. G. M. Gowell, Bowdoin; Dr. G. M. Twitchell, Fairfield; Joel Richardson, Esq., Newport; Hon. Rufus Prince and C. V. Knight, Esq., Turner.

The lectures and papers given in this report show the character and scope of the work carried on.

AGRICULTURE OF THE STATE.

The season of 1888 was a memorable one in the annals of crop production in our State The snow laid on the ground late in spring, no seed was put into the ground till well into the month of May, and as a result the time for seeding was unusually limited, and much of the work was so late as to be out of season for the best results. A rainy season set in the last of August and continued through till winter. But very few sunny days intervened between the rains and the clouds in all that time. It was hardly possible to dry any of the fodder crops of the farm after the rainy season set in, and, as a consequence, there was great loss of the late hay, grain and other crops. To add to the calamity the flat lands became so softened by the excess of water that teams could not be driven upon them, and many large fields of grain and corn were left unharvested. Fields of potatoes were left unharvested awaiting more favorable weather and finally had to be dug with the water standing between the rows. The moist lands could not be plowed and but little of the work usually completed in autumn in preparation for the next year was accomplished. Nothing like it was ever before known in the history of the agriculture of the State. To add to the calamity of excessive wet, cold weather and unseasonable frosts prevailed. A heavy frost occurred the morning of the sixth day of September which killed vegetation all over the State, on high land and low alike, nothing escaping its effects except in isolated cases near lakes and streams affording a partial protection. This sweeping frost was followed by others at frequent intervals through the remainder of the season and characterizing it as extremely cold as well as wet.

Many of the crops grown in the State were seriously cut down by the unfavorable conditions of weather. The hay crop of the shore counties and of Southern Penobscot was cut down from a full crop slightly by winter-killing and by a June drought. In all other sections the yield was bountiful and was harvested in good condition, with the exception of the extreme east where the late cutting was delayed till after the rainy season set in. In the State together the crop was a full average.

As a whole the grain crop was light, as much of the late sown was seriously injured, and a considerable portion of it entirely destroyed by the prevailing rains. Many fields on clay lands were too soft to move teams upon and the grain remained in the fields unharvested, a condition, probably never before known in so many cases.

The corn crop was practically a failure, anything different being the exception rather than the rule. Such a record of this crop has not before been written since the noted "cold season" of 1816. A few fields of yellow corn ripened a light crop, but generally farmers did not harvest an ear.

The record of the sweet corn crop is but little better. The most advanced fields were nearly ready to break, and the canning factories were about starting up, when the frost of September sixth struck the crop. But very few fields escaped. The corn that was sufficiently advanced in most cases was canned, yielding about half the usual amount. Many fields, however, did not furnish an ear. The crop for the State was about one-half the usual average to the acre, but an increased area planted carried the total pack above one-half the average amount.

Potatoes were a full crop the State over. Unfortunately for our State, however, the same held true in the other potato producing sections of the country, which kept the price to so low a figure there was but little money to the farmer in the crop. A large part of the Aroostook crop went direct from the field to the starch factories at twenty-five cents a bushel, a transaction which proved satisfactory to the producers.

The apple crop was a full one, but owing to the wet, cold and prevailing cloudy weather, the fruit was immature and imperfectly ripened As a result it proved not to keep well and much of it, even in mid winter, was found decayed and otherwise unfit for market. Much of it supposed to be fairly good fruit when harvested was reduced one-half on going to market at a time in the winter when usually it would have been in perfect condition Prices were extremely low and trade slow and but very few sales made through the early half of the winter. The prevailing price paid by buyers for the crop was one dollar a barrel.

Beans were almost a total failure, the exceptions being a few individual cases where the crop ripened before the frost.

Thus it is easily seen that the crops of the farm out of which farmers ordinarily realize a considerable income, on the one hand from a failure of the crop and on the other from prevailing low prices, brought to the producers but little money.

A review of the stock interests of the State discloses some encouraging features, with others of entirely the opposite character. The production of beef as a prominent feature of stock farming, and with it the raising of steers from which finally to perfect the beeves, has been chiefly driven to the wall and bids fair to finally be exterminated by the advent of Chicago dressed beef, which is being laid down in our markets at rates so low as to leave no possibilities for the home business. Six dollars a hundred is now the top price for the best oxen with a descending scale on lower qualities.

Sheep are offering some encouragement to farmers, but it is chiefly in a different line from what many of our sheep growers have been following in the past. The price of wool, though slightly improved from the lowest rates of two years ago, is still below a figure which will admit that product to be the ruling incentive to sheep husbandry. Meat is becoming the leading object, while wool is taking a secondary position; and lamb is the chief attraction as a meat product The raising of lambs for the early spring markets by methods of forcing is rapidly on the increase and is proving highly profitable. As lambs become the prime object, a class of sheep are sought for best adapted to this kind of work, and so the different families of the Downs and, latest, the Horned Dorsets are taking the place of the Merinos and the common grades.

The breeding and rearing of horses is still claiming increased attention. The multiplication of specialists in this business is quite marked and at the same time there is a manifest improvement in the quality of the stock bred by farmers in general. That is, there are more good horses bred among the farmers than formerly. A feature as marked as anything connected with this kind of stock is the increased attention given to breeds of heavy stock. There is a vast amount of money annually sent out of the State for heavy work horses, and breeders are beginning to realize that there is a vast field for profitable work in that direction that has hardly been entered upon. So far, the Percheron stock is the favorite with breeders and additional stock is being introduced each year. The latest contribution to the heavy stock classes is the imported French Coach Horse, Gemare, 134, the first animal of the blood brought into the State.

As the outlook for beef goes down, interest in dairying increases. Creamery butter making is proving well adapted to our conditions. Generally the business is increasing where creameries have been established. Several new enterprises also have been started during the year and still others are preparing for work. The new creameries at work are located as follows: Fort Fairfield, proprietary, I. O. Winslow, proprietor; Bangor, co-operative; Rockland, co-operative; Springvale, co-operative; Clinton, co-operative; Rumford, co-operative; Waterford, co-operative; Garland, proprietary; Portland, proprietary, butter and cream; Belfast, proprietary; East Pittston, co-operative; making twenty-seven now in operation in the State.

The returns from the several agricultural societies show the usual effort for promoting the interests of agriculture. The unprecedented and almost continuous rain during the season of holding the fairs, interfered essentially with their financial success. Some of them failed to pay running expenses and none of them were so successful as to secure a surplus. The tabulated returns herewith give a full exhibit of their doings.

OFFICERS OF AGRICULTURAL SOCIETIES.

Societies.	Presidents.	Post Office.	Secretary.	Post Office.	Treasurer.	Post Office.
State Agricultural	Rufus Prince	South Turner	A. L. Dennison	Portland	B. F Briggs	Auburn.
Eastern Me. Fair Association,	J P. Bass	Bangor	E L. Stearns	Bangor	E. B. Nealey	Bangor.
Maine State Pomological	Charles S. Pope	Manchester	D H. Knowlton	Farmington	A. S. Ricker	Turner.
Androscoggin	Daniel P. Field	Auburn	E G. Woodside	Lewiston	David Farrar	Lewiston.
Aroostook	John Stewart, Jr	Houlton	Ira J Porter	Houlton	Albert B Page	Houlton.
Aroostook, North	G. M. Park	Presque Isle	Fred S. Wiggin	Maysville Center,	J. W. Bolton	Presque Isle.
Aroostook, Madawaska						
Aroostook, Van Buren	Ambrose Violette	Van Buren	Simeon Cyr	Van Buren	Simon Cyr	Van Buren.
Cumberland	W. W. Harris	Portland	John J. Frye	Portland	H. B Millett	Gorham
Franklin County	Otis Hathaway	Wilton	E. A Hall	Chesterville	P. P. Tufts	Farmington.
Franklin, North	Joel Wilbur	Phillips.	M. S. Kelley	Phillips	Martin C. Kelley	Phillips.
Franklin, Central	J. M. Lambert	Strong	E. J. Gilkey	Strong	Adam Hunter	Strong.
Kennebec County	George E. Minot	Belgrade	H. O. Nickerson	Belgrade	C. H. Stearns	Readfield.
Kennebec, North	H. C. Burleigh	Vassalborough	S. Gallert	Waterville	C. G. Carlton	Waterville.
Kennebec, South	George Brown	Randolph	F. H. Moore	Pittston	Charles E. Coombs	Windsor.
Knox County	John Bird	Rockland	E. S Vose	Thomaston	Jesse A. Tolman	Rockland.
Knox, North	E. H. Mero	Union	F. E. Burkett	Union	O A. Burkett	Union.
Lincoln County	Henry Ingalls	Wiscasset	E. W. Dunbar	Damariscotta	Geo. H. Weeks	Damariscotta.
Oxford County	Herman L Horne	Norway	A. C. T King	South Paris	A C. T. King	South Paris.
Oxford, West	C. H. Walker	Fryeburg	B. Walker McKeen	West Fryeburg	W. R. Tarbox	Fryeburg.
Oxford, Androscoggin Valley,			H. T. Tirrell	Canton		
Penobscot County			B. A. Burr	Bangor	B. A Burr	Bangor.
Penobscot and Aroostook	Isaac Cushman	Sherman Mills	L. B. Roberts	Patten	S. W. Robbins	Patten.
Penobscot, West	John Rogers	Stetson	T. P. Batchelder	Kenduskeag	T. P. Batchelder	Kenduskeag.
Penobscot, North	N. Averill	Lee	C. R. Ludden	Lee	F. M. Johnson	Lee.
Penobscot, Central	George H. Smith	East Corinth	Chas. Megguire	East Corinth	Joseph M Ames	East Corinth.
Piscataquis, East	M. L. Durgin, Jr	Milo	W. H. Snow	Milo	W. H. Snow	Milo.
Piscataquis, Central	A. M. Robinson	Dover	D E. Dinsmore	Dover	B. F. Hammond	Foxcroft.
Piscataquis, West	W. F. Towne	Monson	J. F. Thombs	Monson	J. F. Thombs	Monson.
Sagadahoc	Gilbert M. Gowell	Bowdoinham	I. E Mallet	Topsham	L. E. Smith	Brunswick.

Somerset, East	C. M. Jewett	Palmyra	G. M. Lancey	Hartland	S. L Mayo	Hartland
Somerset Central	R. B. Shepherd	Skowhegan	A. R. Smiley	Skowhegan	A. R. Bixby	Skowhegan.
Somerset, West			Benjamin Moore	North Anson		
Waldo County	S A. Payson	Belfast	Mark A. Wadlin	Belfast	A S. Redman	Belfast.
Waldo and Penobscot	Freeman Atwood	Monroe	E. H. Nealey	Monroe	F L. Palmer	Monroe.
Waldo, North	Edwin Rand	Unity	J. H. Cook	Unity	H. B. Rice	Unity
Washington County	Nelson S. Allen	Dennysville	H. F. Porter	Pembroke	Peter E. Vose	Dennysville.
Washington, West	James L. Buckman	Columbia Falls	Eben F. Allen	Columbia Falls	Frank L. Allen	Columbia Falls.
Washington, Central	J. C. Talbot	East Machias	W. H. Phinney	Machias	M. Gardiner	Machias.
Washington, North	Oscar Pike	Princeton	W. R. Dresser	Princeton	S. G. Spooner	Princeton.
York County	John M. Deering	Saco	Asa L. Ricker	Biddeford	Geo H. Boothby	West Scarboro'.
York, Buxton and Hollis	John G Locke	Bar Mills	Ira Milliken	Hollis	E. T. Roberts	South Hollis.
York, Shapleigh and Acton	John Lord	Acton	Horace Bodwell	Acton	Horace Stanley	Shapleigh
York Ossipee Valley Assoc'n.	Benjamin F Pease	Cornish	Y. C. Ayer	Cornish	Howard Brackett	Cornish.
York Ramshackle Park Ass'n	U. B. Thompson	West Newfield	A. H. Davis	West Newfield	C. E. Pinkham	West Newfield.

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1888.

	Amount received from State.	Receipts from membership for the year (annual and life.)	Receipts from Annual Exhibition.	Receipts from Loans.	Total Receipts for the Year.	Amount awarded in Trotting Purses.	Total amount of Premiums and gratuities awarded, including Trotting Purses.	Am'nt expended during the year on improvements on grounds and fixtures	General expenses of Society during the year	Total amount paid out during the year.	Value of property belonging to Society.	Amount of liabilities of Society.	Amount awarded for Plowing.
Maine State Pomological	$500 00	$80 00	$500 00	$14 07	$1094 07	-	-	-	$433 79	$1368 54	$515 85	$400 00	-
Androscoggin	400 00	49 00	400 00	5 52	854 52	-	429 00	-	114 58	543 58	-	-	-
Aroostook	143 00	42 00	625 53	-	810 53	365 00	541 10	579 55	196 37	1017 02	379 55	270 00	-
Aroostook, North	246 00	45 00	840 92	-	1131 92	412 00	758 55	-	344 71	1103 26	1022 90	321 00	-
Aroostook, Madawaska													
Aroostook, Van Buren													
Cumberland	400 00	50 00	1477 87	-	1927 87	980 00	1571 50	1000 00	450 00	1927 87	1500 00	1400 00	15 00
Franklin County	139 00	66 00	1291 00	350 25	1846 25	410 00	775 85	440 00	500 00	1715 85	5000 00	700 00	-
Franklin, North	39 00	223 00	238 35	96 12	596 47	150 00	370 05	50 00	254 23	674 28	1200 00	440 00	-
Franklin, Central													
Kennebec County	314 00	603 00	641 49	-	1578 49	260 00	991 50	237 03	278 34	1506 87	1100 00	309 02	-
Kennebec, North	86 00	239 00	155 62	250 00	730 62	229 75	479 75	225 00	293 17	997 92	3000 00	1800 00	-
Knox County	191 00	82 00	206 99	-	479 99	-	278 50	-	460 53	739 03	-	359 05	15 00
Knox, North	138 00	297 75	132 37	4 96	573 08	-	366 95	-	278 30	645 25	100 00	-	-
Lincoln County	248 00	16 00	590 32	-	854 32	247 00	515 22	-	286 05	876 27	1300 00	650 00	-
Oxford County	176 00	18 00	3103 35	-	3715 94	931 50	2090 00	795 22	1268 69	4183 12	7500 00	1809 70	-
Oxford, West	150 00	130 00	1336 40	200 00	1816 40	475 00	985 15	29 26	500 00	2014 41	6000 00	2500 00	-
Oxford Androscoggin Valley													
Penobscot County	28 00	132 89	-	-	160 89	-	150 00	-	75 00	225 00	-	-	-
Penobscot and Aroostook	100 00	50 00	-	-	150 00	16 00	126 25	-	-	165 00	-	-	-
Penobscot, West	305 00	164 00	1139 24	-	1608 24	376 00	769 55	347 82	490 87	1608 24	2000 00	-	-
Penobscot, North	37 00	16 00	61 49	-	114 49	80 00	163 25	25 00	51 21	239 46	-	15 67	-
Penobscot, Central													
Piscataquis, East													

Piscataquis, Central............	115 00	99 00	172 00	-	386 99	100 00	489 26	-	210 26	699 52	-	-	-
Piscataquis, West...	19 00	34 00	45 00	-	98 00	4 00	46 00	2 00	25 00	73 00	-	-	-
Sagadahoo	264 00	39 00	2483 72	40 00	2851 00	875 00	1614 58	500 00	713 46	2828 04	5000 00	-	-
Somerset, East.................	136 00	117 00	515 81	-	137 00	452 25	738 00	75 00	443 20	1181 20	3000 00	-	-
Somerset, Central..............	187 00	52 00	255 05	86 00	580 05	-	411 50	40 00	1021 35	1472 85	4300 00	892 80	-
Somerset, West....													
Waldo County...................	130 00	-	782 50	-	912 50	-	734 50	-	25 00	759 50	2450 00	-	-
Waldo and Penobscot............	130 00	-	1496 31	-	1626 31	550 00	1111 64	1000 00	466 75	1678 39	2500 00	-	-
Waldo, North...................	94 00	-	82 21	-	176 21	-	191 75	30 00	40 00	261 75	-	191 75	-
Washington County..............	117 00	5 00	1167 58	-	1289 58	590 00	1045 05	46 12	142 90	1233 97	1800 00	-	-
Washington, West...............	130 00	8 00	2273 42	-	2411 42	515 00	1298 90	-	698 10	1997 00	1100 00	-	-
Washington, Central............	91 00	14 00	1153 35		1258 35	556 00	1059 40	-	412 10	1471 50	-	375 00	10 00
Washington, North..............	62 00	10 00	607 00	1026 75	1705 75	228 00	553 75	1125 50	26 50	1705 75	2000 00	1225 00	-
York County....................	237 00	15 00	1675 63	-	1927 63	882 50	1317 63	-	504 50	1822 18	2000 00	575 00	4 00
York, Buxton and Hollis........	100 00	250 00	750 85	1000 00	2100 85	330 00	492 50	1613 23	246 28	2382 01	2000 00	1000 00	-
York, Shapleigh and Acton......	63 00	126 00	263 50	96 00	548 50	166 00	420 00	100 00	16 00	536 00	3500 00	-	-
York Ossipee Valley Association .	200 00	-	1632 37	900 00	2732 37	540 00	1010 35	1026 10	240 68	2511 10	5000 00	1825 59	-

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1888—*Continued.*

	For bulls and bull calves.	Working oxen, 4 years old and over.	Steers under 4 years old.	Am't awarded for cows	For heifers and heifer calves	Am't awarded for fat cattle.	Am't awarded for stallions.	Am't awarded for breeding mares.	For other horses and colts.	For swine.	For sheep.	For poultry.	Total amount awarded for live stock.	Total amount awarded for horses—not purses.	Amount awarded for Indian corn.	For wheat.
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Maine State Pomological																
Androscoggin	16 00	12 00	10 00	10 00	-	-	30 00	5 00	10 00	6 00	7 00	-	72 00	40 00	8 00	
Aroostook	17 00	-	1 00	12 00	15 50	-	21 00	6 00	26 50	10 00		4 00	59 50	53 50	-	50
Aroostook, North	36 25	12 50	13 00	27 00	27 25	-	11 00	12 00	40 50	4 00	16 00	75	136 75	63 50	50	1 00
Aroostook, Madawaska																
Aroostook, Van Buren																
Cumberland	38 00	60 00	21 00	93 00	13 50	11 00	42 00	11 00	28 00	7 00	53 00	14 00	338 00	81 00		
Franklin County	45 00	4 50	47 00	19 00	28 00	6 00	10 00	6 00	17 00	12 00	56 00	7 25	225 75	33 00	50	
Franklin, North	13 00	33 00	30 00	18 75	13 00	5 00	5 00	5 00	21 50	4 00	10 00	3 00	126 75	31 50	25	
Franklin Central																
Kennebec County	21 00	58 00	32 00	22 50	37 75	17 50	39 00	6 00	352 00	10 00	14 50	12 50	239 75	103 00	35 25	3 00
Kennebec, North	11 00	21 00	14 00	19 00	14 00	-	19 00	6 00	24 00	4 00	13 50	10 00	106 50	49 00		
Knox County	4 00	8 00	2 00	14 50	7 25	3 00	11 00	10 00	15 50	-	3 00	35 50	92 25	48 50	3 75	
Knox, North	8 25	45 00	31 00	15 00	20 00	7 50	7 00	6 00	34 50	4 00	12 25	7 25	150 25	47 50	5 50	
Lincoln County	6 50	6 00	2 00	6 00	9 50	6 00	22 00	5 00	45 25	4 00	11 00	2 50	51 00	72 25	5 00	
Oxford County	121 00	99 00	126 00	82 00	126 00	10 00	30 00	27 00	78 00	19 00	51 00	11 75	677 75	135 00	1 50	75
Oxford, West	10 50	18 00	34 50	12 00	30 00	3 00	17 00	6 00	20 50	12 00	6 75	16 50	142 15	43 50	6 00	
Oxford Androscoggin Valley																
Penobscot County	-	-	-	-	-	-	3 00	3 00	3 00	50	12 00	13 00	-	15 00	1 00	1 00
Penobscot and Aroostook	6 50	7 50	4 50	6 50	2 50	-	-	3 00	11 00	2 00	6 00	2 50	33 50	14 00	50	
Penobscot, West	18 75	36 50	21 75	24 00	24 50	3 00	16 50	6 00	34 50	11 00	20 00	7 65	179 50	57 00	3 60	1 50
Penobscot, North	2 50	13 50	3 50	3 00	-	1 00	5 00	3 00	14 75	1 00	2 75	2 00	23 50	28 50	50	
Penobscot Central																

Piscataquis East																
Piscataquis Central	10 50	21 00	8 00	20 00	9 00	-	8 00	13 00	118 00	3 00	10 00	1 50	106 50	39 50	50	
Piscataquis, West	2 75	12 00	2 75	1 25	1 50	-	-	1 25	13 75	75	1 25	-	22 25	15 00		
Sagadahoc	38 00	82 00	29 50	61 00	39 00	-	18 00	10 00	27 00	17 00	18 50	45 00	330 00	55 00	5 00	
Somerset, East	24 50	19 00	40 25	39 00	18 00	5 00	9 00	10 75	34 50	8 75	31 00					
Somerset Central	50 00	62 00	31 00	39 00	45 00	9 00	-	-	-	7 00	27 00	18 50	289 00	-	1 25	
Somerset, West																
Waldo County	10 00	12 00	15 00	30 00	24 50	10 00	15 50	12 50	40 00	6 00	2 50	5 00	102 00	68 00		
Waldo and Penobscot	38 00	43 00	21 00	26 00	23 00	25 00	54 00	14 00	73 00	11 00	17 00	21 00	225 00	141 00	2 50	2 00
Waldo, North	16 50	24 00	3 00	12 00	-	9 00	16 50	6 00	20 25	-	16 50	2 25	85 50	42 75	3 50	2 00
Washington County	17 00	10 00	17 00	20 00	32 50	7 00	17 00	24 00	40 00	15 00	16 00	11 25	167 75	81 00	4 00	1 75
Washington, West	26 00	17 00	31 00	14 00	23 50	-	80 00	12 00	37 00	14 00	28 00	15 50	169 00	129 00	2 00	5 00
Washington Central	21 00	29 00	21 00	40 00	43 00	-	33 00	13 00	31 00	23 00	14 00	20 25	211 25	77 00	1 25	6 50
Washington, North	21 00	9 00	18 00	11 00	47 00	-	9 00	6 00	34 00	-	7 00	20 00	133 00	49 00	13 50	75
York County	14 00	78 00	10 50	39 50	8 00	6 00	-	6 00	78 00	8 00	-	31 00	195 00	84 00	1 00	
York, Buxton and Hollis	6 00	28 00	10 00	18 00	6 00	3 00	5 00	5 00	10 00	5 00	4 00	4 00	84 00	20 25	1 00	
York, Shapleigh and Acton	8 25	36 00	10 00	12 00	5 25	6 00	3 00	3 00	20 00	13 50	5 25	4 50	78 50	26 00	2 50	1 00
York Ossipee Valley Association	36 00	83 00	38 00	78 00	33 00	10 00	8 00	9 00	52 00	6 00	14 00	3 00	301 00	69 00	3 00	3 00

Financial Statement of Agricultural Societies for the Year 1888—*Continued.*

	For rye.	For barley.	For oats.	For buckwheat.	For beans.	For peas.	For potatoes.	For carrots	For beets.	For onions.	For turnips	For herds.	For cabbage.	For squashes.	Total amount awarded for grain and beet crops	Am'nt awarded for any other cultivated crops.	For fruits and flowers.
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Maine State Pomological																	
Androscoggin	-	5 00	5 00	-	-	-	12 00	-	-	-	-	-	-	-	82 00	-	12 00
Aroostook	..	25	50	75	-	-	2 75	75	1 25	25	75	-	40	75	10 65	-	13 70
Aroostook, North	-	75	1 50	-	1 50	-	9 50	-	1 25	-	1 50	-	-	-	18 50	-	35 50
Aroostook, Madawaska																	
Aroostook, Van Buren																	
Cumberland	-	-	1 00	-	1 00	3 00	13 00	2 00	2 00	1 00	-	-	1 00	1 00	12 00	74 00	-
Franklin County	-	-	75	-	-	-	55	-	20	-	35	-	25	-	2 00	-	28 50
Franklin, North	-	-	.	-	-	-	4 50	45	45	45	45	-	45	45	7 20	1 00	9 30
Franklin, Central																	
Kennebec County	-	3 00	-	-	-	-	75	-	-	1 50	3 00	-	-	75	7 25	-	62 25
Kennebec, North	-	-	-	-	-	-	75	-	-	1 00		-	-	50	2 25	6 00	25 60
Knox County	-	50	50	-	1 25	1 50	1 00	50	50	3 00	1 50	-	6 25	4 00	24 25	11 75	37 50
Knox, North	-	2 00	3 00	-	50	50	4 25	50	3 50	75	1 75	-	1 25	1 85	25 35	-	38 85
Lincoln County	-	1 00	6 00	-	2 25	2 25	1 75	50	1 00	1 25	1 00	-	1 25	1 00	23 25	1 75	34 50
Oxford County	-	-	-	-	-	-	2 50	-	-	-	-	-	-	50	28 75	-	62 62
Oxford, West	-	-	-	-	-	-	3 25	1 25	1 50	1 25	3 00	-	1 25	1 25	12 75	7 25	28 25
Oxford Androscoggin Valley		1 50	1 50	-	1 00	-	3 25										
Penobscot County	-							75	75	1 50	25	-	75	3 25	17 50	-	25 75
Penobscot and Aroostook	-	-	-	-	-	-	50	-	-	-	50	-	50	50	2 50	3 00	7 50
Penobscot, West	1 00	-	1 65	-	2 25	1 75	2 20	-	1 70	1 75	1 20	20 00	-	50	26 35	7 65	16 40
Penobscot, North	-	-	25	25	25	25	25	25	25	-	-	-	25	25	-	50	5 40
Penobscot, Central																	

Piscataquis, East																	
Piscataquis, Central	-	-	-	-	-	-	25	25	25	25	25	-	25	25	2 00	-	7 75
Piscataquis, West	-	-	-	-	-	-	15	10	10	10	10	-	10	10	75	-	2 65
Sagadahoc	1 50	-	1 50	1 00	1 75	1 50	5 50	75	3 75	8 00	1 50	-	1 75	1 75	35 25	47 00	48 75
Somerset, East	-	-	-	-	-	-	-	-	-	-	-	-	-	-		2 55	5 00
Somerset, Central	-	-	-	75	1 25	1 25	3 00	-	75	1 00	50	-	-	1 50	11 25	3 75	22 75
Somerset, West																	
Waldo County	-	-	-		-	-	-	-	-	-	-	-	-	-	50 00	-	15 25
Waldo and Penobscot	-	1 00	1 50	-	1 00	1 50	7 00	1 50	3 00	1 00	1 75	-	1 50	4 50	29 75	3 25	26 00
Waldo, North	-	1 00	1 50		5 00	-	3 50	-	75	75	1 25	-	1 25	1 25	22 75	1 25	7 75
Washington County	-	2 25	2 25	2 25	11 25	2 25	20 00	3 00	3 50	4 25	4 50	-	3 00	10 00	74 25	8 25	22 25
Washington, West	-	5 00	5 00	-	2 00	-	30 00	3 75	4 75	1 50	3 75	-	2 25	1 50	70 75	-	26 75
Washington, Central	-	1 50	1 50	-	4 00	1 00	18 50	75	2 00	1 75	75	-	1 50	2 75	43 75	2 50	26 75
Washington, North	-	-	75	-	1 50	75	16 50	1 50	3 00	1 50	1 50	-	2 25	2 50	46 00	8 75	7 25
York County	-	-	-	-	-	-	3 00	-	-	1 00	25	-	-	1 75		10 50	18 75
York, Buxton and Hollis	-	-	-	-	1 50	-	1 50	-	20	-	-	-	25	50	4 95		75
York, Shapleigh and Acton	1 75	-	2 50	-	10 00	2 50	1 50	1 50	1 50	1 50	3 00	-	1 50	3 00	33 75	15 50	15 50
York Ossipee Valley Association	-	-	-	-	-	-	2 00	-	-	-	-	-	-		8 00	-	1 30

Financial Statement of Agricultural Societies for the Year 1888—*Concluded.*

	Bread honey, sugar and syrup.	For butter and cheese	For agricultural implements.	Household manufactures and needle work.	Manufactures of wood, iron and leather	For mechanical products.	For all objects not enumerated above.	No. of bulls and bull calves.	No. of cows.	No. of heifers.	No of heifer calves.	No. of working oxen (pairs)	No of steers (pairs)	Total No. of cattle exhibited.	No. of horses and colts.	No. of sheep.	No. of swine.	No. of poultry (coops.)	No fat cattle
Maine State Pomological																			
Androscoggin	-	$28 00	-	-	-	$59 00	-	11	9	-	3	5	5	50	30	8	7	-	25
Aroostook	$2 00	8 00	-	$16 40	-	-	$3 35	7	8	4	7	-	1	30	73	-	9	14	
Aroostook, North	5 50	6 25	-	21 90	-	-	73 75	25	17	32	14	7	7	116	102	40	3	1	
Aroostook, Madawaska																			
Aroostook, Van Buren																			
Cumberland	4 00	15 00	-	14 00	$2 00	-	-	10	24	7	12	12	7	125	20	25	10	20	3
Franklin County	3 70	12 75	$3 00	35 00	4 00	3 50	14 65	26	18	38	12	40	65	255	78	100	13	10	10
Franklin, North	3 00	6 00	3 00	13 00	-	-	10 00	13	29	20	7	38	24	204	63	53	18	7	6
Franklin Central																			
Kennebec County	7 25	57 50	3 00	46 85	1 00	-	-	27	49	44	12	65	26	233	104	31	35	46	10
Kennebec, North	-	16 00	-	3 75	-	-	41 50	5	28	9	7	9	5	77	45	30	3	11	
Knox County	6 50	10 00	-	18 50	-	-	41 25	2	20	6	10	4	2	46	33	4	-	37	2
Knox, North	1 75	12 50	75	39 45	2 00	-	49 15	11	14	19	9	23	25	152	68	38	10	16	13
Lincoln County	75	2 25	1 75	30 60	1 00	1 00	58 37	9	17	12	4	18	6	145	81	37	25	5	14
Oxford County	13 50	26 50	19 00	29 10	32 00	35 30	118 00	32	41	81	27	43	62	392	52	130	48	101	4
Oxford, West	30 75	16 00	7 50	53 40	-	-	80 00	23	18	18	3	12	26	174	32	4	9	4	2
Oxford, Androscoggin Valley																			
Penobscot County	-	2 75	-	16 25	-	-	20 50												
Penobscot and Aroostook	50	5 00	-	22 50	5 50	-	-	4	8	10	-	3	1	27	27	14	1	6	
Penobscot, West	11 48	20 25	-	74 95	-	-	-	10	23	35	5	36	21	140	126	86	22	11	4
Penobscot, North	-	5 00	-	12 80	80	-	4 00	4	2	2	1	8	3	33	37	7	6	5	2
Penobscot Central																			
Piscataquis, East																			

Piscataquis Central	2 10	4 05	-	14 80	-	-	-	8	30	12	6	17	7	80	62	37	14	5	
Piscataquis, West	25	2 00	-	1 45	-	50	1 15	5	15	8	1	5	6	51	20	12	6		
Sagadahoc	6 00	24 00	9 00	55 50	1 00	30 25	115 00	10	59	38	4	30	21	200	54	62	30	76	
Somerset, East	3 00	16 25	-	45 15	-	-	.	13	57	27	8	15	21	185	143	105	67		8
Somerset Central	4 50	12 75	-	13 00	11 00	26 00	17 50	20	18	19	7	53	30	238	-	72	15	22	8
Somerset, West																			
Waldo County	4 00	5 00	-	28 00	-	-	12 00	4	20	12	6	7	4	58	42	6	18	2	5
Waldo and Penobscot	1 50	4 00	-	98 15	-	-	32 99	14	13	9	7	32	10	128	85	38	30	200	9
Waldo, North	75	5 50	-	7 75	-	-	21 00	4	20	10	5	25	6	156	50	50	-	4	8
Washington County	3 75	12 75	-	62 40	11 50	-	11 95	10	20	26	15	4	11	105	67	48	38	23	4
Washington, West	3 75	18 00	-	56 20	12 00	25 00	722 00	7	7	11	7	4	10	46	38	40	10	18	
Washington Central	2 90	6 50	-	75 75	16 00	-	31 00	7	14	19	11	11	14	101	39	20	33	23	
Washington, North	2 25	4 50	-	30 00	-		43 00	8	6	13	6	6	5	55	40	18	-	17	
York County	1 75	8 00	-	120 13	-	.	46 00	5	24	3	3	20	5	84	98	8	20	19	4
York, Buxton and Hollis	3 00	1 50	-	47 80	-	-	-	6	30	11	2	17	12	117	36	14	21	5	5
York, Shapleigh and Acton	3 25	7 50	-	48 25	-	-	18 25	12	21	14	14	35	12	150	40	10	12	8	10
York, Ossipee Valley Association	8 05	6 00	-	70 63	-	-	-	44	44	12	2	86	134	562	48	27	10	3	20

LECTURES AND PAPERS.

MANAGEMENT OF FAIRS.

By J. M. Deering, Member from York.

[Read at the State Fair evening meeting, September 11, 1888.]

The subject under discussion is one that really interests, or should interest, every citizen in the State of Maine, because fairs are intended for the purpose of raising the standard of our agricultural interests to a higher type, and whatever promotes or benefits our agriculture will surely benefit all other industries. So, directly or indirectly, we should all be interested in the fair and its success. By some cause, perhaps rivalry, fairs have become numerous—perhaps too much so for all to be financially prosperous. They have increased, within the last few years, to such an extent as to cause sharp competition between the different societies, especially where two, three, or more, exist in the same county. There is no bad feature, however, in regard to competition, if that is the only evil, because it forces the officers into the position to devise plans and methods in their management whereby they can gain some advantage over others. But it should be borne in mind that a business a little over done is not generally quite as healthy financially, as one with a little less competition. Yet competition is the life of the country, and we have the societies organized and the fairs are to be held, and the question arises, how shall we manage them in order to make them most successful, and meet the demands of the public? In speaking of the management of fairs, I wish to be understood that I do not mean this fair or that, but fairs in general.

An agricultural fair, in one sense, is a business venture, consisting of a board of officers whose duties are to manage and to take charge of all the business transactions and bear all of the responsibilities, whether the fair is a success or a failure. Next are the exhibitors, who possibly may be members of the society, and they, too, *should* feel somewhat responsible. Then come the visitors with no responsibilities, but should have the rights and privileges because they pay for them. Hence we find the fair divided into three classes, namely, managers, exhibitors and visitors; and the managers have their duties assigned by the rules and regulations of the society.

In order to make the fair a success, we should first have a well organized society. The officers should be men of ambition, with true and honest motives in the interest of agriculture. Men who aim higher than to gobble up the bulk of the awards offered for themselves and friends. No man is worthy of the position as an officer of a society who has no higher motive than winning a premium for himself. One of the chief secrets of success of the fair is the confidence which the people place in the managers. And that confidence can only be established by conducting the fair in accordance with the demands of the public. Another secret of success in conducting the fair is an ability to create a feeling within the minds of the people living within the territory that can be made to contribute to it that they may have a direct interest in the exhibition, and make each person feel that the result will depend as much upon what he individually does towards its support, as upon what others may do.

In order to make a good exhibit we must have a variety of goods on exhibition. We need every thing that is grown upon the farm We also need all the different kinds of tools and machinery that are intended for agricultural purposes, that the visitors may decide which ones are best adapted to their conditions, farm, soil, etc. And in order to get them we should aim to interest the public. Treat them in such a manner as to induce them to come and bring their goods and wares along with them, and help make up the exhibition. Our aim should be to notice all classes of people, and a strong effort should be made to overcome the set notions that many have, that they haven't anything good enough to take to the fair. And if this class of people can be stimulated into stronger efforts to produce good things, a point is gained for the educational work of the fair. There is a tendency, however, among some people, to underrate the value of their own products; to think that they haven't anything good enough to carry to the fair, when really it is not the fact. It is the want of ambition, or, perhaps, suspicion that they would not be treated fairly. A strong effort should be made to obviate this difficulty, by the management, by convincing the public that the motto is a square deal, which the public have a right to demand.

Care and judgment should be used in offering premiums. All classes should receive something, even if the awards are small, which is always the case in our country fairs, and no favor should be shown to any particular person or breed of cattle. In the offering of premiums, we should offer all in our judgment that our receipts will justify, and pay promptly. Advertise to pay immediately after the fair, and never advertise to pay pro rata. It is not the amount of money the exhibitor gets that inspires confidence, it is to get what the society agrees to pay him if he wins it.

Exhibitors demand that the managers use discretion in the selection of judges for all classes that require skill and special knowledge to award premiums properly. There are always men to be found in every county that are fitted by nature and education, in a greater or less degree, to award premiums in this class or that. They should be men without prejudice against any particular breed of cattle, or horses as the case may be; men that will look at the real merits of the animal or products, and decide according to their honest convictions and best judgment, without fear or favor. They also demand that their stock or products be properly arranged, in order that they may be shown on equal advantages; that notice should be served on competitors, stating the time the judges are to make the examination, in order that they may be present to answer to such questions as the judges may require. To be sure, it is the exhibitor's duty to see to it that his stock or his dairy products, or any article he exhibits, is brought in proper condition, and he has a right to expect the managers to provide him a proper space to exhibit it, that is, an equal space or position with his competitors. It matters not whether it is out of doors or in some corner in the hall, if the chances are equal.

There is one other complaint that I have heard mentioned by exhibitors, and that is that those who go the farthest to attend the fair, generally receive the least attention; that those who are the best acquainted with the managers get the best quarters, and also receive the largest amounts of premiums; that the fair is controlled by a few, and that the few reap the most of the benefit. Now, my friends, this may be a mistake on the part of the exhibitors. I really hope it is. And yet, I think there is something in it that needs the consideration of the managers, because, if it is the case, the territory from which we draw is continually growing smaller, those interested in the merits of the products grown in their own town or vicinity lose their interest, consequenty the visitors grow less, the receipts grow smaller, and in time the fair is found a failure. So it is safe to assume that the larger the territory we can draw from, the larger the number of exhibits; the larger the exhibits, the more visitors; the more visitors, the larger the receipts and the surer that the fair will be a success. So, I claim that it is policy, as well as courtesy, on the part of the management to see to it that those who make the greatest effort to attend the fair be treated in every respect as well as those who only have to open the fair ground gate to step in.

Visitors may be termed as the interested public. There is no responsibilities resting upon them; they come to see what is to be seen. Now, there is no set of managers so stupid as to not know that the fair is the thriftiest when the crowd is the thickest. And if money does not flow into the association's till through the gate, that financial failure must be the result. So it should stand us in hand to devise every possible means to satisfy them. We should endeavor to create a spirit of readiness on their part to work and use their influence for the success of the fair, also to obtain their good will, which is the paramount secret of success of every fair. Now, what makes the visitors interested? Why, it is simply this: A certain man carries a fine horse to the fair, and his friends follow him to see him compete with another horse, who also has another set of friends. Now, it does not stop with horses. It is the same with the oxen, the steers, the colts, cows and dairy products, and every thing that is on exhibition. Consequently everybody becomes interested, and every eye is looking and every ear is harkening, to see and to hear if their favorites are fairly dealt with; ever on the alert to demand of the managers that all transactions be free from tricks and sharp practices, and that all business be conducted under strict business principles. Visitors also demand that the fair be strictly industrial in all its features, with the exception of what other moral attractions that may be needed to make it interesting. It should be just what it is advertised to be. It should not be all horse or horse trots, but the horse should have his place without favors. There is nothing mentioned in our advertisements about the wheel of fortune, that glistening nickle plated gun, so famous in attracting the boys' attention, (so constructed as to miss the bull's eye ninety-nine times out of every hundred,) or other games of the same sort. Visitors do not expect them there. I once knew a boy who spent his whole three days looking at a windmill, and in two years after, this same boy exhibited a windmill at a certain fair in the West, constructed with his own hands, far superior to the one that engaged his attention two years before. And to-day he is doing a thriving business, and is setting up his windmill in many a farmer's dooryard in the State of Wisconsin. Now, who ever knew a boy who gained a livelihood by shooting at a target, and paying five cents for each shot, and only hitting it once in one hundred times, and receiving as compensation a cigar worth nothing. To be sure we need a variety of attractions, but we do not need the kind mentioned. We want a clean fair—clean from vices, clean from games that rob and deceive the public. Far better have no fair at all, than a gambling establishment sanctified by agriculture. The managers should bar them all out.

In order to meet with the demands of the enlightened public, our fairs should become schools of inquiry and information to the young and the old The gathering together the best of the land in every kind of produce gives a confidence and an inspiration to thousands of farmers. It stimulates them to be able to do another year's work and to try and do it better. The sons gain an idea of ways and means outside of home, and at the same time retain a pride for home accomplishments. Wives and daughters who compete with each other in domestic arts go home happy and ambitious in the fact that so much *can* be done to beautify and make homelike the house they live in. This costs effort beyond what is received in immediate cash. But few receive enough to make them whole in premiums for the time and trouble in attending the fair, and if the money they receive was the only object in view, there would be less fairs. The public is enlightened to the fact that a good clean, orderly fair, well managed, tends to build up the country, stimulates thrift, increases comfort, and enlightens the community in what the world is doing. It makes men of mark and women of influence in their every day's work of life. It encourages the boys and girls, and gives them the idea of the competition of life. It pays, as almost no other expenditure can, in the uplifting of the people who share in it, and are properly interested in it.

Now, my friends, I simply wish to say that the managers may be honest; they may try ever so hard; they may work with a will and a determination to succeed; they may make every effort in order to make the fair a success; they may act their part, and do it manfully; then, in order to make the fair a success, they must have the hearty support and co-operation of the farmers. And as an officer of one of the societies in the State, I appeal to the farmers to wake up to the realizing sense of *their* duties. And remember that the fair is just what you make it. If you have careless, uninterested, dishonest men as officers in your society, go to the annual meeting and turn them out—it is your duty. Don't stay at home and grumble about the management of the fair: go yourself in person, and if necessary stand up and fight for right. for morals, and for justice—it always wins. Then, don't think that you will have a successful fair unless you go in person, and take along with you something to help make up the exhibit. Go, I say, and see to it; work, and co-operate with your managers, and your fair will surely be a success.

FARM LIFE IN NEW ENGLAND.

By Dr. Geo. Austin Bowen, Woodstock, Conn.

[Read at the joint meeting of Board and Pomological Society, at Damariscotta, Feb. 14.]

This very practical subject, broad or narrow as we shall view it, is not of my own selection, but was assigned to me by the management of this meeting, with what object I know not, for my individual sentiments toward it were and are unknown to them. In considering whether I would uphold or decry it, they perhaps exclaimed with Olivia in Shakespeare's play of Twelfth Night.

"Fate show thy force; ourselves we do not owe:
What is decreed must be, and be this so!"

Years ago at the time of my student life, I was a resident of the city. In one of my vacation wanderings in early fall, I found myself in company with a friend pausing at the outskirts of a little village in this State of Maine. The sun was low down in the western sky, giving long and graceful shadows to rocks and trees, and flickerings of yellow light through open boughs and climbing vines. The unpretentious houses of umber tint given by the hand of time; the barns with the "big doors" standing open; the streets grassed to the very edge of the roadway, presented a picture of almost artistic finish, backed as it was with a long line of rugged hills. The smoke of newly kindled fires was ascending in unbroken column from the slender chimneys, betokening the approaching supper hour. Indications of farm life were visible about the barns, and in the neighboring fields, and lent a new charm to us who were but recently in the heat, noise and confusion of city life. Farm life and scenes were not unfamiliar to me then, but the lesson I learned in those moments of contemplation will never be forgotten, for it did much in directing my thoughts to this subject of farm life in New England, which in turn have given place to years of actual and practical experience, developing the unideal as well as the artistic sides of the subject.

If we examine the map of New England, we shall find that the surface of the country is in general bold and rugged, allowing of level and interval lands of limited extent only. This necessitates the division of the country into small holdings, and we find but few of what would be called large farms in other sections of our country. These farms are generally so arranged as to include a little level or valley land, arable hill lands, and some woodland, giving to each owner a chance for a diversified farming, and a share of that which is good. These farms are watered by the purest of hill and mountain springs, and bright sparkling, dashing rills, untinctured by unpleasant or injurious mineral elements, and possess a soil equal in fertility to any similar sized portion of the United States. I speak of the soil only, not the accompaniment of rocks and stones: they are placed there to give character to the landscape,—and develop that of the owner. I do not mean by this statement that the 65,000 square miles of New England territory will produce a crop equal to 65,000 square miles of deep prairie soil, but that where we have an acre that we *can* cultivate, it will equal the average acre of any other section. It possesses more mineral elements than the prairie soils of the west, and for this reason will, in my judgment, outlast them. A fertile soil contains carbon, oxygen and hydrogen, these it can obtain from air and water, and also a portion of its nitrogen, in the form of ammonia and nitric acid; but it must contain as a part of its constituents, phosphorus, potash, sulphur, soda, lime, iron, magnesia and chlorine. The hills of New England are mostly of granite; so called because made up of little grains of three minerals, quartz, felspar and mica. The quartz is almost pure silica, but the felspar and the mica are compound minerals, being composed of silica, alumina, potash, soda, oxide of iron, magnesia, lime, phosphoric and sulphoric acids. All of these substances except alumina are found in plants. As our rocks decay from the action of the changing seasons, it keeps up the supply of these necessary elements ; and the time will come when a class of farmers will occupy these States who will look upon our granite hills as a source of wealth rather than of hardships ; and the western man will find that his soil although rich in carbon, is deficient in mineral constituents, and nature's laboratory not handy by to manufacture them for him. The present agricultural condition will reverse in time, commercial fertilizers will be more required in the west than the east. Could we of to-day mortgage the future, and obtain some of its fertility at the expense of future generations, I think that the so called incumbrances upon out estates would immediately increase, and be rechristened as blessings. This much for the stability of the soil. Its climate corresponds well with it, and can also be classed as rugged. All farmers should read Mark Twain's description of New England weather, which although a ludicrous exaggeration is in the main true. It is a healthful climate, its air is pure and bracing, and is not poisoned by unhealthful emanations from stagnant marshes and sluggishly flowing lagoons. We are more prone to criticise the evil of our environments than the good, and the climate of these States has not escaped the calumny that all good names receive ; but analyze it in your own minds, compare it and its effects with what are called "more favored climes," and I think that you will prove for yourselves, that it has been underestimated, and made to carry on odium that does not belong to it. I will not defend the anxiously looked for and tardy spring, the hot and dry summer, or the bleakness of the winter, cold, lonesome and dreary, and the effect these conditions bring ; neither will I extol too highly the purity of its atmosphere, the beauty of its mornings, the enrapturing nature of its protracted twilights, and the surpassing loveliness of its autumn days. You know of these extreme conditions as well as I. I only ask that you will be fair in your comparisons.

Farm life the world over largely depends upon these two conditions, soil and climate. They are the prime essentials that lead to success or failure. Our brief examination must, however, embrace the other conditions as well, to aid us to a decision as to which word we will follow our title with.

New England farms are small holdings such as we have described. They are mostly owned by their occupants, or are supposed to be, and are therefore in all essentials homes, and we of Anglo-Saxon origin know the full meaning of this term. Volumes cannot tell us more than our own hearts suggest at the sound of this word. We know the influences of the word home in history. It has maintained as well as destroyed armies, perpetuated nations and developed peoples and civilizations, and is the key to New England's intelligence and influence to-day, and if a division of that could be made, a far greater share would come to farm homes than to all other classes combined. In analyzing farm life, too much cannot be said regarding the influence of a permanent home upon a people; it is itself an evidence of high civilization and culture, and still further perfects it. Compare it for an instant with the nomadic life of the half civilized; compare it again with the moving life of towns and cities. where business movements and fluctuations compel frequent changes, and again with the country home life of the west, and mountain regions of the south, carried on in "dug outs," log cabins, or cheap frame structures, all with unattractive surroundings, bare of luxuries, or even comforts, and tell me then, if you can, that the commodious, comfortable and oftentimes luxurious farm homes of New England are not strong factors in developing our people; and does not entire America owe a debt to these homes and to the soil that has maintained them. A debt is due for the men they have produced, who have guided this nation among the many perils of state craft. These men were of the farm; it gave them grand ideas of civil and religious liberty, of true manhood and womanhood, of self-restraint. dicipline and moral courage; true conceptions of which can only be born in the free air of country life, where every morning's sun gives new impetus to noble thoughts and aspirations, and evenings calm, clear reflection upon, and conceptions of the freedom and greatness God intended for the human race. The country home with its imperative round of duties demanding detail in every branch, has developed a class of men that no city could ever send out. The statesmen who have guided this nation, the soldiers who have led its armies against foreign and intestine foes, the noble sailors who have commanded its navy, its business men who have added so much to its wealth, its able professional men, its pioneers in the enterprise of the west, and the host of noble women who have become prominent in the life of the nation have almost without an exception, sprung from the farming ranks. What need to catalogue their names. Take any in that long line of brilliancy and we can trace them back to a humble birth upon an American farm. Does not our republic owe a mighty debt to the soil that has given her this proud list? And if you will pardon a single digressing thought is it not sound political business to maintain this fountain head, this breeding place, in such good conditions that the future shall likewise be assured? The cities have given us but very few leaders. Other occupations located in the country have scarcely placed themselves on record, but to the soil and to the farm training this country owes the larger part of her greatness. This debt can only be repaid by giving a fostering care to agriculture from both State and national standpoint, by relieving it from laws bearing heavily upon it, by guarding it from unjust prospective laws, by regulating its present unequal and excessive taxation, and by placing a higher and more thorough education within the reach of this class.

The condition of agriculture in New England to-day compares favorably with that of any other section of our country. Let me anticipate your contradiction. The farms are mortgaged. Yes, far too many of them for 5 per cent as many are at the West and South for 8 per cent and 10 per cent. Farms are deserted and growing up to wood. Yes, many of them should never have been cleared, and unscientific farming has taken the heart out of many more as it is to-day doing in every Western State; and in the South abandoned plantations are as abundant as abandoned farms in the North. The South and West raise special crops, and receive large sums of money for them. Yes, granted, but at the smallest per cent above cost, and we all remember the adage of all the eggs in one basket; the mixed farming of New England requires many baskets, and all do not get broken at once. The long cold winters of New England. Yes, but I will match clean, healthful snow against a dirty malarious mud, will you not also? The life and push of the west. Yes, but much of it comes from New England and here is the point: *Would you have any more there than you have here?*

The easy working of western lands which enable a man there to care for ten acres as easily as he does one here; yes, and he works just as many hours a day to do it, and receives no more therefor, but has as an especial privilege the pleasure of paying taxes upon his nine extra acres. Oh conservative doubter, where is the gain? And so we could continue our comparisons without showing the fallacy of my statement.

To fully understand one of the most favorable conditions of our New England farm life and at the same time give a basis for comparisons, we must take a glance at the first steps into civilized history taken by the various States. Our own dearly loved New England was settled by English Puritans. with a small percentage of Scotch and Welch. They were of the Anglo Saxon race par excellence, *the leading family of the world.* New York was peopled by the Dutch ; Pennsylvania was settled by Quakers and Germans ; Maryland by English Roman Catholics ; Delaware by Dutch and Swedes ; Virginia by English, not of Puritan stock, but the so-called Caviliers, the adherents of the notorious Charles the First, and the opponents of the "Roundheads ;" the Carolinas in part by French Hugenots ; Louisiana by French ; Florida, Texas and California by Spanish : Utah by Mormons chiefly from England, Wales and Denmark. Immigration from Germany, Ireland, England, Scotland, France, Sweden and Switzerland has been general in its distribution of settlers in all the Western States, giving a population of mixed families, but all of one race. The South is worse than this, for it has a large assimilation of African blood, which is wholly opposite to the Caucassian. There has been less of immigration to the New England States than to the Middle and Western, consequently we have a purer stock. The laws of breeding by which our domestic animals have been brought to the perfection which they show to-day, apply equally well to the human race ; nature knows no distinction in her production of animal life. These settlers brought with them different traditions, modes and methods of farming, ideas of civil and religious government, and those of the third and fourth generation show them to-day. I believe that this great American nation has the power to assimilate them all in time, and mould them into one great family, with as individual characteristics as each parent race presents to-day, but it will require time, and to those who desire to leave present associates, being willing to wait for this mixed class to amalgamate, we will suggest that time also has an important engagement with us not many years hence, which will prevent us from being present to enjoy the delightful society that will probably follow it. This mixture of classes is a prominent feature of the conditions outside of New England, and is deserving of much consideration on our part ; here our neighbors are of the same stock as ourselves. We have been bred pure for generations, and show the results all summed up in one comprehensive word, which I admire because it is the synonym for energy, push, determination, general good character, and crowning of patriotism in the term *Yankee.*

Farm life here presents many advantages over other sections that should determine the future of many who are seeking to enhance their benefits. Let us arrange them in position and see if they will be overthrown. In the first place we have what is called "a natural grass country," and if stock feeding is the basis of agriculture, grass is the basis of stock; you may say New England has literally gone to grass, but as long as she derives a profit from it, it is all right. We have the advantage of an abundance of pure water, none better anywhere,—and in these temperance days in Maine this fact ought to be appreciated. If the law which has had such a good effect here should be enacted in many sections of the West, it would fill the people with perplexity and mineral salts, for in many places it is so highly charged with them, as to render it distasteful and injurious to both men and animals. We present the evidence of older settlement, roads are laid out and constructed, and streams bridged and paid for, school houses and churches erected and paid for, hospitals and other elemosynary establishments in systematic operation, and paid for, buildings required by civil forms of government long ago erected and paid for. New countries *must* construct these for themselves, they cannot go without. There is no other way of obtaining them than by a total new construction, and no other way of paying for them excepting through taxation. This tax for roads and bridges, tax for school houses, contributions for churches, tax for hospitals, dispensaries, orphan, deaf and dumb, and insane asylums, court houses, jails, state prisons, &c., &c., is to my mind a complete offset to cheap lands and imperfect shelter, and I assure you that my mathematical education was not neglected in my early years; had it been, I should have been a dweller in the West rather than the East.

Our rugged hills, which we, as farmers object to, are in reality blessings, for all Yankees are not farmers, and in the search for maintainance they have caught the boisterous streams as they come bounding and hurrying down the steep valleys and confined them in stout dams, compelling them to turn huge water wheels as the price of freedom, and thus endow with life the curious machinery that constructs so many articles for which we are noted. This creates for us thriving market towns wherein we can dispose of our produce at remunerative prices. We are also nearer to the great markets of our own country, and of Europe; and with our newly constructed Inter-State Commerce Law,—the best law Congress ever passed for the farmers,—we may expect a better sale than those of more distant sections.

These are progressive times in which we live; note the great changes that have taken place in human affairs in the last few decades. The world has not gone backward an iota, but forward with gigantic strides far outstripping all previous generations. The improvements in railroads and telegraph; the telephone, electricity also for light and motive power; the various applications of steam for commercial, business and domestic purposes; the subtle development of chemistry and the hundreds of conditions and questions of the day are the result of one word, education, and herein is New England's superiority; she stands in the front rank to-day as an educator of her people. Her school laws although not perfection, are really unsurpassed, her common schools are everywhere, and her colleges and universities are the foremost of any this side of the Atlantic. Our farm life gets the benefit of these; our homes show the influence of what we might term living in an educated atmosphere; our children show it, and they grow up with all of the advantages which education both direct and indirect confer.

The same can be said with regard to religious advantages. It makes no difference what our own opinions may be, whether we would be ruled by presbytery and synod, by priest or bishop, or act independently, believe in sprinkling or immersion, falling from grace or in an iron clad conversion, or in none of them; all thinking people will admit that there is a subtle power in religion, whatever its form may be, that carries its advocates towards a higher and better life, and that a religious community is the safest and most satisfactory one to dwell in. Compare New England with the rest of our country for my application.

Another of the advantages of eastern life is its society. Shakspeare, that great delineator of the human mind, says: "Society is the happiness of life," and Bacon truly places the unsocial man when he says, "It is most true that a natural and secret hatred and aversion towards society, in any man hath somewhat of the savage beast." Undoubtedly a love of society is the outgrowth of civilization. Cultured persons having great resources within themselves often have a fondness for solitude, but it is not permanent, the cultured mind seeks companionship of a level with its own; or higher yet. In speaking of society I do not intend that narrow definition of which the term "fashionable life" is the synonym, but I mean that broad interpretation which covers the free interchange of feeling between human hearts and minds, and that brings man above the level of the brute creation. The social side of New England farm life is far from what it ought to be; it is good, it is cultivated to a certain extent, it is high toned, but it is sadly lacking in the genial good nature shown by the Germans and some of our southern kindred, and could we incorporate that upon our intellectual standard we should have a far better form than we have now. As a proof that New England society is in advance of that of other sections, it is only necessary to allude to the statement that every real estate dealer will make when describing property in the neighborhood of settlers from this section, "We have fine society here, sir, the people are from New England." If New England society has a commercial value abroad, is it not worth something at home? Answer me that, ye decriers of New England's advantages.

In summing up the advantages of farm life in these States we can place a good soil, a fair average climate for the latitude, as large a cash income per acre as any other sections can show, more ready sales of produce from nearness to market, improvements from civil and religious organizations made and paid for, better educational, social and religious advantages, and the healthfulness of its climate.

But are we to drop the subject here? Is there not another question that confronts us in the *possibilities* of our farm life? Are the conditions to remain the same as they are now for years and generations to come giving us situations similar to those of Russia and other European countries? Most emphatically I say not. America stands at the head of the agricultural world to-day; first in the fact that our agriculture is not in the hands of a debased peasantry, but in an intelligent and educated class of our people who already possess the spirit of progression and improvement, a cultured and capable people as the many who have sprung from its ranks prove; and second in the fact that we already have the markets of the world in the leading staples, exporting a trifle above 10 per cent. of our entire agricultural product, a matter of amazement to other nations. This general export from America I predict will increase. New

England farms are already feeling the influence of this trade, in the sale of apples and dairy products. The possibilities in this direction are great, but we will not attempt to develop it, as it pertains to the nation at large, and not to our section alone.

The possibilities of our farm life are great. Let us examine them seriatim. First our agriculture; I do not know of a farm in New England that has yet reached its fullest capacity. We can carry three times the population that we do now, and not test our farms to one-half their limit. Talk of our soil being worn out and exhausted! I know what I am talking about when I say that there is no end to what our soils will produce under reasonably good tillage which they have never received. To give this necessary high cultivation we have not a strong enough force of laborers, a serious drawback. The lesson we must learn, however, is to cultivate a less number of acres, increasing the care bestowed upon those we do treat until we get our lands bearing to a greater extent, then gradually increasing our area only as we can give high cultivation.

Another of our possibilities is regarding our stock. All good farming depends upon some system of stock keeping. What are we doing to-day? Keeping one-tenth the number that we ought to and can with reasonably good planning. Horses, cattle and sheep we can increase to great profit. Swine only to a limited extent. Regarding horses, whenever I mention horse breeding in southern New England, I am always met with the remark that I can buy a horse cheaper than I can raise one. Granted, but you will have one far inferior to the one you would raise. Farmers in Maine and Vermont agree with me. I have an idea that a cheap horse in the end is too expensive for any one to own. Western horses bred for traveling through the mud, little nublins and hacks from Canada, Indian ponies from the plains as uncivilized and unchristianized as their former owners, are flooding the east to-day; but home bred horses, raised where they can sniff the salt air, and which will readily bring from 25 per cent. to 50 per cent. more than the nondescript truck are hard to find. Boston and New York are the best horse markets in the country, yet what are we doing to supply them. It is a legitimate way of obtaining money, easier than hoeing it out of the ground, and it develops intelligence, self reliance and control, and what we term nerve in the breeder.

We also have vast possibilities in cattle raising, both for the dairy and for beef. Not for the latter, however, till we have developed and put in execution another of our possibilities, the overcoming of the Chicago beef trust. Can you see a reason why this trust, composed of a few men, should drive out this great industry, depriving our farms of what has heretofore been a handsome item in their incomes? The business is dead to-day, but I have seen enough of the business pluck of Eastern farmers to convince me that it can be restored.

Another possibility is in sheep, that little animal that the world is so much indebted to, and described by Hugh Miller as "that soft and harmless creature that clothes civilized man everywhere in the colder latitudes with its fleece—that feeds him with its flesh—that gives its bowels to be spun into catgut with which he refits his musical instruments—whose horns he has learned to fashion into a thousand useful trinkets—and whose skin converted into parchment served to convey to latter times the thinking of the first full blow of the human intellect across the dreary gulf of the middle ages." The idea of their value to the land the Spanish embody in the phrase, "Sheep have golden hoofs." They are indeed true gold, bringing blessings to all farms where they are maintained, their nature understood, and their wants supplied. There is no better sheep country in the Northern States than New England, and no country that needs them more. The sheep is an animal whose history goes back to the beginning of civilization, and ever with the same reputation for value and profit.

This is to a certain extent a business man's convention, we are all here looking for improvement or profit. Some of you may say that you have not the capital with which to embark in stock raising and that you consider the market overstocked already. Let me mention another possibility promising a market, a profit, and surely within the reach of all, poultry. The market is always good for the whole race making one think that Thanksgiving lasts all the year round. When once fairly started they grow themselves as Topsy did without much care from the owner. The carcass requires but a little husking to prepare it for market, and eggs no preparation at all, and whoever knew of a time when they could not sell them, even those that by reason of age, are unfashionable, having developed a superabundance of sulphuretted hydrogen, or seem to have been laid by young pullets in poor health are saleable, being used in the arts, there can be no loss, cost price can always be obtained. The West sends many eggs to our markets, Canada sells us her surplus; even France and Germany send us thousands of dozens every year.

A greater possibility at the present time is in the dairy, and it is an immense one. It has not yet commenced to show its proportions, but like an office seeker's ambition grows larger with each fresh acquisition. New England is pre-eminently a growing country, and I know of but one reason why it cannot lead the world in its manufacture of dairy products, and that is the one the Dutchman gave for not flogging his unruly boy. "No," he said, "I not vhip dot boys; the more dot boys gets vhipped, the more vhippen he wants, und pooty soon I gets so tired dot I right away quick, offers a premiums for the largest man in der town, und I captures dot premiums every time mineself."

In addition to the making of a uniform standard of good butter, the selling of milk in cities, towns and villages, the condensing of it for exportation, there can be made cheese of all grades, from those of white oak toughness strangely preferred by some, to those of delicious softness and highly nutritious qualities, and of all the characters that we find in the English, French and German markets and which are now becoming so fashionable in our own. I would not however have the manufacturing of dairy products a feature of farm life as it has been in the past. It is too expensive and burdensome on the members of the family, and not in accord with the demands of the times or the advance in business. The farm should simply produce the milk leaving to the creamery and the factory the production of the finished article, through some of the many co-operative methods.

I frequently hear fears expressed of over-production. There may and probably will be years of more than average prosperity, when certain branches will be crowded, but what is the outlook for general years of production? This country of ours is an immense one, and is increasing more rapidly than any other. The birth rate is about 100,000 per month, 2 1-7 per minute; in addition to this source, immigration brought us last year 518,000 and it is not likely that there will be much falling off for several decades at least. Population is like money at interest, the longer time goes on the more rapid the increase. If we can judge of the future by the ratios of the past which have heretofore been very correct, we are destined to carry one of the largest populations of the civilized world. The tide of emigration is westward and we cannot stop it.

It will regulate itself in time as soon as the wild lands are all occupied. With us the rural population is barely holding its own; towns however are increasing, in other words, markets are better, with production the same. Hereafter the west will consume a larger ratio of her productions than in the past, for other lines of business are increasing faster than the agriculture. We can argue from this that fears of overproduction are groundless, and can consistantly increase our varieties and productions. Market gardening, small fruits, the maple sugar and sweet corn industries; the growing of medicinal plants, herbs and textile fibers; the manufacture of sugar from beets and sorghum, which I believe will yet be a success; the growing of the forests upon our waste lands, and especially of wood for cabinet work. The culture of the edible mushroom (*agaric compestris;*) the growing of flowers for market; the increasing of our grain area, especially in buckwheat, an unknown grain in many sections; the growing of seeds for the trade, which is coming forward so prominently, apiculture, for those who complain of the monotony of country life and want a rousing lively time occasionally; the growing of squabs, trout and carp breeding are items of our numerous possibilities.

The possibilities of New England farm life must of course depend a great deal upon the business conditions of the whole country. In the last few decades agriculture has not held its own with the general increase. Let us see what figures say, and we will take those of English computing, as they will naturally be more conservative than our own. Mr. Mulhall, the well known English statistician, recently addressed the British Association, and presented some striking figures regarding industrial America, covering a period from 1850 to the present year, one generation. He takes the leading elements in our progress, and finds that while our population increased in that time 170 per cent, railroads advanced 1 580 per cent; the banking system 918 per cent; steam power 685 per cent; wealth 680 per cent; manufactures 408 per cent; commerce 315; agriculture 252; education 206; and shipping 74 per cent. Mr. Mulhall also estimates that the next census will show a population of 66,000,000, and an accumulated wealth of $70,000,000,000 or 50 per cent more than the aggregate wealth of all Europe ten years ago. As gratifying as this showing must be to our national pride, is it not also showing us that agriculture is not keeping pace with the general business of the country, although a little reasoning and wrestling with his figures will show that other branches have gained from their alliance with it. If we can receive these figures as a basis for our calculation for the next generation, it shows us plainly that in order to bring agriculture up to the line with other industries, we need not fear to push our possibilities to the utmost extent that there is room for them and a call for them that we as business men should heed.

These possibilities can all be greatly aided by our own exertions The sailor who is intent to reach a distant port is never content with idly drifting with the tides and currents, hoping that good fortune will bring him there. He trims his sails to every favoring breeze, is ever on the lookout for dangers, and by his own exertions, care and forethought anchors in time at his destination, but not until he has many times been rudely buffeted and set back. So we, if we will attain the success that we see awaiting the future, must make up our minds to work as never before, not more by toil and labor, but by the newer methods of business, in strife with the other occupations of the land, bringing to our aid the same helps that they are using, especially seizing upon that great agent that is to-day regulating all business life, co-operation, by its aid reducing our expenses, producing at less cost, lightening our labors and increasing our profits We must be organized to guard against encroaching legislation, unfair business restrictions and influences, and the social laws enacted by false society. Of all organizations which are at present carrying out these objects I know of none superior to the Grange or the order of Patrons of Husbandry.

There is one great question that we must not overlook in our estimation of New England farm life. However profitable we may make it to study its history and see from whence we and it came, to reason and speculate as to the future and see what we and it may become, there is an important feature that comes out more prominently than either, in the fact that we are here as active participants of the present, and likely to be for a few years to come; and our question is, what is our outlook for reward? Columella, that old Latin writer who flourished in the first century of our era, and wrote some twelve books upon agriculture, knew how to grumble as well as any Yankee of to-day. His utterances regarding "our worthy ancestors who esteemed it their glory to take care of their farming interests" etc., etc., sound as familiar as though published in a Boston agricultural paper of the present time. His example has been followed all through these eighteen hundred years, regretting the days of our father's when agriculture paid better. Is there no originality in mankind? It seems to me that it is time to quit that subject and take a new theme, the tariff or woman's suffrage. It has always been fashionable to uphold the past. A peculiarly gifted class have applied themselves to this in New England, while the facts show that the price the farmer receives for all of his productions has greatly increased in the average of years, while the articles he has purchased have decreased with the single exception of rum which has more than quadrupled and then doubled. But fortunately that does not concern you of Maine.

Did time permit us to make comparisons of the net profits of capital invested in agriculture, commerce, manufacturing and mercantile occupations, we should find that the profits of the former are in the average of years one-third greater. I derive this fact from figures of mercantile agencies (who are all getting rich recording the failures of business men), and my knowledge of book farming, account book farming, to give the whole title, and I defy any one not a bank cashier or a railroad director to argue them down. If this is a fact, it would seem that all other occupations would rush into farming, for I find the same dissatisfaction and grumbling in them, but the long hours of toil in summer. the humiliation of wearing rough clothing and showing hardened hands speak louder to them than dollars and cents. The hope of reward is greater in these callings for the reward is more unequal, a few getting rich where many fail, and the *hope* to be the successful one keeps them there, while in agriculture comparatively few get rich while all to a certain degree prosper. The ratios are reversed. Here we can aptly quote the old Latin proverb, "Audaces fortuna zuvat, timidosque repellit." Fortune assists the bold and repels the coward.

If we call reward an honest equivalent for money invested, labor actually performed, mental application given, the outlook is now better in the East than in any other section. If we accept of a different definition and include speculation in its many seductive and deceptive forms, business trickery overreaching and greed, the world outside of New England offers far better chances. If to our definition we add home and village influences upon the children, their educational advantages and chances of following honorable lives, then certainly there is no questioning the position we have taken.

To my mind rewards will come more promptly in the future than in the past for education specially adapted to the calling is fast gaining ground. Government is lending its aid to unlock hidden mysteries; systematic business arrangements, having in view a cash return, are coming into vogue, trained men from scientific professional and business callings are aiding. To all this we can add a knowledge the farmer is gaining of the world at large, of the excessive wear and tear of other occupations and the growing feeling regarding the dignity of country life, recognizing that it is longer, purer and far happier amid such surroundings as I found in the quiet yet active Maine village where my thoughts were first directed to this subject.

Thus can we look at the agricultural future of New England. Her qualifications are good; her dis-qualifications are comparatively few, and can be overcome by systematic and organized effort. New England's agricultural opportunitiy is in her men and women as much as in her soil and climate; in the strength of their minds rather than that of their muscles. All progress comes from labor, mental or physicial, and all well directed labor meets with a reward.

DAIRY CONFERENCE.

A dairy conference was held by the State Board of Agriculture at Memorial Hall, Oakland, November 20, 1888. The object of the conference was to illustrate by actual example, and to discuss at length, methods and practices in private dairying, and thereby call the attention of dairymen in general to the best appliances and the most approved practices known to the business at the present time.

Z. A. Gilbert, Secretary of the Board, opened the meeting with an explanation of its purpose, following with a description of the methods and practices exemplified.

REMARKS OF Z. A. GILBERT.

I have found in mingling with dairymen throughout the State that one of the greatest obstacles to progress is the want of opportunity for observation and comparison between individuals. This conference is designed to present to the people here assembled some of the methods and practices now accepted as being the best known to practical dairymen in New England. Probably those who are assembled here this morning are largely those who are already practitioners of the advanced methods of dairying.

I was surprised at an assembly of dairymen in this butter making county of Kennebec, a short time since, by the statement after the close of the meeting of one of the individuals present, that he presumed in his town one-half of the dairy women practiced allowing their cream to remain on the milk until the milk was sour. It was rather an astonishing revelation to me, that such should be the fact here in one of the oldest dairy counties in the State, and where dairying has been practiced longer as a leading business probably, than in any other county in the State, and where some of the best dairy practice is carried on at the present time Only last week, at an assemblage of dairymen, at a Farmer's Institute in another part of the State a sample of butter was shown, and very fine butter too, and the husband and wife were both proud of the sample, and they volunteered the statement that "it was made in a good old-fashioned dash churn."

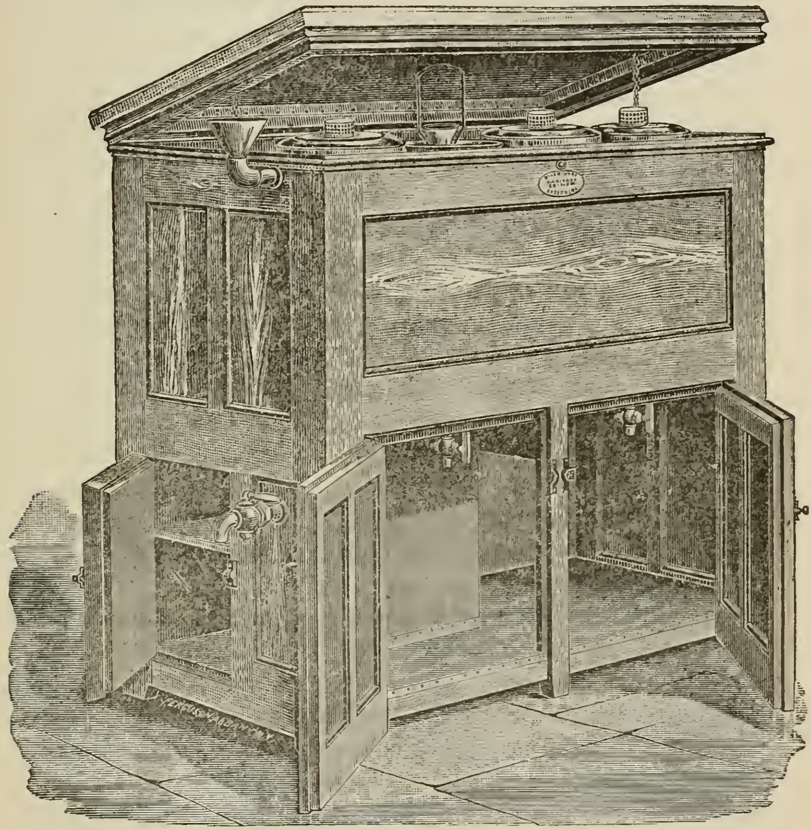
With these practices still prevailing to some extent among us it was thought it would be of value to bring some better methods to the observation of dairymen, and bring them so closely to their attention that if they are interested in the progress that is going on, they could not help seeing what is called for and what is being done at the present time. This meeting is intended to be entirely informal, and what I may have to say is to be in the form of a conversation or conference with you, asking you to aid and assist in carrying it on. If there are any here who want to see cream in what we call a proper condition for churning, I would like to have them file to the platform and we will illustrate by this sample the proper condition of cream when it is ripe for churning into butter to suit the market of the present day.

One of the greatest obstacles I have found in undertaking to enforce the difference in quality of butter is the indifference on the part of makers to taste the butter Nobody knows whether they are making good butter or not unless they taste of it; and if they want to find out and appreciate the difference in quality of different makes of butter they want to have an opportunity, and improve it, to taste of those different makes of butter.

This matter of butter making is one that concerns everybody, either as maker or consumer, hence its importance cannot be overestimated. In the first place, in modern dairying, good milk is necessary. We start out then with good milk. We shall not discuss the methods of producing such milk, merely stating that it must be pure and clean.

There are two methods of creaming milk practiced at the present time; one is the common method in practice among us, called raising the cream by gravitation, that is, letting the cream gravitate or rise to the surface. The other method is separating the cream from the milk by machinery. This last the attention of the dairymen of our State has not been called to, to any extent up to the present time. Still the practice is in vogue in many sections of New England, and in the middle states to quite a large extent, of separating the cream from the milk, immediately after it is drawn, with a centrifugal machine. Sometime during the winter the attention of dairymen will be called to that practice, but to-day we simply mention it in passing. Our work to-day is with the method of raising cream by gravitation.

In modern butter making the first thing to receive attention, after securing good milk, is the setting of the same. And in setting the milk for cream the very first thing for consideration is temperature. In fact the whole process of raising cream is dependent on temperature, hence it is the first thing for the dairyman to look out for. That is the one thing over which we have labored more than any other in the dairy practice in this State and in fact throughout New England and the country at large. The temperature must be controlled to do uniformly good work. After experimenting with the various methods of setting cream in shallow pans and controlling the temperature of the dairy room in which the pans were set, through the process of the large pan system which was for some time in vogue in certain sections and which was warmly advocated as an improvement over the small pan system—we have finally stepped on to the present method of deep cold setting as the best. Through this method the temperature is most easily controlled You will see the force of that statement when you stop to consider that instead of having the temperature of a dairy room to control, under this deep setting system we have simply the temperature of a tank of water in which the milk is set to control; and the difference in expense of the two systems is considerable. So the deep setting method is coming to be the general practice, and it is so approved not because it is not possible to make good butter with the shallow pan system, but from the fact of the more easy control of the temperature. It is possible to make good butter under the right conditions in the old fashioned shallow setting system, but so difficult is it to control the surroundings and the temperature that the quality of the butter is not even. Hence the adoption, almost universally at the



STODDARD CREAMER—WITH SURFACE SKIMMING ATTACHMENT.

present time, where dairying is made a special feature of the farm business, of the deep cold setting method. It is best to set in water, for the reason that the milk cools down more quickly than when it is simply set in cold air. Also, the temperature is more easily secured and held steady and low with the water than it is with air alone. The temperature required under this method depends on the length of time which the milk is to set in the can. If the cream is to be removed at the end of twelve hours it is necessary to reduce the temperature to about 45 degrees; if it is to set twenty-four hours before the cream is removed the cream will all be upon the surface and the division between the watery parts of the milk and the cream will have been carried on to a proper degree of completion at a temperature of 50 degrees.

The length of time the milk should be set depends something on convenience; the cream will all be upon the surface of the cans, under proper temperature, in a very short time. Three or four hours will throw the cream, quite all that is good for anything, to the surface, but it will not be sufficiently separated in that time; too much of the watery parts of the milk will remain mingled with the cream. Hence a little longer time than that is desirable for the purpose of getting a more complete separation. With a temperature of 45 degrees twelve hours will separate it completely and will separate it as effectually as a longer time. If it is desirable to do so, it may as well be taken off at the end of twelve hours as to remain longer. Of course if it remains longer under the cool temperature no injury results to the cream.

The questien has been raised, and has been raised since our assembling here this morning, whether all of the cream is secured by the deep setting method. Many experiments have been conducted to test the different systems of setting milk, and with the final conclusion that the deep setting secures in the long run as large a part of the cream, as the open pan system. Our ideas were formerly contrary to this; it didn't seem possible that cream could rise through twenty inches of milk, but experiment has proved that it does rise effectually.

There are dairy experts who have claimed that a choicer article of butter can be made from the open setting system than is possible by the deep-can system. I merely mention this in passing, for I think the advantages of the deep setting system are so great over the shallow that it will more than over-balance any possible claim of superiority in quality by one system over the other. The late Professor Arnold stoutly maintained that it was possible to make a choicer article of butter, to put a little more gilding to the finishing by the open-pan than by the deep-can setting. Richard Goodman, who a few years ago figured quite prominently in dairy circles, maintained that the exposure of the milk to the atmosphere under the open shallow pan system was an advantage provided the surroundings were absolutely all right. Without stopping to question that point at all, it may be said, that the economy and convenience of the deep can system give it so great an advantage that it entirely outweighs any possible superiority in quality. Besides, the deep can system is making a butter that suits the markets well, and people are becoming educated to that standard, and when dairymen exactly meet the wants of consumers they are doing the very best thing for themselves.

I wish to say a few words in regard to the comparative merits of skimming the cream from the surface and drawing the milk from under the cream. We find that the representatives of different patents are loud in their claims both ways. It is well for us, as candid dairymen, to consider the claims from a practical standpoint rather than from the arguments of interested agents.

The claim is made that in surface skimming the sediment—it is too suggestive to call it dirt—in the milk is left in the bottom of the can with the milk, while if the milk is drawn from under the cream the sediment does not flow out with the milk but remains to mingle with the cream. Right here I want to call your attention to our starting point, and that is, that we start with good milk and have no compromise whatever, anywhere or any time, to make with dirty milk. There is only one place for dirty milk, and that is not in the creamery. Never allow any dirty milk on the premises, whether handled by yourself or by your hired help.

After removing the cream from the milk the practice at the present time is to provide for a ripening process, so called, a curing process with the cream, which is simply setting the cream for a length of time sufficient for it to take on the desired change. This change is simply an approach to an acid condition. Meanwhile it is recommended by all dairymen that it be exposed somewhat to the atmosphere and from time to time stirred so that all its parts may be measurably equally exposed, and all put on exactly the same change as time passes. The length of time which cream should be allowed to stand for ripening is a matter of convenience. At the creameries where a large business is carried on it is usually held only twenty-four hours at the creamery, and it was held twenty-four hours at the dairy before coming to the creamery, making about forty-eight hours; and a very good condition can be put on in that time. This condition may be hastened by holding it in a higher temperature, or retarded by holding in a colder temperature, at pleasure. Never should it be held too long, for cream, even in a low temperature will grow aged One of the greatest mistakes in private dairying by the common methods which dairy women have fallen into is the keeping of cream too long. No one can make a first-class product of butter under any temperature or under any surroundings whatever who practices keeping the cream for a full week, or any part of the cream for a week; it will always put on an aged flavor. If that flavor is taken on by the cream it will be carried into the butter, and it will be an imperfect butter and when put into the market will sell under price. In every private dairy, whether with one cow or more, the cream should be churned at least twice a week.

Question. Would you have the cream closely covered, provided you could have it partly exposed to good air, while it is waiting to be churned?

Sec. GILBERT. The preference would be that it should not be covered, provided the surroundings are all right.

Question. Is it the practice at the creameries to cure it without keeping it covered?

Sec. GILBERT. It is the universal practice at the creameries to keep their cream tanks open; quite a broad surface is exposed to the atmosphere, and the cream is frequently stirred with ladles so that the change shall take place in all parts alike.

There are two methods of hastening this ripening process; one is by temperature alone, and the other is by adding to the fresh cream when it is taken from the milk, a little cream that is already acid, or putting in an "acid plant," as it is called, and setting the acid to work by contact. This is not practiced in any of the creameries of this state, so far as I know. They simply depend on the temperature. Cream that is brought in fresh one day is easily brought into an acid condition the next by temperature alone.

Question. Would you prefer to have the cream dish large enough to hold all the cream for one churning, and so keep the cream for each churning always by itself?

Sec. GILBERT. That is a matter of convenience only if you have two or more vessels for holding the cream for a single churning you want to mix it so that part of the older cream goes into each of the vessels and thus mingles it so that it will be entirely even and alike throughout.

Now, how far shall this curing process be carried on? This is a very important matter. Butter can be made from sweet cream, but it is a different butter from that which is made from acid cream. Generally New England markets and New England consumers call for butter made from cream slightly acid, just commencing to put on the acid condition. When that condition is put on it has been found by many tests that a larger quantity of butter is secured from a given amount of cream than if churned in a sweet condition. So you reach through that practice the two conditions—the largest amount of butter from the cream and also the quality called for by the great majority of consumers. Extreme care should always be exercised that this ripening process is not carried too far. Sometimes a few hours only will destroy the quality of the butter so that it cannot be classed as first quality and for no other reason only that you have allowed the ripening process to go on too long and the cream to become too acid, too rank. That same flavor is carried into the butter. This is found in many private dairies. In place of the delicious flavor sought for you get a rank condition decidedly objectionable to a cultivated taste If the change goes on still further you get the rancid butter which is good for nothing for the market or for consumption. No other change is called for in order to bring on that condition except to allow the acid to have its way. I have two samples of butter here upon the table, one made from cream in the proper condition, and the other from the same cream twelve hours older. I have been a little pleased to hear some remarks made by those who have already tasted those two samples; one of them being called good and the other very readily bad. There is no difference only in one case the cream was what we term ripe, and in the other the same cream was kept twelve hours longer. The difference is plainly manifest to one skilled in testing butter. If you are an expert taster and have ever practiced tasting butter at exhibitions where a large number of samples are shown together, you will find that a large number of the samples on exhibition have that flavor. Remember this, that a slight acid condition tones up the flavor, brings it out more prominently. There is more flavor, to use that expression, to acid butter than to sweet cream butter. Sweet cream butter is called for by a few individuals who have cultivated their taste for that kind of article. The flavors of sweet cream butter are the flavors of sweet cream itself.

Question. How long do they churn the cream under the process you are describing?

Sec. GILBERT. We always have to churn until the butter comes. Under the deep, cold setting system, with the cream under proper conditions, it usually requires about thirty minutes. Under the open pan system the ripening process is carried on more effectually by the atmosphere and consequently open pan cream will churn in less time than deep can cream. A liquid condition of the cream in churning as found in deep setting is very much better and always to be desired; and if the cream is set in open pans it should always be thinned to a liquid form for churning. You get a more even movement of the different parts of cream when put into a liquid condition than is possible if it is churned thick as under former practices. It will all be stirred at the same time and all exactly alike.

In churning, the first point to determine is what churn to use. The introduction of a churn without inside gear of any description is one of the greatest advances of recent years in dairy work. There are several kinds that are manufactured after this idea. The best practice in the country has discarded the churn with any inside gear whatever. The barrel churn here on exhibition is the one most generally used at the present time in private work. The object is to get an even movement, and an exactly even condition of the cream The trouble with the old Blanchard churn, of which so many were sold in our State, was that the cream was not all in exactly the same condition at all times; a portion would stick to the churn and a portion to the cover, and was there held until it was

scraped off in some way or washed off with the buttermilk. When the butter began to come it would begin around the crank first, and then around the angles of the dash. A portion of the cream would be churned in some parts of the churn before other parts were sufficiently churned. With the barrel churn, the square churn used in the factory, or the Davis swing churn you get an absolutely like motion of all the cream at all times. You look into it at any time and any particle of cream is exactly like every other particle. When any change begins to take place in the churn every particle of the cream is affected just exactly alike. That being the fact you get more butter from a given amount of cream than when churned under different conditions. This holds good from the fact that many times with the old method some of the cream does not get churned sufficiently and goes off in the buttermilk.

Question. In open pan setting the cream will be unavoidably hard and thick when it is taken off; would you reduce it with milk?

Sec. GILBERT. When the cream is thick and heavy from the open pan system, to churn it properly it should be reduced with skimmed milk until it is sufficiently liquid.

Question. Would you do that at every skimming?

Sec. GILBERT. If so thick that it is difficult to mix it properly, then put in at each skimming enough so you can, and when you get ready to churn, bring it down to the proper consistency. But if you skim at the proper time from the open pans that thick leathery condition of the cream will not obtain. No milk set in open pans should ever remain without skimming over thirty-six hours under any conditions. If you have surrounded the milk by proper temperature and proper conditions the cream will be upon the surface and had better be taken off before it becomes hardened and leathery. That condition is produced by the dry atmosphere absorbing the water from the surface of the cream, leaving it dry and hardened, a condition which is improper and undesirable.

Question. What is the best temperature for open pan setting?

Sec. GILBERT. About 60 degrees for open pan setting is the best, and milk will keep a goodly length of time when you secure that temperature. If by accident or a sudden change of weather the milk changes more quickly than usual it is always best to take the cream immediately from the milk. After the milk begins to coagulate no cream will rise, and it is just as well to take the cream off at the commencement of acidity as to let it remain there and injure.

Question. Is not the keeping quality of butter made from the shallow setting system greater than of that made from the deep setting system?

Sec. Gilbert. I am unable to answer that question. It is claimed by some that that is the case, but that it holds true I do not think is fully settled at the present time. If I am wrong in this statement I will stand corrected by any authority on the matter.

Another advantage of a churn without inside gear is the granular condition in which the butter comes, and it always comes in a granular condition when all the particles of the cream change at the same time. First the granules appear very small indeed, but all alike through the cream, then, after a little more movement the granules enlarge by adding to themselves. So the change gradually goes on, always uniform in all parts. This condition is very desirable and it is one of the important improvements in this business.

I will say that if by accident, neglect or change of weather one chances to keep the cream a little too long there is sometimes difficulty about the granules of butter rising to the surface of the buttermilk, and to remedy that defect dash in a handful of salt into the churn. The salt dissolves and mingles with the buttermilk, and renders it more dense, hence the granules of butter are forced to the surface. Some always throw a handful of salt into the cream, thus obviating a possible difficulty in that direction, and it never will do any harm.

The next process is to draw the buttermilk from underneath the butter. Sometimes an occasional globule will run off with the buttermilk. The buttermilk can be drawn through a strainer, or the globules can be skimmed from the surface of the buttermilk and returned to the churn.

After drawing the buttermilk, the general practice now is, and I think it is universal in modern butter making, to wash the butter. This is done with cold water, or, in some cases with a weak brine. The water, generally speaking, is satisfactory provided it is pure. The temperature of the water should be governed by the requirements in the case and may be regulated with ice.

How much to wash the butter? Bear in mind what has been said bout what the market demands for flavor in butter, an acid cream flavor. Repeated washings wash out or tone down a measure of the flavor it is desirable to retain. One washing after the buttermilk is properly drawn from underneath and out of these granules of butter, will effectually remove the remaining buttermilk, provided that the butter is sufficiently hard, and in the subsequent working of the butter not much of the buttermilk coloring will be found in the water which is forced out from among the granules of butter.

Question. What is the benefit of washing even once?

Sec GILBERT. It is the easiest way to get the last of the buttermilk out of the butter. It can be done without this washing, but the washing is the easiest way to do it, the quickest way to do it and the least liable to cause injury. This theory of washing away the flavor of the butter is questioned by some. An expert taster however of butter will readily distinguish the difference between that which is simply washed once and that which is overwashed, or between that which is not washed at all and that which is washed once.

Next we come to the salting. Salt is really an artificial adjunct to butter, and there is only one general rule in regard to the matter, and that is, to salt to suit the demands of the market. The scale of points in judging butter gives the salting a prominent place. I hardly know why that should be done, for the salting is simply a variable matter that is adjusted to suit the demands of the market. In the commission houses in Boston at the present time, one ounce to a pound of butter is called for and will best suit the general market. There a great many customers who call for a fresher butter ; there are still some customers who call for a salter butter than that. Butter salted for testing at exhibitions is usually very lightly salted, because when you take butter clear the saltness is brought out more prominently than it is when eaten at table. You can better get at the comparative flavors at fairs when it is slightly salted instead of being salted according to the requirements of the market.

Question. In putting in an ounce to the pound in what condition is the butter when it is weighed.

Sec. GILBERT. Put in as many ounces of salt as there is of butter when it is in the granular state.

Question. Does it not really require judgment?

Sec. GILBERT. There is a point of judgment that comes in ; and it is always found that one element in these processes is to judge when the proper conditions have been reached. There is always a matter of judgment required.

There are two methods of salting in practice, one to salt with brine, and the other with dry salt. Salting with brine is not generally practiced, but is confined to some few fancy dairies where a lightly salted butter for special customers is called for. The butter is washed and drained out as dry as possible, giving it time to drain off well. Then it is floated in brine made as salt as salt can make it. After allowing it to remain for some little time, usually an hour or such a matter, to get fully and completely saturated with the brine, it is removed from the brine to the working table, and there just as much of the salt of that brine is combined with the butter as is possible; and the butter receives no other salting. This is a light salting, amounting to from one-fourth to one-third of an ounce of salt to a pound of butter, as compared with the dry salting. That suits a certain fancy trade and is a method which will secure gilt edged conditions all the way through, provided the saltness suits.

Question. Does not washing the butter in brine have the effect to make it more oily?

Sec. GILBERT. I could not say that it does. I do not recollect that my attention was ever called to the question before, but I hardly see how it would be possible that it should.

MR. CLIFFORD. I have tried that method and my experience is that it gives the butter a brighter color but the flavor is not so good.

Sec. GILBERT. The other method is to salt with dry salt. There are two methods of doing this in practice at the present time among good dairymen and in factories also. One is to salt directly in the churn, and the other is to remove this granular butter from the churn and salt it in the butter worker. The more convenient practice and the easier after one becomes accustomed to it, is to salt in the churn. When the granules of butter are in the right condition and at the proper temperature sift in the requisite quantity of fine salt into the churn and mingle it well with the granules. Before the butter is compacted it is easily and readily mixed up with the granules. After being well stirred up, the churn is given a few turns which compacts the mass somewhat together. This mixes it more effectually than it is possible to do it with a mere manipulation by hand.

Question. Does not that leave the adding of salt to guess-work?

Sec. GILBERT: There comes in a measure of good judgment which is really not guess-work when you salt in that way every time, because your granules are in like condition every time and you know just how you have salted before and just what degree of saltness you have secured, and if you follow that method, being careful that the conditions are similar, you get like results every time.

Question. Do you weigh that butter before you salt it, when you salt in the churn?

Sec. Gilbert. No, but it is adjusted in quantity by the quantity of cream used in the churn; it is not mathematically accurate, but these things are not required to come down to a mathematical point; when we approximate these points we reach very nearly accurate results.

The other method of dry salting is to remove it from the churn to the butter bowl, in which it is weighed, and it is then spread out upon the butter worker and the salt sifted over the butter; and mingled with it by working.

There are three objects in butter working.

1. The mixing or intermingling of the butter and the salt into an even condition so that the whole mass shall be evenly salted all through. This becomes necessary for two reasons; you want the mass salted alike and you want an even color. Salt serves to set the color, and if the butter is salted unevenly the color will be uneven and there will be light streaks of butter.

2. To remove the liquid. You cannot prevent a considerable percentage of water remaining in the butter, about ten per cent I think is the minimum that will remain in the butter. If a large amount above that remains it is an objection, and it should be removed. It becomes necessary to take care in the working of the butter that the liquid is well pressed out. The temperature of the butter mass must be looked after in order to be able to express the liquid. If it is too warm or two soft you cannot force the liquid to the surface and it remains in there and aids in making the butter soft. Here comes in a matter of nice judgment which nothing but judgment can control.

3. To get the proper texture. Texture in butter is pretty hard to describe in words; it is easier to illustrate it than to describe it. It means that peculiar condition which is just right, a sort of waxy condition, close in texture. comparatively free from water and at the same time brittle when you attempt to divide it. If butter is worked too cold it will so grind the particles together that it becomes sticky and adhesive. Here is where many inexperienced butter

makers are more likely to fail than in any other one thing. It is a matter of nice judgment to determine when and at what temperature this working shall be done, and to what extent it shall be carried. This judgment should be cultivated by experience and close observation.

Those constitute the principles involved in the working of the butter. The difference between butter overworked and that which is properly worked is apparent in two directions. One I have referred to as its being too adhesive; it takes on a lardy appearance, that is, the globules have been ground down fine and adhere closely together, and just to the extent that the overworking and grinding process has been carried on we break down the color and destroy that lively appearance desirable in the butter; it is dull and lifeless. When worked just right you will find on opening a sample that it gives you a sort of lively, sparkling appearance; but if overworked it shows a dull lusterless appearance, and seems like lard, not only in handling but in appearance. That is the difference in butter that was otherwise exactly alike, only in one case worked too much and in the other just right.

There is a tendency, in the winter season more particularly, on the part of a great many dairymen, not to work enough. Many samples of winter butter are not adhesive enough, it has not been put in the proper waxy condition in which it holds together like wax, and it will crumble. That condition is objectionable; it has not been compacted, worked together enough. In the summer season there is little danger in that direction.

Question. Do you not consider a sponge advisable in removing the water.

Sec. Gilbert. Some use the sponge in removing the water from the surface of the butter where it is spread out upon the worker, and it is a very good practice and can be recommended to any butter maker whether at the factory or the private dairy. As you press the butter upon the working table drops of liquid accumulate upon the surface. A sponge just drawn over it gathers all that moisture up, and it is more easily removed than by any other process.

Question. Is the working the only agency that renders the butter waxy, or has the feed of the cow something to do with it?

Sec. Gilbert. You can spoil that condition of butter from any cow or from any feed by working if you carry it on too long. There is a measure of that due to the handling of the cream, to the feed which produces the cream, and particularly to the natural capacity of the cow herself.

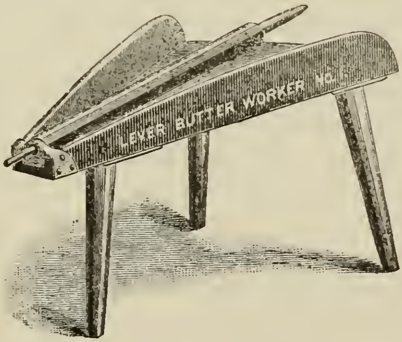
Question. Does the salting with brine have a tendency to harden the granules so that there is less danger of overworking?

Sec. Gilbert. The hardening of the granules is principally due to the matter of temperature rather than to the water in which it is floated, whether it is salt or otherwise.

Mr. A. T. Clifford, Leeds. I tried an experiment in that matter; part of a churning I salted with brine and part with dry salt, and that which was salted in brine was very much brighter in appearance. I understand you to say that the brightness or dullness is a matter of overworking.

Sec. Gilbert. That brightness is the natural condition; if that is not interfered with it certainly will remain. In the brine process of salting there is probably less of movement actually called for than in the other process, and hence it is possible that the result you speak of might follow.

Mr. J. H. Moore, Winthrop. We want to know what kind of a butter worker we shall use to secure the quality that we have shown here.



LEVER BUTTER WORKER.

Sec. Gilbert. I do not know as any butter worker meets the common acceptance as the one over all others to be recommended. We find there are several different kinds and they are all in use more or less at the present time. To select any particular one and call it the one to be recommended would be at least questionable on our part. Remember what is wanted, as has been shown in the discussion, the three conditions that are to be met by working butter, and one will then be able to see which best agrees with them.

As a rule, safe for the guidance of every one, it may be said that all grinding movements on the part of a butter worker should be avoided; we want simply a method of pressure. This with the accompanying incident of folding the butter together again gives the proper working without any grinding whatever The Eureka and the Reid workers are each in use in private dairies and give fairly good satisfaction. The plain lever worker is the one most in use in our State at the present time both in private dairies and in the butter factories. Many of the other kinds have been discarded. In my own practice I prefer the four sided lever. with four plain surfaces three inches broad, and depending entirely on direct pressure without any rolling process whatever. Certainly with this pressure there is absolutely no grinding movement, yet it presses out the liquid very effectually, and at the same time mixes the butter sufficiently for all purposes.

One word, in this connection, as to how long to work butter and whether to work it twice. A great many people stumble over the question of working butter twice, and it is from the supposition that if you work it twice you work it twice as much as when it is worked but once. The expression simply means giving the butter the necessary working at two different times instead of doing it all at one time. That is the distinction between working it once and working twice. The practice is after the butter has been salted and partially worked by compacting it together to allow the butter to stand for a longer or shorter time before a second working. It may stand in summer from one morning to the next; and in winter simply two or three hours—or one hour is better than none. It gives a chance for the particles of salt to dissolve in the moisture of the butter, and then when you come to finish the working it leaves it all in a dry condition and as much of the liquid worked out as is possible. But it in no sense calls for any more working than is called for if it is all done at one time. When you have satisfied the three requirements which have been mentioned, mixing the butter and the salt evenly through the mass, forcing out the liquid, and securing the proper adhesiveness or texture of the mass, you have completed the working whether it has been at one or two times. If you work it but once you do it all at time of churning; if you give it two workings. you simply do part of it then and finish the process at a second operation.

Mr. Clifford. If you salt in the churn with dry salt why not let it remain there until the grains of salt are dissolved, as well as to take it out upon the worker.

Sec. Gilbert. Quite as well to let it remain in the churn until you get ready to do the working. You have done a part of the work already in the churn by mixing the butter and the salt; then, when you wish to finish the operation, you can take it upon the board and work it just as well. I think the best practice at the present time prefers that the butter be left a short time at least after the salt is mingled with it before the working is completed and it is printed for tne market.

A custom that holds in this State in distinction from many other sections, is the practice of putting butter into prints for the market. This is very objectionable in many respects. It puts the butter into a form which exposes the largest possible surface to the air, whereas if the butter was packed solid, in larger or smaller packages, it would be protected from those influences which surround it and which tend to its destruction. I have seen many a sample of print butter exhibited two or three days at fairs which was absolutely spoiled as a salable article from its exposure during the time, while put up in tubs or five or ten pound packages, where it is protected as much as possible from the atmosphere, it would remain perfect during a much longer time. The custom that demands small prints of butter in our State is very much at fault. Wrapping the prints in wax-paper or parchment paper affords a measure of protection if it is carefully put on, but still it does not entirely remove the objection.

Mrs. Robbins. Isn't there an objection to the wax paper, that it will tear?

Sec Gilbert. It is not so strong as the parchment paper.

Mrs. Robbins. The parchment paper you can wash.

Mr. Clifford. I have heard a number of men that are called experts say that you must brush your cows down before milking and take a dish of warm water and wash their udders thoroughly. Now that is costly. Is it necessary to do that? Cannot we keep them clean enough without that if we are particular?

Sec. Gilbert. That is a question well put, and it suggests a great many things that have been stated and written in connection with dairy matters. It is probably best to lay down the requirements a little beyond what is actually called for in practice, because we are always so laggard that we fall a little behind the standard.

The object is to have the cows in such a condition that nothing will drop or scatter from their coats or udders into the milk pail. That can easily be done without going through the process of carefully brushing the cow all over and washing the bag. We simply want to have the cow clean and the milk clean, and any way that we can secure that is sufficient. These small requirements are laid down pretty fine by some. It will not answer to have foreign matter in the milk or objectionable odors around the milk room, and when we say that we have covered the point.

OUTFIT.

The outfit called for, for carrying on first class work in the private dairy, is neither extensive or costly. Good quality of product and low cost of doing the work, however, make it desirable that it be complete

CREAMER.

The first appliance called for is a creamer in which to set the milk. There are different patterns of these to choose from. Considered in all respects there is none better than the Stoddard Cabinet Creamer (See page 53), with or without surface skimming attachment, manufactured by the Mosely & Stoddard Manufacturing Company, Rutland, Vermont. This is made in two styles, with and without the separate refrigerator compartment seen open at the left of the cut. A three-can creamer, dairy class, is large enough for nine to twelve cows where the milk is creamed every twelve hours. The following is the price list of the manufacturers. The capacity given is based on the supposition that the cream is taken at each milking.

PRICE LIST.

FAMILY CLASS.

		No of Cows.	Plain Creamery.	With Spec'l Refrig.
No. 2	2 cans	2	$20 00	
No. 3	3 "	3 to 4	26 00	$31 00
No. 4	4 "	5 to 6	32 00	37 00

Each can holds two and one-half gallons.

DAIRY CLASS.

		No. of Cows.	Plain Creamery	With Spec'l Refrig.
No. 2	2 cans	5 to 6	$25 00	
No. 3	3 "	7 to 9	31 00	$36 00
No. 4	4 "	10 to 12	37 00	42 00
No. 5	5 "	13 to 15	43 00	48 00
No. 6	6 "	15 to 18	49 00	54 00
No. 8	8 "	20 to 24	61 00	66 00
No. 10	10 "	25 to 30	73 00	78 00
No. 12	12 "	30 to 36	85 00	90 00

Each can holds five gallons.

CREAM CURING TANK.

The next thing called for is a receptacle for the cream while held for ripening. These should be plain tin vessels made to order for the purpose and of a size to suit the preference of the owner Plain tin pails of twenty-four quarts capacity are large enough to handle with ease, and three of them will be needed with every twelve cows. The cost would be about $1.25 each.

Where a large dairy is kept a tin tank of a size to hold the cream for one churning will be found better. Two of these would be needed. They should be placed on an elevated platform and the cream drawn through a large faucet directly into the churn. The cost would be from $5 to $10 each according to size.

CHURN.

The barrel churn, is made under many different names and by as many different manufacturers, differing only in the method of securing the cover. For churning twenty pounds of butter at one time a twenty-ffve gallon churn is needed. The Mosely & Stoddard price list is given, aud other makes can be bought at the same rate.

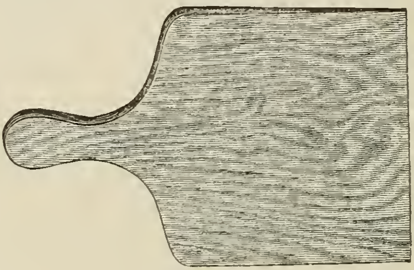
STODDARD CHURN.

PRICES, DAIRY SIZE.

No 1.	Ten gallon churn, churns from one to four gallons cream	$8 00
No. 2.	Fifteen gallon churn, churns from two to seven gallons cream	9 00
No 3.	Twenty gallon churn, churns from three to nine gallons cream	10 00
No. 4.	Twenty-five gallon churn, churns from four to twelve gallons cream	12 00
No. 5.	Thirty-five gallon churn, churns from five to sixteen gallons cream	14 00
No. 5½.	Forty-five gallon churn, churns from five to twenty gallons cream	17 00
No. 6.	Sixty gallon churn, churns from six to twenty-eight gallons cream	20 00

BUTTER WORKER.

The butter worker is a simple and inexpensive appliance. The common lever worker, (see page 65) can be made by any carpenter and of a size to correspond to the work required. For one of twenty-five pounds capacity the cost would be about five dollars. The dimensions should be thirty inches wide, forty inches long, with the end narrowed to eighteen inches.



BUTTER PADDLE.

BUTTER PRINTS.

There are various devices for printing butter from which one can select to suit fancy. The combination print has the advantage of rapid work. See page 71.

The second cut shows the method of removing the mould A after the butter C and print B, is turned on to the paddle D

To remove the print B, from the butter C, place the butter on table or butter worker; place paddle by side of butter so as to start it from the print; then, after removing print cut apart the cakes with cutter.

With a little experience one person can mould two pounds per minute easily.

The desired temperature for butter to mould well is about fifty-two degrees in summer, and fifty-four to sixty degrees in winter.

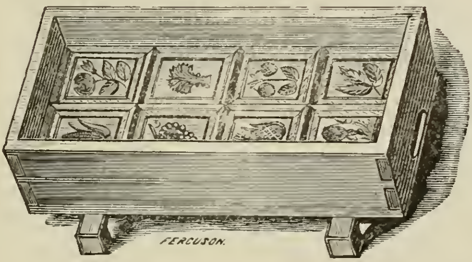
The print should be kept in the mould in the cellar when not in use; during churning take print out of mould and turn face down in water or brine about one-half inch deep so as to have the face of print thoroughly wet.

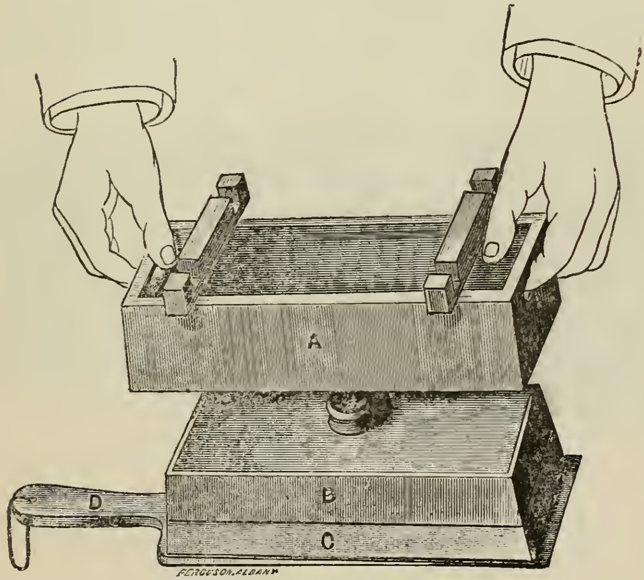
Mosely & Stoddard give the following

PRICE LIST.

No.	No. of cakes.	Capacity of each cake	Capacity of mould.	Price.
1	1	1 pound,	1 pound,	$3 50
2	3	½ "	1½ pounds,	4 00
3	4	½ "	2 "	4 50
4	8	¼ "	2 "	5 50

The above prices are for the regular line of prints, each cake engraved with a neat design as shown in the cut.





COMBINATION BUTTER PRINT.

BUTTER CARRIERS.

Putting butter up in print form necessitates providing special arrangements for transporting it to market. This is now done in trunks, boxes, or more properly butter carriers, supplied with shelves each holding a single layer of prints (see page 72.) In summer the carrier is provided with ice box in one end. All dealers in dairy supplies furnish carriers of this kind.

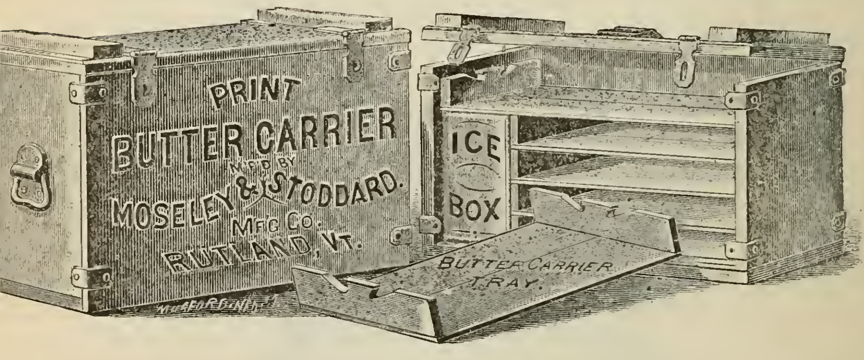
PRICE LIST FOR ONE-HALF POUND PRINTS.

No.	Capacity.	No Trays.	Size.	Price
7.	16 pounds,	3.	10¼x12¼ inches,	$2 25
8.	24 "	3.	13¼x12¼ "	2 50
9.	32 "	4.	13¼x12¼ "	2 75
10.	40 "	4.	16¼x12¼ "	3 00
11.	50 "	5	16¼x12¼ "	3 50

Ice box extra, 50 cents. Trays extra, 15 cents each, net.

Capacity given above is without ice box. Ice box reduces the capacity six pounds.

From the list and description here given one can easily select an outfit suitable to the size of any dairy. If other patterns are desired they can be obtained of dealers in any city of the State.



BUTTER CARRIER.

FEEDING FOR QUALITY.

By G. M. Gowell, Bowdoinham.

Feeders of other animals than milch cows have only the problem of health, development and growth to contend with, and are free to use any of the forage crops, grains or by-products that their farms produce or the market furnishes, that alone or in combination contain nutritive elements in quantity and in ratio suited to the rapid and economical growth of their animals. In the production of beef, pork, mutton, wool and horse flesh, foods are used with reference to their nutritive contents alone. In the growth of the ox and pig, foods with rank flavors are frequently used, and sometimes the flesh of animals so fed is unpalatable as human food. To correct this difficulty it is only necessary to discontinue the obnoxious food during the last few weeks of the animals' lives. Even though the animal has subsisted the larger part of its life upon ill flavored food, the short time of correct feeding near its close is sufficient to eliminate all undesirable flavors.

But the cow, believing in prompt payment for expenses incurred, and in early dividends, yields her lacteal fluid twice daily throughout the whole milking period of her life. Her milk is the daily product of her daily food. With her there is no life of profligacy with a few days of repentance at the end to eliminate the corruption. Bad food in the morning brings its penalty in bad milk at night. Thus the dairyman has not only the question of the contents of his feeding materials in albuminoids and carbohydrates with which to contend, but also their flavoring effects upon the products of the mammary glands. When objectionable foods are used, their preparation and methods of feeding have a tendency to reduce to an appreciable extent, and sometimes almost wholly overcome their otherwise ill-flavoring of the milk. Bearing *quality* in mind, the invariable rule may be adopted that sudden or marked changes in quantity or kind of food are never to be tolerated. When a food to which the cow is unaccustomed is introduced into the ration it should be done very gradually that the digestive and assimilative organs of the animal have opportunity to become familiar with its peculiarities.

The united efforts of the assimilative organs of the cow in milk are devoted to extracting from her food perfect milk only. Had these organs power of reasoning they would doubtless be as dissatisfied with the ill-scented product as is the dairyman himself.

The sudden introduction of pungent food into the stomach of the cow thoroughly charges every part of the animal with its peculiar odor. The digestive apparatus is unable to pass it off and it seeks egress through the milk channels. When such foods are introduced into the ration gradually, the animal system has opportunity to become acquainted with them and the milk organs are toned up to such a degree, as to be able to eliminate the undesirable flavors.

Aside from the one requisite of flavor, we know there are certain foods that excel most others in yielding butter of good color and firmness. Good pasture grass, at its best, supplemented with a moderate quantity of corn meal or good, well cured hay and clover with the addition of corn meal, are foods suited to the production of the finest qualities of butter. Indeed I know of no grain or by-product that, when fed in connection with hay or grass, imparts the desirable qualities of flavor, texture, and color, with so much certainty as does corn meal.

Yet, admitting these valuable properties of corn meal, it is not desirable as an exclusive grain food. It is too heavy and heating to be used alone, and should be mixed with something more bulky, as wheat bran or ground oats. Its content of digestible albuminoids is insufficient to make a ration an economical one. Wheat bran, considering its content of digestible albuminoids—(about twelve per cent), and the low price it usually bears in the market, is a most valuable food. There is no grain food better suited to the health and thrift of growing animals than this. Nothing better meets the drain upon the cow that milks almost constantly and carries young three-fourths of her whole lifetime. From its starchy condition it relieves the system of irritation, and promotes the healthy action of the bowels. Cotton seed meal, showing thirty-five per cent digestible albuminoids and forty-seven per cent carbohydrates, with its nutritive ratio of one to one and one-third, is a most valuable food although the quality of butter resulting from its use is not of a high standard. From its high feeding value and low cost it must have a place in every profitable milk ration.

Ground oats are admirably adapted to use in the dairy herd, but are not so economical as wheat bran, as they contain only about three-fourths as much digestible albuminoids and have a higher market price per pound.

From my own standpoint I advocate a mixture of these three grains, leaving out oats because of their high cost. For a good thrifty cow it is just a moderate ration. Of course to young animals we would give much less, but to mature animals I would give something like this: A quart and a half of corn meal, weighing about two pounds and a quarter, a quart and a half of cotton seed meal, weighing about the same, and two quarts of wheat bran weighing a pound and a half. This gives six pounds of grain in the mixture. I have never yet seen an instance where cows thus fed for a reasonable length of time yielded butter off in flavor, although of course it may not be so highly colored as that from corn meal alone. But in feeding any animal upon a grain ration even of this amount, before they should be fed up to the full ration the work should have gone on at least a year or two. A heifer commencing when young on a small grain ration, and gradually increasing the same as she develops and grows, can digest this full ration with none of the ill results which sometimes come from full feeding when abruptly commenced.

Clover is a most valuable element in our hay crop and should always have a place in the feed of dairy cows. It is a valuable food in its contents, and gives a very good flavor to butter and is not injurious to the color.

Hungarian grass is a valuable fodder product for dairy cows. In my first experience in feeding it I particularly noticed the deep color of the butter. When fed in the winter, dry, the butter was very highly colored and of good flavor. It is a valuable fodder and a strong one, of which we can readily raise two or three tons per acre, according to the amount of fertilizer used, even upon exhausted lands. It is a very economical grass fodder to grow and a profitable one to feed for butter. It may be used to advantage in connection with our coarse fodders, such as corn fodder, or fodders that are injured in harvesting, or over-ripe hay, by cutting and scalding and mixing thoroughly with the grain. Hay that is slightly moulded or bleached in harvesting may be used to advantage in this way, while if fed otherwise it might impart an undesirable flavor to the butter. When it is cut and mixed with corn meal and grain and the whole allowed to steam together for a length of time the whole mass seems to be thoroughly permeated by the flavor of the grain so that these disagreeable flavors are largely done away with. Its effect seems to be to eliminate that old flavor or correct it. I do not say that this is a practical truth, but I say that I believe it; and, bearing right upon this point, I will mention this fact:

Years ago when I first commenced dairying on my own account, I was enthusiastic in getting what stock I could, and in order to increase my feeding crops I sowed half a dozen acres of Hungarian. I got a very good growth and cut twelve or thirteen tons and put it up in bunches, and the night following there came on a heavy rain, and it rained three or four days; and for the next two weeks there wasn't a day but what it rained more or less, and the water ran down and through my Hungarian and under it, and of course I was pretty thoroughly discouraged about feeding that to make butter. We were selling our butter at quite an advance in a critical market. It cleared off, and we dried up the Hungarian and put it into the barn. In the winter I was met with the necessity of either feeding that Hungarian or buying hay at twelve dollars a ton. I made a large box containing a dozen compartments, corresponding with the number of my cows. I cut this Hungarian up fairly short and put into each of these compartments twenty pounds of it, together with the ration of corn meal and wheat bran which I was then feeding. I then brought from a large boiler a pail of hot water for each one of those compartments. After putting in the pail of hot water I put on the covers and let it remain twelve hours. It would then be pretty thoroughly wet through and all warm inside, and it smelt first rate when we took the covers off and the aroma of the corn came up. We didn't get any of the odor of that mouldy Hungarian. We gave it to the animals and they ate it nicely, and I couldn't see but that we got as good results in feeding it as we had from the hay and grain which had previously been fed. The quality of the butter was good; in fact in our market we never had any complaint. In that way we made use of that fodder which we could not possibly have used otherwise and secured a decent quality of butter.

Of course it is a question for every man to decide how far he should feed for flavor; but the market calls for good butter, and of course we must get all out of our fodders that we can. We have considerable quantities of coarse hay and forage crops; we must make use of them, and in some such way we can combine them and prepare them and use them to our advantage.

WHY I PREFER THE JERSEY.

By S. T. FLOYD, Winthrop.

First, they are easier to raise than other breeds. The calves take kindly to drinking their rations, wean easily, are good pets and good feeders. They are intelligent and pretty, so it is a pleasure to care for them; children like to feed them. They come to maturity young, coming into the dairy at from twenty-two to twenty-four months old; they will pay their way from that time on I tested one at two years old that had given milk four months, and she made eight and three-fourth pounds of butter in seven days. Another good quality of the Jersey cow is, she goes dry but a short time; while other breeds require from two to three months' vacation from the dairy, the Jersey will hardly take as many weeks. I have already remarked that the calves are good feeders, so are the cows; always possessed of good appetites, and about as good as sheep to clear the weeds and foul grasses out of a pasture. Mine was overrun with buttercups and ox-eye daisies when I began with Jerseys. and now June and July can only show close cropped grass.

Again, the Jersey will bear more good feed, convert it profitably into butter, and hold out longer than any breed I know. My nearest neighbor has one sixteen years old that has always been fed what farmers call "high," and now, twelve months since her last calf, is giving twenty-seven and one-half pounds of good, rich milk daily.

But the most important reason why I perfer the Jersey is the good quality of her butter. She may thrive well on our hard and rocky pastures, stand our cold winters, or high pressure feeding, still if she will not leave a margin when her product is sold and the bills are paid, she will soon grow out of favor with the hard working and economical farmer. It is really the great question which breed will pay best. We do not keep cows and our wives do not make butter for pleasure, but for pay, and the cows that will produce the most at the least cost, as a class, are indisputably the Jersey. Neither is quantity all. Quality has much to do with the income of a dairy. Ten cents a pound will make quite a difference in summing up the receipts of even a small dairy, for a year. Yet this difference is often made by consumers who know the difference between Jersey and other grades of butter. This is no guess, but has often come under my own observation, and it is, in truth, where the pay comes in.

Dairying, like all other farming, is subject to close competition, and the accepted law of the "survival of the fittest," applies to it as to all other progressive things, and to no branch of it more than to the cow; therefore we can only afford to keep the best. The market now seems to demand new butter, in lumps and cakes, in cold weather and hot. Even dog-days give no respite and no release from the demands of the best paying customers, and from no class of cows can it be furnished to satisfaction except the Jerseys. It may possibly be made with others, by the aid of ice, but by the time it gets to market it will hardly be presentable to the fastidious city customer. If one has a herd of Jerseys, he need have no fears, and he can keep the trade both summer and winter, and that is one secret of a good price.

HOW I MAKE PRIZE BUTTER.

By Mrs. Mary L. Robbins, Winthrop.

It may appear that the Secretary of the Board of Agriculture, in his interest in this specialty—dairying—has made a mistake in assigning this text to me—"How I Make Prize Butter." It seems quite presumptuous to present my own individual practices and methods to this convention, as I have no special appliances or modern improvements, and "nothing new under the sun" in my dairy operations. Since it has been demonstrated that no farming industry makes the returns that dairying does, and since it has been verified in this nineteenth century that "Man cannot live by bread alone," it is but natural that questions and discussions should arise as to the best ways and means to be employed to bring about and produce the best results. I do not aspire to be a teacher in this school. I am just a scholar, and only an A B C dairyman. In learning the Alpha I have found there is no Omega. The primary lessons may be learned, sometimes a reputation earned, but this is but the dawn of the butter era with us. The time never comes when we can vauntingly exclaim as Cæsar did in his triumphs, "*veni, vidi, vici,*" for there are difficulties to be overcome, other heights to be reached, and something new continually to be learned.

Too much confidence in ourselves — our superior knowledge — blinds our success, too little destroys it. A love for the work and a necessity for it, with an appreciation for every word of criticism, have been the prime factors in my own success in dairying. Hints from agricultural journals, talks from practical, common-sense people have all been put to good account.

For many years I have placed my butter in direct competition with fine dairies, at the Eastern Fair at Bangor, at the Maine State Fair at Lewiston, and at the New England Fair. I have always desired to have it fairly tested, to have it rest on its own merits and not be bolstered up by my personal friends, who might or might not be the best judges of its quality. I have never attended the Bangor fair, have never interviewed any committee, so that whatever I may have received from year to year from the State stipend has been honestly earned. I exhibit this butter every year, not for premiums alone but for comparison, for in no other way can be best determined the standard of excellence. By this means I have gained confidence in my own methods and practices; especially within the past few years, when experts from other States have been secured as judges in this department, and have been pleased to qualify their judgment by attaching the blue card to the Robbinsdale make.

"How I make prize butter."—In answering this plain question I find not the slightest chance for any indulgence of fine theories. I may not be allowed to tell you under what conditions the nicest, finest-flavored article of dairy butter *might* be produced. I cannot speculate on the methods adopted by the best dairymen to secure best results. I cannot tell you how the Secretary of the Jersey Stock Association earned his premiums, or Treasurer Briggs, of the Maine State Agricultural Society, wins his golden prizes. I shall not be allowed to discriminate between nice dairies and those not so nice, to advocate any system of cooling milk and raising cream. I presume I should be quickly called to order by any departure from this subject as announced, but I may be allowed to state, in a general way, that there are certain conditions favorable to success in dairying operations; many of these conditions seem but trifles, little things, but which in the aggregate make the sum total of success.

In the first place, the general purpose cow must be sacrificed, and the Jersey or something akin to her be substituted. I have a few choice Jersey cows of the Maine State Registry. These cows are the mainspring of the success and favorable reputation that the Robbinsdale dairy has met with; but the fact of *having* these cows does not warrant a gilt-edged article of butter. The water they drink, the feed and the care, are most important considerations. Our Eastern Maine Fair has always opened the last week in August, the most difficult month of the year to make meritorious butter. It has been my plan to have one or two cows in new milk by the first of this month. As the pastures grow poor at this time, we supplement the grass feed with second crop of clover at night, and mixed provender in morning, occasionally giving bone meal, and never overlooking the fact that they have access to salt. These cows have plenty of room and good air in stable, and are kept clean and dry, which, almost always, ensures cleanliness in milking. A matter of great importance with me is not allowing milk to stand in stable; after being milked it is brought directly to the house and strained, not any being accepted that shows any sediment on strainer. I lay no importance on straining milk to remove impurities. In sultry days I endeavor to free the milk at night from animal heat, by setting the open pails of milk in ice cold water and stirring it a few moments; sometimes add cold water to the milk to reduce the temperature, and at all times exercising a watchful care that no kitchen odors or vitiated air reach it. This fact needs to be emphasized, that the most persistent care and nicety be exercised from the time the milk is drawn from the cow's udder until the butter reaches its destination. The cream for the "fair butter," in my practice of setting milk in open pans, does not go through any curing process after being skimmed, as required by the Cooley system. A part of it is taken from the milk in twelve hours, and all in twenty-four hours, the greater portion being sweet cream, and is directly churned. The churn used has always been on the so-called Blanchard principle. In churning, what cream adheres to the sides of the churn is often removed or turned down with a wooden knife, that it may all have a uniform treatment. To insure the best of butter, I would not have this cream come and be gathered for butter in less than thirty-five or forty minutes. If it should be more than sixty minutes you need not expect it will be prize butter. This is the Scylla and Charybdis where I have been shipwrecked (An illustration from my experience might here be given). The second year of the Bangor Fair, my butter was returned with this criticism, that it was over-worked. It was over-churned, which, as Mr. Gilbert, who was one of the judges at that time informed me, has the same effect. Then I had not learned, as since, the importance of looking at the condition of the cows in August.

After being churned the butter is washed in pure cold water, then rinsed in water slightly salted, then weighed and salted with the Bangor salt. Between one-half and three-fourths ounces of salt are used to the pound of butter. At this point the butter is removed from the churn and set away one or two hours; then it is not re-worked, but is handled as little as possible in moulding — the press or stamp being dipped in salted water. While the butter is hardening, preparatory to placing it in boxes, it is covered with a napkin wrung out of salted water. I am particular in mentioning this, because if there were no salt in the water the butter would be liable to turn white, and if the butter were not covered some of the salt would be likely to come to the surface, and if not close covered there is also danger of the nice nutty flavor being lost.

Then, in concluding this paper, the requirements to success might be indicated in this way:

Good butter cows.

Pure water and sweet feed.

A stable planned for their comfort; this stable and the cows to be always kept clean.

The utmost nicety to be practiced in milking.

Good pure air for milk.

Keeping dry lime in milk room in summer.

The cream never to remain on milk over thirty hours.

Churning often, with an even, regular motion.

Salting as individual tastes require.

Handling butter with great care.

Let it not be understood that I am opposed to co-operative dairying. It is the one best and blessed enterprise for the mass of farmers and their overtaxed wives; neither am I opposed to the creamery for private dairying. We are governed by circumstances, in part. Keeping only a small number of cows, and supplying many families who are best pleased with butter direct from the churn, I have been convinced that the milk from the cow could be quicker converted into acceptable butter by this old process of setting milk in open pans.

Now, I wish to add, as my lastly, a thought that pursues me at this Monday midnight hour. Let no sister present be unhappy, because she has never ministered to the material wants of the butter epicure. The art of simply making butter to please somebody's palate is not like a good deed—a footstep in the ladder reaching heavenward. If all that can be said of one, is that she was a good butter maker, we shall only find in the last just decision the appalling words, *Mene*, *Mene*, *Tekel Upharsin*.

PROFITS OF THE BUSINESS.

By R. W. Ellis—President of the Board.

A satisfactory consideration of the subject assigned to me requires something more than theorizing. You want facts and figures, and I shall endeavor to give you a few which are entirely reliable. You will be able to judge of their value from your own experience. You can tell in less time whether what I shall say to you is true than you could of statements in nearly any other branch of farming. The dairy business gives the quickest and most accurate returns. The question has been discussed so much that it is almost as difficult to say anything new on the subject as on the question of temperance. We hardly take up an agricultural paper without seeing one or more articles upon the "profits of dairying."

In the first place if we would urge any industry upon the farmers of Maine we must recommend something that can be carried on indefinitely, a business that we can apply to our farms permanently. A business that may be profitable for a certain series of years at the expense of the farm is not a business that we can generally recommend. That business which brings in dollars and cents and at the same time keeps up or increases the fertility of the farm has two advantages while any other has but one. The business of selling hay in some localities in Maine is a profitable one for a time, but it cannot be carried on any length of time without serious injury to the farm. By analysis and by experiment it has been proved that every ton of hay that we remove from our farm takes with it in the neighborhood of five dollars' worth of fertility. If a man when selling his hay considered himself obliged, as he ought to, to return five dollars' worth of fertilizers to his farm for every ton of hay sold, he would see very different results in his financial operations from what he does in selling his hay and trusting to luck for something to put back.

There are two elements of profit in the dairy business; one is the saving of a greater portion of the elements of fertility in the soil than any other branch of farm industry that is carried on in this State. I believe it is a fact that there is no branch of stock husbandry that is carried on in the State of Maine that takes away so little of the elements from the soil as the dairy business.

I intended to have figures from a number of different dairymen in the State; I applied to a number, but for one reason and another I have not been able to obtain what I expected to, and I shall rely principally upon the results of my own experiments during three different years, supplemented by a statement from one of the prominent dairymen in the State who was expected to be here to-day. The first experiment I shall give you is the last one I made.

Cost of keeping eighteen cows and heifers in the winter of 1887-8:

10 lbs. hay per day for 240 days, 2400 lbs. at $10 per ton,	$12 00
2 quarts shorts per day, 480 quarts at $\frac{2}{3}$ cents...	3 20
2 quarts cotton seed per day, 480 qts., at $2\frac{1}{2}$ cents...	12 00
2 quarts corn meal, 480 qts, at 2 cents	9 60
Pasturing four months...	5 00
	$41 80
One-fifth of the cows are dry and eat no provender.. ..	2 75
	$39 05

This herd of cows and heifers averaged five quarts of milk per day for the year, or 1825 quarts. The general average of milk at the factories is 20 pounds, or eight quarts for one pound of butter. My herd would make one pound from 7 quarts; but call it 8, and we have 225 lbs., which at the low price of 20 cents per pound, would amount to $45. Allowing for shrinkage, from 1825 quarts of milk we should have about 1600 quarts of skimmed milk, which is worth half a cent per quart to feed to pigs, calves, colts, or any animal you please. That would make $8, which added to the $45 would make $53 as the total income. Deducting the $39, cost of keeping, and you have $14 as the net profit per cow. Or, reckon it another way, and it gives you $22 per ton for your hay in the barn. Or, reckon it still another way, and your butter costs you $13\frac{3}{4}$ cents per pound.

Now bear in mind that this is from nothing but an ordinary herd of eighteen cows and heifers, some in their first year at the pail.

Of course the estimate of the value of hay in the barn will vary in different localities, but I think it is a fair average to allow ten dollars a ton for hay in the barn. I reckon nothing for interest or taxes, because in whatever business a man engages on his farm he has those expenses, and it is the comparative profits of different branches of the business that interests the farmer; so it is fair to leave those items out of the question. I was in the milk selling business at that time, but made some butter at times when we had a surplus of milk, and we found that seven quarts large milk measure would make a pound of butter; but I have reckoned it at eight quarts to the pound, because I find that that is the average of a large number of butter factories. I do not propose to give any figures here which can not be realized by any farmer here. I base my price for butter on what the average factories in the State will pay their patrons. There may be some factories which pay more and some less, but 20 cents per pound is a fair average of what the factories will pay you and manufacture the butter themselves. Any good dairyman in the State who manufactures his own butter does not calculate to get less than 25 cents a pound, but I place the price right down to hard pan. The skim milk I have estimated at half a cent per quart. I would not be afraid to give that for a hundred quarts a day delivered at my house. I can get that out of it by feeding it to pigs and calves and colts or most any young growing animal.

I will give you another year's test with a herd of eight mature cows, some years ago, when I was making butter, and before I began to feed cotton seed meal. My ration then was fifteen pounds of hay, two quarts of corn meal and four quarts of shorts per day, which cost me, reckoned as in the other case, \$36.30 per year, and they actually made one pound of butter per day per cow every day they were giving milk, or 300 pounds per year, and averaged 2100 quarts of milk per year. Reckoning the butter at twenty cents per pound, \$60.00, and the skim milk at one half cent per quart, \$9.00 we have \$69.00, and deducting the cost of keeping, \$36.30, we have \$32.70 as net profit; or \$28.16 per ton for hay; or the butter costs nine and one-tenth cents per pound.

I once had a cow which in one year from the time she dropped her calf, not having another in the year, gave 3285 quarts of milk and made 516 pounds of butter, with a total cost of keep of \$52.80. Her butter, after deducting skim milk cost seven and three-fourths cents per pound. She paid a net profit of $64.40; or she paid $63.-76 per ton for the hay she ate.

I never sold any butter so low as the price I have reckoned, twenty cents per pound. None of these are extra cases except the last one. That was a very extra cow, and I kept her a little extra, and kept a careful account of her expenses and proceeds for a year. The figures in the other cases are no more than any farmer with a good herd of cows well kept may reasonably expect to realize.

Here is a statement from Mr. Meader, of Albion, in this county, who kept an itemized account, with a dairy of twelve cows for one year. He reckoned the interest on his money invested, taxes, pasturing at five dollars per head, hay at ten dollars per ton in the barn, and provender at cost in barn. The total product of his cows in butter cost him twelve cents and seven mills per pound. Or reckoning butter at what it brought in the market, the business paid him $25 27 per ton in the barn for the hay fed.

He kept another account with his cows of which I will give a synopsis. From fifteen cows, from August 16, 1886, to July 24, 1887, he made 3462 pounds of butter that was sold, besides furnishing a family of eight persons. Reckoning the same amount for the remainder of the year, and one-half pound of butter per week for each member of his family, which is about a fair average, and we have 3928 pounds of butter from fifteen cows, an average of 262 pounds per cow. This at twenty cents a pound amounts to $52.40, $8.00 added for the milk makes $60.40. If his cost of keep was the same as mine, $39.00, he had a net profit per cow of $21.40. In this case, as in the others, the price of the butter is put down to twenty cents, though he actually got from twenty-five to thirty cents.

I have had, heretofore, a great many statements of this nature, and it is astonishing how nearly alike they are. If there is any man here who has kept an itemized account with his dairy I think his figures will vary but little from those I have given. Now, gentlemen, if they are correct, if they are anywhere near correct, is it not the most profitable business we can engage in in the State of Maine? It is a business which pays you every month or every week in cash. And you need not fear of running out your farm if you sell only the butter. In a ton of butter there isn't fertilizer value enough to be worth mentioning. I have put these figures where no farmer can object to them on the ground that his surroundings are such that he can not realize them. You can associate yourselves together and be morally certain of attaining equally good results. Of course I would not recommend the business to a man who has no taste for it. I have followed the dairy business. The first year I made butter it was hauled eighteen miles to market and sold for sixteen and two-thirds cents a pound. I have been in the business ever since, and I know something of what I am telling you.

Question. I would inquire how many cows a man can properly care for during the year?

Mr. Ellis. That depends a good deal on the smartness of the man. One man can take care of a large number of cows in every other respect but milking.

Question. How many is it practicable for a man to milk alone?

Mr. Ellis. That also depends a good deal upon the man. Ten is as many as I care to milk, but there are men who milk more. It is not a hard task for a man to milk ten cows right along.

Question. Why do you not allow something for the work done?

Mr. Ellis. I have reckoned the butter at what it will pay at the factory, and I reckon that the dressing will pay the man for taking care of the cows. The women have but little to do where the cream is sent to the factory. That relieves the family of the largest part of the work. The manure and the skim milk will amply pay for the work. I will agree to do all the work for just as many cows as any one will turn over to me, for the manure and the skim milk.

A Farmer. It seems to me that the milk and manure are pretty small pay for the work. It looks pretty small when you compare it with a salary of five hundred dollars a year.

Mr. Ellis. If every male member of a man's family can command a $500 salary I should advise him to sell out his farm. But if you are going to do farming you can come nearer to that figure in butter making than in any other branch of the business.

Mr. Clifford. I can take care of a dairy of thirty cows with two boys that will cost ten dollars a month, and can carry on the farm and do all the work excepting the haying and hoeing.

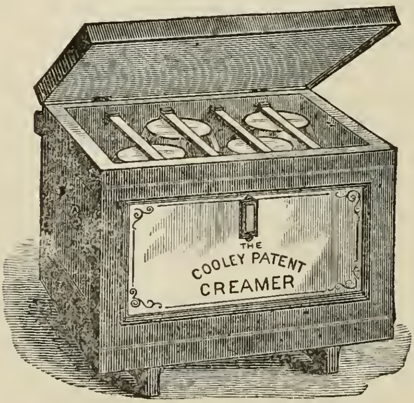
Mr. Ellis. If a man has a mind to plant corn he can keep his cows very much cheaper. Four quarts of corn and cob meal will take the place of two quarts of western corn meal and two quarts of shorts, at less expense. I have for three years kept debt and credit with my corn and I can raise it for twenty-five cents a bushel in the ear. You can reduce the cost of keeping your cows from five to eight dollars every year by raising your own provender. But I have put the figures at market prices for the provender. I want to ask what other branch of stock husbandry one can go into that will pay anywhere near as well?

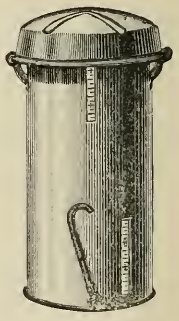
CO-OPERATIVE BUTTER-MAKING.

There is a wide interest at the present time in the State in the business of co-operative butter-making, and in response to calls from the localities where institutes have been held much of the work has been either directly giving information upon the business or it has been of a character more or less intimately related to co-operative dairy work. While a considerable number of creameries have been started during the year in the work of making butter, there is still room in the State for many more, and the call for information still continues. As an answer, in part, to the call for plans, specifications, fixtures and cost, illustrations and plans are given of several of the successful creameries now being operated in other States, and also ground plans of some of those which have been established in this State. These will afford suggestions to any company contemplating starting the business.

The cream-gathering plan of work so far has seemed best adapted to the situation as it exists in the State at the present time. The plans here given are all designed for this system.

There are two methods of carrying on this business. The one is to organize a company for carrying on the business, and place the details of management in the hands of a board of officers selected from among the patrons of the enterprise. The expense of carrying on the business, including interest on capital invested, is paid





CAN ENLARGED.

COOLEY CREAMER.

for from gross receipts, and the makers of the cream have the remainder. The other method is for the factory to be run by a proprietor who contracts for the cream at the farm for a stipulated price per inch.

The outfit called for at the farm in the cream-gathering system of work is simply a tank and cans of uniform size for deep, cold setting in water. The Cooley system of setting the milk has generally been adopted throughout New England at the cream gathering creameries.

The water tanks or coolers are made refrigerator style, having dead air space between the case and lining. The cans are 19 inches deep by 8½ in diameter, with a capacity of 18 quarts. The milk is strained into the cans as soon as it is drawn from the cows, and the cans at once immersed in water in the tank. The temperature of the water is controlled with ice. This method of setting the milk is equally well adapted to private dairying, and is widely in use.

The Vermont Farm Machine Company, Bellows Falls, Vermont, furnishes the following schedule of prices from their catalogue:

PRICE LIST.

No. 0.	1 can,	1 to 3 cows,	18 by 23 in.,	2 ft 5 in	high,	weight 100 lbs...	$18 00
" 00	2 "	4 to 6 "	19 by 31 "	" "	"	" 120 " ...	25 00
" 1.	3 "	6 to 9 "	25 by 32 "	" "	"	" 145 " ...	30 00
" 2	4 "	9 to 12 "	28 by 38 "	" "	"	" 175 " ...	35 00
" 3.	6 "	12 to 18 "	28 by 49 "	" "	"	" 220 " ...	45 00
" 4.	8 "	18 to 24 "	28 by 61 "	" "	"	" 275 " ...	55 00
" 5.	10 "	24 to 30 "	28 by 72 "	" "	"	" 320 " ...	65 00
" 6	12 "	30 to 36 "	28 by 84 "	" "	"	" 375 " ...	75 00
" 7.	14 "	36 to 42 "	28 by 96 "	" "	"	" 425 " ...	85 07
" 8.	16 "	42 to 48 "	28 by 107 "	" "	"	" 450 " ...	95 00

Bickford and Goss, Lewiston, agents for Maine, give the following price list for their refrigerator style of Cooley Creamers designed either for co-operative or private dairying:

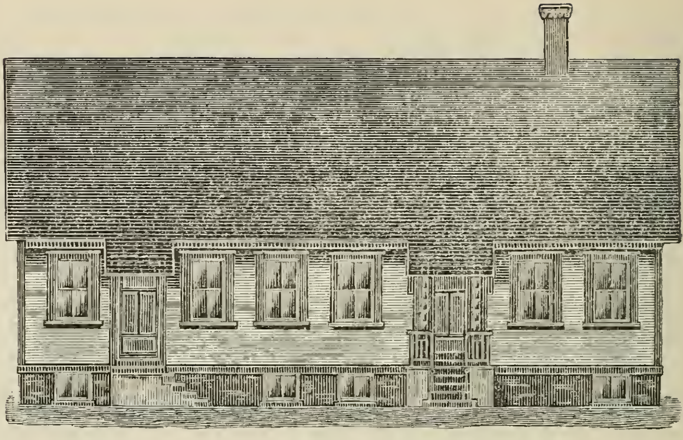
PRICE LIST REFRIGERATOR STYLE.

No. 00 with	two	Cans,	$19 00	No. 5 "	ten	Cans,	$41 00
" 1 "	three	"	22 00	" 6 "	twelve	"	48 00
" 2 "	four	"	25 00	" 7 "	fourteen	"	56 00
" 3 "	six	"	30 00	" 8 "	sixteen	"	65 00
" 4 "	eight	"	35 00				

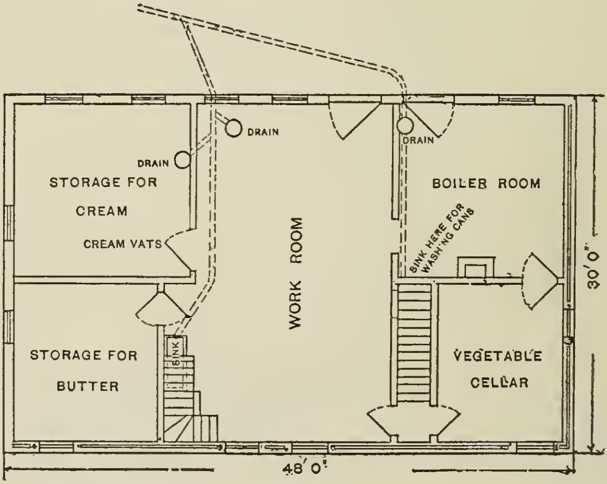
Including Strainer frame. Net 90 days or 5 per cent discount for cash.

Cans separate from Tanks $2.25 each net.

The Hinsdale Creamery, at Hinsdale, Berkshire county, Massachusetts, was designed for both tenement and creamery. The first floor is fitted for a tenement, while the manufacturing is all carried on in the basement. The plan of the basement carries its own explanation.



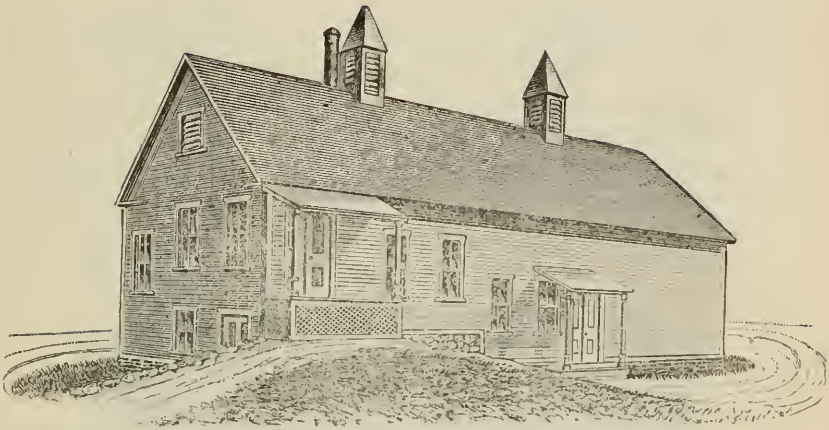
Front Elevation of Hinsdale Creamery.



Plan of Creamery Basement, where all the manufacturing is done.

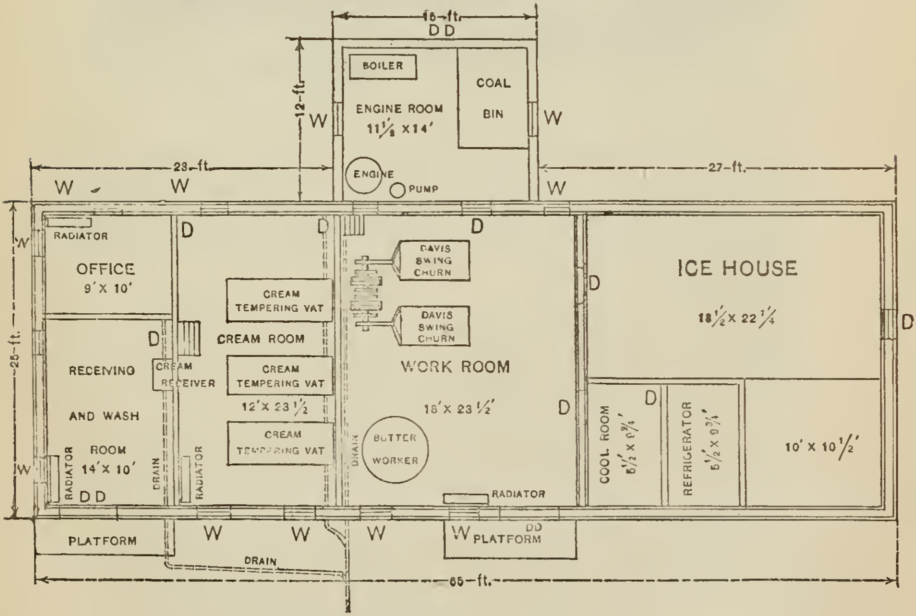
The size of building is 30 by 40 feet. The floor of cream room is raised two and a half feet so that the cream vats discharge into the churns. The boiler room is furnished with a four-horse power engine and six horse-power boiler. The creamery has a capacity for 2000 cows.

The Lemont Creamery, located at Lemont, Pa., near the State Agricultural College (see page 90,) is a building 22 by 65 feet, including ice-house occupying 24 feet of the right hand end with an



LEMONT (PENN.) CREAMERY COST $750.

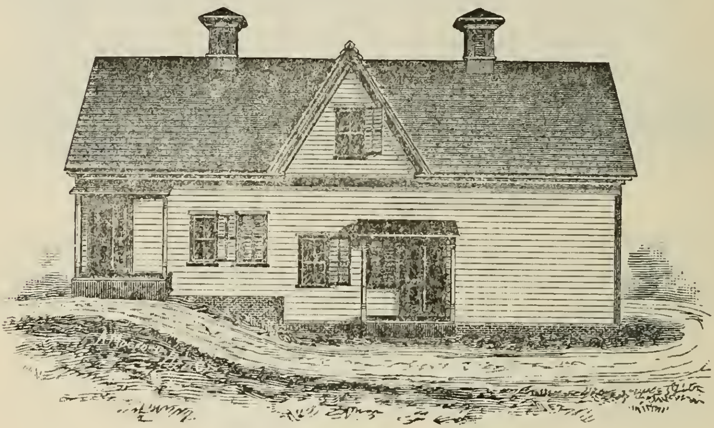
engine and boiler room in a lean-to on the back side. It has fourteen feet posts, a store-room under the receiving room, is papered and clapboarded on the outside, and sealed on the inside. The



LEMONT CREAMERY—FLOOR PLAN.

entire cost, including the foundation, ice-house and cold storage room, was $750. and it has the capacity for working up the product of 2,000 cows. The Cooley system of raising the cream is in use by the patrons of this creamery.

The Schuylerville Creamery, Saratoga county, N. Y , is a style of creamery that is very popular on account of its low cost and convenience of arrangement. It is the same as the Model Creamery which was furnished for the Paris Exposition.



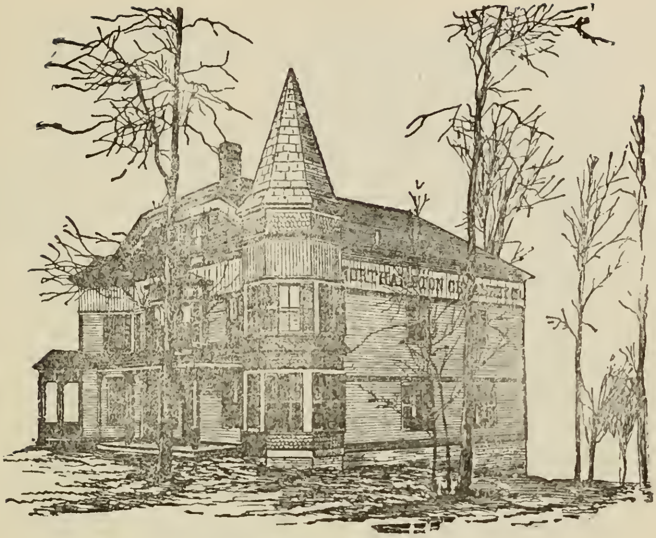
SCHUYLERVILLE CREAMERY.

It is 65x25 feet, with ell on rear side for boiler and engine, 15x12 feet. It contains receiving-room, office, cream-room, work-room, refrigerator-rooms and ice-house The frame is covered with paper and clapboards, or siding, on the outside, and furred out, papered and ceiled on the inside.

This makes a very substantial and thoroughly constructed building, costing from $600 to $1,500, varying with the cost of lumber in the section where built and the style of finish.

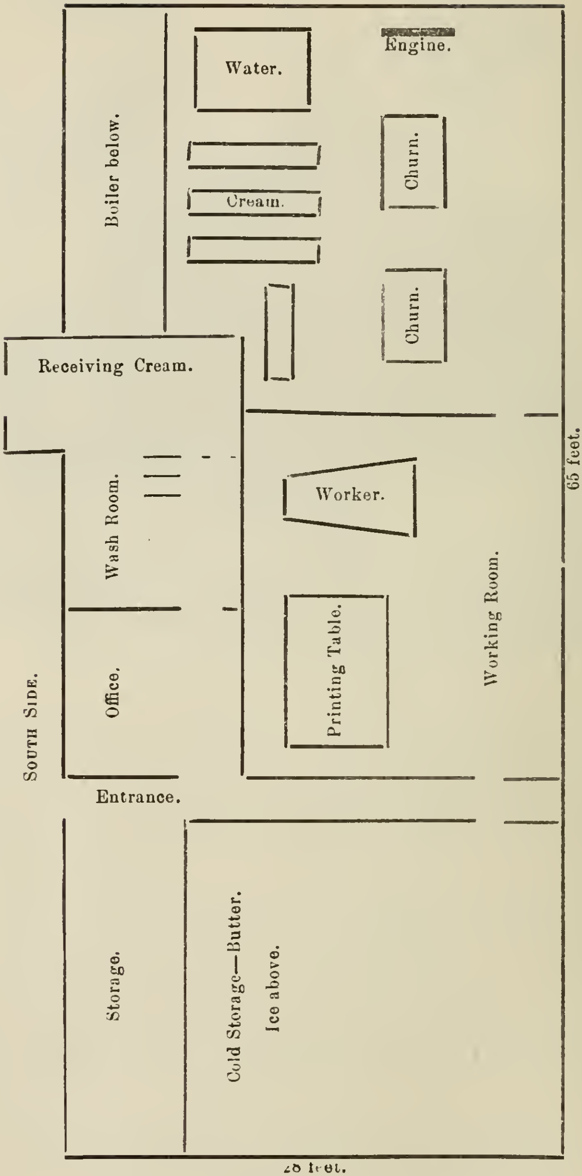
For those who may be looking for a more artistic design for a creamery than any of those already shown an illustration of the Northampton Creamery at Northampton, Massachussetts, is given (See page 92).

While no more convenient in its interior arrangement than others of less cost, yet it presents a more showy and attractive exterior.

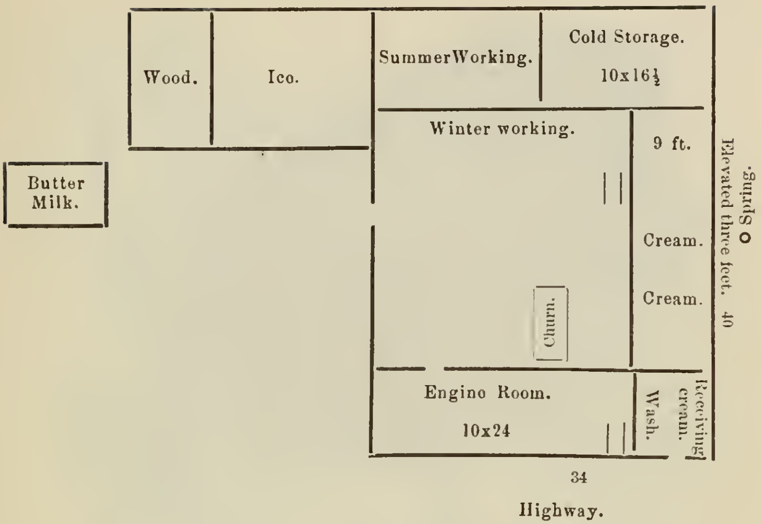


NORTHAMPTON CREAMERY.

Turner Center Creamery, (see page 94,) has a capacity of 1500 pounds of butter a day. The building is 65x28 feet, well covered and painted outside and sheathed throughout on the inside. All the working rooms are on the main floor. The cold storage room has a capacity of forty to fifty tons of butter and is cooled from an ice chamber above. The room where the butter is worked and printed or packed is cooled to any temperature desired by an adjustable cold air draft from the ice chamber. The cream vats stand on an elevated floor so that the cream is spouted from the vats to the churns. The buttermilk is spouted from the churns through an underground conductor which leads down a slope to a tank some distance from the factory. The water from washing the butter, with all other slops and waste water, flows into a sewer and away to the river. The cream receiving-room has its floor elevated to the height of the wagons from which the gathering cans are taken, and from this floor the cream is conducted directly to the curing vats In the same room is a wash sink, supplied with water faucets and steam pipes for scalding, where each cream gatherer after discharging his load, washes and scalds his cans, and where all boxes and trays as taken in from the trains are cleaned and scalded ready for use again.

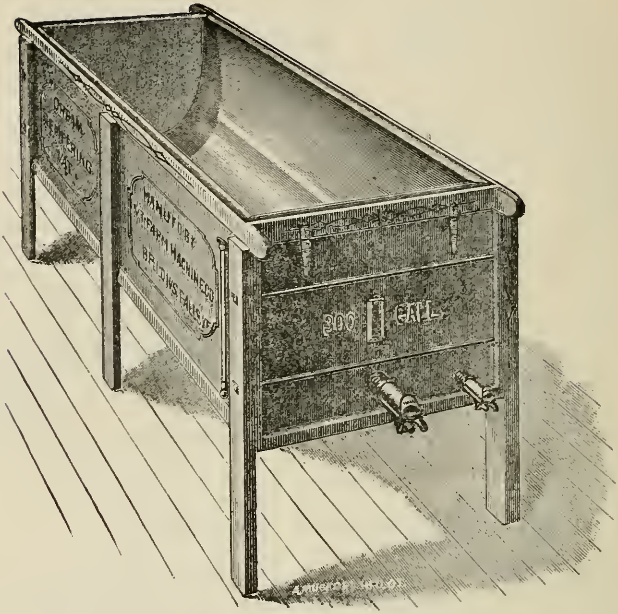


PLAN OF TURNER CENTER CREAMERY.



PLAN OF BUCKFIELD CREAMERY.

The Buckfield Creamery was built new from the foundation for the express purpose to which it is devoted. The building is 34x40 feet thoroughly built and well finished throughout. It was designed for a capacity of one thousand pounds of butter a day. The plan shows the arrangement of the different apartments. It is located on an elevation of several feet above the river which admits of prefect drainage. Water is supplied from a spring located but a short distance from the factory. The furnishings are a four horse-power engine, new, cost $250; cream vats, one 200 gallons capacity and one 300, cost $40 and $50 respectively; churn 300 gallons capacity cost $40; thirty-four cream gathering cans $6.00 each, $204; print butter carriers, $3 each. The lot cost $50, buildings completed $1650. Total cost of plant fitted in full for work, $2400.



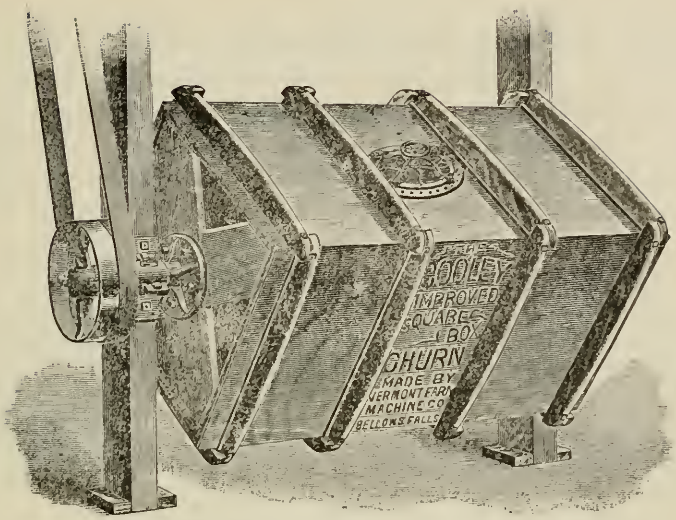
CREAM TEMPERING VAT.

These vats consist of a water tank lined with best quality of galvanized iron, with an inside vat made from tin plates, and are fitted with steam pipes that extend the full length of the vats, and water inlets and overflow for heating or cooling the cream, as necessary to ripen or temper it for the churn.

The bottoms of the inner vats are round, which makes them much easier to empty and clean. The Vermont Farm Machine Company furnish the following

PRICE LIST.

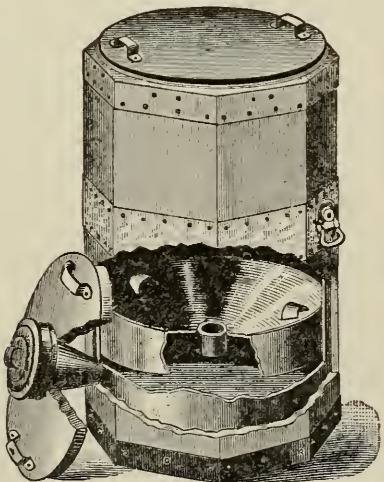
50-gallon vats,	Dimensions	over all,	size,	57x29	inches.	.$40 00
75-gallon vats,	"	"	"	66x29	"	... 50 00
100-gallon vats,	"	"	"	59x36	"	... 55 00
150-gallon vats,	"	"	"	63x42	"	... 60 00
200-gallon vats,	"	"	"	84x42	"	... 65 00
300-gallon vats,	"	"	"	115x42	"	... 75 00
400-gallon vats,	"	"	"	150x42	"	... 85 00



THE COOLEY IMPROVED SQUARE BOX FACTORY CHURN

PRICE LIST.

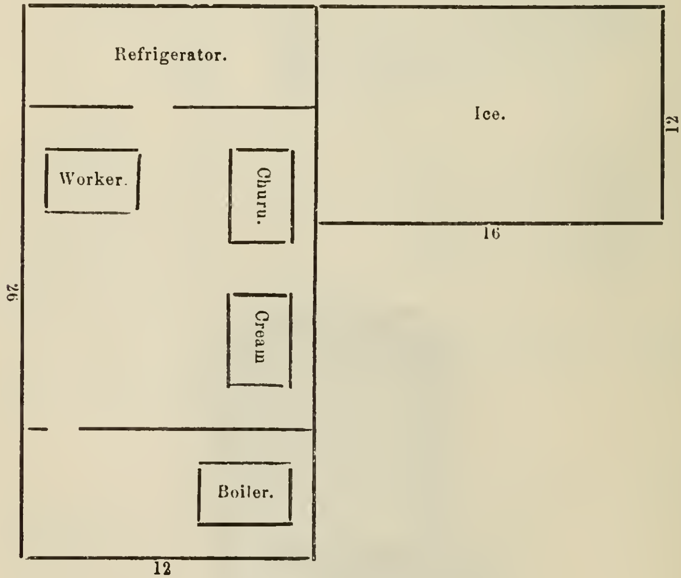
Size.	Capacity.	Will churn.	Inches square outside	Inches long outside.	Price.
1	100 gals.	50 gals	33	35	$30 00
2	150 "	75 "	33	46	34 00
3	200 "	100 "	33	57	38 00
4	250 "	125 "	33	68	42 00
5	300 "	150 "	33	78	48 00
	400 "	200 "	33	98	60 00
7	500 "	250 "	33	110	72 00



JACKIT REFRIGERATOR TRANSPORTATION CAN.

The foregoing cut shows the can generally used in gathering the cream for the factories. It is provided with a self-filling float which fits closely in the can, and prevents the cream from churning. The tin can is surrounded with several thicknesses of heavy building paper. This paper forms dead air spaces between the tin and wooden casing and is a perfect barrier against the heat or cold. A funnel cover is also furnished as shown in the cut.

Co-operation in dairying can be adjusted to meet the wants of any community of dairymen, whether the number concerned be large or small. In case but a few individuals only wish to unite in the business, then the outfit should correspond in capacity and in cost to the amount of business intended. A plan is here given of a creamery of a capacity of fifty pounds of butter a day, adapted to either co-operative or private work. There are many cases where such apartments can be finished off in buildings already erected. The plan calls for space 12 by 26 feet.



PLAN OF SMALL CREAMERY.

The churn may be run by hand power, horse power or a small engine. In case an engine is used there is the advantage of steam for heating and scalding in addition to the power desired for carrying the churn.

The outfit for such a creamery would be:

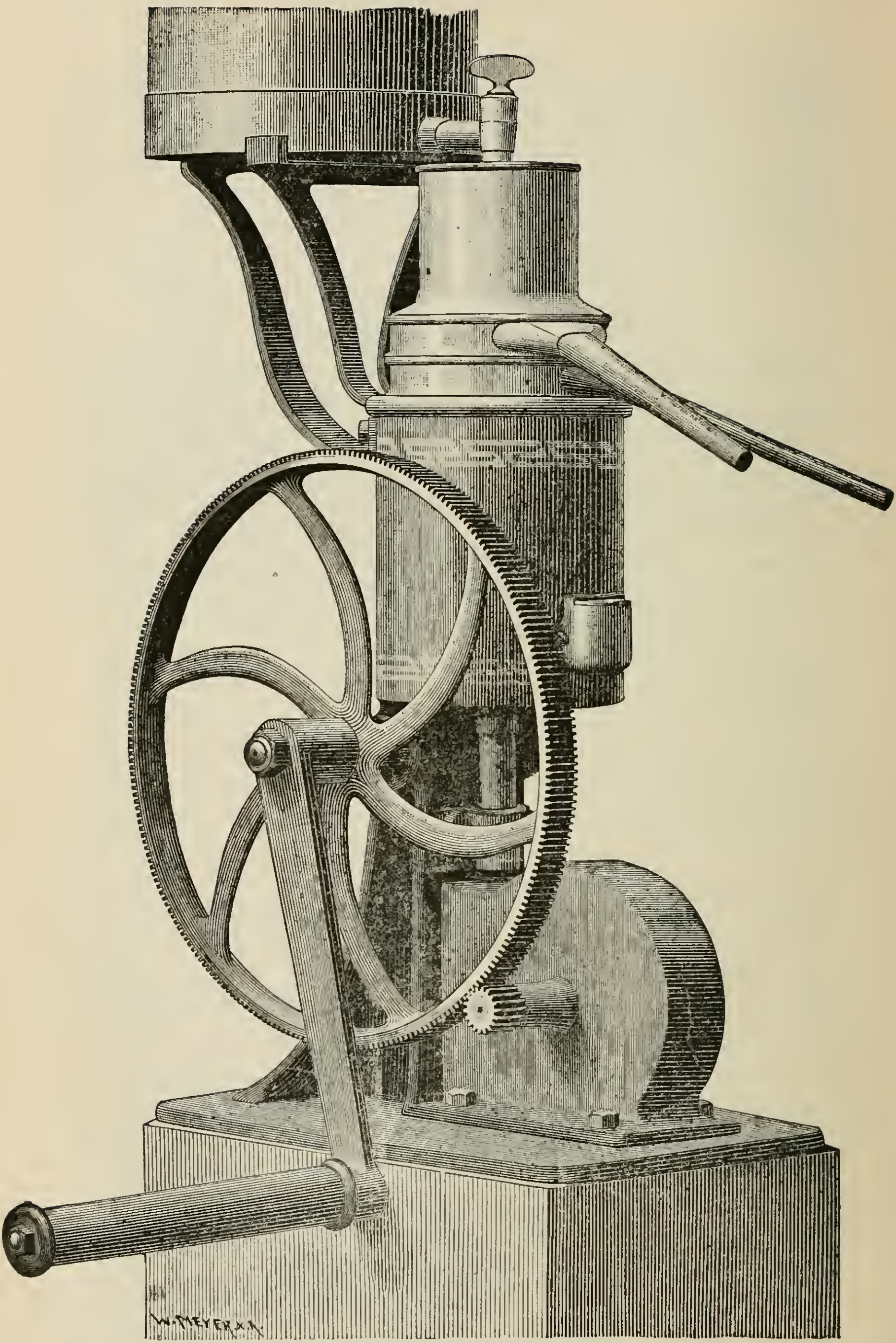
Engine (if one is used), two and a half horse power	$150
Two cream-curing tanks, $10 each	20
Churn, 45 gallons	16
Worker	7
Prints and tray	7
Three carriers, $3 each	9

CENTRIFUGAL CREAM SEPARATOR.

The separation of cream from milk by power, in place of the usual and long-practiced gravity method or letting it separate itself, is of comparatively recent introduction. The work is accomplished by an application of centrifugal force to the milk. It is not necessary that the milk be set at all, as in the ordinary method, but instead may be creamed at once on being drawn from the cow and while still warm. At the present time there are two inventions for doing this work, each involving the same principle but differing somewhat in the arrangements for its application. One is known as the DeLaval Cream Separator, and the other as the Danish Weston. Both of them are of foreign invention. They are manufactured of different working capacities, the steam-power machines creaming from 800 to 1200 pounds of milk an hour, and the hand-power machines from 150 to 400 pounds an hour. The separation of the cream from the milk is as complete as by any of the milk-setting methods.

A cut of a hand-power separator is given, known as the DeLaval "Baby" Cream Separator, which conveys a clear idea of the machine. The milk flows from the vessel at top through a faucet gauge into a bowl within the cylinder shown. This bowl containing the milk revolves 6000 to 7000 revolutions a minute according as the cream is desired thick or thin. The centrifugal force generated by this rapid revolution forces the watery and heavier particles of the milk—the skim milk—to the outer section of the bowl, or to the point most remote from the center, where it flows off through one of the spouts shown. The cream, or the lighter particles of the milk, takes a position on the inner surface of the milk and is forced off through another conductor. The flow of skim milk and of cream is continuous so long as the whole milk is supplied.

The "Baby" Separator is designed for small dairies. One of these machines was shown in operation at the New Gloucester



Centrifugal Cream Separator.

Dairy Conference by Mr. Thomas Collins, the agent. Three trials were made, and it performed its work perfectly. Seventy-five pounds of milk was creamed in twenty-seven minutes at each trial

The advantages of this method of creaming milk are that neither milk rooms, creamers or ice are called for. The milk is creamed directly from the cows, and the skim milk can be appropriated to the use desired without provisions for storage. In these several directions there is a saving of expense which may well receive consideration. It is also claimed on good authority that more butter can be realized from a given quantity of milk than by other methods. While this is probably true, yet it cannot be set down as having been established beyond question.

An objection to the system, in co-operative work is that it requires the concentration of the whole milk at a common centre, and the return of the skim milk to the farm where it is wanted for use. In a scattered community of dairymen where a considerable portion of the milk would have to be taken over long distances this would prove a serious obstacle to patronage, and is a matter that should receive consideration when deciding between this and the cream gathering plan. On the contrary a community of dairymen centrally located might well consider which of the two systems is best adapted to the conditions in which they find themselves placed.

Where the separator system has been established the usual course taken is to set up separators at several points radiating from a center, and transport the cream after separated to the common center for making into butter. The cost of a side establishment for this purpose fully equipped, approximates $1,000.

FEEDING VALUE OF SKIM MILK.

By Prof. W. H. JORDAN, Director of Experiment Station.

[Given at New Gloucester Dairy Conference.]

Mr. Chairman and Gentlemen: The subject I have to talk about this morning is one that has to do with the dollars and cents of the business farmer. I shall not attempt any very elaborate discussion, but shall present some facts and illustrate them as best I may with the exhibit I have here and the figures on the blackboard.

The question of the dairy interests of Maine I conceive to be one of the most important so far as the farmer is concerned, and no insignificant part of that question is the value to the farmer for use upon the farm of the waste products of the dairy. And in order to understand more fully what those waste products are I am going to speak first of whole milk, milk as we take it from the cow; what it is and what it contains. Of course you all know it is very largely water; but the amount of water in milk, or in other words, the amount of solid matter, varies a great deal. It varies with individual animals, with breeds, and somewhat according to the method in which the animals are fed. I have brought here this morning some tubes containing the constituents of a quart of milk; not the old-fashioned quart of two and a half pounds, but the one that weighs two pounds and a seventh.

Now we find one constituent of milk to be mineral matter. If you were to boil down a hundred pounds of milk you would get a dry residue, and if that were burned you would still have something left that is not combustible which we call the ash, similar to the ashes you have left after burning wood. And there would be in a hundred pounds of milk practically three-fourths of a pound of mineral matter. It is the material of which is built to some extent the bone of a human being. Up to a certain period in our lives we all had to get what bony framework was formed out of the mineral matter of milk. Now of course the amount which is burned off is much larger. If you were to dry down a hundred pounds of milk you would have a varying quantity of dry matter. It would vary, for instance, in the case of the animals that are represented here on the board, Shorthorn, Holstein, Ayrshire and Jersey. And let me say now that these figures represent the animals of these breeds as we have them at the college farm. I do not present them as representing those breeds as a whole. I do not wish to convey that impression at all. I simply give these figures as representing two animals of each breed which we have at the State College farm, and we have good animals there. Suppose then you were to take a hundred pounds of milk from each of the breeds I have named. You would find varying quantities of this solid matter left in the dish out of which you had driven the water, in the Shorthorn 12.80, Holstein 12.10, Ayrshire 12.85 and Jersey 14.85 parts in 100. One of the constituents of milk, and an important one in skim milk, is what we call caseine. It is important from the food standpoint especially, whether the milk in which it is contained is used for man or animals. All the muscular tissue of our bodies is built out of this constituent, so far as we take milk for food. It is built, I say, out of this ingredient, or a similar ingredient in some other kind of food, and it is the nitrogenous part. It is that which gives muscular fibre, and tendons in the animal body. Now I have represented here in these glass tubes the actual amount of that constituent of milk as found in the three breeds of Holstein, Ayrshire and Jersey, and the varying lengths of the tubes is almost the exact measure of the relative amounts of that ingredient as found in the three kinds of milk. We speak of the Ayrshire as an animal giving a large amount of cheesy matter. Well, that is true if you consider the Ayrshire milk with reference to the whole quantity of milk given, and not with reference to the relative amount. At least, we have two Ayrshires sent to us by the secretary of the Ayrshire Association, Mr. Winslow, which he said he was willing to have taken as typical Ayrshires and those cows in a quart of milk are not giving as much caseine and albumen as our Jerseys are. They are giving more milk, considerably so, and when you consider the question of the total amount of this constituent produced, that is another thing. I am simply giving the amount of material in one quart of milk.

Then there is found in milk what is called milk sugar, and a larger amount of it than of any other constituent. This is true of all three breeds except the Jersey, which runs a little higher in fat. Sugar of milk has almost the same composition as the sugar used on your table or in cooking, and has the same food value. But it has a very different taste. If you were to take some of that solid sugar in your mouth you would scarcely recognize it as sugar. The material in these tubes represents the amount of sugar in a quart of milk, the Jersey having the least, the Ayrshire the most, and the Holstein standing between the other two breeds. Those tubes give you not only the relative amounts between the breeds, but the relation in amount of the different constituents. You see the figures on the board for a hundred pounds of milk. Of caseine the Shorthorn has 2 86 pounds, Holstein 3.03. Ayrshire 3 37, Jersey 3 91. Of sugar the Shorthorn has 4 94, Holstein 5 01, Ayrshire 5.14 and the Jersey 4 85.

We come now to the remaining constituent of the milk that is combustible, the fats, and we see a still greater difference in the quantity with each breed

You see in these tubes fat from the Holstein, Ayrshire and Jersey breeds. It is the fat in its natural condition. You see it just as it came from the milk of the cow, pure. I have melted it and extracted from it the cheesy matter as well as the water, and you see there is not only quite a difference in the amount, but in the general appearance.

Question. That is what the butter is made up from?

Prof. JORDAN. About 80 per cent of it. There is in fresh creamery butter about 15 per cent of water, more or less, according to quality.

Question. And all the rest is pure fat?

Prof. JORDAN. Yes; nearly so. A little cheesy matter or caseine remains, and of course a trace of sugar It is not absolutely pure fat; but the percentages of other constituents that remain in the butter are very small, the fat being the constituent that makes up about 80 per cent in perfectly fresh butter. Of course as it stands it dries.

Now seeing the constituents of the whole milk. we can easily pass over to the constituents of skim milk.

Question. About how much moisture is there in those tubes of sugar?

Prof. Jordan. That sugar is practically dry. Passing from the whole milk over to the skim milk, what is the relation between the two? You know of course that when the cream rises and is skimmed off you take away—what per cent do you take away in your creamery here?

Mr. TRUE. About 20 per cent of the whole.

PROF. JORDAN. You have left then after the taking away of that 20 per cent four-fifths of the whole bulk of milk which we call skim milk. Now what does that contain? I haven't a complete analysis of the milk of each of the breeds I have mentioned. only of the mixed milk. We have, however, determined the total solid matter and the fat in the skim milk from the different breeds.

You will notice that with the exception of the Ayreshire the total sold matter in the skim milk varies somewhat as the solid matter varies in the whole milk. running 9.30 in the Shorthorn, 9 25 in the Holstein, 10.50 in the Ayreshire and 10 25, practically, in the Jersey, to a hundred pounds of skim milk So far as our work and experience at the station goes. and so far as we have had a chance to notice the work of other stations, it is a mistake to say that Jersey skim milk is poor, and I do not speak of this as advocating the Jersey, particularly, but simply to correct an error. It is not poorer, and not so poor, as the skim milk from some other breeds ; no poorer than the skim milk from our Ayreshire cows. We are setting the milk in the same cabinet and at the same temperature. so any difference arising from temperature would not appear here. Our Jersey skim milk in solid matter has proved to be as good as the skim milk from any breed of cows we have. You will notice that the fat of the skimmed milk varies considerably. For five days in each month we have analyzed the mixed skim milk from the four breeds. because we have been using this milk in feeding experiments and we wanted to know the composition of it. You will find that the average of the skim milk is: solids. 9.93, ash, .80. caseine 3.49, sugar, 4.78, and fat, .37 This is the mixed milk. and, of course, there were different quantities of this milk mixed, so it is difficult to compare these figures with those of the whole milk to show how they agree. But we have also partially analyzed the skim milk of different cows so as to compare the composition with the composition of the whole milk, and it seems to be true that a hundred pounds of skim milk will contain about the same sugar, for instance, that a hundred pounds of whole milk will, and a hundred pounds of skim milk will also contain about the same amount of this caseine as a hundred pounds of milk from which the skim milk was made. That is. if the Jersey cow is giving five per cent of sugar in her whole milk, the skim milk will contain not far from that. If she is giving three per cent of caseine, the skim milk will contain not far from that amount

Question. What part does that sugar play in feeding?

Prof Jordan. That plays the part of keeping up the animal warmth and producing fat. It is classed with starch.

Here we have in the skim milk which we can use for food for farm animals, 90 parts of water and 10 of solid matter, approximately.

What is its value as food?

There is no available solid matter that the farmer has on his farm so valuable for food, pound for pound, as the solid matter of skim milk or whole milk. In the first place it is wholly digestible. From a half to two-thirds or three-fourths only of the hay, corn, meal or cotton seed, and I don't care what else, that you feed your animals is available for use by the animal, and the rest is rejected. In the case of good Timothy hay the animal will reject from two-fifths to a half of it as useless. But in the case of the constituents of skim milk every bit is soluble in the juices of the stomach and the digestive tract, and we can say with certainty that every bit of it is utilized in the sense of being taken up into the blood and carried to different parts of the system. Another thing is true. In order to make the foods produced by the farmer for his cattle well-balanced, and to supply a recognized want, there must be introduced more of this nitrogenous material. The most of the farmers raise no cattle food, unless they go into raising peas, that is particularly nitrogenous, a small amount of clover excepted, and the skim milk of the farm fills an important place in furnishing the muscle-forming material which is so essential, especially in the growth of the young animal—a place that no other common, home-produced food does fill to so great an extent, in the economy of stock feeding. There is no question about that. You see that out of 10 pounds of solid matter in 100 of skim milk there is over a third of it nitrogenous material that is entirely digestible and available for use by the animal.

I suppose you will now turn and say: "That is all very well. It sounds well and may be good science. But give us some practical examples. Give us an example of the value of this skim milk. Show it in dollars and cents," and that is what I will try to do. All of the past week I have been studying the work that has been done by several experimenters, men of good hard sense, men who can make an experiment that is practical in its bearings. I have been studying their results, and I have found the dollars-and-cents side of this matter. I have on the board here the result of some feeding experiments that have been carried on at the Maine experiment station, and at the Massachusetts and Wisconsin stations. And let me say here that the work done with animals at these stations is just as practical as any you do yourselves. If a pig is well bred, has a good pen, is well littered and well taken care of and not abused, the fact that he is fed by a man paid by the State and with food furnished by the State at the State experiment station does not affect its health very materially. He is about the same kind of a pig he would be if a farmer owned and fed him. He is just as happy, will grow on the same kind of food and tells the same story that he would if he were yours, provided that you feed him as well. So we must not get the idea that because an experiment bears the stamp of scientific work it is not practical in the way it is done, and that the result is one that the farmers cannot depend upon in their own practice. That is all nonsense, and the sooner we get rid of that idea the better.

These pigs at Orono have been fed by a man who has long been accustomed to that sort of work, and I know from personal observation that no more thrifty and contented animals ever lived. We began with pigs from the same litter, using two in each lot. In the case of two of those we fed them 196 days. The skim milk which they ate was weighed. The meal was weighed, and the pigs were weighed often, and you can depend upon the figures that are furnished by this experiment. The basis which I have used in reaching these figures is this: I have reckoned the dressed pork as worth 6½ cents a pound. We got 7 cents a pound for these two pigs. But I have reckoned it as I have stated. Or I reckoned the live weight at 5½ cents. These animals when they were killed shrunk less than 18 per cent. The meal with which they were fed I reckoned as costing 60 cents a bushel. That is considerably more than its cost this year, but I take that as a fair average. That may not strike you as a fair average. If not reckon it as you please. Reckon the meal as worth 60 cents a bushel. Subtract that from the value of the pig when he went to the slaughter house, and it leaves 3 46-100 cents for each 10 pounds or one gallon of skim milk. In the case of the other pigs the milk was fed for a shorter time, also less milk and more meal. I was testing another question which I am not going to discuss here. In the latter case after paying for the meal there is left 5½ cents for each 10 pounds of milk.

Question. Fed on meal and milk alone?

Prof. Jordan They were.

Question. Do you remember about the weight of the four when the experiment commenced?

Prof. JORDAN. No, I haven't the weights here; but they weighed in the neighborhood of 50 pounds apiece.

Question. About how much at the close?

Prof. JORDAN. When they were killed they weighed in the neighborhood of 300 pounds each.

I would not have you draw the conclusion that it is more profitable to feed a small amount of skim milk and a large amount of meal, that is, relatively large, because in order to consume a certain amount of skim milk and sell it to the hogs you would have to feed a much larger number of hogs and increase the work and handle a good deal more meal in proportion. I am going to express the opinion, though I have no data or figures to prove it, that a small amount of meal with the skim milk will prove more profitable to the farmer who has a lot of skim milk to dispose of than to feed skim milk entirely. I don't know that that is so, but it is my opinion.

Question. Possibly that might vary with the age of the pig?

Prof. JORDAN. I am considering the whole life of the pig.

Question. In what condition did you feed the meal?

Prof. JORDAN. Mixed with the milk. The meal was divided into two portions each day and fed night and morning and only milk at noon. The meal was raw.

Question. What would be the relative value of meal and whole corn?

Prof. JORDAN. Two experiments which we have conducted to test this question involved the use of twelve swine, and in two separate instances we have got slightly better results with whole corn than with meal. These were pigs grown from 60 pounds in weight up to the time they were killed.

I have here the results of some experiments by Dr. Goessman of Massachusetts, and the milk figures out to be worth in pork 25 cents a hundred pounds practically. Prof. Henry of Wisconsin carried on the experiments indicated by the last figures on the board, in which he used three animals in two cases and six in one, and he got results all the way from 18 to 39 cents for a hundred pounds of milk. The conditions under which he fed his swine varied greatly. Some were at pasture and some not, and to what extent that affected the results I do not know. But I have here quite a variety of conditions under which pigs were fed skim milk, and the average of all is that the milk proved to be worth in money, or pork sold, 3.10 cents for each ten pounds or 31 cents a hundred.

Perhaps the question may now be asked, is buttermilk of equal value with skim milk? Not so many experiments have been made with buttermilk as with skim milk. I have here the results of three experiments involving the use of three pigs in two cases and six in one, and the figures vary greatly; but the average value of buttermilk is less than skim milk, and that is as it must be, as it seems to me. At the station we have been analyzing buttermilk, taking the buttermilk before the butter is washed, and we find that in a hundred pounds of buttermilk there is on the average one pound less of solid matter than in a hundred pounds of skim milk, and I think those figures can be trusted as representing practically the relative amount of solid matter in buttermilk and skim milk. I would express the opinion that these experimental figures do not quite do buttermilk justice, but they are all I could get at. I think buttermilk is worth just about a tenth less than skim milk.

Now what is the skim milk of a cow worth in money for a year? Have you cows that will give 6,000 pounds of milk a year?

One-fifth of that will go away in cream and you will have left 4,800 pounds of skim milk worth for pork raising, as you have seen, 31 cents a hundred pounds. You are thus getting practically $15 out of the skim milk turned into pork, and I will leave it to you to say whether the manure from the pig pen will pay for the care or not. Now that in a somewhat brief way finishes that side of the question.

What about the effect on the fertility of the farm in the loss or use of this skim milk? Every hundred pounds of skim milk contains about 55-100 of a pound of nitrogen for which you are paying to-day in commercial fertilizers from 17 to 18 cents a pound. This year you will pay higher for it as compared with last year I expect, because the price has been going up. You have in that hundred pounds of milk about one-fifth of a pound of potash and a little more than a fifth of a pound of phosphoric acid. If you buy those ingredients in commercial fertilizers and pay the ruling prices—and they are worth as much in this milk as there, because they are in an entirely useful form—we will say 18 cents for nitrogen, four cents and a quarter for potash and eight cents a pound for phosphoric acid, the manurial ingredients of your forty-eight hundred pounds of skim milk would cost in commercial fertilizers $5.71.

But you say that the milk has been fed to the animal, and the animal has taken out some of it. Not over a tenth. This is a safe statement, especially in the case of swine, because they have a small quantity of bone as compared with the body, and only a small quantity of lean meat, and the fat you need not worry about, because it does not contain a thing that is valuable to your farm. Take away that tenth and we still have over $5. I am not going to say to you that that is worth $5; but you have to pay $5 for it if you buy it, and it adds just so much to the heap of manure and to the fertilizing material you have for use on the farm. This sum added to the $15 which we estimated for the feeding value of the skim milk makes about $20, that you can estimate that the farmer would lose from the farm by sending the skim milk of one cow from the farm for one year, provided that cow gives 6,000 pounds of milk and you sell one-fifth of it in the form of cream.

Now suppose you are keeping 10 cows. You would then multiply $20 by ten and you have $200. You may say that cannot be realized in practice. I think it is possible, and if it is not being done it is to some extent your own fault.

Question. The experiments to which you have referred were with pigs alone. Have you any data as to the value of skim milk fed to other kinds of animals, calves for instance?

Prof. JORDAN. No experiments that furnish extensive data. I know this: We fed a Holstein calf, the mother of which was bought in this place, entirely on skim milk with a little timothy hay to chew, and at the age of eight weeks he was as fine an animal as one often sees. I think a man can as safely take his chances to grow calves on skim milk as on whole milk. He will simply need to feed more of the former.

Question. Suppose this skim milk is reduced to a curd. Do you get practically the same benefit from it?

Prof. JORDAN. You do not get the full benefit of it. If you reduce it to a curd and reject the whey the sugar is largely lost. The sugar is largely in the whey. That is one reason why whey from the cheese factory has some feeding value.

Question. How about the fat?

Prof. JORDAN. There is a little fat in the skim milk. But when the milk curds the greater part of the fat is caught up in the caseine and goes with it.

Question. Did I understand you to say that milk has the same feed value after it has soured as before?

Prof. JORDAN. I did not say that. I understood the question to be with reference to the value of the curd, leaving the whey out of the question.

Question. What I wanted to know was whether the curd represents the full value of the skim milk.

Prof. JORDAN. No, sir. I have given some reasons why it does not. Another reason is, the milk loses value by souring. The sugar has been changed to lactic acid, when the milk sours, and in doing that it has lost some food value. It is necessarily so, because the value of that sugar for keeping the animal warm depends upon the union of oxygen with it, the burning of it, and that is partly burned before the animal gets it in case it is sour.

Question. In the case of curd from whole milk isn't there considerable fat left in the whey?

Prof. JORDAN. There is a small amount; but in good practice the most of the fat is caught up with the curd.

Question. Have you any data as to the results of feeding skim milk directly to cows for the making of milk?

Prof. JORDAN. No, sir, not data from an exact experiment. But a man who doesn't say anything unless he knows what he is talking about says it is most valuable.

I have taken pig feeding as the common way of disposing of skim milk and as the way in which it has been used in the experiments which give exact data.

THE DAIRY FARMER AND CREAMERIES.

By Prof. JAMES CHEESMAN, Boston.

In what respect does the farmer of to-day differ from his brother of a former period? The great majority of farmers are tillers of soil almost by tradition and yet there is a marked contrast between the men of to-day and those who farmed ten years ago. It may be the men are the same persons, farming the same lands, but none the less, the change of practice has been so complete with those working dairy farms as to amount to nothing less than a revolution. It is not the winter dairy as we understand it to-day, so much as the entire range of farm practice, that has been re-organized, at least by those who take the lead in the business. Everybody now admits that it is better so to plan one's operation as to even out the supplies of farm goods so that we may have a regular supply of fresh butter, eggs and pork in winter as well as summer. On some of the best managed farms the practice to-day is *growing raw material* in summer to convert into animal products during the winter. Why has this change come about? What is the reason for thus reversing the output of the farm? Simply this: The farmer has been improving. Summer butter and eggs glut the market; prices are low and there is always a surplus to be carried over. This surplus must be held till the fall or the winter, and be marketed just when there is room for it. and this time comes when farm supplies fall off in quantity and quality.

How shall the farmer of to-day modify his practice so as to enable him to even out supplies when the market pays best? To answer this question we need not go to Europe, nor indeed to some of those great dairy States out West. Some of your own farmers in this State are answering the question.

That we have clung to June butter so long is because we had learned to believe that the midsummer product was nature's best work. Modern dairy farming claims to make an excellent substitute, if not as good butter, in the dark days of December and in the bleak month of March, by skilled stall feeding and intelligent care of animals. The modern dairyman has discovered that many of the conditions of June feeding may exist at other seasons of the year if he wills it. Many have willed it and the result is in our town and city markets we have choice of increasing quantities of choicely-made butter. I wish to speak of the farmer's connection with butter-making, as we now think of his share in woolen factories. The sheep farmer is quite content to grow wool, and he needs no great amount of persuasion to convince him that his connection ends with the raw material, for his advantage no less than for that of the consumer of the manufactured goods. To grow wool of a satisfactory quality requires more knowledge and experience from the feeder than was formerly expected of a family weaving its own raw products.

With the progress of civilization we have changes on all sides of us, and the most remarkable of all the changes we have seen in our century is in man himself. Man is never a constant quantity in any age of the world's history. Every change he is subject to is accompanied by a change in his wants and general mode of living. With his advancement there comes an expansion of his wants and these new wants are reflected in the development of new industries. Hence it is that we are asked to reform old habits, to adopt new methods, and to enlarge our faith in the farm.

Every year the tendency of modern farming specializes the work of the husbandman to that of a grower of raw materials. It may be objected by some that this is a narrowing of the farmer's life. Those who have seen the change wrought on the life of the farmer regard this as an advantage from every point of view. The old view of farm life required the farmer to be a man of all work in a very much wider sense than he now is, but experience has decided that a limitation of sphere is widening his capacity for his more specialized function of a grower of raw material.

To know his soil, to understand the special food wants of the plants he grows, the method of cropping which will be most suited to his circumstances are questions which farmers may study to much greater advantage if they have not to divide too much of their attention. To succeed in growing well any one farm plant might well engage the attention of a life time. The cost of cultivating any one of our regular farm crops is now discussed by farmers with far greater seriousness than in former years, because their cultivation requires more intelligent effort than formerly, and any loss sustained in any one of the items of cost greately effects the margin of profit.

Consider the vast sums spent annually on fertilizers and ask yourselves the question, would all this be so if there were not greater possibilities in farming than formerly? There are men on all sides of us who think that this harping on improvement is but the fancy of a few enthusiasts, and that what is being done outside their town or county is of no consequence to them. To such the institute has no message. Sooner or later those men will learn to respect the voice of warning, and may wake up too late.

The specialization of farm work applied to dairying commenced about a generation ago. The leaders of the new practice were convinced that before fine butter could be taken from the churn good raw material must be put into it. If the manufacture of choice butter was a purely mechanical effort, limited to what takes place in the churn, and to what may be done to it after the butter is removed from it, then the "oleo" manufacturer will have a long innings indeed. It is precisely because butter quality is governed by the kind of raw material made on the farm that there is such a wide and impassable gap between the real article and the substitute. How wide the difference between these two products shall be is one of the questions for the dairy farmer of 1889 to settle. Most men agree that "oleo" does not compete with good butter. That the goods injured by its rivalery is the product of men who don't understand their business. The men who show most hatred towards this substance are those interested in the sale of label packed goods, or hash butter. These are packed by storekeepers in the west and shipped to the east to depress the butter market. In the west they are washed, re-worked, salted and packed. Kept in refrigerator cars and cellars in eastern cities the process of deterioration is arrested till the goods reach the consumer under some fancy name of "Dairy," "Creamery," or whatever the fertile brain of the salesman may suggest. These goods and not "oleo" do more to depress your business in the city of Boston and adjoining cities than anything else and to keep it down. The creamery, and the high class farm butters of New England are heavily weighted with .these western goods.

The educational influence of good butter on the taste of the consumer is the one bright ray of hope for the producer. The faster we can improve quality the more rapidly shall we increase the demand for better goods. Few but the very poor buy butter substitutes, and none of those who use them will ever be found to patronize creamery or high classed goods.

Now, what is our great need to-day? Is it not so to change our farming that we may have a regular supply of good, sweet, richly-flavored milk and cream the year round? We cannot have this abundance unless provision is made beforehand for full winter rations of rich, milk-yielding meals and fodders, such as we have been talking about to-day.

The modern cow of whatever breed she may be, calls for rations containing many rather than few sources of food substances if we would make the most butter of the highest quality from her milk. We may balance her rations very carefully, and give her a fair proportion of succulent food in the form of roots or ensilage, but if the mixture is composed of few substances, the butter will be simple in flavor, and will sell for less than fine gilt edge goods. How do we know this? For the same reason that you know the best butter is made in June. The best butter must be made in winter when animals have had the best and most varied diet. Hence it is that we always think of clover as an ideal food, and regard with suspicions any advise which encourages the use of an undue proportion of corn meal, gluten meal or cotton-seed meal. The danger we must always guard against is satisfaction with the quantity of milk or cream we are producing. It is in this blending of food in winter, no less than in summer that the farmer's skill will best serve him. I look forward to the time when butter will be made to order just as we now make flour, chicken meat and wool.

Another important influence on the quality of cream is the period of lactation and its effect on the milk produced. The condition which will give us the largest quantity of butter in winter when prices are highest, is the same for improvement in quality. There is still too large a proportion of cows coming in during the early spring and too few in the winter months. The latter half of the period of lactation decreases the quality of the butter, and if the cow be in calf, as she invariably is, the tendency is still more in that direction. A regular succession of fresh cows throughout the year is the condition most desired, but it is much better that we should be flush in winter than at any other period of the dairy year. As the cows fall off and go dry you will approach a season when feed is flush, and when the evil effects of staleness are least perceptible. Of the effects of bieed I need not say much because most of you are familiar with animals of specific butter habit. The large returns of some of your best farm butter makers, and of your best managed creameries settles that point as far as your experience is concerned. I would urge you to pause and consider well any advice which may be given you to change the animals which you now have for others which may disappoint. Prove them at every step before you resort to change, and be very sure that improvement is probable before you start out on the venture.

Complete your organization for effective work. What you attempt, do well, and try to remember that what is of advantage to one farmer is a gain to the town.

A few weeks ago a most distressing letter reached me from a New England Creamery superintendent. He was asking what he should do to get more butter from his cream and to maintain its quality. This was a case of operating a creamery with too few cows, too large a number of them being far advanced in the period of lactation and many of them poorly fed. The business of dairy farming is not unlike all other trades in this respect, it must be operated with ordinary intelligence, and with common business prudence. The greatest promise of improvement for the immediate future lies in the manufacture of good butter on some uniform plan of action. Nowhere outside of the Creamery or factory method are you so likely to realize success. Whatever inequalities are found in farm butter may be more easily remedied in the factory where you have to deal with the same conditions every day in the year, and the associated plan is much better suited to raise the general standard of quality. All the best interests of the farmer will be found in supporting the system which costs the least to operate, and returns him the largest net payments on the butter contents of his cream.

What is the farmers' interest in good butter? No other article raised from the farm makes so little demand on soil fertility as good butter. The better the butter, the greater its value. and the larger will be the income derived from the by products as skim milk and buttermilk. In platform talks such as this, butter-making cannot be taught. That is the work of an instructor on the premises of the maker, where alone he may learn what are the defects of the present system, and what remedies may be needed. An instructor can hardly hope to do any good unless he can spend a day or so at the creamery and if need be make a trip round to some of the patrons to trace out defects of practice in feeding, or in caring for the milk.

Most of you can remember that but a few years ago butter was not worth as much in many parts of the country as it is to-day. Why is this? What has happened to produce so marked a change in all the butter markets of the country, and not alone in this land but all over the world? Less than thirty years ago we began to feel the effects of what we call modern competition, and with this excessive rivalry there came a change in the domestic habits of the people. Those who had consumed much grass meat reduced their consumption of coarse fats and cultivated their tastes for butter and other dairy products. Now we use more milk, cheese, and butter, and the descrimination of the consumer is not wholly confined to the finer shades of quality in cheese and butter, but is applied to milk also. Go into the homes of people in comfortable circumstances, or to the first and second class hotels and we find a quality of milk and cream much higher than that formerly met with. In some cities, and especially is this true of New York, Boston, Philadelphia and Chicago. besides a number of smaller cities, and Jersey and Guernsey milk and cream are met with under their own names because of the larger proportion of fat they contain, and for their deeper and richer tints of color. This taste in the selection of food although largely stimulated by the general cultivation of the arts of life the world over has been greatly stimulated by the special work of the dairy colleges and institutes all over the world. In the United States the people in suburban residences who kept family cows have had the greatest share in the work. Twenty years ago the few New Englanders who made good butter had a large share in moulding the taste, and developing our present market for good butter. One of the most perplexing questions you can present to a good dairyman, or institute worker in the present day is to ask him when the market limit will be reached. That there is a limit somewhere nobody doubts, and that it may reach us some day no one will dispute but when, and how no one can tell, for the best of all reasons that no one can know. The private dairyman who makes the highest priced goods, the creamery man who commands the best markets are the most ready to impart information to assist others because they know there is no danger of overlading the market with high-class goods.

What is the relation of the farmer to this business, and how can he obtain the largest share of income from it? What is its effect on the agriculture of a state, and how does it effect the farmers outside the circle of dairymen? Why may not the interest of the farmers of this State be awakened? In New England we have abundance of cheap land, the primary requisite of successful dairying. Here we have to wait less time for the improvement of stock than the western farmer. Already we can show higher butter averages, and we can reach the markets in less time, and possibly at as little cost. Quite recently a Boston editor wrote the following communication on the western competitor:

"A large amount of New England capital has been diverted the past few years to Western farm mortgages. The high rate of interest, and the fat commissions paid to smart agents in the East for selling these Western mortgages, has induced heavy purchases. These obligations are now beginning to mature, and New Hampshire, which was one of the first communities to invest in them, has begun to appreciate the uncertain character of the security, and its investors are re-insisting upon payment in preference to making renewals Evidence is accumulating every day that the Western debtor is preparing to resist the payment of these obligations, except upon such terms as he sees fit to make. For instance, it is the intention of an influential party in the Kansas Legislature to pass a bill this winter that will stay the collection of leins upon real estate until three years after they have matured. We trust New England savings banks will finally wake up to the importance of loaning more money, and at reasonable rates, on property nearer home, and of more certain value. Local loans will tend to develop and improve the property in the immediate vicinity of those whose surplus earnings furnish the capital to our savings banks."

Can New England economy and thrift invest its savings to better advantage than by investing in stock, buildings and creameries? The effect of dairy influence on land values offers the highest testimony of the value of butter making in the countries where dairying has been followed for ten, twenty or thirty years. In the three oldest dairy States of New England the creamery has largely increased the amount of taxable property, and in those counties where land values have not decreased, or decreased more than they have, is largely owing to butter dairying. I can offer no higher tribute to the intelligence of a farming community than to select the cases of a few of the many dairy successes in Massachusetts, Connecticut, Vermont and New York. At a meeting of the New York Dairyman's Association, held a year ago, one of the speakers was called upon to figure up the cost of ensilage by the acre and ton.

In providing for interest charges I noticed he charged six per cent interest on $160 an acre. He stated $160 as the price of good farms in Herkimer county. In the western part of Canada there is a group of three counties where dairying has been followed for over twenty years, and land cannot be bought under $100 per acre. There are many farms in Michigan, Ohio, Illinois and Wisconsin which have doubled their values in ten years, which could not be bought for less than forty to fifty dollars an acre. This indicates pretty clearly what we have to face in fertile conditions, most of which have resulted from the pursuit of dairying. It is not the value of land that will determine the superiority of one part of the country over another, in dairy success. I mention these values as showing the effect of dairy influence on soil fertility, and general improvement in farming.

It is not the value of land in any particular district that will count far in the element of cost immediately. Cheap land is a great advantage to a State for dairying. The competition of the immediate future will be in the capacity of the individual cow, who after all determines the cost of the butter.

I prefer to treat that part of the farmer's work which concerns the production of crops, and the making of cheap cream from the most economical animal. In choosing your cows you must decide after you have the breed which commends itself to your judgment which cows in your herd are the best to perpetuate. It is a very simple thing to note which are the best feeders and which give the greatest quantity of cream or butter by an occasional test. What you must fear most from the west is not the superiority of the cattle which they have to-day, because they are not so good as yours, but the care and attention which they give their stock, and the pains they take to improve the next generation.

We must remember that it is not the cow of the breeders making great tests that we have to compete with, but those animals on the plain every-day farm which make from 250 to 350 pounds of butter per year. The feature of western competition which you must watch most closely is the energy and persistent faith of the men who are raising their standards of butter capacity. Recollect that the standard cow of fourteen pounds of butter per week, or 300 pounds of butter per year, as defined by the American Jersey Cattle Club is a limit which has probably been exceeded by a much larger number of matter-of-fact farmers owning high grades than by the regular Jersey breeders.

DAIRY CATTLE.

THE JERSEY COW A MONEY MAKER.

By G. M. Gowell, Bowdoin.

L. S. Harden, in his admirable essay on Jersey cattle, says:

"The man who handles Jersey cattle, must have ground into his nature all the known principles that govern the art of breeding. In the development of science there is generally an accumulation of knowledge, and the new worker begins where his predecessor left off. With this accumulated knowledge and the simple principles of induction he is certain to make some progress."

The man who starts out to improve our dairy cattle is not so fortunate. While he has some excellent breeds to begin with, yet when he comes to think that some of them have been hundreds of years acquiring their present excellences, and then, only because they seem to have grown into the habits of their owners, the outlook is anything but cheerful.

So far as the principles involved in breeding are concerned, the whole matter is lamentably empirical, each man following his own fancy. Now that the intelligent minds of the country are taking up the business of breeding there should be more information and greater precision of thought brought to the task.

Let us take a cursory glance along the line of progress already accomplished in the art of breeding. The bovine race and man are intimately associated in the earliest glimpses of ancient history, and this intimacy, never relaxing, has grown closer and closer to the present day. But with all the evidence around him of the improvement under domestication,—at least so far as his own wants are concerned—of these animals there yet seems to have been no settled effort to breed them for a specific purpose until late in the eighteenth or early in the ninetenth century. The first reliable history we have of the improved breeds is contained in the work of Wm. Youatt of

England, written in 1834. The various breeds of improved cattle were then so numerous and local that even in a book of considerable size, Youatt could devote but small space to each, but with the characteristic English love for beef the Shorthorn received by far the largest share of his attention.

Taking the Jersey as our specialty let us not forget that we are breeding a thoroughbred butter cow. How she became a thoroughbred is a matter of history. The origin of the race is, has, and always will be shrouded in mystery Able writers have advanced various theories, basing their opinion on conformation, color and prominent markings, and thus connecting them with Brittany, Swiss, Norman or other Old World breeds. Such theories are based on the actualities of the present, and do not penetrate the antiquity of descent of our noble cow.

The probabilities are that the Romans as they pushed their conquests towards northern Gaul carried with them a better race of cattle than they found in the conquered country, and as the inhabitants improved their condition, these cattle spread into Normandy, and thus became by their proximity to the Channel Islands the immediate ancestors of the Jersey.

It is evident that the inhabitants of the island at an early day became aware that they were in possession of a type of cattle especially adapted to their circumstances, and desired to protect it from dissipation by an admixture with foreign blood, as attested by the record that as long ago as 1789 very stringent penal laws were passed to prevent the importation of cattle to the island.

The Island of Jersey is eleven miles long from east to west, and five and one-half miles wide, or about the size of one and one-half, or two of our average Maine townships. With deeply indented shores it still forms an irregular square. The northern and western shores are high and rugged; the hills at some points reaching a height of four hundred feet. From these hills the land gradually slopes to a smooth beach along the eastern and southern shores. This conformation gives the whole Island a southern exposure, with the hills sheltering it from the north and west winds.

The proximity to the Gulf Stream renders the climate mild and temperate—"the heat never excessive nor yet the cold intense." The eastern low lying ground is for the most part a rich loam, while the hill lands of the north and west are generally more light and sandy.

The farms are usually quite small, ranging from two to fifteen acres with a few as high as fifty or sixty acres. As showing the products of a Jersey farm the following is from the pen of Le Cornu, on the "Agriculture of the Islands of Jersey, Guernsey and Alderney."

He says a farm of twenty acres will, with few exceptions be distributed as follows: "Hay and pasture, 10 acres; turnips, 2 acres; mangolds, 1 acre; parsnips, 1 acre; carrots, ½ acre; potatoes, 2 acres; wheat, 3½ acres.

The stock usually kept will consist of two horses, six cows, six heifers and eight pigs. The farmer generally depends upon the members of his family to do the work, the men attending to the crops and the women to the cows. The main source of his income is from his cows. He grows wheat enough for his bread, but the butter and calves must bring in money enough to pay a high rent, from £4 to £15 per acre, and in some cases even as high as £40 per acre and other expenses. The average rental for the whole Island is £9 per acre. It is mainly for his cattle that all these turnips, parsnips, carrots and mangolds are grown.

The population of the Island is very dense, about two to the acre, forming one of the most complete colonies of small gentility possible to conceive, and who have preserved to this day, their ancient forms through all the disturbances of eight centuries."

This indicates settled habits that must be highly conducive to the formation of special breeds of animals. If the Jersey cow as we now find her, originated on the Island or Jersey, we must then look closely to her home surroundings for the source of her present characteristics. We believe, with Col. Waring that the Jersey cow is the product of the Island of Jersey—of its soil, its climate, its system of agriculture, the circumstances of its farmers, and the needs of the dense population there concentrated.

All classes and breeds of animals are the results of conditions, treatment and food. The Jersey is no exception to this rule. In her Island home with its dense population, her owner was forced to practice the strictest economy in order to pay the average annual rental of over forty dollars for every acre occupied. Every farmer of necessity became a butter dairyman—the great city of London readily consuming the product. In his business and life, he had no place for a show cow, but as the hungry need bread, so he needed an animal that would utilize and turn to the greatest good, every leaf, root and kernel he could produce for her.

Tethered out by ropes, and moved a few inches at frequent intervals that she might feed a little further into the standing grass or forage, she made clean work as she was gradually moved across the field and then taken back again to the place of beginning to repeat the process. In such farming there was no place for neglect. The lives of the farmers' family and his animals were united in a common cause.

Under these conditions and this treatment the Jersey cow became an economist. In those early years, as a thoroughbred she possessed a rugged form, characteristic color, fine legs, large eyes and crumpled horns, and yielded milk wonderfully rich in cream. But of far more importance than all these, she had, by force of an isolated position, in consequence of the uninterrupted continuance of the penal laws prohibiting the landing of live cattle upon the island, been bred in the line until she reproduced her characteristics in her offspring with that precision that alone marks the pure thoroughbred animal.

A breed of cattle possessing such admirable qualities for increasing the comforts of home could not long remain strangers in the countries adjacent to their own. Youatt, writing in 1834, speaks of them as being quite common in England at that time. Since then they have obtained a stronger foothold, and large numbers have been annually exported from the island to that country.

Among the first importations of Jerseys to America was one spoken of by Col. Waring in his prize essay on "Jersey Cattle" as having been made by Mr. Richard Morris of Philadelphia in 1817. The most important of the early importations were those of Taintor, Norton, Motley, Henshaw, and Cushing, about the year 1850. Jerseys were first brought into Maine about the year 1855, when Maj. Thomas Harward of Bath imported direct a bull and cow, and Dr. Holmes and W. S. Grant brought animals from Massachusetts. However much public opinion has favored the Jersey cow in these later years, it is nevertheless true that she was not well received by the generality of farmers upon her first arrival or for many years thereafter.

The leading cattle industry of the State had been ox-raising for the purposes of work and beef. In those days every barn in Maine

9

was the home of one or many pairs of oxen or steers. They furnished the motive power for farm work in summer and lumbering operations in winter. They had a brisk selling value for these purposes here, and a well paying market always awaited them at Brighton, the great cattle emporium of New England.

People would persist in comparing the Jersey with the beef breeds, for beef purposes. "What use," said they, "have we for the little yellow, peaked Jerseys? They can never make beef and they will destroy what we have already gained." Many times have I heard the assertion that "the introduction of the Jerseys has caused the cattle interests of Maine hundreds of thousands of dollars." They saw no place for the Jersey in their business and could not appreciate her mission.

Now it is not at all surprising that they should view the subject as they did, for the farmers of twenty or thirty years ago believed in general purpose animals. The newly introduced animals were not acclimated, and as grades were raised many of them found their way into the possession of men who gave them the crudest treatment, placing the delicate, nervous, sensitive young things with yards full of coarsely bred cows, steers and oxen, and because they did not prove successful "rustlers" and yield lots of milk they were condemned.

But from her first introduction she has constantly been making friends. A few young grade cows and heifers in the possession of careful farmers have had the argument all their own way, and since these first few years people have been constantly rallying to the support of the gallant little cow, until now she is acknowledged the queen of economists. Though the Jersey is a native of a temperate climate, she has abundantly proved that she is equally and admirably adapted to the extreme heat of our Southern States, or the vigors of a Canadian winter. At the same time this is not claiming that she can rustle with the native cow. Profitable dairying does not mean tests of endurance. The man who intends keeping only those cows that can endure the most neglect had better turn his attention to some other occupation. Dairying is not a question of which cow can do most with least food and attention; but the question is, with best appliances, and most intelligent handling, which breed will return the greatest profit for the outlay?

With reasonable care and feed the Jersey asks no favors, while we believe she will give a better return for extra care than any other breed. The Jersey cow is a machine that it has required a hundred and fifty years to produce and perfect. She was made for the special purpose of extracting from the various farm products that are used as cattle foods, those necessities and delicacies that enter so largely into the every day support of the people of the civilized world. Her cream and butter are not approached in quality by like products of any other breed of kine. Not only is she able to transfer the elements extracted from vegetable forms into products of such superior excellence as to cause them to be sought for by artists, epicures, and an intelligent consuming public, but she does this work with a greater degree of economy than any other breed of animals is capable of doing.

So far as practical tests have gone it has been proved beyond question that the Jersey cow gives more for the food consumed than any other breed of milch cows. Thirty years ago, he would have been considered an idle prophet indeed, who had proclaimed forthcoming events as they have transpired. That the choicest of fresh beef, direct from the great abattoirs of the Mississippi valley would be dealt out to consumers by the shopmen in every city, and at almost every country village and cross road in Maine, and at prices so far below the cost of raising as to ruin the business of beef growing in New England. That the patient oxen, working in the logging swamps of Maine would be superseded by horses, the majority of which would be brought from the British Provinces or the Middle States. These changes came gradually as they have in all interests of agriculture, and every year saw the numbers of oxen and steers lessening, either to make place for other stock, or the sale of hay.

While the industry of stock raising was becoming unprofitable and being abandoned, dairying was gradually developing and taking its place as the leading industry in New England agriculture. New methods of manufacture have been discovered and applied. The shallow pans have given place to the Swedish system of deep setting with the American improvements, and granular butter is the product of the modern churn. Better treatment and handling of stock prevails, and the problems of intelligent feeding are in process of solution.

And the dairy stock has been changing through all these years. The Jersey cow, introduced with so much opposition, has been quietly gaining in numbers, until now she is found, either as full blood or grade, on nearly every farm in central and southern Maine.

She has been the factor that has so leavened the stock of our State that when the time had come, and beef raising was forced to give place to butter dairying upon Maine farms, we found ourselves in possession of many cows well adapted to this special industry. Although insufficient in numbers for our wants, yet here were enough for the nucleus of an ultimate whole.

When the laws of supply and demand—the force that controls the movements of the world—had forced the farmer to recognize this future, he found the work of nearly half a century of acclimating and breeding the Jersey cow already accomplished, thus adding another fact in support of the axiom: "There is ne'er a lack but the world e'en fills it."

Our State was particularly fortunate in the quality of the animals comprising those first importations. They were of marked character and rugged make up, with well developed milking organs, and much constitutional vigor.

Quantity and quality of butter has been the object sought for by our breeders, and the pernicious custom of breeding for solid colors and fancy points has never prevailed among our farmer breeders as it has in some sections of the country where the external and not the internal qualifications determined her value.

It is not claimed that every Jersey cow is a good one. Among them are to be found poor and inferior ones as there are in all breeds. I am speaking of the Jersey cow in the interests of our working farmers, and a poorly paid and depleting agriculture. I believe her to be the key that unlocks the treasure that lies hidden all up and down these hills and valleys. Through her agency the products of these fields and pastures, these clays and loams, can be converted into that substance that passes current in every market of the world without discount, and a larger margin be retained by the yeoman tillers than by any other process yet employed.

Were I treating of the Jersey cow from any other standpoint than as a money maker for the poor man, I might tell her history for the last ten years, that sounds like a fable. How the great Eurotus first startled the world by producing 778 lbs. 1 oz. of butter in eleven months and six days. How, in the following year, Jersey Belle of Situate yielded 705 lbs. in 365 days. How incredulous the public were at the report of the yield of the Canadian cow, Mary

Anne of St. Lambert, which was 36 lbs. 12¼ oz. in seven days! Soon following came Oxford Kate, with 39 lbs. 12 oz. in seven days; and when Princess 2d yielded 46 lbs. 12½ oz. in seven days no one cared to venture an opinion as to what the possible limit might be.

How the spirit of speculation took possession of Jersey owners, and how fabulous prices were made and met upon animals carrying even small percentages of blood in common with these great testers! Animals that before tests were made were valued only at hundreds, afterwards sold even as high as $30,000. At the Kellogg sales in New York where hundreds of animals were offered and taken, the prices received averaged over a thousand dollars for every creature in entire lots. Every corner of the world was searched for animals in whose veins ran, even though much diluted, the blood of Coomassie, Rioter, Victor Hugo, or Stoke Pogis.

After running its course, as all booms do, prices settled down until they were based on actual worth for breeding and work. Here, the Jersey cow proved herself a money maker for some people and a money *loser* for others.

There is another class of people who receive dividends from the Jersey, in the way of satisfaction and pride, in the possession of a creature of such beautiful, deer-like form, with large, lustrous eyes, mild and gentle disposition, and the many attributes a young lover sees in the object of his adoration. With poetical fervor he sings:

"So I let down the bars and my pet comes through,
With a step that a duchess might envy, and now
With a grateful moo and a musical low,
She enters, so glossy, and stately, and slow,
My three-hundred-dollar prize Jersey cow."

The intrinsic value of a Jersey cow is the quantity of milk and butter she will yield yearly, for from ten to fifteen years in succession, in connection with the calves she may produce. Men marvel how an ordinary sized cow can give such quantities of milk and such extraordinary yields of butter. The secret lies in presistent work day by day. There are no holidays in her calender. A generous diet all the year round has encouraged her to continue her flow of milk until with many Jerseys it is extremely difficult to dry them off before producing the next calf.

Wm. Crosier, in speaking of the Jersey says: "She will milk the year round—at least that is my experience with them. I usually milk them within a month of the time of calving, which is of great value to those who have contracts to supply families with butter the year round. I then get a steady supply from the Jerseys, while other breeds do not hold their milk so long, with the exception perhaps of the Ayrshire."

Writing of the importance of presistence in milking, Maj. H. Alvord, says: "I place this habit, this attribute of the cow first of all. A large flow of milk when a cow is fresh is very deceptive and often leads to carrying an animal which really, in the course of the year is a source of loss."

The following experiment was reported by Gen. W. S. Tilton when in command at the National Soldiers' Home near Augusta:

"The herd consisted of Dutch cattle, Grades and Jerseys. The average of milk per day for the whole year, as compared with the average weight of the cows of each class was: Dutch one and fifty-six one hundred per cent of live weight; Grades one and fourteen one hundred per cent of live weight; Jerseys one and twenty-eight one hundred per cent of live weight. The proportion of cream was as follows: Of Dutch it took three and two one hundred pounds of live weight to produce one quart; of Grades it took three and eighty-eight one hundred pounds of live weight to produce one quart; of Jerseys it took two and twenty-nine one hundred pounds of live weight to produce one quart.

Near many of our cities, the milk men are employing Jerseys to the exclusion of other breeds. To a certain extent they are obliged to do so in order to retain their customers who demand rich milk. Notably is this the case near Bath, where nearly all are high grade Jerseys. These men say, the Jerseys milk so much longer than cows of other breeds, that they yield quite as much milk when the whole year is taken into account.

When the practical man adopts the plan of daily weighing and recording the milk produced, he accumulates convincing testimony. In my own experience with the Jerseys, I have found the annual milk yield of cows after three years of age, to be from about 5,000 lbs. to 7,500 lbs. each.

While Jersey milk may be regarded as quite uniform in its butter capacity, yet I have had extremes where in one animal 20½ lbs. of milk were required for a pound of butter; in another 11¼ lbs. were sufficient for a like amount.

I have found 16 lbs. to be about the quantity of Jersey milk required for a pound of butter on the average. With this basis the cow yielding 5,000 lbs. of milk produces, approximately 300 lbs. of butter; and the cow yielding 7,500 lbs. of milk yields above 450 lbs. of butter.

In my private dairying with a herd of ten or twelve Jerseys, about one-third of which were usually heifers, the average, annual yield of butter to each animal was over 300 lbs. I find these conclusions are similar to those of other Jersey breeders. I might add the testimony of Guild, Floyd, Pike, Ellis, Briggs, Alden, Crane, Gardner, Litchfield, Ingraham, Reed, Snell, Robbins, White, Robinson, Whitney and many others. I have failed to find any one who has an extensive experience with Jerseys in the butter dairy who is satisfied, even when a large part of the herd consists of heifers, with a less annual yield than 300 lbs per animal.

In order to secure such results, only the best of management can prevail. Comfortable, frost proof, attractive homes must be theirs in winter, where the genial sunlight may stream in upon them as they repose and ruminate. Provender must be fed—not in large quantities, for a time, and then withheld, but regularly every day while the creature is in milk.

A moderate grain ration for a cow for the year, is something like this: 2 quarts of wheat bran per day for the whole year; 1½ quarts of cotton seed meal and 1½ quarts of corn meal for 310 days each year. Or, 700 lbs, corn meal, 700 lbs. cotton seed meal, and 600 lbs. wheat bran—a total of a ton of mixed grain fed to each cow per year. When we speak of feeding grain to cows continuously, in however moderate quantities, there are lots of people who always hold up their hands in holy horror and exclaim, "You will ruin your animals! It is unnatural! You will drive all the milk out of them in a year or two at most, and then you will have nothing but old burnt out, worthless cows left on your hands!"

Lamentable as sometimes is the truth, it is nevertheless the fact, that large numbers of our people, either through ignorance or a willful determination to adhere to preconceived notions, are not able to discriminate and adapt themselves to the changes that have been wrought in our agricultural problems during the last thirty years. The grain ration which I advocate is a moderate one, extending over the whole year. It is just sufficient to nourish the cow and keep her in that rugged, vigorous, healthy condition that she must enjoy before she is able to yield to her possessor, her greatest measure of good. Let reason and experience answer how long this work can continue.

Were not the milking organs of the cow made for use? and should they not continue in perfect working order during the whole period of her vigorous life? While in my experience I have never had an animal injured by injudicious feeding, I can cite numberless cases of long lives of usefulness where the grain ration had been a twice daily accompaniment from the first milking year, up to old age.

I will give one instance in support of this. The cow Pet, seven-eighths Jersey and one-eighth Ayrshire, I raised from calfhood. Every day of her life, when in milk, she received her provender regularly, and as regularly performed her work. When fourteen years of age she gave 14 lbs. 2 oz. of butter in seven days, and yielded 8,734 lbs. 15 oz. of milk during the year. From four tests, made at different seasons of the year, to find the quantity of her milk required to yield a pound of butter, it was found that her butter yield for the year must have been over 425 lbs. I think this yield of her fourteenth year was as large as she had ever made.

When speaking of the spirit of manliness and independence of the native working men of the United Stated as compared with the laborers of other countries, we ascribe it to the influence of our free government and institutions. Do we not lose sight of the fact that the food of our native bread winners is of a much higher quality than that to which their brothers in the Old World are subjected? Is it not to this, more than all other causes, that they owe the ability to perform with alacrity and skill those greater tasks; and which makes them so intollerant of any aggression upon their supposed rights?

The average grain ration for the year, that I have mentioned, viz. 700 pounds corn meal, 700 pounds cotton seed meal, and 600 pounds wheat bran, taking an average of prices for the last five years, would cost not far from $25 on a line of railroad in central Maine. During that part of the year that the cow is fed exclusively from the barn, she will consume twenty pounds of hay per day. Allowing her to be fed from the barn during the entire year she will consume 3 tons 13 cwt. of hay, which at $10 per ton will cost $36.50. Added to the cost of grain, this gives the food cost of keeping the cow at the barn during the entire year, without recourse to pasturage, as $61.50.

If she has good pasturage from May 15 to Sept. 15—four months—a saving of feeding 1 1-5 tons of hay would result, and the cost of support for the year, be reduced to $51.50. This gives the food cost for one pound of butter, when there is no pasture in connection with the farm, as 20½ cts. But when there is pasture, as is usually the case, the food cost for each pound of butter would be 17 1-6 cents.

Now, the practical man is asking himself the question: Can I bear the expenses incident to the investment, taxes, cost of handling the stock and manufacturing and marketing the product for the margin of difference between the cost and selling value of the butter?

A source of income not taken into account so far, is the heifer calves produced. These calves, fed upon the sweet skimmed milk —not for two or three months, but until they are eight or ten months of age,—in connection with two quarts of wheat bran daily until the time of coming in with the first calf at two years of age, will have so well developed milk organs, and such vigor of constitution as to be able to do profitable work in the dairy herd, and continue to grow without serious check until they attain weights from 1000 to 1200 pounds. There is a sharp demand for such cows, and the country is being constantly canvassed for them, for use in other states.

Our city milk men are always ready to pay well for them, and in neighborhoods where dairying is increasing in importance, and creameries are being established, they are eagerly sought for. There is no branch of cattle growing that pays so well as the raising of grade Jersey cows of substance and quality. This feature is a side issue to, and should always occupy a place upon the dairy farm.

Another source of income, is the great underlying corner stone of our agriculture—manure. By the employment of the cow, the hay is sold upon the farm, the farmer receiving ten dollars per ton in cash for it, and the farm retains nearly all the manural properties it contains. The Jersey cow, as a machine, extracts ten dollars per ton in cash from that hay and gives it to her owner. She takes from that hay its fertilizing element with greater economy and certainty, than the chemist can do, and gives them free of expense back to the acres that produced it. She pays cash for the ton of grain that is purchased for her each year, and extracts from it an amount of plant food, equal to what is contained in two tons of good hay, thus increasing the manure supplied to the farm more than fifty per cent yearly, from this one source of grain feeding alone. Aside from these considerations, she leaves with the farmer that cash margin between the food cost of the butter, which we have seen was, according to surroundings, either twenty and one-half, or seventeen and one-sixth cents per pound, and its selling value.

And, what is the selling value of Jersey butter? In discussing this question from a practical standpoint, I do not think it best to reach out to those possible prices that are obtained by a few expert producers and salesmen, and claim them to be within the reach of large numbers of less favored workers. I will say this however: In sending our Jersey butter to Boston, we have always received a higher price than the best Western Creamery butter was selling at. When first placing the butter product of over twenty Jerseys, comprising the College Farm herd, in the Bangor market, it was with difficulty that I was able to find a dealer who appreciated the idea of handling it at a price above the regular market. I was told that the consumers were not educated up to fancy butter, and that ours could not be sold at an advance. But by giving the public an opportunity to test and compare it, we soon had ready sales, and for four years our wholesale price averaged not far from thirty cents per pound, and we were constantly far behind the orders of our dealers. Bar Harbor was an outlet for a few months each year at net 40 cents per lb. wholesale. In order to secure remunerative prices, we must be able to guarantee uniformity as well as high quality in every pound sent out.

The superlative excellence of Jersey butter is a never ending theme for praise with those who are familiar with it. We are told that in other countries it is not uncommon for epicures to eat at a single sitting a pound of freshly made, lightly salted Jersey butter.

While I hope this may never be true of our own people, it is nevertheless an established fact where consumers are supplied with an article, freshly made, lightly salted, waxy, firm, and filled with delicious flavors, that it is eagerly and greedily devoured. Reasoned from this standpoint, the demand for Jersey butter is not likely to diminish.

I do not claim that the business of butter dairying is a quick or easy road to wealth. The profits are only moderate and there is exacting work all the way along. Why, in a measure, will not the Jersey cow do for the people of New England what she has so nobly done for her originators in her island home? Our natural advantages are not surpassed. We have a health-giving climate and a naturally productive soil, and are close at the doors of the best paying markets of the country. Instead of being rent payers we are land owners. Through the influence of the Jersey cow the condition of the present may be changed and our future redound with a prosperous agriculture.

THE GUERNSEY COW.

By E. F. BOWDITCH, Millwood Farm, Framingham, Mass.

Mr. President and Ladies and Gentlemen:—

In addressing you upon this subject of the Guernsey cow I should be glad to have anyone ask any questions they desire. The answers thus brought out will serve to give a more careful description than I should otherwise be able to convey.

The Guernsey cattle came from the island of that name, which is one of the group between England and France, about sixty or seventy miles from England. The nearest of the group, Jersey, is within about fourteen miles of the coast of France. The climate is very different from ours. It is very much warmer, and the cattle graze practically all the year, at any rate, ten or eleven months. The breeding of the animals on those islands has been rather peculiar. How the breeding originally started is not clearly known, but the laws have been very strict there for many years, so that the animals have been kept distinct. When the animals were first imported to this country they were all called Alderney, probabably for the reason that Alderney was the last of the group at which the steamer touched on its way back to England. But it is a misnomer to call them Alderneys. The Jerseys were the first imported here and they were then known as Alderneys; but they are entirely distinct, or have been for the last few years. The laws of the Island of Jersey are such that an animal carried there must be killed on the moment of its arrival, no matter what its age. The islands of Guernsey and Alderney, and two little islands that amount to almost nothing, breed their cattle together, so to speak, and many years ago a few Jerseys were probably dropped off of the steamer before the laws were so stringent, on to the island of Alderney. But the laws are now such that no animals except from those little adjacent islands are allowed to land on the island of Guernsey. The breeding of the animals on Guernsey and Jersey have been rather different in many ways. The people of Guernsey, which is much the smaller island, are strictly an agricultural people. They raise a great many vegetables for the London market, and almost every farmer has his few cows. I think I did not see a single animal loose on the island of Guernsey when I was there. They are tethered, or, as they call it, "pegged out." The breeding there has been following the line of the cow that was productive of the most and best butter, without any regard to her color or personal peculiarity, whereas in Jersey they have gone more for fancy colors. On the island of Guernsey you find cows of light red, brindle, brindle and white and black and white and some with black noses, although the breed is supposed to have a yellow nose, and I think it is much better to keep it so if possible in order to distinguish it from the Jersey. The Guernsey is a very much larger animal than the Jersey. I should say the Guernsey cow at maturity on the island would average about 1100 pounds. They are taken care of almost wholly by women. The men have very little care of them in any way, either in the barn or at tether. The kind treatment they receive from the women renders them very quiet and tractable. I have seen on the island one woman leading seven cows with perfect ease by long ropes to tether them out. They are pegged out ten or eleven months in the year, and they feed them a little grain. I think the largest yield of milk I heard spoken of on the island was twenty-three quarts a day. That is rather large. The average Guernsey cow on the island is said to give sixteen or seventeen quarts, and in her best estate, at five or six years of age, is expected to make two pounds of butter a day. They generally come in with their first calf at about two years of age, and at that age are expected to give about a pound of butter in the flow.

Question. You speak of feeding grain. What kind?

Mr. Bowditch. On the island they feed principally bran. For the last few years they have been feeding a great deal of our American grain, and they are beginning to feed more corn meal and a little cotton seed.

The people there are very primitive. They do exactly as their forefathers did and it takes years and years to start an innovation. The climate is mild in winter and a great many English people go there on that account, temporarily. One of their main streets is so narrow that you have to get onto a doorstep to escape being run over when a wagon comes along. The land is very much broken and the island is only about six miles square, yet they have, I think, about four thousand animals, which gives a good idea of the richness of the soil.

One great advantage in the Guernsey cow is the very high color of her milk. It is very much higher colored than that of the Jersey. To go into personalities a little, when I first began to make butter I went into the Island of Jersey and bought me a herd of Jerseys, and I made butter for the Boston market. That was twenty-five years ago. I made through the winter a butter the color of which which was perfectly satisfactory to the market and used no artificial coloring. I don't mean to disparage the Jerseys, because I have bred them a good many years and have had some very good ones, and still have the greatest respect for them ; but I was led to change my breed after having bred the Jerseys for ten years. At an auction sale in Boston of imported Guernseys I bought two heifers, and one of them calved the next January. In a few days her milk was put in with the milk of the rest of the cows. My dairyman who made the butter was not a very good friend of my herdsman, and he informed me one day that the herdsman was not feeding my cattle according to orders; said he was feeding too many carrots, and called my attention to the butter. I was milking twenty-two Jerseys and this one Guernsey heifer. I looked at the butter and concluded somebody had been doing something wrong. I went to the barn and was there assured that there had been no change in the feed. I could not make it out until it came into my mind that possibly that little Guernsey heifer might have made the difference. I set her milk and churned it separately, and I found that it had. It was quite a lump of leaven for one two year-old heifer to color the milk from twenty-two Jerseys. That was one of the reasons that induced me to think more of the breed. I bred from those two for several years, and finally gave up the Jerseys, although the last three I sold made records of twenty-three pounds of butter a week. Now I am breeding Guernseys. Their being a larger breed seems to make them an all-round cow for the farmer, because you have a calf of good size for veal and steers large enough to make workers, and they are not quite as nervous or high strung as the Jerseys. The Guernsey bulls I find no trouble with whatever. I work them in yoke as I do my oxen. I don't know that I can describe the appearance of the Guernsey any better than to say that she would remind you more of a very yellow skinned rich grade Shorthorn.

She is a large cow, not as handsome as the Jersey. She generally has a large head, a full placid eye, and a pretty large nostril, a tapering neck, large round body and pretty straight back. She is well developed as a rule. But the great peculiarity about her is her yellow skin. In the summer season when they are in the highest color, you cannot move a hair from her horns to her hoofs but beneath you see a golden skin, which is almost a sure indication that the butter will be of the same desirable color.

Question. Can you get bigger calves than from the Jerseys?

Mr. Bowditch. Twice as large. I set my Guernsey cows, two years old when they come in, to be larger than the average Jersey decidedly. My bulls at a year old I want to have weigh about 800. The largest bull I ever had was one I kept until he was seven years old, and he weighed 1998 pounds.

With reference to the winter butter of the Guernsey, it is not necessary to try and make the color high. Twenty years ago the market did not demand butter with a high color. If it had a show of straw color and was good butter that was all that was required. But it seems to me as I have watched the market that it has been since the introduction of the Guernsey that the demand has come for higher color. I had been in the habit of feeding carrots to my Jerseys which has an effect on the color of the butter, and I did the same by my Guernseys, but soon found I was losing customers, as they said they would stand only a certain amount of coloring. But by feeding corn stalks I managed to make butter satisfactory to the trade.

Question. Do you find it so high colored that it is objectionable in the market in the summer time?

Mr. Bowditch. There are very few dairies of pure Guernseys, and most everybody who purchases Guernsey butter, believe that the butter is not colored artifically, and so they are willing to take it. In my first importation of Jerseys some of them made almost as high colored butter as the Guernseys; but when the fashion came for black faces and solid silver colors they bred out the innate richness which used to apply to the Jersey. They are coming back to it now, however, and I rather think better cows are leaving the islands of Jersey to-day than for many years.

Question. Do your Guernseys average more milk per cow than the Jersey herd?

Mr. Bowditch. They have done so with me. The highest yield I have ever had from a Guernsey cow is forty-seven pounds. She gave nearly 9,000 pounds in the year. I make my winter butter partly from corn stalks, hay, and four quarts of meal, and when I am grinding my own meal it is corn and cob meal.

Question. How does the composition of the milk compare with that of the Jersey?

Mr. Bowditch. It is practically just about the same. I don't think the analysis would show any material dtfference, because, as far as that goes, the Jersey is a wonderful producer. But it is more in the color of the Guernseys, and many Guernsey breeders think the butter a little higher in flavor. I have found it to stand up as well as the Jersey butter.

Question. Do you find the yield of butter to be greater or as great in the Guernseys as the Jerseys in similar herds, in your experience?

Mr. Bowditch. Very nearly the same, probably a little more.

Question. Do you find in the calves a greater degree of hardiness immediately after birth than in the Jerseys?

Mr. Bowditch. That depends upon the manner in which the herd is taken care of. I believe much of the trouble in having delicate animals arises from not taking the proper care of the older generations. When I first imported my Jerseys I bought a farm with native cattle on it. My Jeresys arrived in September, and except some very cold days when they were not turned out to water, they were taken the same care of as the native stock. I have never had any trouble with unhealthy cows. One of the great troubles with all of us is that we keep our stables too warm and not well ventilated perhaps. The cattle did not produce as much perhaps in old times when the snow used to sift in through the cracks, but they were healthier. My idea is that it is better for the health of the cattle to go to the extreme of letting snow and wind through the cracks than to keep the cattle too warm. If we do not give an animal pure air to breathe, and still force it with hot food, we are burning at both ends.

Question. But may you not have fairly warm barns and pure air at the same time?

Mr. Bowditch. Yes; but you rarely see it. We cannot of course keep anywhere near the nature of the cow in our requirements of her, because that is merely to give milk enough to raise her calf. Now we want her to give about three cans of milk a day, and besides that to make two pounds of butter a day. Of course that cannot be done, but at the same time we can approach very near to it. I very much rather in the morning to find that the manure had stiffened a little with the cold than to have the stalls full of oppression. There is not a day in the winter, even when it is below zero, that my side ventilators and top windows at the cow shed are not open, so that there is never the slightest feeling of bad air. And the effect of that bad air spoils the product of the cow. Expose milk to it for but a short time and it will be impossible to get first class butter from it.

Question. Do the Guernseys breed reasonably even in these qualities you have described as characteristic of them?

Mr. Bowditch. Very even. You can find individualities in any breed. There are exceptions to the rule of course, but from a selected herd they breed very true and regular. I should say, without any disparagement, that if you took from a herd of fifty or sixty Guernsey cows the one that gave the lightest colored butter you would find it higher colored than the highest from a Jersey. There are exceptional Jerseys that make just as good butter as is made from any cow.

Question. To what extent have these cattle been imported into the country?

Mr. Bowditch. There are very nearly as many in this country as on the Island of Guernsey, between three and four thousand. They are in Pennsylvania, a great many in Chester county and thereabouts, a great many in Philadelphia, quite a little plant of them in Connecticut, and Wisconsin within the last three years has been making a tremendous stride in that direction, car load after car load having gone out there, and they tell me it is having a decided effect upon the quality of the butter.

Question. In case a man wished to purchase two or three animals, how would the price range as compared with Jerseys?

Mr. Bowditch. The Jersey market is a little unsettled just now. I don't think the Guernsey breeders have tried to boom the breed, because none of us have been really much overstocked. On the island of Guernsey, you buy a very good two-year-old heifer coming in for about $125 or $130 there. And so it would make it worth here about $225 or $230. Of course after the animal has matured and had two or three calves and proved herself a good butter cow, her value increases.

Question. In choosing your males, to what color do you give the preference?

Mr. Bowditch. I have always tried to have nothing to do with color. The main thing in the Guernsey I should say is to secure good size, strong constitution, yellow skin, and a light colored nose, although the latter really means nothing. In our Guernsey scale of points we count that nothing. It is a mere fancy. Out of a scale of 100 points the quality of milk mark of the Guernsey is 30, quantity and duration of flow 40, size and substance 16, symmetry 14, so that the real points of quality of milk and quantity and duration of flow are 70 points out of a hundred.

Question. Then do we understand that you consider the higher color of the butter product to be the chief reason of her superiority over the Jersey?

Mr. Bowditch. And the finer flavor of the butter. The Guernseys are also a more rugged breed of animals than the Jerseys. The Jerseys have been bred down too fine. I have kept each breed about twelve years.

Question. Do you consider the butter from the Guernseys of a finer flavor?

Mr. Bowditch. I do. That is what the market says.

Question. Is the Guernsey butter as firm as the Jersey?

Mr. Bowditch. I have found no difference. As a breed I don't think there is a cent's worth of difference in the "standing up," as you call it, of the two kinds of butter.

Question. Do we understand you claim a stronger constitution for the Guernsey as a breed than we find among the Jerseys?

Mr. Bowditch. Yes, that has been my experience.

Question. Is it generally recognized by the breeders of that breed in this country?

Mr. Bowditch. I think so, for the reason that a good many Jersey breeders have gone over to the Guernseys and tried them and haven't gone back.

Question. How does the quality of the beef compare?

Mr. Bowditch. The Guernsey beef is delicious, but it is yellow. The Jersey beef is decidedly yellow, and the Guernsey desperately yellow. It is disgustingly yellow when you see it hung up, but very good when you get it cooked and browned over.

In my reference to butter making of course I shall have to confine myself to my own methods more or less. One thing that is of importance is cleanliness. Without that you cannot make good butter if you have the best herd of cattle and the best dairyman in the world to make the butter. And cleanliness begins in the barn. Your cows and barn have got to be kept clean, and the barn free from bad odors. The cow that breathes bad air all the time will have her milk affected by it, and about that there is no question. And the feed must be clean. I know I shall be doubted in a good many statements; but I go so far as to say with reference to feed, a fact derived from my own experience in the sale of butter in the open market, that one feed of turnips to one cow in a herd of twenty-four cost me ten cents a pound on the butter of that churning; and that seems rather a broad statement. You get used to the taste of a certain butter. If I feed my cows on bran and oil meal with any regularity I get word directly from my dealer in town that I am feeding something I had better not. People don't like it. So in feeding my cows I have come down to feeding well-cured corn-stalks, well-cured oat-fodder, early cut hay and corn meal. I am milking from sixteen to twenty in my herd. I can feed a little oil meal once in three or four days to one cow at a time and have no fault found; but more than that in the way of feeding oil meal or bran I have never been able to do. I have found that if you put oil meal or bran in your mouth and chew it up so as to get the taste, that taste you will get again in the butter made from cows fed with the same. I am speaking, of course, of fancy lump butter.

There is a good deal in the manner of manipulating butter. I have tried a good many methods of making it. My barn is well ventilated and the air in it is fresh and sweet, but as soon as a can is filled with milk it is taken out and put into the creamer at a temperature of 94°. I use ice the year round and try to have the water in my creamer always below 40. All of the cream is up inside of twelve hours, but if I am not milking a large number of cows I generally allow it to set on the milk for twenty-four hours. I churn three times a week. In the winter the cream is kept at a temperature of about 65, about ready to churn, and in the summer it is kept cooler until twelve or fourteen hours before churning, or the time necessary to get it to the proper temperature for that. The cream must be slightly acid to give the best results to the butter. If you keep it too cold and then raise it to a temperature of 85 or 90 when the right time comes round to get it ripe to churn, and then let it cool down again, you injure the flavor. You damage the flavor by getting the cream too hot or too cold. Some people do not hesitate to allow it to go down almost to 32 or thereabouts, but in my experience it hurts the quality of the butter.

After you have got the cream ripe enough to churn the next important consideration is the vessels and utensils to be used, and the condition in which they are kept is of more importance than the kind you use, though I would say that the churn that is entirely empty, the barrel churn, or something of the sort without spatters, is very much better, for the reason that with anything like the cylinder churn and spatters or dashers attached that I have used you cannot get a perfectly even lot of butter. You cannot get the same action on the cream with the latter kind that you can with one which has no attachments in it and which simply splashes the cream against the churn. In winter I churn with the cream at a temperature of 62 to 65, and in summer sometimes down to 53, according to the day and the warmth of the room. You will be about half an hour in having your butter come, whatever kind of a churn you use. I do not think you can get quite as good butter by getting the cream at a little too high a temperature in order to try and shorten the time of churning. My experience is that thirty-five minutes is about right. The churning should stop when the kernels come about the size of a grain of wheat, or even smaller, as soon as they are firmly gathered. The hands under no circumstances should even touch the butter. I think it makes very little difference whether you wash the butter with clear water or brine. I generally make one or two washings with brine, and if it does not come off perfectly clear I make one or two with clear water, and when the water is perfectly clear I take the butter onto the table to be rolled with a butter roller. For about a year I have worked my salt in with a wooden rake. I think I obtained better results from that mode. I put onto the table about ten pounds of butter in the granular form, at a time and put onto it nearly double the amount of salt that I would if I were going to roll it in, because in that way a good deal dissolves and you don't get anything from it. Then with the butter in this granular form and the salt thoroughly raked in, I cover it up perfectly tight and allow it to stand a number of hours, at least four or five. Generally it is more convenient for me to churn in the afternoon and put it up in the morning in half pound lumps. You will find by that process that when you take the butter to work it the salt has dissolved and worked all through the granules very thoroughly, and upon rolling it out two or three times under the roller, and in bringing it together again, if there is any moisture you want to get out, use sponges, and bring it together by the same method. That is a general outline of it.

Question. You say you feed corn meal. Do you think you get as much and as good butter from corn meal and wheat bran as you can from wheat bran and cotton seed?

Mr. Bowditch. I know I can get better butter from corn meal than from anything else I have ever fed. I don't know of any butter that brings the highest price that is not from cows fed on corn meal. The Darlington butter that has such a wonderful reputation is from hay and grain, and almost no bran. He gives his cows all they can eat of clover hay and meal. We would all feed clover hay if we could get it. If you make medium priced butter, thirty-five or forty cents a pound, you can feed from ensilage bran and cotton seed. It gives very nice and good butter; but I am speaking of what I know more about, and that is the higher priced or fancy butter. A friend of mine has a herd of Guernseys and runs a sort of private creamery, having several herds of cows in the neighborhood. He feeds his grade and common cows on ensilage, and makes a hundred or more pounds a day of the common grade of butter, as he calls it, from purchased milk, and gets about forty cents for it; and it is very good butter. He is not in the habit of feeding ensilage to his Guernsey stock, but makes that butter up separately, and that brings a good deal more a pound. His man thought he would try an experiment of feeding ensilage to the Guernseys without his master's knowledge, and the result was that the butter did not bring as much as usual. It may be the taste of the people were vitiated by having butter from cows fed on hay and corn meal, but that I don't know.

Question. How much meal do you use?

Mr. Bowditch. Four quarts, and sometimes a little more to an old cow that needs a little building up, and two or three to a heifer.

Question. Do you ever get as good flavored butter from dried corn fodder as hay?

Mr. Bowditch. No, nothing will make so good butter as good clover hay and corn meal.

Question. What is your next best?

Mr. Bowditch. Early cut grass, the more of a mixture the better.

Question. How about Hungarian?

Mr. Bowditch. It will produce more milk than butter, but is an excellent fodder.

Question. We understand you are making butter for a fancy market and at a high price, so you can afford to be particular about the feed of your cattle. Now, we down here in Maine are making butter for thirty-five or forty cents a pound. Would it be advisable for us to sacrifice cotton seed, wheat bran, ensilage and the coarser farm products and feed your more particular rations with the possibility of securing the higher prices which you obtain?

Mr. Bowditch. By no manner of means.

Question. Is there an unlimited market for the higher priced butter which you are making?

Mr. Bowditch. It is limited. The whole butter market has changed within the last twenty years. Twenty years ago it was the custom for people to buy their butter in the fall, having it laid down, and keep it all winter. Now butter comes into the market within a week certainly of the time the milk is drawn from the cow, and nowadays they buy but ten pounds where they used to buy two or three hundred pounds at a time. The whole system has changed. There does not seem to be any limit to the amount of butter that is wanted at the price of forty cents, more or less.

AYRSHIRE BREEDING.

By Prof. James Cheesman, Boston.

Few of us can recall any period in the breeders' experience more interesting than the present, and none when the breeders' art demanded greater knowledge and larger courage than in our time. Of all the breeds of dairy cattle, the Ayrshire is one of the few which has not been injured by booming, high pressure tests for milk or butter, or for elbowing out all competitors. If the Ayrshire has escaped these vices it is largely owing to the fact that her owners are plain, matter-of-fact farmers, working their cows for a living. She has progressed slowly, but none the less surely, because she has lived a rather isolated life of self-confidence in the memory of past deeds. The influence of the Ayrshire in the development of American dairying has been so pronounced that all the best known breeders of thoroughbred stock have been owners of Scotland's choice at some period of their lives. Why is it that this cow with her grand inheritance of constitution, as rugged as the Scotch mountains, and as enduring as the rocks of her early new England home, has not asserted her influence with as much emphasis of late years? The answer is simple. Fashions in animals, as in coats and bonnets, change. The old Ayrshire men have not been as aggressive as some of their rivals, and so the public interest has been allowed to flag a little. The present day breeder is a man of greater possibilities than formerly. To maintain his position in the ranks he must satisfy the market demand for a cow of greater capacity for dairy work, and a larger net profit on the working life of the animal. This is a large order. How can we face it and promise to fill it with any degree of certainty? The steam engine, the dynamo, the cotton mill, and the railroad train have within a generation of lives doubled their capacity. The acre has in many cases more than doubled its capacity, but how can we expect the same rate of increase when we come to deal with animal life? All experience has its limitations. The number of farm animals living a merely commercial life, which have doubled their earning power within the last decade, is always on the increase. We c nnot enlarge the power of the dairy cow without still further specializing, and intensifying her mode of living, and indeed her nervous organization. On the turf the greatest performers are animals having most nerve power. What is the character of a horse's life? To be well bred, to have come from a line of ancestry of spotless fame is really only half way towards suceess. Every breeder and trainer knows this, and is quick to appreciate the fact by careful, patient and unremitting attention in the stable and on the track.

How can we expect the modern cow to give us her bounty year in and out if we continue to treat her as we do. With her increased activity as a milk maker, she has in too large a number of cases become less robust. Intensity of the milk secreting function has in many instances been accompanied by a supersensitiveness to climatic changes. Some stockmen are too apt to coddle their cattle, closely confine them in ill ventilated stables, or expose them to draughty barns having openings in the walls, floors, and roof in all sorts of irregular places. The modern notion of keeping cows penned up in their stalls the entire winter, feeding water warmed to temperatures of 60 to 80 degrees—is enervating in its effect, and tends to morbid conditions of living. The increase of tuberculosis all over the world seems to indicate that while we have advanced in the matter of pedigrees, and record making, we have not been quite so successful in making strong and vigorous animals, nor in keeping them so when we have made them. That this is so is largely because of the peculiar conformation of the cow. The ideal dairy cow is a wedge shaped animal sloping from front to rear. In this differentiation there is a transformation in the relative size and activity of the vital organs. In winter she cannot be exercised like the horse or the ox, and so the lungs of the cows, unless the stables be well ventilated, and comfortable are peculiarly liable to disorder. So prevalent has this disease become in Europe that physicians from all the principal nations deemed it important enough to call a Congress in Paris to discuss the whole question. The large mortality of calves, among the dairy breeds bears evidence of the highly organized physique, and its greater susceptibility to tuberculosis. Weak bowels, and unthrifty growth tell their own story, and too often end in the death of the calf. There is perhaps no better testimony to the vigor of an animal, or the skill of the stockman than the health and thrift of his calves. The more highly born the calf the more sensitive it is to unsanitary quarters, and to kindly and rational treatment of all the farm animals the calf is perhaps the most responsive to proper living. Unless the calf pen is dry it can never be warm. Heat, comfort, and contentment are absolutely essential to all infant life. If withheld, a stunted growth will be the result even if the calf has escaped death. The care of the calf during the first twenty days of infancy is of more importance than any amount of care and attention bestowed afterwards. I consider the attention to the calf the most important of all the labor of a live stock farm. The best bred stock, and the best known animals in the stockman's world are those that were well nourished in infancy.

Never were the prizes in the breeders profession greater than now, and he who can offer the cleanest bill of health, and point to an unbroken record of animals free from disease may always have the preference in the sales market. Among farm animals we have no parallel of the dairy cow, our illustrations must come from the human. The man of to-day who is capable of prolonged effort in his profession or business, who scores the greatest success is the one whose life has been most rounded out by diversity of scene and occupation. Generally he is an athlete whose body is the ready servant of a clear mind and strong will. The athletic exercise of the youth or adult is a pleasurable occupation but it yields no profit which can be recorded in a ledger account.

How can we secure the physical advantages of athletic exercise for dairy stock? Many breeders have already begun by breaking bull calves to work on tread powers, and in the yoke. While I would urge persistence in this course as the best means of maintaining health, and improving the vigor of offspring, it is no less important to the stockmen as a remedy for the mischief and the serious accidents so often caused by bulls leading idle lives in pent up boxes and stalls. How many deaths have been caused by keeping bulls isolated in lonely stalls, a terror to visitors, and in too many instances an object of suspicion to their attendants.

What is the object of the breeder? Surely he has something beyond the desire of reproducing offspring as capable of earning profit as the parents. Every breeder has his own ideal. To most men it is to get as many animals in the pedigree of high merit, a praiseworthy object in itself. but certainly this alone does not cover the requirements of the modern breeder. Line breeding and family bias have been too long persisted in by some men for the sake of preserving a specific type of animal. The most successful breeders the world has known are the men who possess the stockman's instinct.

The true stockman is a child of nature. He knows what he wants and sets out to secure it Often of rugged constitution himself, possessing a good stomach, he enjoys his food ; he is large hearted, full of animal spirits, quick to delineate good framing, fine proportions, and symmetrical finish in his stock. Such men seldom err in their mating of stock.

One of the best object lessons in breeding may be had at little cost by attending a combination auction sale of three or four hundred head of animals Among this number every conceivable type may be met with,—narrow chests, hollow backs, short quarters, goat-like udders, slab sides and papery skins. If an animal has a passable udder, and has come of good stock, defects of structure and delicate constitutions are too often overlooked. Without a good habitation, and fairly good nerve power it is hopeless to expect that mere udder development and fine skins will be perpetuated.

If we have no perfect animal as yet from which to pattern our operations, we at least have a great wealth of experience in the failures and successes of modern breeding. Every stockman knows the value of a good constitution. The plan must always precede the foundation, the base the edifice, and the substantial structure the finished building. If we count up mentally all the remarkable animals we have known we shall find that comparatively few of them prolong their lives to beyond eight years. Many breeders own animals many years older than this, and their offspring go down to posterity to perpetuate their fame. The recent practice of preserving from year to year the record of a cow's products is extremely useful, and should be encouraged in every possible way. The breeder of the future will be more likely to found his judgment of value on the annual earnings of a cow than on the published accounts of tests made under forced feeding. What we need most is improvement in verifying our commercial work; so that when a buyer desires to know the commercial feature of a cow's working life of five or ten years he may get it without trouble by reference to an authenticated statement covering the full period of her working life.

Of late more than one person has challenged the quality of Ayrshire milk. Only a few days ago I was asked if the average quality of Ayrshire milk would come within the Massachussetts standard of 13 per cent of total solids. The best answer to this query is a quotation of some analysis of Ayrshire milk sampled by the Canadian analyst in various cities of Canada I give the date and other facts as they occur in the reports.

1887. MONTREAL.

Herd of Pure Ayrshires.

June 23.	Water	87 42		
	Fat	3 80	Total Solids.	12 58
	Other Solids	8.78		
		100.00		

A Montreal Herd.

July 14.	Water....... ..	87 20		
	Fat	3.90	Total Solids........	12.80
	Other Solids.	8.90		
		100 00		

The Bay State milk must analyze 12 per cent solids in May and June and 13 per cent during the balance of the year. These milks contained even in the midsummer period more butter fat than is required by the Massachussetts standard which is the highest in the world.

In the Ottawa district, Ayrshire grades are found on the majority of farms supplying the city with milk, and the average for the entire supply in the month of June 1887 was 12.93 total solids, of which 4-26 per cent. was fat. In some of the exhibition tests the Ayrshires have stood well, particularly those herds used for the milk business. In some of the older French Canadian counties the Ayrshire grade creameries average twenty-two to twenty-three pounds of milk per pound of butter, for the season of six months, from May to November. I know of several herds in the counties of Huntingdon and Chateaugnag sending whole milk to the creamery averaging over 5000 pounds per cow and 220 pounds of butter for the half year, or working season. A year ago when on the way to Buffalo our friend Governor Hoard desired me to tell you that in other days he had gratifying experiences with the Ayrshire cow and her grades sending milk to creameries and cheese factories. Why cannot more of this experience be grouped together? Taken from the farmer's herds supplying milk or cream to factories, for butter or cheese, they are of special value and possess more influence than the carefully kept records of the breeder The average farmer is influenced much more by the experience of his fellows whose experience most nearly resembles his own.

One of the best long time records I have ever seen for a single animal is that of Roxanna 1816. Her largest yield for one year was 8183 pounds; average yield for nine years, 6521 pounds; average yield for twelve years, 6011 pounds; average yield for fourteen years, 5808 pounds. Roxanna 5th 4606, a daughter of Roxanna, 1816; averaged for three years, 8361 pounds; average for five years, 7339 pounds.

From 1874 to 1887 the herd to which these cows belong, gave an average of 5612 pounds of milk, representing 197 cows. Mr. French began his breeding of Ayrshires twenty years ago but his record was not commenced till 1874. Take another Massachussetts herd of Ayrshires from Milton. The name Douglass has already become well known to most of you. Fourteen cows in this herd produced in one year 4,130 pounds or more than 6000 pounds each. Among these is a heifer giving 7163 pounds. In this herd is Queen of Ayr 2nd, with an average of 5859 pounds for thirteen years.

The Green Mountain State has borne a part in these triumphs. From Mr. Winslow's herd we will take a look at three cows. Ruth 4816, 10, 219 pounds in a year; Rosa 3143, 7562 pounds; Queen of Ayr 6029, 7149 pounds. The average for sixteen cows for the year 1888, 6356 pounds. The quality of this milk will produce one pound of butter from twenty-two of milk or an average of 289 pounds for the year. There are over thirty herds in the State of Vermont which average 300 pounds of butter per cow. This Ayrshire record is a very satisfactory showing in Vermont because Jersey influence is known to predominate in the best butter dairies. Beside the butter value of the milk in this case we have a large proportion of other milk solids for other uses, as calf and pig feeding.

The Empire State claims the old Duchess of Smithfield. Her last performance closing the year 1888 was, Duchess of Smithfield, 4256, 7399 pounds; Lady Essex 4th, 4450, 8793 pounds; Alline Douglas, 5259, 6593; Mandina, 8615, 5940 pounds.

I have referred to the butter value of Ayrshire milk. I would prefer to treat it rather as a product for the milk market, the cheese factory or the cream trade. It is probable that the Jersey and Guernsey will be preferred for butter and for a very large share of the cream trade. There are certain physical characteristics of Ayrshire milk which specially fit it for the milk, cheese and a considerable share of the cream trade.

The finely divided curd, the size of the globule and ease with which the fat is held in suspension make it very acceptable to housekeepers for domestic uses. These same qualities render it a much easier milk to deal with in the cheese vat. There is less loss of fat, and the globules are more evenly distributed in curd than is the case with the richer milks. There is a field for cream which the richer milks cannot occupy so well. It is pretty well known that cooks and confectioners find a cream of small globules, of medium quality, containing from 20 to 22 per cent of fat when obtained by cold, deep setting, is better for ice cream, or Charlotte Russe. The larger proportion of caseine and albumen in this relatively dilute cream is of great value in making light and firm goods. The richer creams being more concentrated in butter fat, although of finer flavor will not beat up so well. In ice cream the tendency to increase the strong essences, and the proportion of foreign bodies such as eggs or gelatine for stiffening and smoothing the product, disguise the finer flavors of the Guernsey and Jersey products. Again, for coffee, oatmeal and other table uses, many good housekeepers prefer Ayrshire cream as being more dilute and digestible. The cream trade is always on the increase and shows an increasing tendency to centralize in cities. In the summer season cream is distributed from Boston to as far distant places as Portland, Old Orchard Beach, Newport and a number of the seashore resorts.

Last May while spending a few days in Richmond, Va., I was surprised to learn that its surplus cream was shipped from New York rather than from Philadelphia, Baltimore or Washington. I learn that telegrams may at all times be sent to New York dealers for a cream supply. Another important feature of interest to Ayrshire men is the constantly increasing milk trade of the cities. Notwithstanding the high standard of quality we require in Massachusetts, I have no hesitation in saying that if the law was as well administered in other Bay State cities as it is in Boston the increased trade to the farmers would be a million dollars. Now if this estimate be correct, what would be the result in a State like New York. In that State according to reliable figures there are 1,500,000 cows. Dr. Collier is reported to have said at Oswego that if a merciful providence would kill off two-thirds of them, which are not paying their way, it would be a blessing to the State. Prof. Roberts also said that the cost of wintering unprofitable dry cows in that State was at least $20,000,000. Is there any danger of overdoing the breeding business? Something must be done by stockmen's clubs and associations to bring the claims of thoroughbred bulls more prominently before the farmers. I would urge the plan of giving prizes to the best herds of half bloods through the State Agricultural Societies or through some of the great fairs, as for instance, the Boston, Buffalo and St Louis fairs.

Another potent and practical way of reaching farmers is for Ayrshire men to organize creameries in those parts of the country where they number large enough to group together one thousand pure bred and grade Ayrshires. The co-operative creamery should superintend the breeding, give two classes of prizes, one for the pure bred herd making the most butter, and one to the grade herds yielding the largest returns. Competitions of this kind excite much healthy stimulus among the patrons, and awaken a widespread public interest in the breed of cattle concerned. The power of the press in eagerly seeking and publishing such facts as work of this kind creates and is of inestimable value to the stockman The cheese factory and creamery are of great value to the stockman in this connection. They show the commercial side of the work at every turn. Such a factory might be run up in Vermont, or wherever enough breeders could be got together. I favor the plan followed by Mr. Edward Burnett, of operating the farm and factory together, and making it co-operative wherever possible.

We have witnessed a great development of dairying of late years. The croaker, who is always present, is already crying out, "over-production." How can there be overproduction when the market is not getting enough of choice products? The great majority of the farmers find dairying is not so profitable as it is represented to be It would be a miracle indeed if men keeping three and four carcasses to do the work of two could make money in the business. The men who make most money in the trade are those owning cows such as those I have spoken of, and like many of the successful men in co-operative dairying, who own cows giving three hundred pounds of butter a year. The average cow product in New York is stated at one hundred and thirty pounds. The earnings of such cows would not pay the bills for purchased food for a good New England farmer.

Considering the special prominence which all stock breeders' associations now give to butter value, is it not time to ask whether special premiums on bulls and progeny, daughters and grand-daughters, would be likely to emphasize the value of some bulls over others. During the past year there has been a keen rivalry among breeders to possess the best sires of dairy bred cattle. The bulls selling above $200 are very choice now, and yet it is far easier to sell one at that price than one hundred-dollar animals. In some of the well known stock-breeders' advertisements you may read the postscript notice that no animals are sold below $100 each. Not two years ago this same firm were accustomed to receive more money than that for a service fee. These facts represent the condition of the market. Although the supply has increased, and the prices represent business farm figures, the demand is by no means satisfied. In New Hampshire and Vermont there is a vast field for the Ayrshire, and the great plains offer ever widening possibilities. As a grazer on the slopes of the Rockies she will hold her own against all rivals. A tardy enforcement of milk adulteration laws in Chicago and St. Louis would be of special benefit to the Ayrshire. No one has yet attempted to trade on the name of the Ayrshire, though there is as good reason for adopting this name as many others. We have seen from ordinary farming experience that the Ayrshire is a good butter maker in Vermont and Canada, producing in six months an amount of butter which Denmark after thirty years of special education cannot excel on her best managed farms. With such a cow, with such a home market for her products, and with a future so full of promise, we may be forgiven the enthusiastic song of praise for Scotland's best animal.

HOLSTEIN-FRIESIAN CATTLE.

By P. M. Harwood, Barre, Mass.

[Given at Institutes at Skowhegan and Biddeford.]

Among the pleasant memories of my boyhood days I recall the old open fireplace in the kitchen before whose genial flames our family used to sit during long winter evenings, and we sometimes listened to tales of adventure in Maine by my father whose early life was spent in the vicinity of Machias. Upon one point he was always sure to dwell, and that was the hospitable disposition of the early settlers. With such an introduction to your people made at a time when the mind was deeply impressible, can you wonder that it is with more than ordinary pleasure that I come before you?

Your Secretary has invited me here to speak upon Holstein-Friesian Cattle.

In order to form an accurate idea of the capacity of the breed, let us first look to the history and conditions of its development. To do this we must cross the Atlantic in our imaginations and take a look at their native country, North Holland, where they have been bred for upwards of 2000 years, being kept comparatively pure during all that period and yet without the herd book or that systematic intelligence which is now being applied to their breeding in this country. The province of North Holland is about 50 miles long by 20 miles wide, a large portion of the land being below the level of the sea from which it is protected by natural barriers on the west and by artificial dykes on the other boundaries. It is said that the best cattle are bred upon the polders which have a heavy clay soil and are often worth $300 to $1000 and sometimes $2000 per acre. These polders are lands reclaimed from the lakes and the sea by means of pumps and wind mills This strong clay soil is of superior quality and supports a population of between 600,000 and 700,000 persons. The peasants devote their whole attention to cattle breeding and dairying—in fact they go so far as to live a part of the year (from October to May) under the same roof with their cattle. From May to October the beautiful blacks and whites may be seen in the pastures, not always presenting to the eye that beautiful sight which they do upon the green pastures and meadows of Maine and Massachussetts—for they are often covered with coarse linen blankets to protect them from insects and the weather But the farms are beautiful and rich beyond anything we have here. There are no fences, their farms are separated by canals. The Hollander's house and stable are all in one. The building is usually of brick walls about eight to ten feet high covered with a thatched roof of straw or rushes. The roof is very steep. The interior is divided to suit the occupants. The family uses a large room, on the sides of which are seen what appears to be cupboard or closet doors. Opening these a large feather bed is discovered in a bunk which is one of the sleeping apartments of which there are several openings into one room. The kitchen and dining room are usually in one corner of the stable with no partition between. Here you would be invited to sit down and take a cup of tea.

The cows are usually fastened with their heads towards the sides of the building, which is well lighted with windows. They stand on a level raised one foot or more above the floor and behind them is a drain eighteen inches to two feet in depth and one foot in width. This is thoroughly cleaned and washed twice every day. At a convenient height over this drain a wire or rope is fastened to which the cows tails are attached with cords to keep them out of the filth when lying down.

The feed is put into a trough in front of the cattle and water is pumped into it so that they feed and drink without leaving the stable once during the entire winter. Sand is used for bedding; no straw is grown. The cows are cleaned like horses and fed regularly several times daily. The heat in the the stables is at times most oppressive, and moisture collects upon the walls like dew. In 1873 the number of cattle in North Holland was 145,220 head. The cheese and butter sales of Holland amount to enormous sums.

Much the larger proportion of the cattle are black and white in color, yet quite a per cent of them are red and white, dun and white, etc. Some of the herd books record all these cattle. In America only the blacks and whites are recorded. In size the cattle vary greatly. Cows range from 1,000 to 1,870 pounds each, and bulls from 1,800 to 3,000 pounds each. Under such conditions are the Holstein-Friesians developed in their native country. [For the foregoing facts I am indebted to Dudley Miller's work on Holstein-Friesian cattle.]

Two thousand years of breeding upon most fertile and productive soil, with but little influx from other breeds, under the almost family treatment of careful Hollanders have combined to produce the greatest milk producing, and I may also add, milk, butter and beef combined animal in the world. But the lymphatic Dutchman was not the man to discover the value or the superiority of the breed. It was left to the American, the embodiment of enterprise and thrift, to not only discover the facts but also to apply them in a practical manner. Mr. Chenery of Belmont, Mass., made the first importations. These were soon followed by Hon. Gerrit S. Miller, and later by Smiths & Powell and others. It is due to the latter firm, now known as Smiths, Powell & Lamb, perhaps more than to any other, that the wonderful capacity of the herd as milk and butter producers has been developed and advertized the world over. Other breeders and speculators have spent much time and money in the work, but I believe that no firm has worked with so much system on so large a scale as has this one. The Aaggie, Netherland and Clothilde families have all been established by the above, and the secret of the wide popularity of these families is due to the fact that records have been kept of both their milk and butter production, and the world has been constantly informed as to what was being done. Others could have done the same thing with other animals had they started at the same time and exhibited the same skill and perseverance. Men of good judgment in selection like Alonzo Bradley of Lee, Mass., and Mr. Baldwin of Ohio have brought over from the old country many valuable animals, perhaps as individual performers equal to any ever imported. But the family and record ideas have not been followed up. Yearly records for milk and weekly records for butter have done the business. And the world to-day knows by actual figures what many of the best animals in the breed are capable of doing at the pail and churn. What Hollander ever dreamed of one of his cows giving 30,000 pounds of milk in a year? He kept no record except for a few days, perhaps. He knew about the 80, 90, 100-pounds business, but that was as far as he cared to go. Then, too, the Americans were the first to establish the herd book. This forced the Hollanders to early copy the example. Improvements have been made from time to time until to-day only those cattle that are black and white in color, recorded in Holland and imported by a member of the Holstein-Friesian Association of America can be recorded upon our books. I have seen recorded cattle in good and regular standing that produced off-colored calves. This is often a great surprise and always a great annoyance to breeders. Such animals, being of very little value to breeders, should be destroyed. But to the man who is thoroughly acquainted with affairs in Holland it simply tells him that some ancestor back several generations was of some other color than black and white. Had there always been herd books in Holland similar to those now existing in this country respecting color there would be little or no trouble with off-colored offspring here. Fortunately this trouble is rare, and there will be less and less of it in years to come.

For several reasons the breed, although exceedingly popular, is not so universally favored to-day as it might otherwise have been. When the record of the famous cow Aaggie, of 18.000 pounds of milk in one year, was announced to the world all eyes were turned in the direction of the source from whence such a cow could come. Speculators at once commenced importing, and kept it up until 1884. when a very large number of cattle were brought to our shores. So alarmed became our association for the reputation of the cattle and for the protection of the American breeder that in March, 1885, greater restrictions were put upon importations. But much mischief had been done. Many inferior animals had been scattered broadcast over the land. and as men are apt to jump at conclusions. one poor one was enough to condemn the whole breed. It is perhaps safe to say that there is as wide a difference in the milk and butter powers of Holstein-Friesians as there is between the individual powers of all breeds combined.

Speaking of color I will say that all that our association requires is that the cattle shall be black and white. But the prevailing taste would seem to require black with star (sometimes a strip) band over shoulders, one over hips, legs, belly and two-thirds of tail white. We do not like to see a black switch or black legs—although under the rules there is no objection to recording such animals provided their sires and dams are recorded. A well marked Holstein-Friesian bull bred to an Ayrshire cow would in a majority of instances produce an animal black, (not a dead black) and white in color with black legs and switch. Cross a Holstein bull with a Shorthorn cow and the white switch and legs will generally appear and the color will be black and white or red and white in about the same proportions. Cross with the Jersey and we have the white points but the black will be largely tempered by the Jersey color, and the Jersey muzzle will frequently appear. These crosses often make excellent dairy animals and in the section where I live the Holstein-Shorthorn cows have been very popular for years, many and many a cow having been sold at $75 to $100, and in a few cases from $100 to $500 each. These cattle very much resemble pure bloods. The Holstein-Ayrshire cross I do not consider so valuable. The animals being homely in color and as far as my observation has gone, the quality of milk is not particularly good. The Holstein-Jersey cross if judiciously made produces a most excellent dairy animal; the quality of the milk is improved, the quantity is large although never prodigious, but the beef form is destroyed. Form is sacrificed for quality of milk from the butter stand point. If I were to establish butter breed to-day without regard to any thing else, I should take animals of this cross. But as I am one of those who believe in a combination milk, butter and beef animal, I never would attempt the cross. This combination animal exists to-day among the butter class of Holstein-Friesian, and the best way to build up an ideal herd is to make selections from the very best animals to be found.

Now in order to do this it is desirable to understand what an ideal combination animal is, then where such can be found, which individuals and families possess nearest the ideal qualities; and then by judicious selection breed from such animals as will be most likely to produce our ideal. And right here comes in the importance of structural development, which should be studied into and thoroughly understood by the breeder. What shall we breed for? I answer milk, butter and form every time. As one breeder puts it. "It is not necessary that an animal be 'homely enough to stop a clock' in order to be a great producer of milk and butter." Probably no intelligent dairyman to-day doubts that the Holstein is the greatest milk producer in the world Some may agree also that she has no superior in point of the quantity of butter she can make. But any one cannot fail to be impressed with the fact that there is a wide difference in the form as well as the size of different individuals in the breed. Come with me to almost any herd and I will show you individuals that are homely and give large quantities of milk and are also good butter cows; others that are handsome and are not extra good dairy animals; and still others that combine all three essentials. Now I am perfectly aware that a great deal of discussion has been going on of late, particularly in the west, about this combination animal, some claiming that such an animal cannot and does not exist. I suppose that those who make this claim are honest—I think they are biased.—Let us be charitable and call them mistaken. We will take as our first illustration the great cow Clothilde—a large, strong, well formed, handsome cow, with second largest annual milk record and largest life milk record in the world—winner of first prize (sweepstakes) for butter at New York Dairy show 1887—her daughter getting second position in the same public test. Twelve animals were in competition comprising five Jerseys, one Guernsey and six Holstein-Friesians.

As another instance of a combination animal let us take Lady Fay, a cow never beaten in the show ring, and a cow pronounced by many excellent judges to be the handsomest one they ever saw. She won first prize for best Holstein-Friesian cow at the great New York show; also gave the most milk of any cow on the ground, thus winning sweepstakes in that capacity. And she has a butter record of over 22 pounds in one week. I might make a long list of these illustrations, but I will let these two illustrious examples suffice.

On the other hand, some of the largest milk records ever made in this country have been made by animals angular and homely in form. I could name the animals, but refrain. Some noted butter animals remind me of elephants in size and form, of the rhinoceros in their hides and hindling, and of the English draft-horse in the size and coarseness of their legs. Who wants a barn filled with such animals? If it were a necessity there might be some excuse for it. But it is not a necessity, and any man who starts out with a one-sided idea in breeding cattle for the present and the future markets is sure to get left, that is as compared with the man who attempts and in a measure succeeds in combining the three essentials, milk, butter and form. The breeding problem therefore becomes an exceedingly complex one to the man who aims for the highest results. It is easy enough to breed for milk; it is easy enough to breed for butter; and just as easy to breed for form, but animals that possess all three essentials are scarce and high. Granted, and that is just the reason why we should breed them. It would not pay to undertake the difficult task were it not for the prospect of realizing good prices for our labor The man who paints the best pictures never wants for a customer. Cows such as I am talking about bring three and sometimes four figures each. If you doubt it, just endeavor to purchase a few, and see how far I am out of the way. But all who attempt to reach an ideal standard in practical results will fail to a greater or less extent. We can only approximate an ideal standard. There are subtle forces at work in this matter of breeding over which we seem to have no control. Note two animals, full brothers or full sisters, and behold how different! Have you not seen the same thing, too, in the human family? There is no greater field for thought and study than this subject of breeding. It lifts the business of farming above the "hum drum" existence of the old methods. It is a field worthy the mind of a philosopher and right in the line of practical, every-day life at that. Stock breeding in America to-day is engaging many of our best minds. Look at the advances which have been made within the memory of us all. The improvement in the trotting horse, the draft horse, the beef animal and the dairy animal. All go to show that a skill has been exercised and a progress realized during the past twenty-five years that finds no parallel in the history of nations.

For the young man there is a great future in agriculture His work is not that of yesterday but is the work of to-day. Fully abreast of the times, with an eye ever open to the future—filled with the spirit of energy and perseverance, and with the exercise of good judgment he cannot fail of a large measure of success. He does not need therefore to leave the country to find a business that will require all the brain activity that he can command. Then stick to the farm.

But will it pay? How many a young man asks that question. And who blames him? American standards of success are mainly measured by whether a thing pays or not My reply is that much more depends upon the man than upon the business he engages in whether it pays or not. Daniel Webster is said to have once remarked that "there is plenty of room up higher." It seems to me that answers the question. Those who do the best work usually succeed best. And if a man sets out to make a thing pay and exercises due care and judgment, refrains from speculation and works hard he will be pretty sure to succeed. There is a good deal of truth in the old adage that "where there is a will there is a way." But we must live on work and take an interest in it.

But we are slightly wandering from our subject. I wish to call attention to the fact that for New England too large cattle are not desirable. Cows that weigh 1,000 to 1,200 pounds, and there are plenty of such among Holstein-Friesians, are large enough. Our climate, soil and surrounding conditions are not conducive to the maintenance of the largest type of any breed of cattle.

The man who must depend upon the products among the jagged rocks on the mountain side cannot keep a cow—he must have a goat. A little lower down the small Ayrshire will live, thrive and give milk where the Holstein might almost starve. Still lower down, and along the fertile valleys, the Holstein-Friesian will thrive and give milk. Even the goat and Ayrshire would be better in the valley, but the Holstein-Friesian if she does well would give milk enough to drown both the other animals.

Consider, then, that the Holstein-Friesian has no equal as a milk machine. Put the feed to her and she will respond. She is equal to a small herd. "Ten acres enough," and a man need not be land poor. Ten cows enough, and a man need not be cow poor. But few Hollanders have over twenty animals in a herd. The great trouble with New England farming is that we try to cover too much ground, and do not do well enough that which we undertake. I believe that most men make this mistake some time in life.

A very natural and fair question to ask is, "Do Holsteins pay better than any other animals?" The reply must be, "That depends." A truckman in Boston would not naturally select a George Wilkes trotter to draw his heavy loads. Neither would a Boston physician select a Clydesdale for his driving horse. If a man wants to make money selling milk he wants the animal that will give the largest quantity and will convert the greatest amount of food into milk after the amount necessary to maintain the system has been used,—in other words, an animal adapted to his purpose. There is no more question in my mind that the Holstein-Friesian is this cow than that the sun rises in the east. As a milk machine she is incomparable. But she must be located right and fed right to pay. To pay she is exactly like a large factory, capable of turning out a large product. But a dead loss if only half run. Run her to her full capacity, and feed her and she will respond. Then sell the products at a price that will pay and you have the most profitable milk machine possible. Is she a profitable butter cow? This is a question upon which there seems to be some doubt in the minds of many, while others claim that she also excels all other breeds in butter as well as in milk production. I believe that it is a fact that in public tests the Holstein-Friesian cow stands at the head.

In private tests she is also in the front rank.

Aaggie 2d made 304 lbs. $5\frac{1}{2}$ oz. butter in ninety days.

Albino 2d, made 25 lbs. $14\frac{1}{2}$ oz. butter in seven days as a three-year-old.

Netherland Princess 4th, made 21 lbs $10\frac{3}{4}$ oz. of butter in seven days as a two-year-old.

One firm advertize 100 cows that average 18 lbs. 17-100 oz. in seven days; sixty-two cows that average 20 lbs. 43-62 oz. in seven days.

Individual records are reported of over thirty pounds in seven days, but it is useless to enumerate instances. Any one who will take the trouble can find any amount of evidence to prove the butter producing capacity of the Holstein.

The fact seems to amount to about this: that by selection of those cows that give an extra quality of milk as good a herd of butter cows as any man could wish for may be had from Holstein-Friesian cows. When crossed with the Jersey or Guernsey (distinctively butter breeds) a most excellent dairy animal is usually the result, when grades are preferred to the pure breeds. As beef producers the Holstein-Friesian is good. Not so good as the Shorthorn, Polled Angus or Hereford, but vastly superior to any other dairy breed of cattle except the old dairy branch of Shorthorns. They have the advantage of size and good form. The great mission of the Holstein-Friesian cow may be summed up in the words, *Combination dairy animal*—an animal capable of giving more milk than any other—of making as much butter (or more) than any other, and when through with their mission is convertible into a large quantity of good beef. If there is another herd of cattle about which this or as much can be said, I have yet to hear it. Or if there is a handsomer sight in the bovine world than these same black and whites grazing upon our pastures and meadows in summer I have yet to see it. Or if there is a pleasanter business connected with agriculture than the development of this wonderful and excellent breed of cattle I have yet to learn it.

Fellow breeders let us strive together, endeavoring to produce the best in kind and quality. They can never become too abundant. We must ever keep the wheel of progress rolling. Otherwise others will get the lead and we shall be retired to the ranks, a position unworthy New England and her energetic people.

MISCELLANEOUS PAPERS.

SOILS AND THEIR COMPOSITION.

By Joel Richardson, Esq., Newport.

[Read at Institutes at Wilton and Readfield.]

Many centuries ago, when the light of what is now the noble science of chemistry first began to dawn on the minds of the learned men of that time they found that two or more substances unlike each other would under certain circumstances unite and form another substance entirely different from either of the original. They began to believe if they could learn the right process they could change the common metals into gold. And for many centuries down to comparatively modern times, men have studied and toiled to accomplish this object. While they were toiling in vain, in the soil on which they trod the chemical agents of nature were changing the elements of earth and air into golden harvests as much more valuable to man than gold as food and clothing are more valuable than glitter and show. To this soil I wish to call your attention.

Nearly all the rock which forms the crust of the earth is covered with a loose material which we call soil. It varies in depth from a mere film, sufficient to give root to mosses, to several hundred feet. It is made up of decomposed rock and the remains of plants and animals and insects which have lived and died in and on its surface. To be capable of producing crops, the soil must contain all of the elements which the crop requires except the organic elements furnished by the air and water. It is only about fifty years since it was known that mineral elements entered into the composition of plants. It is now known that although the plant contains less than ten per cent of mineral matter, and that soils contain from sixty to ninety per cent, yet it often happens that some one or more of the required elements is lacking in the soil, and that the lacking elements must be supplied by the farmer. Of the enormous quantities of commercial fertilizers now made, the mineral elements form far the largest portion of their weight. It must be constantly borne in mind that however minute the quantity of a given element required by a plant that atom *must* be supplied or the plant cannot be brought to perfect maturity.

Soils suitable for cultivation usually contain all of the necessary elements. But they are often in so close chemical combination that the plant cannot obtain the necessary supply. For it must be constantly remembered by cultivators of the soil that the plant can take its food only in liquid or gaseous form, and it is the work of the farmer by cultivation and application of the right elements to not only supply lacking elements, but by cultivation and application of solvents to dissolve plant food already in the soil so as to be available to the plants. The texture and mechanical condition of soils has much to do with their capacity for absorbing and retaining moisture and fertilizers, qualities on which every farmer knows much of the value of a soil depends. A knowledge of their origin and their constituent elements is of deep importance in obtaining a thorough acquaintance with soils.

Soils may be classed, first, as soils which have been formed by decomposition of the rock on which they rest; and, second, as drift soils, which are those which have been carried from the places where they originally formed by water and other agencies and became mixed with other soils and finally deposited on rock very different, perhaps, from any of the material of the soil above it. The entire soil of New England and the Middle states is composed of drift. therefore we must bear in mind there is no uniformity of soil over any considerable area. and we often find a marked difference in the soil in different parts of the same field. The value of a given soil depends much upon the kind of subsoil immediately below the plow. A clay soil resting on gravel or sandy subsoil will drain readily and pulverize with the plow and by the frost so as to be in a fine condition for a crop, while the same kind of a soil resting on an impervious clay subsoil will retain too much water in wet seasons, and will be too hard when dry for the roots to penetrate. On the other hand, gravelly and sand soils do much better when lying on clay subsoil, as it will hold moisture, which the sands and gravels are not able to do, only to a limited extent. In judging the value of soils, their capacity for absorbing and retaining water must not be overlooked. Our loams will absorb from forty to fifty per cent of their dry weight of water without dripping, clay still more, and peat nearly twice its dry weight. Experiments seem to prove that plants thrive best when about ten per cent of water is present in the soil. This shows the importance of draining, for if the excess of water must escape by evaporation, it not only remains too long in the soil, but, as a large amount of heat is carried off by evaporation, it makes the land cold.

The color of the soil indicates its capacity for absorbing the heat of the sun, and is an important factor in promoting the growth of plants The color of soils mostly depends on the amount of decomposed vegetable matter they contain and various oxides of iron. The soil under the direct rays of the sun will become much warmer than the neighboring air, often rising to one hundred and ten degrees when the air is only seventy or eighty. This heat greatly assists and stimulates plant growth. The color of the soil may be changed materially by adding muck in considerable quantities It must be remembered, however that no physical condition, however favorable, will produce crops unless all of the elements required by the plants are present and in condition to be available to the plants.

The depth of the soil is an important point to be considered. Few farmers who have not given the subject special attention are aware to how great depth the roots of plants will go for food if the nature and condition of the soil permits. I have found in mellow loam the roots of Timothy abundant, two and one-half feet below the surface. Deep mellow soil seldom suffers either from excess or lack of water, and good crops may be grown on such land almost any season if properly cultivated. It is in the power of the farmer to deepen most of the soils he cultivates. Not only are deep soils less affected by excess of rain and drought, but the roots have more soil from which to obtain their food and it often happens that the subsoil contains elements in which the surface is entirely wanting. In such cases if the roots are not excluded from the subsoil by water or by its being too hard for them to penetrate good crops may be grown where nothing could be produced if the subsoil was impervious to the roots. It is difficult to classify soils as they are always more or less mixed with each other. But to assist in presenting the different kinds and qualities we will divide them as follows: Gravels, sandy loams, clays, peats, and alluvial soils. These when mixed in different proportions form the various loams known as gravelly loam, sandy loam, clay loam, &c.

Gravels and sands differ but little from each other except in fineness of the particles of which they are composed. But a sand or a gravel may differ from another sand or gravel very much in its constituent elements, owing to its being ground down from a different kind of rock. It may be said in general that gravels and sands usually consist of the same element, principally silica. They differ from each other in the particles of the sand being much smaller and more uniform in size in sand than in the gravel. Gravel and sand appear to have been produced by being ground down by natural forces, while loams and clays are formed by chemical decomposition. Where gravels consist mostly of hard pebbles which decompose very slowly it is worthless for cultivation. But when the material is not too hard and has a fair amount of clay and decayed vegetable matter, and a subsoil that will hold water, it will usually produce fair crops. There is a kind of flat gravel, or slate, which is very poor soil when coarse but decomposes rapidly, and when fined down forms a fair soil. There are spots in my fields where forty years ago the plow would turn up slate as large as my hand and on which nothing would grow that now is fine enough and fertile enough to produce good crops, and it is an encouraging fact to farmers on slaty lands and shoal soils lying on slaty rock, that the rock is rapidly decomposing and the soil growing deeper and finer. There are spots in my fields that forty years ago were nearly bare rock that now have sufficient soil to bear very good crops except in very dry seasons. Sands are composed of finer particles than gravels, but are usually from very hard rock and decompose slowly. Consequently they are difficult to improve, and unless they contain a considerable portion of clay and decomposed vegetable matter, so as to form loam, such lands had better be allowed to grow wood. Gravels and sand have some advantage over heavier and richer soils. They can be cultivated very early in spring, warm quickly by the sun, retain heat well, and where one can afford to manure often such lands are good for early maturing crops. But to the man about to purchase land for general farming, I would say avoid gravels and sands.

Loams are intermediate between gravel and clay, and are called gravel-loams or clay-loams as they tend toward the one or the other in composition. They differ from gravels in being finer and containing more vegetable matter. They differ from clays in being less compact and adhesive, and usually contain less potash and more lime. Most of our light loams contain abundance of lime but are often deficient in potash, and respond at once to an application of wood ashes. Loams differ so much that but few facts can be stated that will be applicable to all.

Clays are our finest and richest soils. They are composed of very fine particles mostly from slate and feldspathic rocks and are rich in potash but are often deficient in lime. Hence lime and plaster are usually good for clay lands. Most of the clay has been washed out of the soil on our hills and brought down and deposited in the valleys near the streams. While clays are usually rich in the necessary elements required by the plants, and the particles of which they are composed are very fine, both of which are favorable to plant growth, unless it is mixed with a good proportion of sand or gravel and some decayed vegetable matter, it is too adhesive to pulverize by cultivation, and holds too much water in wet weather, and becomes too hard in dry weather to allow the roots of plants to penetrate through it, and it is only by thorough drainage and skillful cultivaiion when the soil is dry that stiff clays can be made to produce good crops. But when clay has a sufficient proportion of sand and gravel and vegetable matter to allow the water to pass down through it, and the roots to follow, and will crumble readily by the plow and harrow we have an excellent soil And the fault is the farmers if he does not raise good crops, and that too without exhausting his land. It must be borne in mind that while clay loams are rich soils but very little of our best soils ever contain all of the elements required in proper proportions and proper condition to feed the plants. Clays differ much in texture and constituent elements, and while lime is often deficient, it is sometimes abundant and some other element may be wanting. It is the business of the farmer to find out what is wanting and supply it. The way to do this is to ask the land. So long as nature, by the soil, the air and the water, supplies ten or twelve of the necessary elements the farmer should cheerfully and promptly supply the three or four lacking ones, especially as these are only required in small quantities, and nature provides these also if we will but search for them and bring them to the right place and apply in the right condition.

Peat soils are those which consist mostly of decayed vegetable matter and are deficient in mineral elements. They are usually low-lying lands and filled with water. They are consequently cold and unproductive. By draining and applying lime with sand or gravel such land often becomes very productive. Where the peat is not more than five or six inches deep, by letting down the plow and bringing up two or three inches of subsoil, a very productive soil is obtained. But few attempts have been made in this country as yet to reclaim deep peat bogs and marshes, and where tried has been followed with rather poor success. Where land is cheap it is doubtful if it can be made to pay. Where the peats can be flowed in winter they will produce large crops of sedges and water grasses without any attention, and the hay from such grasses may be fed with provender quite profitably.

Alluvial soils are those which have been brought down by rivers and streams and deposited at low places along their banks and near their mouths. They consist of the finest particles of the soil on the hills from which they have been washed and usually a large amount of vegetable matter and much of the soluble parts of the upland soils in solution with water which by chemical changes are again precipitated as solid matter. Where such lands are covered by water annually, leaving a new coat of sediment each year, they are inexhaustable and where the climate is favorable, as in the delta of the Nile and the Ganges, large crops have been grown for thousands of years with very little cultivation and no manuring. But alluvial lands, which we call intervale, and Western people bottom-land, which overflow only for a short time during high freshets, require better cultivation. When properly treated they are very productive lands. Alluvial soils are usually in better mechanical condition than any other lands. The particles are fine, seldom become hard or adhesive, allowing the water a ready passage downward while absorbing or retaining enough for the use of the plants. All these soils are more or less mixed and blended with each other so that only small spots here and there show any one of these soils named with all of their characteristics.

The productiveness of land depends on climate, constituent elements and mechanical condition. Over climate the farmer can have but little control. He can, however, lengthen the season by draining wet soils, and increase the warmth by adding muck or other dark matter to absorb the heat of the sun. If one or more of the necessary elements are wanting, he can supply them, as all of these elements may be found somewhere in nature and can be reduced to proper conditions and brought to the place where wanted and applied to the land.

But it is over the mechanical condition of soil that the farmer has the most control. The favorable changes which may be produced in the structure and condition of the soil is full of promise to the inquiring farmer. When we realize that an acre of soil that is well pulverized to the depth of two feet is worth more than two acres that is only six or eight inches, and learn that land which is now worthless, because full of stagnant water, is the best of land when properly drained, and that well-pulverized soil will thoroughly absorb and retain the moisture and the fertilizers applied and give them up only to the roots of plants, while in coarse, hard soil they are washed away and lost,—then we begin to see some of the control which the farmer has over the productiveness of the soil, and why good farming pays, and why bad farming is always a loss.

Grecian mythology tells us that when two of her heroes contended for mastery, one lifted the other's feet from his mother, the earth, when his strength left him and he was conquered. It is no myth that habitual contact with the earth gives physical and mental strength.

The earth purifies the water we drink and the air we breathe. Brother farmers, let us strive to obtain a better knowledge of mother earth. for just in proportion as our work harmonizes with her ways and requirements will she yield us her bounties. The earth is not the inert mass that it seems. It is a great chemical laboratory in which that wonderful chemist, the sun, with his assistants, the air and water, is preparing and sending forth for our use millions of plants, not one of which our most skillful chemists can produce. The bounties of mother earth have supplied all our wants from childhood, through youth and manhood, and will through our declining years, and when the journey of life is ended she will take us to rest in her bosom.

STOCK-FEEDING AND ITS RELATIONS TO THE FERTILITY OF THE FARM.

By B. W. McKeen, Member for Oxford County.

It has often been said, that it required no brains to farm upon a virgin soil whose stores of fertility only needed the presence of the seed to show themselves in abundant crops that well repaid the husbandman, and seemed to warrant a better treatment than wanton tillage. Our forefathers, careful, prudent men in most respects, utterly failed to see the necessity of returning any of this natural fertility, but kept up a system of exhaustive cropping, until their lands, robbed of the valuable contents of nature's storehouse, failed to yield any return, just as a bank refuses to honor drafts made upon it by parties who have overdrawn their deposits.

These lands are now in our possession, and we must look the matter fully in the face, and meet the difficulty of reclaiming them like men. Chemistry comes in with commercial fertilizers that help out the process, but the main reliance of the average farmers throughout the State, must be from manures obtained by a judicious system of stock-feeding Therefore the best methods of feeding and care, such as will return the most to the soil and at the same time pay a fair measure of profit, must be carefully studied to the end that we may add fertility to our fields, comfort to our homes, and lay by something as an investment. Neither should stock-feeding be conducted only with a view of enriching our farms, but in all its bearings, realizing that stock husbandry is, and must always remain the foundation groundwork and first great principle of New England Agriculture. Therefore the objects of stock-feeding on our farms are threefold.

First—As a means of maintaining and renewing the fertility of the farm.

Second—As a source of providing for the necessities of our families and increasing the food supply of the farm.

Third—As a source of income from the sales of animals and their products.

In order to secure the first object, to the consideration of which this paper will be largely devoted, it becomes necessary to use a great amount of diligence, care, and forethought. In the first place, all the food products must be fed upon the farm, and the feeding must be so managed that there shall be no waste. It amounts to but little for our legislators to enact laws in behalf of farmers, pass stringent measures to protect their interests, or for farmers themselves to strive through the Grange or any other organization to lessen their expenses and thereby increase their incomes, if all this time there is a material waste of much that is valuable in fertility from their farm-yards and stables. What would be thought of the manufacturer who allowed a continual waste to go on, unchecked, about his establishment; that, although hardly perceptible, yet would draw quite largely from his income? What would be the result of any business venture when thus conducted? It is easy to predict. And still, many farmers who would be the first to notice any such waste by any manufacturing neighbor will allow one still more vital to go on unchecked, year after year, drawing out the very life blood from his farm, and not only diminishing his income, but the original capital as well. Victor Hugo wrote against the loss of soil-food from dumping the waste of cities into rivers and sea. His words, so apt, and characteristic of the man, may well be applied to the waste from many farm yards. "Do you know," he says, "what all this fœtid, frightful looking stuff really is? It is green grass, a flowering field; it is the satisfied lowing of kine, it is the cattle themselves; it is perfumed hay, it is gilded wheat, it is bread on every table, it is warm blood in the veins; it is health, joy, life that is being thrown away."

Now in order to feed stock to any advantage every possible source of waste, however small, must be stopped. And to accomplish this result is no very hard task if we will only comply with certain conditions that are as plain as simple addition. There is no doubt but that the liquid manure from well fed animals is more valuable than the solid, and as it supplies certain elements that are not found in the solids, its presence becomes necessary if we would have a well balanced manure that will answer for all crops, and will tend to maintain or renew the original fertility of the farm. Peer says: "There is, perhaps, no branch in farm economy that receives so little attention as the saving of this most valuable fertilizer, liquid manure. Many farmers have brooks running through their yards, or have their yards on side hills or on gravelly soil. Thus stores of this most valuable plant food are lost." The following table, showing the number of pounds of nitrogen, potash and phosphoric acid in one ton of fresh dung and of urine, is from Prof. Wolf, to which I have added the values, as reckoned by our fertilizer control station for 1887. These prices are based upon the market value of the materials. Viz. nitrogen sixteen cents per pound; phosphoric acid five cents per pound and potash five cents per pound:

	Solids.				Urine.			
	Nitrogen.	Phosphoric Acid.	Potash.	Value.	Nitrogen.	Phosphoric Acid.	Potash.	Value.
Sheep	11.10	6.2	3.0	$2.22	39.0	0.2	45.2	$8.51
Horse	8.8	7.0	7.0	2.10	31.0	–	30.0	6.46
Cow	5.8	3.4	2.0	1.20	11.6	–	9.8	2.35
Swine	12.0	8.2	5.2	2.59	8.6	1.4	16.6	2.27

It will be seen by this table that, with the exception of swine, the urine is the more valuable. Being quite largely composed of nitrogen, the highest priced fertilizer in the market, it becomes very valuable, while its excess of potash helps to supply the place of fertilizers usually purchased in ashes or their equivalent.

Now I venture the assertion that in but few of our average farm barns is this liquid from the stock nearly all saved. And still our farmers are at their wit's end to produce manure enough to grow crops sufficient to even keep good the fertility of their farms, to say nothing about increasing it that they may bear larger crops of hay or other fodders.

French says the average English farmer pays $10 per acre (yearly) rental for his entire farm, on land that has been under the plow for centuries. That he is able to do this, and pay $10 more per acre for manure and $10 for expense of cultivation, support his family comfortably and add something to his income, shows that he understands saving all the fertilizers from his stock, and applying them to the best advantage.

How many American farmers could do this, do you think? How many of us think of the actual valuation of a ton of hay for feeding purposes? But few, I will warrant. Unless we can say to each ton of hay, "Now, you are in my possession; you have two values; you have come to my barn to fulfill your full mission; I shall not allow you to pass through my hands until I have taken all there is of value from you; I distinctly see the value you have to supply my stock with food that shall enable them to grow, take on flesh, or fill the pail; and I as plainly see the value you have to return to my land to aid me in growing more crops, and thus help maintain or renew the natural productiveness of my farm, and keep intact the inheritance of my fathers, which came to me as a trust, and which I am bound to transmit unimpaired to my posterity," we fail to realize its full value. Let us look for a moment at figures that tell the story:

The money value of a ton of English hay to return to the farm in actual fertilizing material is $5.86; clover, $7.60; wheat straw, $2.61; oat straw, $2.46; rye straw, $2.77; corn, $5.55; barley, $5.95; wheat bran, $11.37; cotton seed meal, $16.18. Now if the ton of hay, or other fodder, is sold off the farm, just that amount of fertilizer must be supplied from some other source in order to prevent an actual loss of fertility, which lessens the amount of capital invested in the farm. For it must be remembered that the amount of capital in a farm is in proportion to the amount of available fertility it contains, not in proportion to its size. A farmer may own acres enough for an earldom, and still have no available capital. The loss is identical if the same amount of fertility is allowed to run to waste and pollute streams and wells, while the evil effects are far more serious to contemplate. Now, to avoid all this, it is necessary to have things so arranged that all the waste from the animals may be secured. Just what the arrangement may be, each farmer must study out for himself. But we will name the first necessary condition to be a good supply of absorbents of some kind. The locality must determine what this shall be. Something that has some actual fertility in its composition is much to be preferred, but is not indispensable. Muck being composed of waste vegetable matter, is very valuable if judiciously handled, but it must go on to the land through the pig-pens and stable. Sand has been used by some of our farmers, and when placed upon a clay loam soil, its effects are good. Road dust, sods, shavings, sawdust, leaves, cobs, etc., may be used to advantage, if obtainable. If much sand is used there will be required a large amount of labor to handle it and its extra weight is apt to press some of the liquid from the manure pile.

Common soil, when dried, is very valuable as an absorbent. If a good supply is kept on hand, and when first placed under the stock is thrown well up under the forward feet, then drawn back each day as a new supply is placed under them, it will become so thoroughly dried that but little unnecessary weight need be handled. The liquid may be saved by having water-tight apartments to receive it, then drawing it direct to the field in carts made for that purpose. Anything that will absorb moisture is valuable, and no evil results will follow from its constant use if properly handled. For cows I have found nothing better than sawdust. It is an excellent absorbent and not heavy to handle.

A certain successful farmer was asked to give his methods of carrying on his farm that led to his success. His reply was, "By having my plowed land all in one piece." Now if this is true of our plowed land, it is also true of the manure pile. Enough sawdust may be placed under the horses to keep the whitest one clean, and if the resultant mixture is wheeled into the cow hovel, you still have a fine absorbent that will keep the cows clean, and when placed upon the manure pile the total value of the liquid and solid animal waste is there, and will remain until placed upon the la d for crops. Any farmer who allows his horse manure to waste for lack of moisture, on one side of the barn, and the liquids from his cow hovel to waste for lack of an absorbent on the other, is criminally careless to his own best interest. He is the very one who will wade through the mud and slush of a reeking barn yard to hitch up his team to go for phosphate, a practice that leads to disappointment and disaster. Therefore let us prepare ourselves with plenty of absorbents, use them judiciously and in sufficient quantity to secure all the liquids, and expect good returns for our labor.

After learning to avoid all waste, the proper methods of feeding come as the second step. Much fodder of a coarse nature, that has but little actual value, either for food or fertilizer, can be used very profitably by so arranging the feeding that it shall become a part of a balanced food ration, thus adding much to the food capacity of our farms to our ability to enrich the land and to the health of the stock. Meadow hay or straw becomes a great factor in our farm economy, when properly blended with the rich fodders and grain rations of the farm. And just here it will be proper to consider the merits of the silo to preserve the corn fodder, especially on farms that are largely made up of light, sandy loam. By using the silo to preserve the corn fodder its full feeding value will be realized, and a very valuable addition to the fodder of the farm be obtained. Variety, well shaken up, is said to be the spice of life. So it may be claimed that variety of food is the spice that creates an appetite, aids digestion, and increases the health of all animals. That course of feeding that brings the best returns in the animals fed brings the best returns in fertilizer, and makes more certain the general success of farming. It has often been remarked that farms situated near our large meadows, on which large quantities of meadow hay are used, very seldom increase in fertility. And this result has led to the supposition that its use does not tend to enrich any soil. The real error is in the method of feeding. When fed alone to carry young cattle and dry cows through the winter the manure has comparatively little value. This has too often been the practice of our farmers. All of the best hay and most of the grain have gone to feed the working teams or the family horse, and thus have been almost entirely wasted, as far as their fertilizing constituents are concerned. Then the business of farming is depreciated and all poor fodders condemned, because of the poverty of the manure pile and consequent poor crops. As soon as we learn to feed all fodders together, and mix the manure from all our farm animals, we shall never have reason to complain of any lack of fertilizing qualities in our manure pile, or of resources to increase the fertility of the farm. The crops will then attest the value of the manure by their vigorous growth that shall gladden the heart and increase the income. If the business of procuring fodder and properly feeding it to stock, and saving all the waste, as also the best methods of applying our home made dressing to the land, is thoroughly mastered and well carried out, I believe a farm can be kept up to its full capacity of growth, and in nearly all cases its fertility restored without going off the farm for one particle of fertilizer.

When we consider the second object, that of providing for the family, and increasing the food supply of the farm, it becomes proper to examine the different kinds and varieties of farm animals. A certain variety of animals is necessary in order to supply the food required for the family. Many times certain members of the family take naturally to some particular kind of stock, and, by studying their natural tastes, a valuable factor of the farm may be created.

One person may be given one kind and another some other kind, so that each one may find a place, and be cared for by those who have naturally a taste for that particular kind of work. By studying to maintain something of a variety, the farm becomes, in a large measure, self sustaining, and the branch that is pushed for all it is worth as a source of income will be much more of an income, as nothing has to be taken from it to support the family. Thus if we are keeping a herd of cows, we may with profit turn some of our attention to swine and poultry. By so doing we shall have their food products for an increase in the family larder. As much of their food may be obtained from the waste products of the dairy it will be nearly a clear gain. If our income is to come from horse raising, or any other special branch, there is still room for the same variety for general home use. An occasional veal from the family cow, a few chickens and sometimes a pig or a beef, will go far towards supplying our wants and lessening the general expenses. That system of stock feeding which overlooks this source of supply for home use, and depends solely upon the returns from the special branch, is essentially incorrect, and brings failure oftener than success. Also, an exclusive growing of one crop every year to the exclusion of all others tends to lessen the fertility of the farm, and draw from its natural resources. One of the purposes of the Grange, that should find an echo in every farmer's heart throughout the State is to make our farms self-sustaining by striving to produce more and buy less, to diversify our crops and our stock so as to supply our own general needs.

And now comes in the third consideration, feeding for profit. For too many years the farmer has been conducting his business more for a means of subsistence than for any profit that might arise from it. In far too many localities every whim has taken its own course. The great rule has been, haphazard. Fields have been badly tilled and poorly managed. Crops have been changed each year to suit the caprice of the owner, and, as he was always striving after some one that happened to suit his momentary whim, he was never at his best, but always just one notch behind. That this same haphazard system has prevailed in growing and feeding stock, needs only a glance at our herds to prove. But this slipshod method is rapidly going out of fashion, and many of our thinking farmers are now, happily, turning their attention towards a method that shall bring uniformity of results and a return that shall add capital each year. While looking for some branch to follow for its profits, it is well for us to learn some of the simple rules to follow in feeding and care.

As the same rules hold good for all stock, a few general principles will not be amiss. The first rule to be observed when feeding stock for profit is to provide it with an abundance of food suitable for its requirements every day it is in our care. As the usefulness of all animals depends largely upon the manner in which they are fed the first year of their lives, all our young stock should be kept growing every day. No practice of feeding produces such woful results, or is so much of a crime, as the far too common one of starving young animals through the winter by keeping them upon the coarser fodder alone. Their needs induce an appetite that leads them to eat such food a little more readily than full grown animals, therefore they are kept upon it and all growth stopped just at the time when they would best repay a liberal feed, keeping them in a state of chronic hunger, while their owner, perchance, spends most of his time arguing that it does not pay to keep or raise stock. And who wonders? Such men meet the advice to feed liberally with the old saw, "I can't afford to feed grain." Never was there a greater mistake. We cannot afford to feed any other way than liberally. Poor feeding impoverishes the soil and its owner, while a generous diet brings ample returns in more productive fields and more income from the business, besides the indirect source of gain which yields the sense of pleasure and pride which is derived from handling sleek, well fed animals and contemplating the beauties of growing grain and abundant harvests. A well known writer says, truthfully, "The economy in feeding farm stock, in order to obtain the greatest improvement, earliest maturity and largest profits, is the result of continued liberal feeding of the most succulent and nutricious foods abundant in albuminoids and carbohydrates. He who would practice true economy in feeding should have lettered upon the walls of his stables, and distinctly and indelibly stamped upon the tables of his memory the ancient and wise saying: "Withholding doth not enrich thee nor giving impoverish," says Lockhart. "Good farming consists in taking large crops from the soil, while at the same time you leave it better than you found it."—Also, "Good crops make good manure, and good manure makes good crops." How better can farmers supply themselves with this good manure which will make good crops, than by liberally feeding all their animals and carefully securing all the waste for their growing crops. By a wise provision of nature the needs of our animals and our plants are dissimilar. Therefore after the animals have taken all they require from our fodders there is still left, the larger part of the plant food, which, being returned to the land will enrich it as much as if the whole had been plowed under. The rations for young stock need not be expensive. We do not feed for fat but for growth and flesh. Ground oats, wheat bran, corn and cob meal, with roots, make a profitable feed and furnish an abundance of fertilizing material that is left upon the farm. The quality and amount of the grain ration must be determined largely by the kinds of hay fed. If much low ground hay or straw is fed, the grain must be varied accordingly and made to supply the food elements lacking in these. Cotton seed meal makes a valuable grain ration to feed with such coarse fodders, and as each ton fed on the farm leaves $16.18 in fertilizing material it is a desirable addition to our cattle foods. The only profit to be derived from food is from what is consumed over and above the actual needs of the animal. The more food we can cause our animals to eat and properly digest the greater the returns relatively. Therefore liberal feeding should be the rule, no matter what kind of animals we have in our care.

Possibly the kind of stock to be fed should be next considered. As this paper is largely devoted to methods of increasing the fertility of the farm, and as each branch or speciality of farming should be carefully considered before making any choice, we will look for a moment at the amount of plant food taken from the soil by the various products to be sold, so that we may intelligently supply its place and reckon its cost on the debtor side of our account. We give a table showing the plant food taken from the soil by one ton of the different fodders and animal products, with its value, market value of the articles named, and per cent of plant food in each.

Name.	Nitrogen.	Phosphoric Acid.	Potash.	Value of Plant Food.	Market Value.	Per Cent. of Plant Food.
English hay	31.	8.2	26.4	$5.86	$16.00	36.6
Clover	39.4	11.2	36.8	7.60	13.00	58.4
Potatoes	6.8	3.2	11.4	1.58	16.00	9.8
Corn	32.	11.8	7.4	5.55	20.34	27.2
Barley	32.	15.4	9.	5.95	32.33	18.3
Oats	38.4	12.4	8.8	6.63	21.87	30.3
Peas	70.6	17.2	19.6	12.00	33.33	36.
Beans	81.6	23.8	26.2	14.15	58.33	24.2
Fat beef, alive	50.	31.2	2.8	9.70	95.00	10.2
Fat mutton	44.	22.6	2.8	8.31	80.00	10.3
Fat swine	34.8	14.6	2.	6.30	120.00	5.2
Fine butter	.55	–	–	.088	500.00	.01
Cheese	90.	23.	5.	15.80	160.00	9.8
Milk	10.2	3.4	3.	1.95	40.00	4.8
Unwashed wool	108.	8.	147.2	25.04	560.00	4.4

The choice of stock will depend upon so many different conditions that each one must answer it for himself. But whatever choice is made, stick to it. Put all the available resources of yourself and your farm into it. Make everything else secondary to the main object, study all the details of the business, and expect success. Feed stock whose natural tendency is to convert food into the product desired. Sir Joshua Reynolds was once asked by a young student, with what he mixed his paints to produce such wonderful colors upon canvas—such effects of light and shade, such magnificent stretches of landscape. His reply was: "With *brains*, sir! I mix my paints with *brains*." Now let us all who would renew our wornout fields, increase the number and value of our herds, or add yearly to our income and to the beauties and comforts of our homes mix our colors with "*brains*," and we shall have no reason to belittle our calling, or look longingly towards the blandishments of every other profession.

RAISE MORE AND BUY LESS.

By Hon. F. D. Douglass, President Vermont Dairymen's Association.

The future of American agriculture is a subject which should deeply interest every American citizen. All new capital is developed from the earth and from the manipulation of the products of the earth. Our agriculture, mines and quarries furnish the foundation upon which all wealth is based. Stop production in these departments of industry, and ruin to all financial interests would immediately follow. If the conditions under which these must be prosecuted are such that they cannot be profitably pursued, every financial interest suffers. Especially is this true of American agriculture. When this calling with us ceases to be a paying occupation, the great array of consumers of manufactured wares directly and indirectly dependent upon it for the means of purchasing personal and family supplies fail to be longer free purchasers of those wares, merchants and trades-people of all descriptions, mechanics, transportation companies, manufacturers and the professional classes, all feel the financial depression, and if this condition is long continued general financial panic and disaster results.

The financial outlook is somewhat discouraging to the farmers of all sections at the present time. Especially is this true with farmers who have a heavy mortgage indebtedness, and with those whose soils are naturally poor and where from want of skill in their management they have become so impoverished that they produce but scanty crops and the consequent cost of production is out of proportion to their market value.

A general depression in the value of agricultural productions at the present time seems to extend to all of the markets of the world upon which we are compelled to rely for the disposal of our surplus crops. This result has been brought about by those improved facilities for transportation which have vastly extended the territory from which the supplies for these markets are drawn, and by the improved facilities for their production. The east, even to far-off India and the islands of the Pacific, are flooding the markets of Europe with their agricultural staples. The boundless West, in consequence of the enterprise and energy of our people, has been unduly developed, while its capacity for production has been vastly increased by the introduction of farm machinery, to the use of which its level prairie soils are admirably adapted.

The great agricultural staples of a vast territory once supposed to be inaccessable to our Eastern markets are now thrown upon them, and often at a less cost for transportation than like products can be shipped from the remote portions of New England. The result of such a combination of influences is inevitable. Our markets are flooded and broken, and competition in the line of Western grain and other staples rendered hopeless on the part of the New England farmer. He is even strongly tempted to buy his home supplies rather than raise them, often paying out large sums in the aggregate which he can not afford to spare, and consequently neglecting the systematic development of his farm and the attainment of that high productive capacity in the various departments of his agricultural work as indispensible to success.

It is a great temptation to the man who is disposed to take life easy to drive to the mill or depot and return with a load of Western grain purchased at a low price rather than produce it himself, and then console himself with the argument that it is cheaper than he can grow it upon his own farm.

These changed conditions have evidently come to stay, at least until this generation has passed off the stage. What the ultimate result of an increase in the population of the West may do towards the restoration of our markets is a matter which need have no practical bearing upon our present plans. The key note of our New England agriculture must be *cheap and abundant production*, rather than unlimited purchase even at low rates. We must adapt our farming to these changed conditions, and produce for the market those wares with which we can most successfully compete with Western producers. We must, at the same time, make our farms self sustaining, often producing for home consumption those wares which we can not afford to produce for sale in the market.

It is a practical fact which I have often observed that those farmers who rely upon the purchase of Western grain do not as a rule develop the productive capacity of their farms and succeed as well financially as do those who adopt an opposite course. Grain must be used freely, especially in connection with winter dairying and if not raised it must be purchased.

The plow must necessarily be the leading implement in the work of home production and of farm improvement. It may, though, be used to the ruin both of the farm and also of the farmer's financial prospects. When intelligently used, and that in connection with such other appliances as intelligence and enterprise are sure to provide, improved crop production and farm profits will inevitably follow. The work of improvement must extend at least to all the arable land of the farm. Large yields on comparatively small areas are no evidence of good farming but rather the reverse. A premium crop on one acre, produced at the expense of a dwarfed production on the balance of the farm is neither praiseworthy nor profitable.

Let us apply figures to this question of home production, and furnish if we can a mathematical demonstration of its practicability based upon known facts. I will present a statement of the annual gross and also the net receipts produced by a very simple rotation of crops, applied to a field of thirteen acres in my own practice. I will here state that the field was purchased of a farmer who bought a large portion of the grain consumed upon his farm, because he could do so "much cheaper than he could raise it." The soil is clay, free from stones, and the field is much like the average clay pastures of Champlain Valley, which in an unimproved state can be purchased at prices ranging from fifteen to twenty dollars per acre. It is not an exceptional case, but may be regarded as an average of the results of many years practice in the renovation of soils. The grain was measured but the weight of the hay was estimated, but at a manifestly fair estimate. The values affixed to both are not above the average prevailing prices for the last ten years. The barley was much of it sold for seed at eighty cents per bushel. The land was plowed with Casaday Sulky Plows, and the teams driven by boys at ten dollars per month, as was also the seeder, harrows, reaper and mowers. The grain fed upon the farm was ground in a farm mill, operated by the same help which, however, is not included in the following estimates for labor. With these explanations I submit the following table, showing both the gross and net results per acre for each of the six years.

First years product, 33 bu. peas and oats, at 50c per bu..	$16 50
Cost of production per acre, including seed	5 50
Net receipts per acre	$11 00
Second year, 26 bushel barley, at 50c. per bushel	$13 00
Cost, including seed, barley, clover and timothy.........	7 50
Net receipts per acre	$5 50

Third year, 2½ tons clover hay, at $8 50 per ton	$21 25
Cost of labor	2 50
Net receipts per acre	$18 75
Fourth year, 2 tons clover hay, at $8.50 per ton	$17 00
Cost of labor per acre	2 50
Net receipts per acre	$14 50
Fifth year, 2 tons mixed hay, clover and timothy	$17 00
Cost of labor per acre	2 50
Net receipts per acre	$14 50
Sixth year, 1½ tons timothy, at $10.00 per ton	$15 00
Cost of labor	2 00
Net receipts per acre	$13 00
Total net receipts per acre for the six years	$77 25
Average net receipts per acre per year	$12 87½

The above results represent six per cent. interest on a cash valuation of over $200.00 per acre.

You will observe, that I have not brought into the account, the value of the manure or fertilizers applied, or cost of application. Neither have I given credit for the manurial value of the crops raised. In this case the crops were mostly fed upon the farm, and the manurial results or their equivalent returned to the soil upon which they were grown. This should, and did, result in a greatly increased fertility. Neither have I taken into account the fact that we began with land, the market value of which is not now over twenty dollars per acre, and leave it paying the interest on over two hundred dollars per acre. Had I purchased an amount of hay and grain equal to that grown upon each acre, and continued to pasture the field, I should have paid out $99.75, and saved in seed, and labor, $22.50, while the value of the pasturage would not have exceeded $9.00 per acre, for the six years at the present rental value of such pastures. This obviously left a balance in favor of the enterprise of $68.25 per acre for the six years during which the rotation was continued. In view of such facts as these, I submit, whether we can afford to purchase western grain at even the present low prices and in consequence neglect the development of our farms.

Appearances in this matter are often deceptive. While attending an agricultural meeting in a town noted for the excellence of its dairy products, the high price received for them and the superior yields of butter per cow, I remarked to the resident physician that the farmers of that section must be prospering financially, and that most of them must be out of debt. "No," he replied, "it is just the opposite; almost every farmer in town is mortgaged." "But how," said I, "can this be, with their superior dairies and reputation for dairy products?" The facts are," he replied, "that they carry their dairy products to the depot and return with an almost equal value of western grain in some form and neglect to raise the food upon which their stock should be fed."

There is abundant evidence of the bad policy of purchasing rather than producing those products, to which our soil and climate are adapted. If we consider the tremendous aggregate outflow of money from the farming districts of New England for agricultural supplies, we can not fail to be alarmed at the situation, and wonder that it has not resulted in wide spread ruin to the farming interests.

If one would be impressed with the vital importance of this matter, let him call upon the prominent dealers in grain in its various forms in almost any locality where farmers are wont to purchase these supplies, and enquire in regard to their annual expenditures and receipts for these staples. From these figures let him estimate the probable outflow of money in this direction from his own town, county or state. The student of political economy who will do this cannot fail to be impressed with the overwhelming importance of this matter, and be led to enquire how this ruinous drain can be prevented.

I have in my possession a statement drawn from the ledgers of two firms, mill owners and grain dealers, in one of the towns of my own county, giving their aggregate receipts for western grain, flour and feed for one year. It is a humiliating record, but one not unlike those which may be found almost every where in New England. The statement is as follows:

Ninety carloads corn, 45,000 bu., at 65c. per bu	$29,250 00
Thirty carloads bran and shorts, 450 tons, at $20.00 per ton..................	9,000 00
One thousand five hundred bbls. flour, at an average of $6.00 per bbl...............	9,000 00
Total............	$47,250 00

These firms do a strictly retail business, and their sales were for actual consumption. There is one other mill and a large number of dealers in the same town who I should judge must have sold enough of these wares, in the aggregate to supply all other classes, and that an aggregate nearly or quite equal to the one above given must have been paid for foreign grains by the farmers of that, and the adjoining towns, who draw their supplies from that center. This, in one of the best agricultural districts in Vermont.

In view of the present changed conditions under which agriculture must be pursued, the strong competitions, flooded markets, and depleted soils, it is imperatively necessary that farmers should carefully consider what improvements they can make as offsets to these adverse conditions. Not only how they can increase their receipts, but reduce their expenditures. The latter is just as important as the former. The balance-sheet, and not the receipts, determines the success or failure of every financial venture. Our motto must be, "raise more and buy less."

THE PHILOSOPHY OF FARM IMPROVEMENTS AND CROP PRODUCTION.

By Hon. F. D. Douglass, President Vermont Dairymen's Association.

The fundamental conditions which determine the question of gain or loss in fertility are obvious. Effect follows cause with unerring certainty in this as in all other affairs. If I take from the soil those elements of plant growth which render it fertile, I shall thereby reduce its productive capacity. If I increase the amount of these while the mechanical condition and other influences remain the same, its fertility will be increased.

In conducting a farm we should keep these three objects constantly in view—the production of the largest aggregate amount of crops, the largest practicable amount of plant food, and the maintenance of the best possible mechanical condition in the soil.

We should endeavor to make our farms self sustaining so far as practicable. Stock farmers, as a rule, should raise their own stock food, not excepting grain, while feeding much more of it than they now do. It has been demonstrated in individual practice that this may be accomplished in connection with a rapidly increasing fertility, and that without the purchase of plant food in any form. If this be true of individual practice, on an average farm, it must also be true on a larger scale with the same systematic application.

The agriculture of a state or nation is but the sum of individual practice in that department.

Success under existing circumstances can only be attained by the adoption of some intelligent system extending to all departments of the work pursued. Intellect has come to be an important factor in our agricultural problem. When our soils were first cleared of their original forests little thought was required of the husbandman. He had but to plow, sow, and harvest his crops. The same is now true of the virgin soils of Dakota. But in consequence of such thoughtless, unsystematic management our soils have been depleted, and their present condition demands an opposite course.

The modern farmer must understand the essential conditions of an intelligent system of farm practice, without which he can not reasonably hope to succeed. Let us consider some of the most important of these conditions.

First—A favorable mechanical condition is indispensable to the successful production of crops. If I change the mechanical condition of a hard compact soil, and render it comparatively light and friable, I shall by that means alone greatly increase its capacity for crop production. I shall thus extend the feeding ground of the crops grown upon it, make the plant food which it contains more available, increase the capacity of the soil for the retention of moisture and thus protect the crops from drougth, and to a certain extent from that hard, bricklike state which results from extreme saturation and the heat of the sun in summer. As the roots under the changed conditions extend much deeper, we thus protect them from upheaval and destruction by the frosts of winter.

The extension of the feeding ground of plants is quite as important a consideration as that of extending our grazing fields. Heavy clay soils may often thus be doubled in their productive capacity. It is much more desirable every way to practically double our farm downward than to buy out our neighbors.

On light soils this extension of root growth may be affected by increasing the amount of plant food, and the depth to which it extends. If the food on which plants subsist is in a mellow soil their roots will find it at any depth consistent with their characteristic habit of growth.

The plow must obviously be our first and chief reliance in the prosecution of the work of farm renovation and crop production.

Without its aid we cannot reasonably hope to maintain that mechanical condition of soil so indispensable to successful farming.

Second—The crop raised, or its equivalent in plant food, must be returned to the soil. One of the first conditions of successful farming is the provision of convenient and effective appliances for saving both the solid and liquid manures produced upon the farm, and for returning them to the soil in the proper season. Manures should be hauled to the fields in winter when the ground is frozen. There is no time for this after the soil is in condition for seeding, and it is ruinous to its mechanical condition to drive upon it while in a wet unsettled state.

Plant food holds the same relation to agriculture that bank stock does to banking, or the merchants stock in trade to his business. The banker will receive no dividends if he has no bank stock, the merchant no profits without the goods in which he deals, the farmer no income without plant food on which to grow his crops. Each of these sources of profit is the foundation of financial success in the department of business to which it pertains. The more of these judiciously employed in their respective departments the greater the pecuniary gains. The farmer can no better afford to waste or lose the use of his plant food than can the banker his bank stock. The loss of either implies bankruptcy, while their accumulation is evidence of financial success. To waste the liquid manure of a stock farm is equivalent to the waste of one-half of the accumulations of our stock in trade.

Third—The farmer to succeed, must have two objects in farming. He must not only raise good crops, but he must also provide an abundant supply of material with which to grow succeeding crops. He must like the merchant increase his stock in trade—his plant food. He should keep the fact constantly in view, that the larger the crop grown the larger the amount of plant food produced. The more plant food produced, and applied, the larger the succeeding crop. This work goes on in arithmetical progression, each accumulation insuring further increase.

This work can be greatly accelerated on most farms by the substitution of forage crops in place of ordinary pasture grasses. While we thus supply an increased amount of plant food, we also increase our stock food and shield ourselves from loss in consequence of the failure of pasture grasses by drought or otherwise. This is especially important on a dairy farm.

By converting a portion of his pasture lands into mowing fields, the dairyman may supply himself with an increased amount of early cut hay for late spring and early summer use. His cows should be allowed only a limited range until his pastures have developed a rank growth of grass upon which to maintain his stock in midsummer, and by which the pastures themselves must be protected from the ruinous effects of too close cropping. By thus continuing his winter rations until early summer, the dairyman not only increases his present profits by securing a large yield of dairy products, but he also avails himself of the advantages of soiling with a smaller expenditure of labor.

Fourth—The stock farmer as a rule should grow and gather his own plant food as well as stock food. He should make his farm self-sustaining in this so far as practicable, as in other farm products. He has an endless variety of opportunities which he should learn to recognize and improve.

One important consideration in the arrangement of a practical system, is the characteristic habit of growth in the crops which we produce. When practicable we should select those which draw their sustenance largely from the atmosphere and sub-soil; those which serve best as a medium for gathering plant food from sources outside of the feeding ground of ordinary crops. There is a wide difference in the habits of plants in this particular. Let us apply figures to this subject, that we may understand more clearly what may be accomplished by a proper selection of crops.

If I purchase ten pounds of large Northern clover seed, and after a proper preparation of the soil sow it upon an acre of clay or loam land, it should produce in an average season two tons or more, of well dried clover hay. But we will assume that it will produce but one and one-half tons. Taking the market value of the average commercial fertilizers as our standard of valuation, we have by this operation harvested $13.14 worth of plant food, as the manurial value of a ton of clover hay is $8.76 by this standard. But this is not all. It has been demonstrated by repeated investigations that the roots of a crop of clover contain as much plant food as the harvested crop, and if so the value of the plant food contained in the entire clover products would obviously be $26.28, per acre. It is true that the crop is grown upon the soil, and is not a net gain of plant food; but the habit of growth in the clover crop is such that it extends its roots very deeply into the subsoil far beyond the reach of ordinary crops. These roots have often been traced to a depth of over four feet below the surface. It also gathers a large portion of its sustenance from the atmosphere. It thus serves as a medium for gathering a very large portion of those valuable elements of which it is composed from beyond the feeding-ground of ordinary crops.

What is true of clover is also true of all farm crops, only in a less degree. All crops are gatherers of plant food. They create nothing, but could all the fertilizing elements thus gathered on the farms of New England in time past have been saved and applied and re-applied since their first occupancy, they would now rival the prairies of the West in their fertility.

"But," says one, "how is this? Can you feed your crops to stock and make them available for fertilization also?" I answer yes, practically. It is true that when fed to growing and fattening stock there is a slight loss, when the stock is sold from the farm, but it practically retards but slightly the work of fertilization. Both science and observation tell us that animals extract but a small percentage of the food which they consume; only the amount represented by their increased weight, and their dairy or other products for which they are kept. A mature ox while fattening extracts but five per cent of the plant food from the rations which he consumes. Growing animals retain somewhat more than this. A dairy cow while giving a full flow of milk extracts twenty-five per cent. But if the milk of the cow is converted into butter, and the skimmed milk and butter milk are retained upon the farm and returned to the soil, there is no loss of the fertility. Pure butter has but little if any manurial value. Its constituents all come from the atmosphere.

I have given the above illustration of the practical effect of vegetable growth in the gathering of fertilizing elements for the purpose of showing how it is that a judicious cultivation of the soil may and should add to its fertility, and that we should not be content with a mere spontaneous production, while purchasing agricultural supplies to the production of which our soils and climate are adapted. The farmer is constantly gathering the materials for fertilization in every crop which he grows. Each succeeding crop contains more plant food than it takes from the soil, and each succeeding crop should contain more than its predecessor, with the same favoring conditions of moisture, heat, etc., prevailing.

By a proper selection of crops this gathering in process, which I have illustrated in connection with clover, may be greatly accelerated or retarded. In other words, the principles which govern a correct farm practice may be regarded or disregarded, and success or failure will in this, as in all other matters, follow their legitimate cause.

There are certain natural aids which come to the assistance of all farmers, whether intelligent and enterprising or not. Every soil has a natural capacity for crop production peculiar to itself. It will produce indefinitely a certain amount with the application of only such fertilizers as nature supplies, even when the annual plant growth is removed. This supply comes from the disintegration of the soil by the agency of frosts, etc., and the consequent liberation of a portion of its plant food. It is also supplied by deposits from the atmosphere through the agency of rain and melting snow. But these supplies, though materially aiding in the work of crop production, are utterly inadequate to the production of large crops, and can not be relied upon for maintaining the fertility of the soil. There will be a gradual increase, even in connection with spontaneous production, if the plant growth is not removed. We have examples of this in the Western prairies, where by the accumulations of ages great fertility has been developed. But as the time allotted to man on earth is limited, he can not afford to wait for this natura process of fertilization. We must assist nature, and she will more effectually assist us. Nature will indeed do the work, but we must so arrange the conditions that she can work rapidly and well.

Fifth—There is still another source to which the stock farmer should look for that additional supply of plant food, by the aid of which he may be enabled to raise any crop which he may desire for home consumption, and that is, selection in feeding. The market value of stock food is no criterion by which to judge of its manurial value. We may often hasten the work of improvement by disposing of certain crops, and purchasing in the market those more valuable, both for stock and for plant food. As a practical illustration of this we will suppose that a dairyman has a bin of oats which he exchanges for an equal value of cotton seed meal. The former will command a much higher price in the market in proportion both to their food and their manurial value. While the meal is much more valuable for stock food, in proportion to cost, it is also more than three times as valuable for manure.

Let us apply figures to this matter that we may better understand its importance. In doing so I shall refer to tables prepared by the best scientific authority, and which I have found by practical experience to be substantially correct, making no allowance for the slight changes in the market values of manurial elements, which may have occurred since their publication. By these tables, we find that a ton of decorticated cotton seed meal is worth $26.29 for manurial purposes, while a ton of oats, is worth $7.62 for the same purpose. Were the food value the same, in proportion to cost, the feeder would secure $18.67 worth of additional plant food as a reward for his enterprise.

Or, again, if the farmer has a bin of barley, he may profitably exchange it for bran. The manurial value of bran is $13.25 per ton while a ton of barley is worth for the same purpose but $6.76. By this exchange he would secure $6 49 worth of manure.

Please observe that I neither affirm or deny that the manurial values given above are the actual practical values of the crops named when applied to ordinary crop production. But they are substantially the prices which the farmers must pay if he goes into the market for his manures, and they are the only available standard of market valuation. The illustrations given show the comparative manurial value of the crops named, which is the object of their presentation. I will not follow this branch of the subject farther, as I only propose to call attention to it, leaving the farmer to pursue the matter for himself if he shall choose to do so.

I trust that I need not say more in order to convince the thoughtful farmer that there is here a wide field for investigation and improvement, upon which the farmers of New England have scarcely entered; that we have within our reach those agencies which if brought to bear upon our work will furnish us with the means for raising any farm crop required for home consumption, to the production of which our soils and climate are adapted.

The prevailing belief that grain raising is necessarily attended with deterioration of the soil is a mistaken one. It is the sale or waste of the elements of which the grain is composed which results in this, and not their judicious production. The farmers of New England can raise much more grain than they now feed, and that with a constantly increasing fertility in their soils, if they understand and apply the principles by which the business should be governed. If they will but follow the example of our western brethren, and provide themselves with the necessary appliances, where practicable, for substituting horse power for man power, they can surely succeed, while at the same time they supply themselves more abundantly and cheaply with the various fodder crops. The grain and grass crop must alternate upon the same soil, and thus an increased production will result which will save untold thousands of dollars to the farmers of New England.

DOES THE FARM PAY.

By J. M. Deering, Member for York County.

The question, under discussion at this time is really one that I have been wrestling with for twenty years. And there have been times when I thought I had the problem solved fairly satisfactorily, as far as my own interests were concerned. But as I wandered along I became aware of the fact that farming is a business, like all other occupations and industries, that in order for one to be successful it requires on the part of the farmer that he be careful, industrious, foresighted and economical.

The changes that have taken place in the agricultural interests of the country within the past few years have brought farmers into a sharper and closer competition with each other, and have revolutionized some features of the agricultural industries, and to a certain extent have knocked the Maine farmer off his base, and we are continually hearing the statement made that "farming doesn't pay." We will assume that farming is a business like all other occupations, and it has its two sides. The one lies in the glow of the warm and bright sunlight of prosperity. The other is on the shady side buried in the gloom of adversity. Now the bright and prosperous side we are apt to let pass by without much notice or recognition on our part, but the side of adversity is continually calling our attention. The year of 1888 was a hard year for the farmers of Maine. More failures I venture to say occurred than in any one year in the ten preceding. Every farmer present remembers the cold wet spring and the early frosts. Had he known what the season was to have been, he would not have taken the chances of planting his sweet corn in the month of June. So we cannot conscientiously say that the farmers were wholly responsible for the failures made upon this crop, yet we can claim that it is a duty we owe ourselves our families and our country to guard against such failures in every possible manner. And what is still more important is to protect ourselves in case we meet with such calamities. I cannot at this time go into detail in regard to the sweet corn crop, it is enough for a lecture of itself. But I wish to touch upon it because it has become one of the leading industries in Maine agriculture. Its increase within the last ten years exceeds that of any other farm product. I find when I first raised corn for the factory I received two and one-half cents per pound for the cut corn, and one year I received $91.50 per acre. This was an exceptional crop. I found that as years went on the price continually grew less each year until it reached one and eighty one hundredths cents per pound. After receiving this price for a few years the account stopped with the factory. This price failed to induce me to raise the corn for them, but after a few years I found myself raising it again for the factory, and for 1 and 80-100 cents per pound, and I have been a patron to the factory since. The price has advanced within the last three years, and this last year I received 2 10-100 cents per pound. Now to give the best result would be liable to mislead, and I will give the smallest, which was $35.20 per acre; but in averaging up I find that I have received $55.35 per acre for the corn at the factory. Now this is not a very brilliant showing, but even this average for nine years, take the seasons as they come, I claim is a fair average and can only be reached by good cultivation. Loose, slipshod farming will not reach it unless the season is very favorable.

Now I will give the last year's result. Five acres brought at the factory $300.25. This you will see is $60 per acre—a good result for the season. I have found that 3,000 pounds of cut corn per acre, after the waste is taken out at the factory, such as waste in husking, cutting off, cleaning out the silk, etc., which the raiser must bear, is a very good grown acre of corn and is as much as is safe to reckon upon, with good cultivation and a fair season, which is very near my average.

The amount of fodder that will accompany the amount of cut corn per acre will vary somewhat, and will depend upon the variety of corn. Late Crosby produces the largest amount of fodder, and will give from eight to ten tons of green fodder to the acre, and from two to three dry. I consider this fodder worth to me $5 per ton dry, and $2 green to cut into the silo. To give the minimum, in the one case we have ten dollars' worth of fodder, in the other we have sixteen dollars' worth. This really figures in favor of the silo.

Now, what does it cost to produce this amount of corn and fodder. I have heard it stated that an acre of sweet corn can be produced as cheaply as an acre of yellow. My experience says it cannot be done. First I find that the seed costs more. I also find that if the seed is ever so good it is more liable not to germinate; the young plants are not as strong; when it first comes up it is more pindling and it needs more care to cultivate it and we are not as sure of getting as good a stand of plants. On the whole we have more chances to take than with yellow corn. Then I consider it a stronger feeder upon fertilizers. It draws more plant food from the soil. It costs a little more to pick and haul it to the factory than it does to husk yellow corn. By having the advantage of raising both crops in the same field in the same season and upon the same kind of soil, and by keeping an account with both crops, I find that I need about ten dollars more to raise an acre of sweet corn than an acre of yellow. Soil, season and fertilizers being equal I find that it costs me from thirty-five to forty dollars per acre to grow sweet corn, after deducting one-half of the value of the fertilizer applied, and doing the work with improved machinery as much as possible. By the way, I have a new method of harvesting yellow corn which I consider practical. When the corn is in the right condition to cut up and stock, gather the ears, lay them upon the ground, let them lay until the corn is ripened enough to put into the crib. The weather will not injure it. If it rains stir it up. Cut the fodder immediately after plucking the ears and cut it into the silo. The husks on the ears can be easily saved and will pay for husking.

I have often heard these two crops compared as to profit and I must say that my experience hardly endorses some of the statements in favor of sweet corn. And yet I claim that if any one is favorably situated the margin is in favor of sweet corn. With all due respect to the proprietors of the factories, appreciating their prompt payments and business principles, and their faculty for looking out for themselves, I only wish to say to the farmers that it is only business on their part to look out for themselves; that while they take all the chances, run all the risk of poor seed, of extremely wet weather in the spring and also drouth some time in the season, late frosts in the spring and early frosts in the fall, that often ruins the crop, and do all the hard work pertaining to growing the crop, see to it that the proprietors of the factories do not make all of the money.

We find that we must produce 3,000 pounds of corn per acre in order to make it a fair business at two cents per pound; we find that it costs about thirty-five to forty dollars to produce it; (of course the cost will vary somewhat on account of different soil, but not much upon an average;) we find that those very few, and we might say fortunate farmers who receive one hundred dollars per acre for corn are few and far between.

It is only the best results we read of in the papers; the others seldom reaches the printing office. The average of the State will not exceed forty-five dollars per acre, leaving only the fodder for the farmers on an average. I find that it has been the custom of the proprietors of the factories to set the price they will pay for corn. I know well that I have traded that way for nine years.

Now I simply wish to ask one question: Would there be anything unfair or unjust if the farmers should set the price they will plant for the next year? Would it be unreasonable for the farmers to have a voice in the matter one year in two? I say frankly that taking all things into consideration in regard to growing this crop that $2.50 per hundred pounds of cut corn is as low as it can be profitably raised. As far as the proprietors are concerned it has been claimed that they run the risk of the market, that they have a large amount of money invested in buildings and machinery, etc. That is all very true but I claim that if there is any money made in this business they have made it. The farms on an average in the State have not got their share of the profits in the business yet.

The beef growing interest has been sadly depressed for the last three or four years, and the depression still exists. There is no reason presents itself to me why it will not continue, how long no one can tell. But this is a business I have always taken a deep interest in and have given my close attention and observation. Twice within the last four years I have visited the West in order to inform myself in relation to the future prospects of this industry, and I can freely and unhesitatingly give my opinion. You have read of the three territories that have recently been taken into the union as states, representing 372,000 square miles of territory, or equal in area to the New England and Middle States together with Maryland, Virginia, West Virgina, Ohio, Kentucky and Indiana. Now the four states taken in represent only one million population, while the other states mentioned represent nearly one-half of the population of this country, proving the fact that these new states are simply a great and almost boundless cattle pasture to-day. It would be encouraging if it stopped there, but there is Wyoming, Colorado, the Indian Territory, Arizona, New Mexico and Texas, whose farming facilities are better adapted to the growing of cattle at present than anything else. Hence we find that the production of beef exceeds the consumption. And there is no remedy for us—there is nothing we can do but to let it find its own level. In the far off future when the boundless territory becomes as thickly settled as the State of Ohio, representing three million population and making a home market for their own productions, then their beef and also other farm products will bring a better price in the East. But our lives are too short to see that day. I do not mean that there will not be fluctuations in the price of beef, but I think that the price is doomed to run low, on an average, in the future. This is rather a discouraging outlook, but I believe in putting things as they are.

What are we going to do about it? Are we going to give up the ship and let it sink? I say no, but tack it and keep on tacking until we get it pointed in the direction to conform with our conditions and circumstances.

We must admit that our hay crop is the most important and valuable crop grown in the State and whatever tends to reduce the feeding value of this crop to our domestic animals is really detrimental to our agricultural interests, because it reduces the profit of the farm, and influences the farmers to look more closely after the selling value of this crop. If the selling value exceeds the feeding value then the farmer sells his hay without recognizing the fact that year by year he will become more and more dependent upon the commercial fertilizer dealer, who, my friends, is a gentleman I don't wish to become wholly dependent upon just yet. Now, what is our remedy?

In order to demonstrate this I will give you an experiment, that I have just closed, which was the feeding of a pair of steers and a pair of cows. Time 150 days. Cost of grain during trial $37.50 for steers; cost for cows the same. Cost for hay, three tons for steers, $18.00; cost for hay for cows the same. Steers gained in live weight 635 pounds; cows gave 23 quarts of milk per day on an average, or 3450 qts. valued at 4 cents, $138,00 less the cost of keep $55.50, leaves a net profit of $83.50. Beef 635 pounds live weight at $4.00, gives $25.40; Cost of keep, $55.50, a loss of $30.10.

You will see in the one case we have $83.50 profit in the other we have a loss of $30.10. Perhaps all may not be as favorably situated as to the sale of their milk, but the point is there has been no depreciation in the price of milk or butter. There is a profit in the milk or in dairying where strict attention is given to it. Under the present condition of things our only salvation is in the cow.

There is no other question in the country that is agitating the public mind at the present time as much as the beef growing interest. There is a meeting to-day in St. Louis where nine states and one territory are represented by eight members of the legislatures of each State for the purpose of devising measures whereby to build up the values of the live stock interests of the west. Where the growers of cattle and farmers of the west resort to such desperate means to recuperate their interests, it is perfectly safe for us to conclude that we are not suffering alone. I have spoken of these two industries, which are important factors in Maine agriculture, but the profit upon our beef product has faded away. Still I consider it in the power of the farmers to make the sweet corn industry a paying business yet. I don't give it up. There is no question but there is a profit in the business, and the farmer should receive his share—he should have a little more for producing the crop.

Now let us turn to the brighter side of the question and learn if we can by what conditions, along what line we must work to achieve success. I venture to assert that we should be more thorough in the cultivation of the soil. Our dairy stock should be bred up to a higher standard, in order that our dairy products be of a more uniform quality. If the State of Maine is to be a dairy State it should build up its reputation by producing a good article. There is no necessity of manufacturing a quantity of twelve-cent butter, if proper care and skill, and strict attention is given to the business. As far as competition is concerned, it is a fair fight between the State of Maine and other states. It costs as much to milk a cow or make a pound of good butter in Iowa as it does in Maine.

The dairy business represents a manufacturing industry, our dairy stock being the machinery and the milk, butter or cheese the manufactured product. The different breeds represent differently constructed machines, and the farmer should choose the one best adapted to the product he is manufacturing. We recognize the advantages of associated dairying and believe in its practice, because if the butter was all made at the factories and the butter was all of good quality, and no doubt it would be, there would be less grades or brands of butter, and the sooner the reputation of the State would be established. I believe to produce a uniform quality of milk or butter that the machine requires uniform feeding. The changing of feed changes flavor. But I cannot go into details in regard to dairying,—it is a subject of itself. But I believe no other line in our stock husbandry offers such inducements as the dairy interest, providing the farmers will adapt themselves to it. Certainly we hear of no complaints among those who are carrying on this line of work in a practical manner.

The farmers of Maine always have been and are to-day a sturdy, economical and intelligent class of people. There are no more disadvantages in the business of farming than there are in other industries, and none but what can be overcome by systematic and organized effort. We can claim that there is a profit in farming because four-fifths of the wealth of this great and rich nation has been accumulated by the profits made upon the products of the soil. To prove this, take a look at our prosperous cities and villages scattered throughout our country. If their leading industry be the manufacture of woolen goods the farmer grows the wool. If it be the manufacture of shoes, the farmer grows the sheepskin. No other industry outside of farming employs as many people as railroading. In this industry can be found the richest men in the country, but without the farmer's products they would all be bankrupt. The proprietor of the canning factory must have the farmer's products, the manufacturer of lumber uses the farmer's timber and consumes his product. We might go on with an innumerable list, but we have mentioned enough to prove that there is a profit coming out of the business. The question for us to settle is, does the farmer receive his share?

I lay down this discussion not because it is finished, but because it is time to stop. Such tasks as this, of defining, illustrating and trying to enforce right principles are never finished. One may labor at them for a time but very soon in the nature of things he must leave them to the care of others.

THE PERCHERON HORSE.

By Dr. G. M. Twitchell, Fairfield, Maine.

Among the special industries absorbing the attention of the farmers of Maine, that of horse breeding is taking an important place. In every direction men are turning to this as the branch of breeding which is to give the surest returns. Whether these expectations are to be realized or not time only can tell. If, in the multiplication of colts, quality is the prime essential sought after, then the industry rests on secure foundations.

The active demand for the stock produced in Maine has brought wealth to many a breeder, and insures prosperity to those who study to produce what is wanted. In the breeding of horses Maine occupies a peculiar position, and the advantage which has been secured by years of patient, unremitting toil, and the expenditure of large sums, can only be maintained by holding firmly to the highest possible excellence. With the growth of the industry there has followed a more critical demand, and the standards of former years have been discarded.

Indeed one can hardly appreciate how this idea of perfection rises constantly, though slowly, as a man's conception of the character of his horses grows within him. What is now needed is that the agricultural press and other publications, stand by and sustain this industry, not only in its completeness but excellence. There is still an urgent demand that public sentiment touching this question be more fully aroused to the importance of breeding such classes as the market demands. The horse that can be bred at least cost is not always the most profitable to raise. Value at maturity, in connection with cost of production, should, yes, must determine the lines of breeding.

There is great danger of drifting into a condition where substantial returns can hardly be realized, because men lose sight of the end and consider only present cost. Colts to sell at a profit must be bred and reared with the one thought of merit. This, then, is to be the foundation for success, no matter what class of breeding be adopted. There is and will always be a demand for a choice article. There never can be an overproduction of the best. This being true the lesson is obvious.

In presenting the claims of the Percheron breed of horses it should be understood that there is no reason for conflict between classes. There is an unsatisfied demand for the better grades of draft and larger driving horses, and there are persons, by nature, disposition and surroundings, better adapted to this line of breeding than to any other. The man who urges the value of the all purpose Percheron, may have as high an appreciation of the finely bred trotter as his neighbor who devotes himself to breeding for speed. Each has its peculiar field, and it is impossible for either to encroach upon the other without sacrificing some of the essential qualities which are necessary for the highest excellence.

Men succeed best with that line of work for which they have the greatest fancy. This element in ones nature needs be fully comprehended and encouraged. It alone demonstrates the necessity for, as well as opportunity of carrying forward all lines of breeding. Ones inclinations and surroundings have very much to do with success. Held by adverse circumstances, cramped by reason of conditions not easily controlled, men drag out an existence, whereas if they could and would but rise above their environments and do what is pleasant and agreeable the measure of satisfaction and ratio of profit would be greatly increased. It makes no difference what the field the lesson is the same. Stock breeding is no exception to the general rule.

Success here depends as much on the selection being made in accordance with one's desires and fancies, as on any other one factor. Where one makes a grand success with trotting stock another would fail. All around one notes failures and they are charged to the industry, whereas they should be set against this other fact that men are trying to do what by nature and disposition they are not fitted for.

The field for draft stock is far removed from that of the race horse. The ideals are entirely different, and while the general laws of breeding apply, the special lines of action run in altogether different grooves. In any consideration of this question this thought of adaptability to the work should determine what is best.

In the estimation of New England breeders and buyers the Percheron stands to-day unrivalled in the field to which he rightfully belongs. As a draft horse, for the carriage, for endurance and substance, he is unexcelled, hence the breeding of this class claims our attention. On the farms of Maine royally bred specimens of true merit are being brought in and grade colts are multiplying. What is the breed and what does its name signify? While writers may differ upon other points, on this they are agreed, that the race traces directly to the Arab stallions captured by the French from the Moors in the ninth century. Here was the foundation of the Normans and Percherons of the present day. In the division of the spoils the horses, or a large portion of them, fell to the soldiers of France and especially to those of Le Perche, Orleans and Normandy. If it be said that the Arab type is lost, we have but to state that there was a complete change in conditions, as well as climate, either of which would have worked the transformation. It has been modified by its labors. For centuries it has ranked as a driving as well as a draft horse, and been of supreme service at the plow or the cart, as well as on the road. The Percheron of the earlier days had a gray coat like the Arab, in fact that color seems to have predominated, and being fixed by generations of breeding it is seen to-day in a very large per cent. of the horses of the breed. As they were largely used for the postillion, before the days of railroads, this seems to have been the proper color, and was doubtless cultivated in order that it might be seen at a distance in the night.

The Percheron has long been noted for the abundant mane, large, expressive eye, broad forehead, dilated nostril and full, deep chest. A willing servant, it has been brought down through centuries, exhibiting that mildness of disposition and readiness of action which is recognized to-day as one of its leading characteristics.

The early crosses were doubtless on the Brittany mares, adding to the size, and building up the larger types seen at the present time. It may not be without interest to note the method which has so long been followed in that section of France which has given the name to the breed.

That portion of France lying between the Seine and Loire rivers and known as the Perche has for centuries been noted for the superiority of its stock. A good farming section, with excellent grazing and abundant hay and grain crops, the farmers seem to have taken naturally to the work of perfecting the type of horse most desired in that country. In the early history of the race they were bred chiefly for the saddle, and substance and action seem to have been the characteristics sought for with a patience and perseverance which brought its full measure of satisfaction. The country in the section named is hilly and uneven, cut up by small valleys, watered by springs or brooks flowing into the rivers. These valleys are natural meadows, rich and fertile, and the soil generally clayey.

With the farmers the plants for dry and green forage are first, clover and then fennugreek. Thorough cultivation we are told, is what has brought these lands into such a high state of cultivation, and enabled this comparatively small section to send forth horses in such numbers and excellence. Coupled with this fact is another, that the Government of France has always maintained a liberal policy, and aid to agriculture has become a settled policy, so that while parties may change, this policy is fixed and unchangeable. Recognizing the worth of the horse industry, the government at an early period began the purchasing of the best specimens of Percheron stallions to be found, and the subsidizing of others, sending them out through the country and offering farmers every encouragement to use them, making the best possible selection of mares. At the present time fully twenty-five hundred are owned by the government itself, and about seven thousand subsidized. Going still further in this work of protection and encouragement, all others are obliged to be inspected and licensed before being admitted to public service. In this way all grades of unsound horses are excluded. With the value of each sire practically tested, the intelligent system fostered by the government in making selections, the climate and soil have combined to produce magnificent specimens.

The State of Maine is soon to see the practical workings of a system of governmental assistance in horse breeding, in the case of the Province of New Brunswick. There the labors are not confined to one class of stock, nor is there such careful restriction, but the good results will be noted in the immediate future, bringing wealth to the farmers and strengthening all agricultural interests. The State of Maine may here find additional testimony in encouragement of a like practice.

The district of Perche is bounded by the immense plains of Beauce, the thoroughfare of the post-coaches for Paris, and of transportation for all supplies from the West. Being directly in the line of travel it has for centuries been the rendezvous of the draft and long distance driving races.

This was doubtless one of the leading factors in the building up of the Percheron family. There was demanded a horse, strong yet quick, easy to raise, best to feed, of good disposition, and possessing an enduring body, and here was the foundation in the Arab and Barb stallions crossed on the Brittany mares until the type was fixed. In breeding throughout this section of country, the peculiar practice is followed of one section growing and developing what another produces. Thus the sexes are divided at weaning time. The mares are kept steadily at work during the period of gestation with a few days rest before and after foaling. Of course the nature of this work is tempered by her condition, but during the larger portions of the year she labors as though not bearing a foal. At the age of five or six months the colts are weaned and the males abruptly sold to be taken into the interior, upon the fertile meadows of adjoining sections. For these the farmers who bred them receive from five to six hundred francs.

For the next year they graze in the fields during the season and are fed hay and bran in the winter. In this way they reach the age of eighteen months, having thus far been a bill of expense. Now they are put to work. Docile by nature through centuries of breeding and education in this one direction, they begin to do something towards paying the expense of keeping.

No man can continue to breed and train horses successfully without getting control of himself, and here, too, one sees the effect of this special line of work generation after generation. The colts partake of the characteristics of their owners and the farmer, out of his love for the work, becomes patient and mild in the treatment of his stock. Four or five of these colts. not yet two years old, are harnessed to a plow or wagon and pull what would be an easy load for two horses.

As this labor commences, the method of feeding is improved and the progress and development of the good qualities are noticeable at once. At the age of three years, if kept intact, the Beauce farmers purchase for their work on light, soft soil. The premature work instead of being hurtful has been very beneficial when in the hands of a good master. The labor now is constant, but the country is one of proverbial richness, and cereals abound and the colts receive an abundance of good hay and oats. The work done requires quick movements, for it is all sowing and harvesting, plowing and hauling. As regards the horse, everything must be done promptly, and the education is in this line. Thus the colt matures and at five years of age is bought by the dealer at the annual fair on St. Andrews' day in the town of Chartres. The farmer usually realizes from one thousand to fourteen hundred francs.

In this system the colt has passed through four hands before it is dedicated to its final uses. The education has been continuous, the growth steady and work begun at an early period. Size has been gained, muscular development secured and the fast walker and good roadster is the result. It has been the continuation of this systematic course of feeding, working and training which has given the Percheron horse to the world. At times there may have been a degeneration through improper crosses, in the desire to get rich rapidly, but in the last century there has been a regeneration through judicious selections, an aiming at the choice of the most perfect types.

In France the Percheron stands as the family horse, the middle type weighing from twelve to sixteen hundred, light of foot, easy of action and possessing wonderful endurance. This was necessary during those centuries before the railroads came, when the call was for postillion horses ; and ever since the road qualities have received attention even while working at the plow. Abundant evidence of speed is produced to satisfy the most credulous, but that does not strictly apply to-day, the Percheron standing in this country not as a draft horse neither a trotter, but as a general purpose animal possessing qualities unequaled by others. If on the one hand evidence is seen of remarkable draft powers, or on the other of records made and races won, the great majority will look for the horse of good disposition, best adapted to all kinds of work, ready at all times and seasons, docile, intelligent, sound by nature and inheritance, a fast walker and free, easy roadster of size and substance, and will find this combination in a marked degree in the noble Percheron.

In this brief sketch one can do no more than outline the work of the past. An attempt has been made to indicate how the race sprang into existence and became established. This much is necessary, for only as we appreciate the efforts of former generations can the work be carried forward systematically and successfully.

The first importation to this country, of which any authenticated record is found, was in 1839, and was made by Dr. Edward Harris of Morristown, N. J., though it is highly probable that the horse "Norman" or "Morse's Grey" as he was known, owned in Washington County, N Y., was a Percheron, as he was by a French stallion imported in 1816. Those selected by Dr. Harris were of the smaller type and seem to have been taken because of the combination of good qualities. They stood about fifteen hands and weighed from twelve to fourteen hundred. They are described as having been "very broad and deep, of great girth, short in leg, close coupled and compact in every way, yet rapid roadsters. Their legs were flat, strong in the joints and free from blemishes, the hoofs protected by hair growing above the coronet as well as at the fetlocks." All or nearly all were grey, and this seems to have been, as it probably is to-day, the predominating color.

In 1851 Mr. Charles Fullington, of Ohio, brought out a horse known as "Louis Napoleon," the first importation West of the Alleghanies. The superior character of the grades gotten by this horse led at once to numerous importations. Meanwhile the breeders of the East had not been idle, but in Massachusetts an active interest was taken in this class of stock. To Hon. Geo. B. Loring much of the credit should be given for the impetus this industry received during the sixties. As President of the Massachusetts Society for Promoting Agriculture, he urged and finally secured the importation of some of the finest specimens ever brought from France. Even at that early day he foresaw a future for this class of stock, and that in the economy of farm work the Percheron must play an important part.

In 1868 the first importation was made to Illinois where now one finds the great heart of the industry in America. From this date the numbers increased rapidly, and soon after, the earlier importers organized and instituted the Percheron Stud Book. Like breeders of all blooded stock, they placed great stress on pedigree values, as well as individual merit, and labored to secure and maintain that purity of blood which is always necessary for its preservation. To-day millions are invested in this industry, and to the West it has been one of the most profitable of all departments of breeding.

While through the entire West, and in the Canadas and the Maritime Provinces so much attention has been given to the breeding of this class of horse stock the State of Maine meanwhile has been an immense consumer instead of producer, and only within a comparatively brief period has the subject of breeding Percherons engaged more than passing notice, save perhaps in a very few individual cases.

Even at the present time the number of pure bred Percheron stallions in Maine, is ridiculously small, when compared with other classes, while hardly a single mare can be found within our borders, and purchasers of breeding stock are obliged to go out of the State for pure bred sires.

If the business is to be continued, breeders should turn their attention to producing the stallions necessary for breeding purposes, and to secure these, the introduction of pure bred mares should be made. If the older sections of the State lack the abundant pastures of Aroostook and the Provinces, there can still be no doubt but the class might be multiplied throughout our borders, many times, with profit to the farmers and breeders. The great danger is that in the use of so many grade stallions the standard will be lowered and the industry injured. The fact that one dealer brings into the State over one thousand draft and larger driving horses yearly should silence all fears as to the practicability of an industry here which would supply this want, and that, too, with stock far superior to what is now received.

It may be seriously questioned whether we are by climate and other local conditions adapted to the producing of the extremely heavy weights of the West, but there is a middle ground on which we may stand. There is a middle class which could be made of great value to the State.

One special advantage in growing Percherons is the freedom from liability to accidents because of the docility of the colts. But very little trouble is experienced in weaning, and by reason of their more quiet dispositions, as compared with the thoroughbred or the highly bred trotter, they run together like sheep in a flock. We have seen on the farms of New Brunswick six weanlings in a large pen with an open door to a well protected paddock, where they could go and come at pleasure. There they are fed on hay and roots, chiefly turnips, and receive but little grain. Looking over a lot in February that had been grown in this way, we were surprised at the growth made and the fine condition of each. In France the feed is dry clover and a thin mush of barley and bran mixed. This diet is continued until spring, when green fodder is substituted gradually until ready to turn into the clover fields and pastures.

Surely there is no other breed of horses possessing the powers of endurance of the Turk or Barb, and the early cross with the hardy Brittany mares, long noted for road qualities, produced the Percherons in all their excellence. Systematically bred for centuries they have come to be strong in type, and this is made apparent when pure blooded sires are used on our ordinary mares. There is a great uniformity in the characteristics of the colts and in the distinguishing features of the breed.

Without disparaging other classes there seems to be special reasons why the Percherons should be chosen by farmers as the type to be bred. The illustration given at the head of this sketch is of a horse possessing in a marked degree the characteristics of the family. A study of his several points will confirm the claims presented.

One obstacle in the minds of many and which has stood in the way of the increase of this stock in the East, and especially in Maine, has been the scarcity of large mares to breed from, and the fear to use those of ordinary size. The impression has prevailed that the common mares of the country coupled with Percheron stock horses would not produce well proportioned colts, and that the danger of accidents would be greatly increased. But experience has opened the eyes of breeders to the fallacy of this idea. Some of the best formed, most symmetrical and valuable grade colts bred in the State have come from mares weighing nine to ten hundred pounds. The success of this breeding has been so often demonstrated that no further evidence need be supplied. Medium sized mares in fit condition to breed from, will produce as symmetrical colts when mated with the medium weight Percheron as with any other class. It is no uncommon sight in sections where these stallions are patronized to see yearling colts as large if not larger than their dams. No one owning a sound, well formed mare of merit need hesitate for a moment about using a pure bred Percheron stallion for fear of the results. In every section of Maine where a stallion of this breed is or has been kept for service, abundant evidence of this fact may be seen.

Within the past few generations efforts have been directed to the color question, and in many sections blacks are fast coming to the front. While the gray may be as sure an indication of hardiness, breeders recognize that there does not exist the urgent demand for it as centuries ago, and that the matter of color is as much under the guiding hand of the breeder as any other quality.

Without sacrificing any of the essential characteristics of the Percherons, attention is being directed to color and very soon the wants of the public will be met. This accomplished and the great objection of color entertained by farmers will have been removed.

The only question remaining is that all-important one of profit or loss. Will it pay to grow these grade colts for the market?

To this one tribunal of profit all questions relating to growing or cropping, breeding or feeding, must be brought. In the consideration of agricultural topics the one thought of possible profits must be uppermost. The field for successful operations in husbandry is just now circumscribed, and intelligent study and close application are necessary. High prices cannot again prevail. If money is to be made in the business it will be by reduced expenses, and the production of a better article. The class of stock to be grown must be that which will sell at the best profit when two or three years of age. What shall it be? Here should be considered the conditions, surroundings, tastes and opportunities of the individual breeder and farmer. Men who have a love for the fine limbed, proud acting, royal bred trotter should give free rein to their desires, and by a study of blood lines, breed and sell a superior article.

On the other hand, those whose fancies are satisfied with the size and substance of this larger class, will find here the sure road to profit in breeding. In either case the determination to produce only the best will settle the question to the satisfaction of the breeder.

One point should be urged over and again and that is to use only pure blooded males. Encouragement should be extended to individuals to bring in pure bred Percheron stallions for service. The man who does this is a public benefactor. and should be so considered. The risks and uncertainties are all on his shoulders, and the fee charged a minor item when the quality of the offspring is considered. It is a serious question whether Agricultural Societies may not, by offering substantial aid or by purchasing outright, do more for a county than by such heavy expenditures in other directions. State aid may be neither practicable or possible, but in towns and counties combined effort would secure what would at once give a powerful incentive to breeding, and very soon check the current now pouring out of the State through so many channels.

With the average farmer, occupied as he is with many cares, there seems to be satisfactory reasons why the Percherons should be adopted as the class to be bred. If they can be grown in herds, like flocks of sheep, without danger of accidents, it is a strong argument in their favor, and the cost of care is very materially reduced.

The tendency is to make rapid growth on moderate rations, and grade colts two years old should weigh one thousand pounds or more. Selecting well formed, sound, healthy mares of medium size, and using *always* a pure bred sire, colts may be grown, without forcing, to even a heavier weight than has been indicated. These are in demand, and will be so long as quality is maintained.

Where one stops to consider that the State of Maine pays annually over half a million dollars for this class of stock, there surely need be no fear as to the market. The average price paid is now from $350 to $450, per pair for three-year-olds and over. The superior quality of Maine bred stock is admitted and this insures a ready sale at a higher price than is paid for western colts, which, being corn fed, have not the muscular development of the home bred, and will not be able to perform full labor for at least two years after they are brought into the State.

The demands should be met by home production. In supplying this call the farmers of Maine may find a market for their hay, grain and roots where more can be realized than by shipping the raw products of the farms.

Not only from the towns and cities, the lumberman's camps and the quarries, but from the farms and villages the call is for horses of size, substance and good dispositions, suitable for driving or working. The incoming tide spreads over the entire State, and the promise for the future is rich if in breeding the best is sought. A good per cent. of those brought in are far below the average of eastern bred stock.

The possibilities of the future are in the hands of the breeders. If while holding firmly to present standards they strive to improve in all true essentials, the Percheron of to-morrow will be better than he is to-day. By the same steps which have led to present excellence must the work be carried forward, and in doing this the Percheron will come to be recognized as the *all purpose* horse of the people.

BREEDING AND RAISING COLTS.

By S. C. WATSON, Member from Kennebec County.

[Read at Readfield Institute.]

The question that is being asked, not only by Kennebec farmers, but by farmers all over the State of Maine, "how can we make farming pay," must to a great extent be answered by the farmers themselves. The character of the soil, the location of the farm, the inclination or natural bent of the farmer himself, must govern largely in deciding what lines of farming will pay best in the individual case; and yet, from observing others' ways, availing himself of others' experience, making more correct application of the principles that govern in the raising of crops and the breeding of animals, one may improve his methods and increase his profits. Hence the farmers' institute, the grange and other agencies for obtaining information relating to his business, and the importance of availing himself of the benefits afforded by them.

In discussing this question of making farming pay, I shall attempt to show that the breeding and raising of fine horses offers as great inducement and promises as sure returns of profit as any business that Maine farmers can engage in.

I have stood on the old Kennebec fair ground, just round the corner from where we are assembled, and as I have looked down the long lines of oxen and steers brought together from the surrounding towns, I have reasoned that these men have faith in oxen, they believe in beef, they must have found profit in this class of stock. And so they have, but how is it to-day? Is there a man among them all that can figure out one cent of profit on the beef product of his farm in the last year, or in the last five years? But say these ox men, "we must have oxen to do our farm work with." Must you, have you ever tried a horse team? If not you will be astonished to find how much more comfortably and readily it can be done with the latter. A pair of good horses, weighing from ten to twelve hundred pounds, will do more work, from breaking up greensward to hauling lumber in the forest, and do it with greater ease to the team and the owner, than will your seven and a half foot cattle, and at a great saving of time and of cost in keeping, and time is money on the farm as well as in the whirl of business.

It costs no more to feed the two horses than it does to feed the two oxen, while the horses will do nearly or quite double the amount of work in a day that the oxen will. Besides, every farmer is supposed to have one horse at least, so in fact the additional horse really takes the place of the two oxen, thereby reducing the cost of keeping the team that will do all the work on the large majority of farms, and be suitable for going to market, for visiting friends and for taking the family to church. Again, the necessity of employing machinery for doing farm work makes it also necessary to employ horses for operating that machinery. The farmer of to-day cannot plod behind the slow-moving ox team of our fathers' day if he would not get left. The small margin of profit in all the products of the farm compels the farmer to produce all of his crops at the minimum of cost, and in no way can this be done more surely than by substituting horse power and farm machinery for hand or man labor.

But what has this to do with breeding and raising colts? It has this to do with it: The farm team that I have been recommending should consist of a good brood mare and another horse or what is better, of two of the best mares that you can obtain. Such a team will readily perform all the work on a hundred acre farm, and bear and bring up one or two colts, as the case may be, with but little trouble and inconvenience. The mare can be worked up to within a few hours of dropping her foal, and when the colt is two or three days old she can again be put to light work without doing herself or offspring any harm whatever, by using proper care in feeding and never overheating.

In breeding-horses whether trotters, roadsters or strictly work-horses, too much importance cannot be attached to the dam—if you expect to meet with success in breeding horses you must select the right kind of stock to breed from. Especially should this apply to the dam. The Arabs placed more dependence upon the dam than the sire. Americans have reversed the rule and place more dependence on the sire. Whichever rule may be right, the best results have been realized when both animals were superior. It is a fact that the dams of a majority of our most distinguished horses were especially remarkable for their endurance. Speed in the sire and endurance in the dam are the prerequisites to transmitting those qualities unimpaired to their offspring. Other qualities that I would combine in my ideal horse—the horse most in demand, the horse produced with almost absolute certainty, and withall the most profitable horse for farmers to raise in my opinion, are size, symmetry, color and disposition. Size is demanded in nearly every class of horses now and will continue to be so, and size will almost invariably sell a horse at a paying price. Symmetry, or that conformation combining beauty of carriage, style, action and frictionless gait, is another valuable quality to be sought for. Color,—"A good horse is said to be the best color," but I prefer a good color for the best horse especially when it can be had as well as not. Color can be bred with almost unvarying certainty, and adds to the value of the animal when it is of a desirable kind. A good disposition is an indispensable quality in any horse. Without it you cannot have a good horse; and yet disposition is largely the creature of habit. In other words a vicious disposition can be toned down and made kind and mild by kind treatment, and just as well the kindest horse can be made into the ugliest brute, but it takes a brute or a fool to do it.

With such a mare as above described coupled with a stallion possessing like qualities and being also a speed performer and producer of speed in his progeny, colts may be raised upon our farms that will return better profits than any other product in the live stock line.

All here will agree with me that speed is the most valuable quality of the equine race—most valuable because it sells for most in the market. Therefore when you have obtained the sixteen-hand colt, of good finish, desirable color, lofty action, and that "can go along a little," as horsemen say, you have an article that there is an active and growing demand for, that it is profitable to raise, and that can just as easily be raised as the little, ill-proportioned, fiddle-gaited things that have in so many cases proved a disappointment and a source of disgust to their owners, and which have been to a great extent the cause of bringing horse-breeding into disrepute with many of our best farmers. Yet what can be expected when old, crippled, under-sized mares, after having passed the period of usefulness for any other purpose, are turned to breeding and are bred to stallions as inferior as themselves, but disappointment and loss?

Now, brother farmers, don't understand me as recommending horse-trotting, or the training of every colt you raise to the end of making a trotter of him, nor of making speed the prime end of your breeding venture. But aim to produce the large, stylish gentleman's roadster; and the more of a trotter he is, the more dollars he will bring you. And right here let me say, the best time in nine times out of ten to sell the colt is when you are offered a fair paying price for him. Many a man has deceived himself with the idea that *his* colt possessed speed sufficient to bring a sum up in the thousands, when but a very few hundreds would measure his full value; and he has held on, spending time and money trying to develop a trotter, until twice the amount for which he could have sold his colt (and made it profitable, too) would be insufficient to pay him for his time and trouble, to say nothing of the vexation and disgust that has mingled in his cup of disappointment.

REARING THE COLT.

The food for the first four months of the young colt's life is supplied in large measure by its dam. It is therefore important that she have an abundance of rich, succulent food, and when worked, sufficient grain rations to maintain the extra draft made upon her. After the colt is weaned, having already learned to eat oats and drink skim milk from the creamer, he should be kept in a thriving condition until he has fully matured.

There is an old Dutch saying that "the breed goes in at the mouth," which, though not altogether true, yet it shows the potent influence exerted by food in perfecting the forms of domestic animals. Such food and in such quantity as will maintain a natural, healthy growth without producing a preponderance of fat should be supplied. Fat is not wanted in the growing colt but bone, substance, form. Sweet skim milk is an excellent food for growing colts, and I am of the opinion that it can be fed to no kind of stock to better advantage. I have never seen any but good results from feeding it. Colts like it exceedingly, and thrive upon it remarkably well. The dairy farmer can raise colts to good advantage.

The education of the colt should commence the first day of his life. Handle him, hold him. Show him at the first that you are his friend and his master, and he will soon learn to trust and obey you. Kind but firm treatment during colthood makes the kind and reliable horse.

THE MARKET.

There are certain Maine products that rank with those of any other State of the Union, and Maine horses is one of them. In some particulars they excel, and are superior to the horses of any other country. Especially is this true of their feet and legs, and their power of endurance. A New York dealer in native stock, and who crosses the ocean frequently to purchase European horses, said recently: "There is a remarkable call for fine coach horses. We cannot supply one quarter of the demand. Down in Maine they are beginning to breed horses again that were in fashion twenty-five years ago. Maine horses step through the snow so much that it causes them to move their shoulders more freely than those raised in warmer climates. This makes their chests broader and their muscles stronger and more flexible, and imparts great knee action."

Of breeds, he says: "The old Morgan cross. Knox, Flying-Eaton and the Drew stock, make the best coachers in the world. They have wonderfully high action, are always level-headed and possess remarkable intelligence without any foolishness. One is rarely found that a lady cannot drive. Kentucky contributes some very fine horses, but they have not the intelligence and even disposition of Maine horses."

Speaking of coaching teams, he continues: "I have seen the best four-in-hand in England and France at the races, and I can confidently say that no team has ever been shown in Europe equal to Mr. Pierre Lorrillard's four browns. They are Maine horses. Every one of them can trot better than three minutes. It is an easy matter for them, with sixteen passengers on the coach, over a good road, such as they have in England, to jog off twelve miles an hour without raising a hair."

Maine horses have a good reputation, and are sought after abroad as well as at home. The demand for the horses, that I have attempted to describe and recommend to you as a desirable stock, and that are being raised on many Maine farms at a good profit, is far beyond the supply, so that with the advantages of the horse team over the ox team, with the four-year-old colt worth four times as much as the four-year-old steer and costing but little if any more to raise, with as good horse stock to breed from as can be found in any section of the country, I believe that in following the line of farming recommended the answer to the question how to make farming pay will in part at least be answered.

FERTILIZERS AND PLANT FOOD.

By Prof. G. H. Whitcher, Director New Hampshire Experiment Station.

Plants no less than animals require food; they create nothing, but simply take the compounds which exist in the air and in the soil and by unknown chemical processes build up starch, sugar, cellulose, vegetable acids, oils, albuminoids, etc. This power belongs exclusively to plants: animals are unable to transform the elements of water and carbonic acid into starch and glucose, or any other organic compound.

If plants must be fed it follows that we must have food upon which to feed them. This we call *plant food*.

To know what plants require we must know what they are made up of. Chemical analysis alone is able to take apart the substance of a plant and tell what it is composed of. A stalk of corn weighing five pounds, or eighty ounces, was analyzed at the Agricultural College Laboratory and found to contain:

		Ounces.
Water		65 15
Albuminoids		1 51
Fat		47
Carbo-hydrates,	Cane sugar	4 80
	Glucose	80
	Starch, etc.	2 79
	Fiber	3 65
Ash		83
	Total	80 00

Water is made up of hydrogen and oxygen. Sugar, glucose, starch, fiber and oil are made up of carbon, hydrogen and oxygen, and about eighty-five per cent of the albuminoids is made up of the same three elements, while the remaining fifteen per cent. is nitrogen. It has been shown by various experiments that all the carbon of a plant comes from a gas called "carbonic acid gas" which exists in the air; the hydrogen and oxygen come chiefly from water.

Nitrogen is believed to come almost wholly from the soil, and the ash also comes wholly from the soil. Thus it appears that the elements from which the 12.51 ounces of starch, sugar, fiber, oil, etc., were constructed came from the air and water; add to this eighty-five per cent of the albuminoids and we get 13.79 ounces, which with the 65.15 ounces of water gives us seventy-nine ounces out of the eighty ounces total weight of the stalk, which came from the carbonic acid of the air, and from the water of the soil; this water also comes from the air. The remaining ounce is made up of eighty-eight hundredths of an ounce of ash and twelve hundredths of an ounce of nitrogen. With this ounce the study of feeding plants commences, for nature provides the other seventy-nine ounces free.

The figures will be more valuable if we apply them to the product of an acre of land rather than to a single stalk.

The yield was twenty tons, or 40,000 pounds of corn as it was cut for the silo. This amount contained the following:

		Taken from soil, lbs.	Taken from the air and water, lbs.
Water			32,580
Albuminoids, (756 lbs.)	Nitrogen	113	
	Carbon, hydrogen and oxygen		643
Fat			237
Carbohydrates,	Cane sugar		2,400
	Glucose		400
	Starch		1,394
	Fiber		1,825
Ash		408	
		521	49,379
			521
			40,000

The soil thus contributed 521 pounds of the total yield. It is evident that the exhaustion of the fertility of the soil comes from that portion of the crop which the plant takes from the soil and not the elements taken from the air, and this question at once arises:

In the particular case under consideration was it necessary to supply the whole of the five hundred and ten pounds in order to produce the crop? To answer this it will again be necessary to ask the chemist to tell us what the ash of the crop was made up of.

There was

Nitrogen in the albuminoids	113
Phosphoric acid in the ash	44
Potash	120
Soda	17
Lime	60
Silica, iron, etc.	150
Magnesia	17
Total	521 lbs.

Commencing at the bottom of the list we may strike out the seventeen pounds of magnesia, for soils, as a rule, contain all of this substance that is needed; there are exceptional cases where the application of magnesia is beneficial. The one hundred and fifty pounds of silica may be set aside at once; plants get this substance in abundance, for as a matter of fact it is not essential to the growth, but seems an accidental constituent of no special use.

Of the sixty pounds of lime it may be said, that on most soils it is unnecessary to apply it, but even if a soil is deficient in lime, we shall more than make good this deficiency in almost any form of fertilizer we may use, for manures and fertilizers all contain a good percentage of lime.

The seventeen pounds of soda is of no use to the plant, and even if essential it is abundantly supplied by the soil.

But here our work of setting aside must end. Potash is one of the substances that becomes exhausted in soils that have been cropped for a considerable time.

Phosphoric acid is another substance that must be used to restore fertility to worn soils.

Nitrogen is an element about which little is known. It is pretty well understood that plants have the power of getting a considerable portion of their nitrogen from the soil without application from external sources, but this power seems to depend upon the kind of plant to a considerable degree. It is also known that application of manures containing nitrogen are beneficial, but just how much of the nitrogen a crop can supply itself with, and how much may profitably be applied to the soil, is an open question and likely to remain so for some time.

We may now define the term

PLANT FOOD.

It is any substance that can contribute towards the growth of a plant.

Carbonic acid, water, ammonia, phosphoric acid, etc., etc., are examples of plant food.

Plant food may be divided into two classes:

First. Those substances, usually abundant, which we will call *abundant plant food*, including lime, iron, magnesia, silicia, soda, sulphur, water and carbonic acid.

Second. Those that become exhausted by long cropping, which we will call *deficient plant food.* This class includes *potash*, *phosphoric acid* and *nitrogen* In special cases soils may be deficient in lime, or iron, or magnesia, and if so then these should be included in the latter class for that particular soil, but in general it is true that only the first three forms are deficient.

Abundant plant food the farmer cares very little about, but *deficient plant food* must always be the chief factor to be regarded in old agricultural regions.

The deficient plant food required by the ensilage crop, above mentioned, narrows down to forty-four pounds of phosphoric acid, one hundred and twenty pounds of potash, and one hundred and thirteen pounds of nitrogen, in all two hundred and seventy-seven pounds, or less than (7-10) seven-tenths of one per cent. of the entire crop.

Let us take another case, that of the hay crop 12,000 pounds at time of cutting will make not far from 4,000 pounds, or two tons, when fed out, after shrinking in curing and in the barn.

This 4,000 pounds of cured hay will be made up of the following:

	Lbs.
Water	500
Albuminoids	304
Carbo-hydrates	2,960
Fat	56
Ash	180
	4,000

The ash is made up of the following:

	Lbs.
Phosphoric acid	17
Potash	77
Soda	$2\frac{1}{4}$
Lime	20
Silica	$53\frac{1}{4}$
Magnesia	$10\frac{1}{2}$
	180

This crop of hay would be made up of elements taken from the air and from water,	11,775
Elements taken from the soil, including nitrogen,	225
	12,000

The *Deficient plant food*, or that which must be attended to by the farmer, amounts to one hundred and thirty-nine pounds, made up as follows: nitrogen, forty-five pounds; phosphoric acid, seventeen pounds, potash, seventy-seven pounds.

It is necessary to provide for all of the nitrogen, phosphoric acid and potash, or will the soil furnish a part of these?

It is a well-known fact, that all soils fit for tillage are capable of producing small crops continuously. Old fields will produce in the vicinity of half a ton per acre of the so-called "June grass," or "white-top," year after year. Such a crop takes from the soil plant food, and when once the crop has reached the lowest limit in its yield and continues year after year practically the same, the plant food contained in this minimum crop represents the *natural capacity* of that particular soil to provide nitrogen, phosphoric acid and potash. Just what this natural capacity amounts to may be illustrated by comparatively definite figures. Lawes and Gilbert, in their famous English experiments, have raised wheat for forty years continuously on their plots, and some have received absolutely no manure in all this time. The following figures show the natural capacity of their soil.

	Bush.
Wheat average for 40 years, no manure,	14
" " 32 " "	13⅛
" " 7 " "	15⅞
" " 3 " "	18
" " 4 " "	25⅝

The first two cases are on the same field, the others represent results on different parts of their estate. The average yield of straw for thirty-years was 1,125 pounds

Taking the experiment plots on our Experiment Station farm and I find that in 1885 we produced on the plots having no manure 47½ bushels sound corn, weighing 40 pounds per bushel; 27⅓ bushels soft corn, weighing 34 pounds per bushel; and 3,246 pounds of well cured fodder. The yield of oats on the same land was 33⅓ bushels, and 1,900 pounds of straw, and the past year the yield of hay was

3,600 pounds. These cases are sufficient to show that soils have considerable producing power when left unmanured. This is accounted for in the following way: All soils fit for agricultural purposes contain a considerable amount of plant food; for example, on the plots above mentioned, where wheat had been produced for forty years and no manure had been applied, there was in the first nine inches of the soil 2,000 pounds of nitrogen per acre. Plots adjoining these and cropped the same, but which had received annual dressings, showed much more. One plot which had received fourteen tons of manure annually had in its top nine inches 4,000 pounds of nitrogen. A soil analysed by the Department of Agriculture showed 4,957 pounds of nitrogen 1,567 pounds of phosphoric acid, 17,429 pounds of potash per acre. If we compare this large quantity with the comparatively small quantity taken up by a good crop we shall see that there is enough for a great many crops, but plant food may be present in vast quantities, and yet not be available to the plant.

This brings us to a new classification of *plant food*, namely, *available*, that which plant roots can pick up and use for the growth of the plant, and *unavailable*, or that which is insoluble, so that the roots fail to gather in any part of it, and the fact is that a very large proportion of the 2,000 pounds or more of phosphoric acid, or potash, or nitrogen, that is in the soil, is *unavailable*. But so far as the soil produces crops, even if small, plant food is furnished. The average supply of plant food taken up by the 13½ bushels of wheat and 1,125 pounds of straw, in Lawes and Gilbert's experiments, would amount to 20 pounds of nitrogen, 17 pounds of potash, and 10 pounds of phosphoric acid, it is evident that this soil is capable of supplying these quantities annually, else the crops would not grow, and this small but necessary allowance comes from the change of *unavailable* plant food into *available* by the action of air and water containing carbonic acid, as well as other more complex influences, which render soluble a limited amount of plant food each year, and this amount is a measure of the *natural capacity* of any given soil. In raising crops, therefore, we need not be at the expense of supplying all of the deficient plant food contained in the crop we raise, but only the excess which the crop contains over and above that which the soil is capable of supplying, year in and year out, indefinitely. It must be remembered, however, that not all of the plant food supplies will be received by the crop. Thus only

15

one-half (50 per cent.) of the nitrogen applied in the fertilizer is recovered, the remainder is either lost in the drainage water, or is carried down into the subsoil or held in the soil. It has been demonstrated that very little if any influence is exerted by the *nitrogen* in chemical fertilizer after the second year, and even the second year this influence is very slight. With potash and phosphoric acid the case is different, the effect of a large application being felt for many years. This is explained by the fact that nitrogen in the form suitable to be used by plants is readily washed out of the soil, while potash and phosphoric acid combine with the soil, and though not immediately available are gradually made so, and hence in time will be largely recovered.

On this point the conclusions of Lawes and Gilbert are expressed as follows: "While the soil fixes potash and phosphoric acid independent of vegetation, nitric acid is only fixed by the agency of vegetation."

This being true, it follows that we must apply a sufficient excess of plant food so that the roots may avail themselves of a quantity equal to the excess which the full crop contains above the natural capacity of the land. With nitrogen we should carefully look to see just what amount may be used to advantage, for what is not recovered the first year is quite likely to be lost; with phosphoric acid and potash this is less important since the excess above that utilized by the plant, is retained in the soil and may be had by future crops.

What has thus far been said may be summarized as follows:

First. Plants draw their nourishment from the soil and air.

Second. The term *plant food* is applied to all substances which help to nourish the growing plant.

Third. From one to five per cent of the food of the plant comes from the soil, the remainder coming from the atmosphere. That which comes from the soil is the part that must be looked after by the farmer.

Fourth. The plant food taken from the soil I have divided into two kinds, one, *abundant*, and so far as the farmer is concerned this requires little or no attention; the other, *deficient*, or scarce in an available form when soils are worn out by cropping. Deficient plant food amounts to about fifty per cent., on an average, of the *total plant food* taken from the soil (that is the total ash plus nitrogen).

Fifth. All soils fit for agricultural purposes contain a considerable amount of the deficient plant food, even when of low crop producing power. This fact gives rise to a classification of plant food as follows: *available* plant food, or that which is in such a condition that the roots of the plant can take it up in solution; and *unavailable* plant food, or that which the roots cannot make use of.

Sixth. By the action of frost, air, water, carbonic acid, etc., changes are brought about in the soil which annually convert a portion of the unavailable into available plant food, and this portion sustains the natural crop which all soils will produce. This we term the *natural capacity* of the soil to produce crops.

Seventh. If we desire to produce larger crops we must supply a sufficient amount of available plant food in manures or fertilizers to feed the *increase* of vegetation above what the particular soil would produce, but as only a part of the available plant food is recovered by the crop more must be supplied than the analysis of the increased crop would show.

In connection with the subject of fertilization the terms manures, fertilizers, commercial fertilizers, chemical fertilizers, indirect fertilizers, natural fertilizers, artificial fertilizers, superphosphate, complete and incomplete manures, etc., are used, and as there is often a misunderstanding of the meaning of some of these I will give a few definitions which may help us in the following pages.

A *fertilizer* is any substance which furnishes *deficient plant food* in an *available* form.

Fertilizers are either *natural* or *artificial;* the former including manures, or the solid and liquid excrement of animals and green crops plowed in to increase fertility.

The latter, (artificial fertilizers) including *commercial* fertilizers, sometimes called prepared fertilizers, and *chemical* fertilizers, or those mixed from crude fertilizing chemicals.

A fertilizer is *complete*, sometimes called *general*, when it contains nitrogen, phosphoric acid and potash, and *incomplete*, sometimes called *special*, when furnishing only one or two of these deficient forms of plant food. Mixed animal manures are all *complete*, or *general*, fertilizers. Green crops plowed under are complete. The artificial fertilizers, whether commercial or chemical, are complete or incomplete, according as they are mixed from raw materials containing the three forms of plant food above mentioned, or as they lack one or more of these. A fertilizer is said to be *indirect* when it does not contain deficient plant food, but in some way acts on the soil so as to hasten the change of unavailable plant food in the soil into available, that is, they increase the *natural capacity* of the soil. Lime, gypsum, salt, etc., so far as they have any action, belong to this class; others, like ashes, and especially leached ashes, are both direct (furnishing plant food) and indirect.

SOURCES OF PLANT FOOD.

We are now in position to inquire about the sources of plant food, and for our present purposes only the deficient plant food will receive attention, that is, *nitrogen*, *phosphoric acid* and *potash.*

Farm yard manure is the chief source of plant food in mixed agriculture. It consists of two parts, *solid* and *liquid.* The solid portion represents that part of the food which is not digested in the animal system, while the liquid manure contains the waste products of the digested food.

Ordinary farm yard manure, from cows, oxen, and growing cattle, has the following average composition. The composition of horse manure, sheep manure, and hog manure, is also given:

In 1,000 lbs. of manure.	Oxen, cows, etc.	Horse.	Sheep.	Hogs.
Water,	781 0	713 0	646 0	724 0
Dry matter,	219 0	287 0	354 0	276 0
Ash,	40 77	33	36 0	26 0
Potash,	4 80	5 3	6 7	6 0
Lime,	8 11	2 1	3 3	0 8
Magnesia,	1 41	1 4	1 8	0 9
Phosphoric acid,	2 33	2 8	2 3	1 9
Nitrogen,	4 82	5 8	8 3	4 5

In order that we may be able to know the actual amount of plant food applied to an acre, in any given case, I will give the best available figures showing the weight of a cord of manure.

Manure from neat cattle and sheep will weigh not far from 8,000 pounds, or four tons per cord; horse manure, 6,000 pounds, or three tons; while hog manure, as usually found, will probably weigh more than either of those given. As manure is ordinarily drawn in a cart holding forty bushels it will require three loads, without treading to make a cord. The number of cords and tons may thus be estimated with considerable accuracy. In the following table I have figured the actual plant food per ton, per cord, and per load of one-third cord:

DEFICIENT PLANT FOOD IN MANURE.

Manure from		Per ton. lbs.	Per cord. lbs.	Per load. lbs.
Neat cattle,	Nitrogen	9.64	38 56	12.85
	Phosphoric acid ...	4.66	18.64	6.21
	Potash	9.60	38 40	12.80
	Total plant food....	23.90	95.60	31 86
Horses,	Nitrogen	11 6	34 8	1 16
	Phosphoric acid ..	5.6	16.8	5.6
	Potash	10.6	31.8	10.6
	Total plant food....	23.8	8.74	2.78
Sheep,	Nitrogen.............	16 6	66.4	22.1
	Phosphoric acid.......	4 6	18 4	6.1
	Potash	13.4	53.6	17.9
	Total plant food....	34 6	138.4	46.1
Hogs,	Nitrogen.............	9.00	36.0	12.0
	Phosphoric acid.......	3.80	15.2	5 0
	Potash	12.00	48.0	16.0
	Total plant food ..	24 8	99.2	33.0

The amount of manure produced annually has been estimated as follows, for a 1,000 pound ox:

	Nitrogen.	Phosphoric acid.	Potash.
Solid manure, 20,000 lbs. containing ..	96.4	46.6	96.0
Liquid " 10,000 " ..	95.5		160 9
Total per year	191.9	46.6	256.9

At the prices usually placed upon nitrogen, phosphoric acid and potash, the liquid manure would be worth $23.95, and the solid $23.01, a total of $46.96, provided it could be saved, but owing to the ease with which urine decomposes, there is great difficulty in saving the nitrogen in the liquid manure, and if we remember that $16.71 of the value of the total manure, or thirty-five per cent is in the form of nitrogen in the urine, it at once becomes evident that farmers should take every precaution to save this element.

Those who draw their farm yard manures, liquids and all, and spread them on the land as fast as produced, without doubt handle the urine with the least waste. Next to this the use of a liberal amount of absorbents, cut straw, saw-dust, muck, etc., and the presence of hogs on the manure pile, thus keeping it compact and excluding air, is probably the best method

BONES.

One of the earliest substances used as a fertilizer, aside from manures, was bone. Waste bone chips and horn parings were first used about 1750, and later, say about 1780-1800, bones became a comparatively common manure in England and Scotland for turnips. An average sample of bone will have the following composition per one hundred pounds: Thirty pounds of animal matter containing two and one-half pounds of nitrogen, and seventy pounds of ash containing fifty-eight pounds of phosphate of lime, made up of twenty-four pounds phosphoric acid and thirty-four pounds of lime, the remaining twelve pounds consisting of magnesia, carbonate of lime, etc.

It was found by various experiments that the phosphoric acid in the bone was the chief cause of the well-known effect of bone fertilizers. The first great improvement in the use of bone dates with the introduction of a bone mill, by which they were reduced to meal. This was in 1814. The next step was the process suggested by Liebig in 1839, by which bones were dissolved with sulphuric acid; bones thus dissolved, or "cut," with acid were called *superphosphate*, and differ from the raw bone in having the greater part of the phosphate of lime soluble in water, while very little of the lime phosphate in the raw bone is thus dissolved out when treated with water.

The term *superphosphate* should only be applied to a fertilizer containing soluble phosphoric acid, and is not correctly used when applied to the *prepared* or commercial fertilizers. In 1843 a new source of phosphoric acid was discovered in Spain. A vein of rock, about seven feet wide, was found there which contained about thirty-four to fifty per cent of phosphoric acid; in 1844 English farmers tried this new source of phosphoric acid and found it a valuable substitute for bone.

In the United States bone was first used about 1790. The first bone mill was established in 1830, and superphosphate, or dissolved bone, was first tried in 1851.

One of the most important geological discoveries in the United States was that of the so-called South Carolina Rock. This rock is found in masses varying from the size of the fist to fragments weighing a hundred pounds or more, and forms a closely packed layer, covering a considerable area near Charleston, S. C., and in other of the coast States. It is intermingled with shark's teeth and the bones of various animals, which have changed to stone. The "Rock" contains from twenty-five to thirty-two per cent of phosphoric acid. This rock was first put on the market in 1868, six tons being the total output. In 1885 437,856 tons were mined, and in 1887 480,558 tons.

The phosphoric acid in these rock phosphates is insoluble, but when ground and treated with sulphuric acid they become converted into superphosphates, or soluble phosphates.

Another valuable source of phosphoric acid is in boneblack. This substance is simply bone charcoal; it is used by sugar refiners, the raw sugar being filtered through it. In this process the impurities of the sugar are held by the boneblack and from the syrup the granulated sugar is crystalized. After a time the boneblack loses its power of removing the impurities, it is then sold to fertilizer manufacturers, for it contains the phosphate of lime originally in the bone.

Crude boneblack contains about thirty-four per cent of insoluble phosphoric acid.

At the present time there is a comparatively new source of phosphoric acid is the so-called Thomas-Gilchrist Slag. This comes from the manufacture of iron or steel from certain ores of iron, which contain phosphoric acid. The slag has about twenty per cent of phosphoric acid in a form not soluble in water.

POTASH.

Until 1868 the chief source of potash was *wood ashes*. It is true that nitrate of potash, or saltpetre, has been used from a very early time, records dating back to 1625, but it was more for the nitrogen which this substance contained, than for the potash; hence we may regard the discovery and use of the "German Potash Salts," as the first rival of ashes. Unleached wood ashes vary very much in their composition, containing from two and five-tenths to eight and one-half per cent of actual potash. In "Canada" ashes* the average is not far from six per cent of actual potash (K_2O). While leached ashes may contain anywhere from one-half to two and one-half per cent., according to the thoroughness of leaching.

*Massachusetts Experiment Station Report 1887, average of seventy-one analyses.

GERMAN POTASH SALTS.

About 1850 an effort was made to open a salt mine at Stassfurt in Saxony. Salt was reached in 1857 at a depth of over one thousand feet In sinking the shaft beds of potash and magnesia salts were passed through; in 1861 a factory was established to purify these salts and put them in commercial form. The first of these crude chemicals were brought to the United States in 1868. There are several forms of these salts, the muriate, sulphate, also what is called kainit, krugit, etc.

NITROGEN.

Nitrogen is a costly element of plant food, its use should be well looked to, when we remember that every pound of nitrogen will cost us not far from twenty cents, while a pound of phosphoric acid (P_2O_5) costs less than eight, and of potash (K_2O) about five cents, it is evident that we cannot afford to be so thoughtless about the nitrogen as we often are about the other two.

As has been already said, *nitrate of potash* was one of the earliest fertilizers used; it contains about thirteen per cent. of actual nitrogen. The high value of nitrate of potash as a constituent in the manufacture of gunpowder, prevents the use of this source of nitrogen in agriculture, but about 1820 a substitute was found in the so-called Chili saltpetre, or nitrate of soda. This source of nitrogen was not at first popular; the first ship load, going begging for a customer in England, was sent off to this country. At present, however, *Chili Saltpetre* is regarded as a valuable source of nitrogen. It is dug from the ground in South America, where it has accumulated in past ages.

In 1836 "Gas Liquor" was first used in England. This is the water in which illuminating gas is washed, and is found to contain ammonia gas (commonly called hartshorn); ammonia gas is made up of nitrogen and hydrogen, fourteen parts of the former to three parts of the latter. The results from the use of this liquor compared favorably with those from saltpetre, but the bulk was too great. Later, by the use of sulphuric acid the ammonia gas was saved in the form of *sulphate of Ammonia,* which to-day forms one of the best sources of nitrogen.

English farmers long ago learned the value of *dried blood*, and for a time English speculators bought both dried blood and bones in this country and shipped them to be used on English fields, but as the demand for plant food became greater at home, this trade ceased, and to-day this valuable form of nitrogenous fertilizer is extensively used. Meat and fish scrap are also largely used.

These are among the principal sources of the three substances, which I have classed as *deficient plant food.*

A word of explanation as to what is meant by phosphoric acid, potash and nitrogen.

By *phosphoric acid* is meant a white powder which is made up of the metal phosphorous and the gas oxygen. Chemists express this as P_2O_5, which means two parts by volume of phosphorus and five parts of oxygen.

By *potash* is meant a white substance made up of the metal potassium and the gas oxygen, expressed as K_2O, or two parts by volume of potassium and one of oxygen.

By *nitrogen* is meant the gas which is abundant in its free form in the air. Chemists indicate this by the letter N.

The term *ammonia* is used and often misunderstood. It means one part by volume of nitrogen and three parts of the gas hydrogen, or in chemical work written NH_3. It must be remembered that when a fertilizer is said to contain a certain amount of *ammonia* that it really means that it contains *nitrogen*, but that the amount of nitrogen is only fourteen-seventeenths as much as the amount of ammonia.

USE OF FERTILIZERS.

Farmers use fertilizers in the same way that manufacturers use their raw materials. And the same business methods and rules apply in each case. Nitrogen, Phosphoric acid and Potash, or the crude materials containing these are the farmers' raw materials and from them he hopes to manufacture corn, oats, potatoes, hay, fruit, etc., through the agency of the soil which is his machine. The following points should be duly considered in this manufacturing process:

First. The amount of material required by various crops.

Second. The utilization of all waste products, such as animal manures, ashes, etc., which are produced on the farm.

Third. The purchase of the most economical fertilizing materials as an aid to those home produced fertilizers.

Fourth. The use of all fertilizers in such a way as to get the most profitable returns in as short a time as possible.

In all of this the final result must be determined in dollars and cents for this is the true business standard in farming as in manufacturing.

The following table shows the plant food taken from the soil by various farm crops.

"Deficient Plant Food" removed by various Crops.

		Weight as harvested. lbs	Weight after shrinkage. lbs.	Nitrogen. lbs.	Phosphoric acid. lbs.	Potash. lbs.
Corn,	Sound, 97 bushels, Soft, 15 bushels,	4390	3512	20.55	16.27	71.07
	Fodder...........	5352	4281	56.19	19.32	11.59
	Total.........			76.74	35.59	82.66
Oats,	Grain, 47½ bushels.	1520	1292	24.82	7.11	5 43
	Straw............	5267	4740	18.96	8.53	45.98
	Total			43.78	15.64	51.41
Hay....................		6202	4961	60.30	21.09	95.51
Potatoes, 200 bushels...		12000		33.40	21.60	67.20
Clover, 1½ tons			3000	64.32	16.80	58.5
Wheat,	Grain, 15 bushels.		930	19.18	7.63	5.11
	Straw, 1 ton		2000	6.40	4.60	9.80
	Total			25.58	12.23	14.91
Beans,	Beans, 20 bushels.		1240	50.59	14.38	14.88
	Vines		1500	24.48	6.15	38.85
	Total.........			75.07	20.53	53.73
Ensilage, 20 tons				113.00	44.00	120.00

USE OF FARM YARD MANURE.

The general character of farm yard manure has been alluded to; it is not a concentrated fertilizer, but rather the reverse, 1562 pounds of water, 9.6 pounds of potash, 4⅔ pounds of phosphoric acid, 9.6 pounds of nitrogen and 414 pounds of undigested matter, sand, iron, lime, magnesia, etc., making up a ton. The total amount of *deficient* plant food amounting to 23.9 pounds. The amount per cord is 95.6 pounds, or if 7 cords are applied per acre the figures amount to 669.2 pounds. It must not be supposed, however, that all of this is available, for a part of the nitrogen is in the undigested food and must decompose in the soil, while a part of the phosphoric acid (about one-half of it) is insoluable. From the analysis of chemical fertilizers it will be seen that there is actually more available plant food in a hundred pounds of corn fertilizer than there is in a ton of manure, as has been already pointed out a large part of the value of the manure of an animal is in the liquid manure in the form of *urea*, a substance containing nitrogen, and which by fermentation changes into ammonia, and is lost, or may be if no precautions are taken. This being true the safest way would seem to be to get the manure both solid and liquid into the soil before fermentation takes place. This may be accomplished by drawing and spreading the manure as fast as it accumulates whether in summer or winter. In many places this is practiced, but the deep snows of a New Hampshire winter prevent this generally. It is also true that on steep hillsides the plant food would be washed away to a certain extent, but on level land or land of moderate slope I should never hesitate to spread manure at any time when I could conveniently draw it to the field whether in the fall, winter, spring or summer. It is sometimes urged that manure loses nitrogen by exposure to wind and snow, but if manure is drawn out before fermentation commences there is little or no ammonia in it, and as the nitrogen of manure, to be volatile must be in the form of ammonia, the loss from this source must be very small indeed; manure spread on the surface in summer or early fall should be harrowed in, for the reason that if left on the surface it dries in hard lumps and is hard to break up and mix with the soil. Manure applied in the late fall and before or after the freezing of the soil, is probably in the best position possible, and I am satisfied not only from general observation and the experience of the most observing farmers, but from experiments in which the exact weight of products has been determined, that if all the farm yard manure could be applied in November instead of April that the average yield would be increased by more than ten per cent. from this change alone.

The explanation of this is to be found in the even distribution of the plant food in the surface soil. The fall rains and the melting snow soften the manure and dissolves the available plant food, washing it into the soil where it is left in the best condition possible for the young plant.

The following experiments made on the Experiment Station farm show the effects of manure applied in this way. Three acres of land were set apart for the work, the strips being fifty-six rods long and three rods wide.

Each acre was divided into four sections, and each section consisted of three rows of corn, space being left between; these spaces were planted but not included in the experiment. The three rows had eight hundred hills, the hills and rows being three feet two inches apart; this would give three-fourths of an acre in each set of four sections. The fifth acre had six cords of manure plowed in in the fall, the sixth acre had six cords spread on the surface in the fall, and the seventh acre had six cords spread on the surface in the spring. The yield was as follows:*

	Sound corn lbs.	Soft corn. lbs.	Fodder. lbs.
Fifth acre plowed in in fall,	2,690	935	5,555
Sixth acre on surface in fall,	3,070	754	6,066
Seventh acre on surface in spring,	1,690	1,084	5,271

The manure was in all respects the same, so far as it is possible to get manure of like quality.

If manure is to be stored and all applied at one time, either in the spring or fall, it should be kept under cover, the heaps well leveled down and hogs kept on it. In this way it is packed solid and the air largely excluded. This prevents fermentation to a large extent, and thus preserves the nitrogen. It is well known that sheep manure so long as it lays in the pen is packed so solid that no fermentation takes place, but as soon as thrown into a pile it quickly "heats" and gives off strong gases. This is caused by the access of air, and the same is true of all manures.

A liberal use of absorbents is always to be recommended and when available there is nothing better than sawdust, not that the sawdust in itself contains much that is useful, but it readily takes up the liquids, and makes the manure easy to spread. Muck when well dried is a valuable absorbent. Straw and meadow hay are much used, but unless of very poor quality they can be put to better use.

As a general rule manure should not be plowed in deep, more manure is lost by burying too deeply than by exposure to the air, and if it were possible to mix evenly the whole of the manure with the first three inches of surface soil, it would be in the best possible position for the ordinary crops. Every rain tends to carry the nitrogen, phosphoric acid and potash down into the soil, and the action of the air near the surface tends to render available the unavailable parts of the manure, but if deeply plowed in this decomposition is slow and often unsatisfactory.

FERTILIZERS OTHER THAN FARM YARD MANURES.

But after all the manure is used there is in most cases a deficiency to be made up. This deficiency is caused by the sale of farm products. The following table shows the nitrogen phosphoric acid and

*These yields are only for three-fourths of an acre.

potash, carried away in one thousand pounds of the substance mentioned.

1000 lbs. of	Nitrogen.	Phosphoric acid.	Potash.
Oats	20.0	5.33	4.25
Potatoes	3.4	1.80	5.60
Hay	12.8	4.25	19 30
Oat Straw	4 0	1.80	9.70
Beans	41.0	11 60	12 00
Corn	16.0	5.50	3 30
Milk	5 60	1.95	2.14
Butter	1.00	0.75	50
Fat Oxen	23.20	16 50	1 84
Live Hogs	17 50	6.90	1.50
Wool	73.00	1.00	40 00
Live Sheep	19.60	11.39	1.60

There are two ways of making up this deficiency, by the purchase of feeding stuffs, thereby increasing the number of animals that may be kept and thus adding to the manure, and by the purchase of fertilizers, or fertilizing materials. Both methods are to be recommended, but at the present time it is proposed to consider the latter method, namely, the use of *fertilizing materials.*

So far as the use of *prepared* or *commercial* fertilizers is concerned, I have only to say that my experience and that of farmers in various parts of the State has gone far towards demonstrating that more economical results may be obtained by the purchase of crude fertilizing waste products and chemicals than by the use of the many prepared goods that are to be bought. In a considerable number of experiments it has been found that the increase of corn and fodder for a dollar's worth of fertilizer applied, has been valued at about $1.50 to $2.00 with prepared goods, while mixtures of bone-black, muriate of potash and sulphate of ammonia, have given from $2.00 to $3.00 per dollar invested. The results from the use of all fertilizers are more striking on the hill farms and on soils of low *natural capacity* than they are on the river lands which produce larger natural crops. But as the experiments from which the foregoing averages are drawn, have been upon both kinds of soil, I think they represent the relative efficiency fairly. How is this difference accounted for? I answer in two ways; 1st because the crude chemicals contain the plant food in readily available form.

Nitrogen in either sulphate of ammonia or nitrate of soda is soluble, and therefore more likely to be readily taken up by the growing crops. But in prepared fertilizers part, and often a large part of the nitrogen is in organic matter and may not be available. The potash of the easily soluble muriate is ready for the plant at once. There seems to be some reason for believing that the phosphoric acid of bone-black is more effective than that in South Carolina Rock; at least we are sure of our materials if bought in separate form, while we may not be so certain about the mixed goods. But the secret of the increased efficiency of chemicals is to be looked for in the ratio in which they are mixed. It is assumed by most fertilizer manufacturers that a complete fertilizer should contain twelve per cent of phosphoric acid, four per cent of potash and two per cent of nitrogen, but if we look at the composition of the ash of plants we find a different ratio.

Ratio of phosphoric acid to potash in the ash of plants.

	P_2O_5.		K_2O
Ensilage	1	:	2.7
Hay	1	:	4 5
Corn	1	:	2.3
Oats	1	:	3.3
Potatoes	1	:	3.1
Clover	1	:	3.5
Wheat	1	:	1.2
Beans	1	:	2.6
In Manures.			
From neat cattle	1	:	2
From horses	1	:	1.9
From sheep	1	:	2.9
From swine	1	:	3.1
In prepared fertilizers	3	:	1
Ashes	1	:	3

It is seen at a glance that the plant requires on an average three times as much potash as phosphoric acid, while the prepared fertilizers as we buy them, give us three times as much phosphoric acid as potash, just reversing the ratio.

I am well aware that another factor comes in here, namely, the capacity of the soil for providing plant food.

It might be true, and doubtless is in some, perhaps many, localities that the soils yearly liberate more potash than phosphoric acid, and there are cases where phosphoric acid alone will give bountiful crops, thus showing that in such soils there is enough available potash, but in many cases it has been assumed that phosphoric acid is the regulating substance, when experiments carefully conducted have proven that it is potash. This leads us to inquire whether there is any method by which we may satisfy ourselves of the requirements of our particular soil.

The answer must be, field experiments! and the method must be based upon the use of fertilizing materials which contain the three forms of *deficient plant food* in separate substances, so that we may test them singly and in a variety of combinations, having nitrogen, phosphoric acid and potash in varying proportions. These tests when well conducted and when properly duplicated and made by the side of plots having no fertilizer, are capable of giving a great deal of practical information.

ANNUAL REPORT

OF THE

Maine State College Agricultural Experiment Station.

1888.

MAINE STATE COLLEGE.

AGRICULTURAL EXPERIMENT STATION.

STATION COUNCIL.

STATION OFFICERS.

W. H. Jordan, M. S .... Director

M. C. Fernald, Ph. D .... Meteorologist

Walter Balentine, M. S .... Experimental Agriculture

F. L. Harvey, M. S .... Botanist and Entomologist

F. L. Russell, V. S .... Veterinarian

J. M. Bartlett, M. S .... Chemist

L. H. Merrill, B. S .... Chemist

F. P. Briggs .... Assistant in Botany and Entomology

A. M. Shaw .... Foreman on Farm

Mrs. Jennie Waitt .... Clerk

TREASURER'S REPORT.

THE MAINE STATE COLLEGE AGRICULTURAL EXPERIMENT STATION.

Receipts and Expenditures for the year ending June 30, 1888.

RECEIPTS.

Annual appropriation from the U. S. Treasury		$15,000 00

EXPENDITURES.

Salaries	$3,496 67	
Construction	3,000 00	
Chemical Laboratory	3,745 52	
Field and Feeding Experiments	664 16	
Live Stock	1,005 00	
Library	1,627 88	
Traveling Expense	338 10	
Printing	254 31	
Stationery and Postage	104 25	
Department of Meteorology	307 79	
Department Botany and Entomology	2 39	
* General Expense	453 93	
		$15,000 00

J. FRED WEBSTER, TREASURER,

Trustees Maine State College Agr. and Mech. Arts.

I find the above accounts properly
vouched and cast.

WILLIAM H. STRICKLAND,

Auditor Trustees Me. State College Agr. and Mech. Arts.

* Mostly office furnishing.

DIRECTOR'S REPORT.

M. C. Fernald, Ph. D., President Maine State College:

SIR:—The work of the Experiment Station for 1888 has been largely that of organization and preparation. This department of the college, which has been created and endowed by the act of Congress, and accepted by the legislature of this State, will, without question, be maintained as a permanent agricultural institution, provided the national appropriation is so applied in this and other States as to meet the approval of the intelligent farming public. In order that the Station organization shall be made on a permanent and progressive basis, such as shall meet not only present, but future needs, in a manner that shall insure the effective application of the funds appropriated, it is necessary to proceed slowly and deliberately at first. This is the reason why at the end of nearly a year's active existence, it is possible to report only a limited amount of actual experimental work begun, and still less so far completed as to report results.

The erection of a building with its equipment of water, gas, apparatus and furniture, the purchase of the appliances for field and feeding experiments, and the special plans for the different departments of Station work have engrossed much time and thought. The inspection of fertilizers, which becomes more and more laborious each year, has also been carried on as usual.

That which has been accomplished in these various directions, it is the purpose of this report to make clear, and it is hoped that what has been done as a beginning, in laying the foundations for future work, will meet with approval.

THE FORMER STATION.

The Maine Legislature of 1885 passed an act locating at the college what was to be known as the Maine Fertilizer Control and Agricultural Experiment Station, appropriating to its support the sum of $5000 annually. This Station was not placed under the control of the trustees of the college, but was intrusted to a board of managers, three of whom were to be appointed by the Governor of the State, the others to be the Secretary of the Board of Agriculture, and the Professor of Agriculture at the college.

This Station existed about two and a half years, and issued twenty bulletins and three reports, the former being published only in the leading papers of the State, and the latter as a part of the report of the Maine Board of Agriculture.

The work of this Station consisted of the inspection of commercial fertilizers, and the conducting of such experiments and investigations as the remaining time and means allowed.

Upon the passage by Congress of what is known as the "Hatch Act," establishing an agricultural experiment station in every State, the legislature of 1887 repealed the law of March 3, 1885, by an act which took effect on October 1, 1887. It was expected at the time this act was passed that by October 1st a Station would be in operation under the provisions of the national law.

This did not prove to be the case, owing to the failure of Congress to appropriate money, and had not the college assumed the risk of advancing the funds to pay the expenses of the Station for another three months, work would have ceased on the date at which the old Station law stood repealed. As it was, work was continued until January 1, 1888, when the Station force disbanded to await the action of Congress.

THE PRESENT STATION.

The congressional act establishing what are known as the national experiment stations, became a law on March 2, 1887, and designated October 1st of that year as the time at which the first quarterly payments for the support of these stations should become due. Congress failed, however, to make the appropriation required by the act named, and so these stations did not go into operation. It was not until after the passage of a deficiency bill early in February, 1888, that funds became available for the payment of the expenses of the year 1887–8.

Previous to this, the Maine legislature of 1887 had accepted the provision of the "Hatch Act" on the part of the State, and at a meeting of the college trustees in June, 1887, the present Station was organized as a department of the college, by the election of a director and two other members of the staff of officers. It only remained, after the funds had become available, for the trustees to take such steps as were necessary to put the Station into actual operation, which they did at a meeting on February 16, 1888.

RELATION OF THE STATION TO THE COLLEGE.

The act of Congress establishing the Station, creates it as a department of the college, which stands in the same relation to the trustees and president as any other department. At the same time, such are the peculiar conditions under which this department is created, and so essential is it for the college to be able to show that the congressional appropriation is applied according to the intent of the law, it seems necessary for the management of the Experiment Station to be more fully distinct and separate than is the case with the other departments of the college.

At a meeting of the delegates of agricultural colleges and experiment stations held in Washington, D. C., Oct. 18–20, 1887, resolutions were adopted, a brief summary of which is given below:

1st. All the appropriations under the "Hatch bill" should be wholly applied to agricultural research and experiment, and not to the general uses of the college.

2d. These stations should be so far separate and distinct from the colleges that it will be possible to show at any time that the funds have been used according to the intent of the law.

3d. Every department known as an experiment station should be distinctly organized with a recognized official head, whose time shall be chiefly devoted to this department.

It is believed that the plan of organization upon which this Station has entered is in conformity to the letter and spirit of these resolutions. It is true that some members of the faculty of the college will divide their time between station work and the instruction of students, but in all cases, increased assistance will be provided to compensate for added duties, and in no instance will the Station funds be used to pay for time devoted to teaching.

ORGANIZATION AND WORK OF THE STATION.

At the meeting of the trustees mentioned above a general plan for carrying out the provisions of the "Hatch bill," involving the expenditure of $15,000 per annum, was presented to the board of trustees, and was accepted by them, and the development and management of the Station under this plan was placed in the immediate charge of an Experiment Station Council, constituted as follows: The president of the college; the director of the Station; the professor of agriculture; the professor of natural history; the Station veterinarian; the Station horticulturist (when appointed).

At a subsequent meeting this council was enlarged by the addition of a committee of the trustees.

In accordance with the action of the trustees the Station Council has perfected the organization of the Station somewhat in detail, and the various lines of work important to Maine agriculture, to which attention will be given, from time to time, as seems expedient, have been assigned to the Station officers as follows:

(1) *Cattle Foods, Cattle Feeding and Animal Products.* (Director of Station.)

The forage crops adapted to Maine agriculture.

The composition of cattle foods, and the influence of varying conditions upon their nutritive value.

The digestibility of cattle foods.

The special functions of the ingredients of cattle foods in animal nutrition.

The economical use of foods in the production of milk, meat and other animal products.

The adaptability of the various breeds of animals to the profitable production of milk and meat.

The best methods for the manufacture of butter and cheese, and allied questions.

(2) *Fertilizer and Crop Production.* (Prof. Balentine.)

The composition, availability and use of the various kinds of fertilizing material, including commercial and farm manures.

The relation of different cattle foods to the fertility of the farm.

The economy of different systems of farm management as related to the fertility of the soil and to the profits of farming.

Methods of cultivation best calculated to promote the fertility and proper physical conditions of the soil.

(3) *Varieties of Farm Crops, Agricultural Botany and Entomology,* (Prof. Harvey.)

A botanical study of plants, both useful and injurious to Maine Agriculture.

The nature and remedy for the fungoid and other diseases to which agricultural plants are subject.

Inspection of the agricultural seeds sold in Maine to determine their purity and vitality.

The life history and ravages of injurious insects, and the means of their prevention or extermination.

(4) *Animal Diseases.* (Dr. Russell.)

Dr. F. L. Russell, a graduate of the Maine State College and of the New York College of Veterinary Surgeons, New York City, was elected veterinarian to the Station early in 1887, and since that time has been pursuing special studies in bacteriology and pathology at the Johns Hopkins University, Baltimore, in preparation for the work which he is to undertake. He will enter upon his duties at the Station about the first of March, 1889, and will then devote his time largely to a study of the nature of those diseases from which the farm animals of this State seem likely to suffer.

(5) *Horticulture.* (No special provision for this yet.)

It seems desirable that horticulture should find a place in the work of the Station, and it is only necessary that certain facilities be provided in the way of buildings in order that proper attention may be given to this important branch of agriculture. In the mean time as much will be done in this direction as time and facilities permit.

(6) *Agricultural Meteorology and Physics.* (President Fernald.)

This department of experiment and investigation embraces such subjects as temperature, rainfall, evaporation and percolation or drainage, in their relations to the mechanical conditions of the soil and the plant growth. It is now proposed to begin in the spring of 1889 certain meteorological observations, additional to those heretofore made at the college.

(7) *Fertilizer Inspection.*

The new fertilizer law enacted in 1887 gives the Experiment Station the authority to sample and analyze the commercial fertilizers sold in the State, and therefore this inspection will be continued as heretofore.

It will be possible, now that the Station bulletins are to be sent directly to farmers, to distribute information in regard to the character of the fertilizers offered for sale, more promptly than has been the case when the newspapers were the medium of communication.

On the other hand large increase in the brands of fertilizers offered for sale in this State will tend to delay the report of the spring inspection.

Samples can not be collected until the new goods are shipped to dealers, and the greater the number of brands sampled the longer the time required to perform the analysis.

(*8*) *Chemical Analyses.* (Mr. Bartlett and Mr. Merrill.)

It is to be noticed that of the nine Station officers two are chemists, who will devote nearly their entire time to analytical chemistry, with perhaps some assistance. Almost all of the experimental work to be undertaken in the field, barn or dairy, will require the aid of the chemist in obtaining the data necessary to full and safe conclusions. Conclusions from experiments in plant feeding and cattle feeding are often looked upon with suspicion as a guide to practice, unless chemical analysis is employed to give full information about the materials used, and the products obtained. Moreover, the amount of analytical work involved in the inspection of fertilizers is very great and because of the large business interests that are affected by the report of this inspection, it is essential that the analyses be reliable beyond question. So great is the necessity for entirely trustworthy laboratory data, the Station has adopted the policy of entrusting this work largely to men of experience at salaries that shall tend to secure their services permanently, rather than to employ mostly assistants of a lower grade, and at small salaries, whose results would be less satisfactory even with constant supervision, and who would constantly be changing to more lucrative positions.

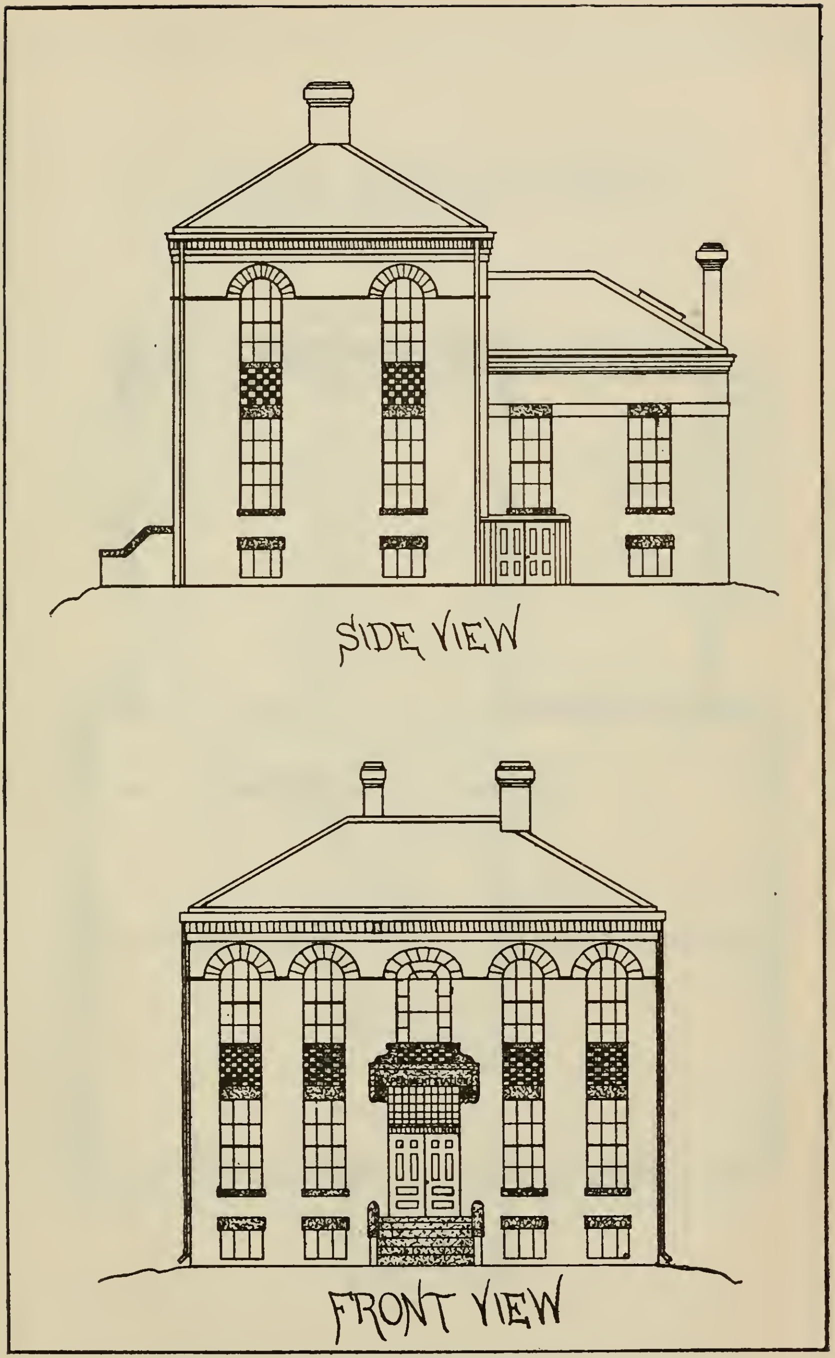
(*9*) An important part of the conduct of field and feeding experiments is the immediate supervision of the details of their execution. An experiment may involve ever so interesting a problem, and may be ever so wisely planned, but unless it is carried out with good judgment and fidelity on the part of the one who attends to its actual execution, it is likely to be worse than useless. It is no easy thing to exercise the care necessary to correctness in weights and records, when several experiments are being carried on at the same time. These duties now devolve upon Mr. Shaw, foreman on the farm, who has rendered the Station efficient service in this direction.

The work of the Station, as outlined above, covers a wide field of inquiry, and it should not be expected that all the problems important in Maine agriculture will receive attention at once, or that these problems will be quickly solved. Many points in farm practice must be studied experimentally for several years, before safe conclusions can be reached, although some questions can be answered more promptly. An effort will be made to adapt the work of the Station to the special needs of the State, and to secure results whose direct practical value shall be unquestioned.

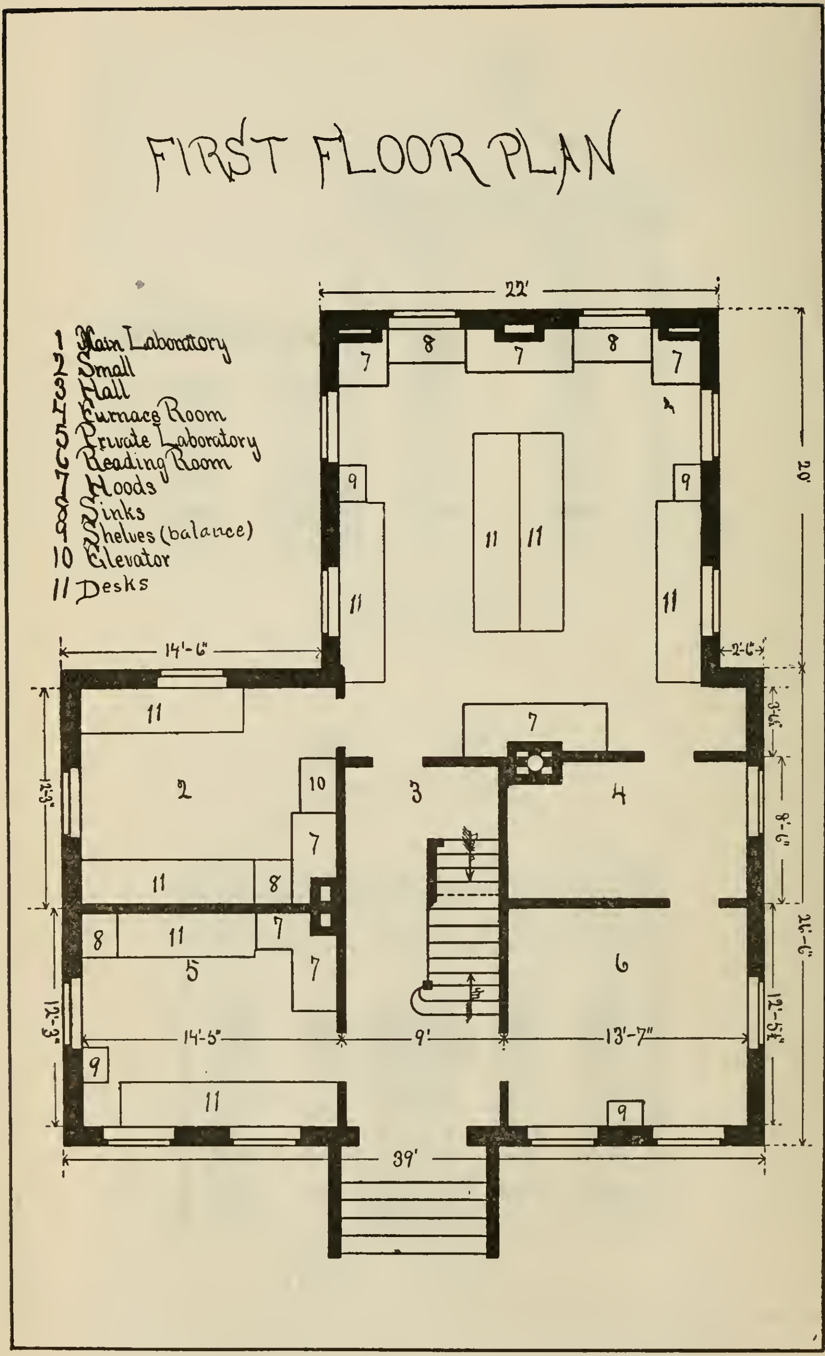
STATION BUILDINGS AND APPLIANCES

Since the first organization of an experiment station at the college in 1885, it has occupied building space that has been needed by the departments of instruction. Moreover, now that national aid has so greatly enlarged the scope of the work to be done, the demand for more and better room for laboratory and other purposes has become imperative. This fact was recognized by the trustees at the February meeting of 1887, and consequently they made arrangements for the erection of a building to contain the chemical laboratory, station office and director's room. This building, constructed of brick with granite trimmings, is now nearly ready for occupancy, and is believed to be well suited to the work for which it is intended. Its general appearance and plan are shown by the accompanying plates.

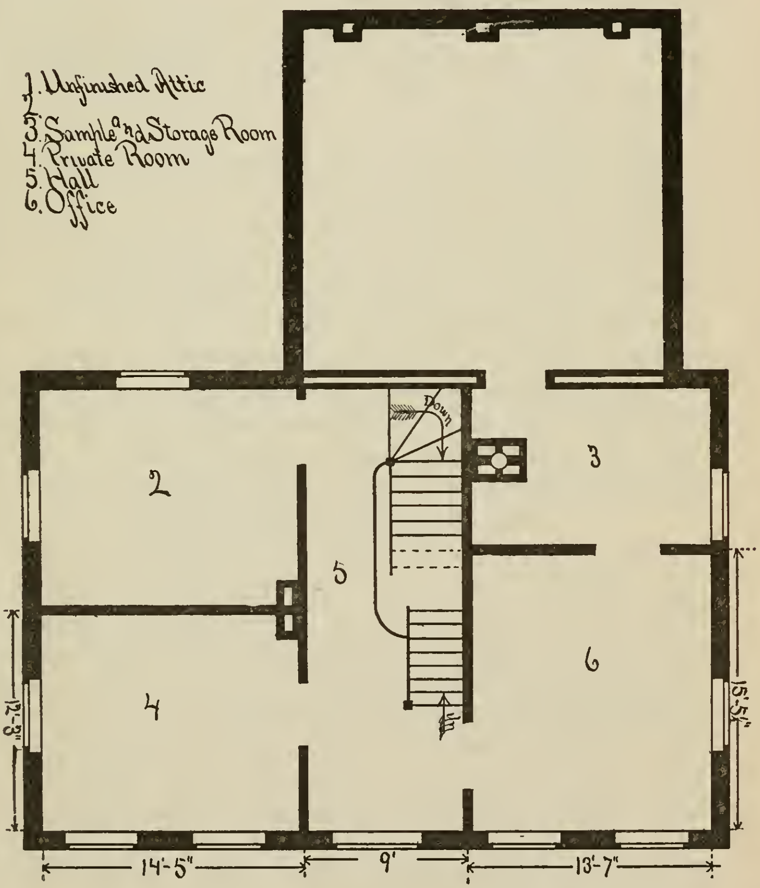
The basement contains space for the unpacking and storage of apparatus and chemicals, a Springfield gas machine for the manufacture of burning gas from naptha, a boiler which supplies steam for heating and laboratory purposes, and room for coal. On the first floor are five rooms devoted entirely to chemical work, including a reading room in which is to be placed a special chemical library. Three of these rooms are furnished with gas, water, tables, hoods, steam baths for evaporation and balance shelves set on brackets built into the wall. The apparatus for these rooms is already purchased. The upper floor has a Station office with an accompanying small room for storage, the director's private room, and a room which will probably be temporarily devoted to bacteriological investigations. The whole building is heated by steam and lighted by gas. In the office has been placed a large Hall's safe for the preservation of the records, a National Files Cabinet for the systematic filing of letters and papers, and a large case for the proper storage and distribution of pamphlets, bulletins, etc.



AGRICULTURAL EXPERIMENT STATION BUILDING, MAINE STATE COLLEGE.


FIRST FLOOR PLAN
1 Main Laboratory
2 Small
3 Hall
4 Furnace Room
5 Private Laboratory
6 Reading Room
7 Hoods
8 Sinks
9 Shelves (balance)
10 Elevator
11 Desks
22'
20'
14'-6"
2'-6"
12'-3"
3'-6"
8'-6"
26'-6"
12'-3"
14'-5"
9'
13'-7"
12'-5½"
39'

SECOND FLOOR PLAN



The whole building is to be equipped so thoroughly, that with a given force the maximum amount of work will be accomplished.

The experiments with live stock have been carried on so far in the barn that will be needed for other purposes as soon as the college farm is restocked, and space for this work must be provided elsewhere. If in some way funds can be secured to complete the outside of the unfinished new barn, the amount allowed from the national appropriation will probably be sufficient to fit the inside for feeding and dairy experiments, and to build the dairy room that must be provided when the one belonging to the farm is again occupied. Such an arrangement seems to be the only possible one that will adequately provide for the experimental work which the station proposes to do.

Land necessary for field experiments has been set aside from the college farm, and is already occupied, and the field experiments to which it is devoted include the use of small plots for fertilizer tests and tests of varieties, and of large areas on which different systems of crop production will be practiced for a series of years.

As a means of conducting, feeding and dairy experiments, the station has purchased eight thoroughbred cows (two each of the Jerseys, Ayrshires, Holsteins and Shorthorns), six thoroughbred steers (two each of the Herefords, Holsteins and Shorthorns), twelve pigs and six sheep, also the necessary scales for weighing animals, rations and milk, and an outfit of dairy apparatus.

THE CONTENTS OF THIS REPORT.

This report contains the results of a comparatively small amount of experimental work, for reasons previously given. It is quite largely devoted to matters of an explanatory and informational character. For instance, under the head of foods, quite an amount of space is occupied by explanations in regard to the composition and digestibility of cattle foods, and the basis, value and use of the German feeding standards, and these subjects have been treated at so much length in response to a direct call for such information. It is proposed to treat other subjects in a similar manner, so that the Station Reports may serve as books of reference. It will be noticed, also, that the main part of the matter given in the bulletins published in 1888, is reprinted here.

Quite a number of experiments are either under way or are definitely arranged, as can be seen by the following summary of what has been done, or is already undertaken, and some results have been secured which are not published here.

EXPERIMENTS AND INVESTIGATIONS, THE RESULTS OF WHICH ARE ALREADY PUBLISHED.

(*1*) *Wood Ashes.*

Object: The determination of the composition of ashes from different woods, and of those burned and kept under different conditions.

Plan: The collection and analyses of ashes from as many sources as possible.

Time: Summer of 1885.

Results published: Report M. E. S., 1885–6, pp. 29–34.

(*2*) *Manure Residue.*

Object: The determination of the value of manure residue from corn meal and cotton seed meal.

Plan: The feeding of corn meal and cotton seed meal with same amount of some kind of hay, and collection and analysis of fæces and urine during the two periods.

Time: Fall and winter of 1885–6.

Results published: Report M. E. S.,* 1885–6, pp. 42–46.

(*3*) *Digestion Experiment.*

Object: To determine digestibility of timothy hay.

Plan: Timothy hay fed to a sheep, with corn meal or cotton seed meal, for twelve days, fæces collected for last five days. Digestibility of meal assumed from German averages. The feeding was carried on for three periods, of twelve days each.

Time: Fall and winter, 1885–6.

Results published: Report M. E. S., 1885–6, pp. 35–58.

(*4*) *Digestion Experiment.*

Object: Digestibility of maize kernel fed in different forms.

Plan: Weighed quantities of whole corn, corn meal and corn cob meal fed to pig, each for twelve days, and fæces collected for last five. Three periods.

Time: Winter, 1885–6.

Results published: Report M. E. S., 1885–6, pp. 59-64.

(*5*) *Feeding Experiment.*

Object: The advantage of combining cotton seed meal with corn meal in moderate grain ration fed to milch cows.

Plan: The feeding of same weights of food in three different periods, in first and third periods the grain ration being a mixture

2 *M. E. S., for Maine Experiment Station.

of cotton seed meal and corn meal, and in second period pure corn meal. Three cows used in the experiment, each period of feeding being four weeks. During the last two weeks of each period a record was kept of the milk produced, and of the cream and butter, the milk being analyzed also.

Time: Winter, 1885–6.

Results published: Report M. E. S., 1885–6, pp. 65–72.

(6) *Feeding Experiment.*

Object: Comparison of wheat straw and a nitrogenous grain ration with timothy hay and corn meal, as food for growing steers.

Plan: Two lots steers, two in each lot, same weights of hay and straw fed, and same weights of grain, only the lot eating straw received some cotton seed in place of part of corn meal fed to lot eating timothy.

Time: Winter, 1885–6.

Results published: Report M. E. S., 1885-6, pp. 73-76.

(7) *Field Experiment.*

Object: The practical effect of different forms of phosphoric acid in crop production, also of a complete commercial fertilizer against yard manure.

Plan: Three plots in series manured with each form of $P2\ O5$, accompanied by a sufficient supply of ammonia and potash salts alone, three plots with no manure and three plot with yard manure.

Time: Spring, 1885.

Results published (first year): Report M. E. S., 1886-7, pp. 41-49.

(8) *Field Experiment.*

Object: The use of partial as compared with complete fertilizer. The profitable quantity of fertilizers to use.

Plan: Similar to experiment seven.

Time: Spring, 1885.

Results published: First year Report M. E. S., 1886-7, pp. 47-49.

(9) *Field Experiments.*

Object: To stimulate habits of inquiry and observation. To render farmers more familiar with the composition of fertilizers. To add something if possible, to our stock of knowledge in regard to the profitable use of commercial fertilizers.

Plan: The sending to farmers bags containing different mixtures of fertilizing material with directions for making experiments. The various combinations were P2 O5 alone, P2 O5 and K2 O, and P2 O5, K2 O and N.

Time: Spring, 1886.

Results published: First year, Report M. E. S., 1886-7, pp. 49-64; second year, this report.

(*10*) *Digestion Experiment.*

Object: Digestibility of Timothy hay.

Plan: Seven hundred grams hay fed to a sheep for twelve days, fæces collected for last days. Fæces and food analyzed.

Time: Fall, 1886.

Results published: Report M. E. S., 1886-7, pp. 72-73.

(*11*) *Digestion Experiment.*

Object: Digestibility of clover hay.

Plan: Same as experiment 10, only 700 grams clover hay fed.

Time: Fall of 1886-7.

Results published: Report M. E. S., 1886-7, pp. 74-75.

(*12*) *Digestion Experiment.*

Object: Digestibility of oat straw.

Plan, same as experiment 10 and 11, only 350 grams oat straw fed daily.

Time: Fall of 1886-7.

Results published: Report M. E. S., 1886-7, pp. 75-76.

(*13*) *Digestion Experiment.*

Object: Digestibility of potatoes, both raw and boiled.

Plan: Three hundred and fifty grams oat straw used in experiment 12 and 1000 grams raw potatoes fed to two sheep for twelve days, fæces collected last five days. Digestibility of straw assumed to be as found in experiment 12; 300 grams Timothy used in experiment 10, and 1000 grams boiled potatoes fed to one sheep for twelve days.

Time: Winter, 1887.

Results published: Report M. E. S., 1886-7, pp. 47-79.

(*14*) *Feeding Experiment.*

Object: Same as experiment No. 5.

Plan: Four cows used in experiment and in each period two cows received Timothy and two clover hay, otherwise plan same as experiment No. 5.

Time: Winter 1886-7.

Results published: Report M. E. S., 1886-7, pp. 84-89.

(*15*) *Feeding Experiment.*

Object: The profitable quantity of food and the profitable combination of foods, in feeding steers for growth.

Plan: Ten steers about eighteen months old, divided into five lots.

Lot 1. Maintenance ration hay.

Lot 2. Ration for moderate growth, hay and corn meal.

Lot 3. Ration for moderate growth, hay, corn meal and cotton seed meal.

Lot 4. Ration for rapid growth, hay, corn meal and cotton seed meal.

Lot 5. Straw substituted for hay.

Time: Fall and winter 1886-7.

Results published: Report M. E. S., 1886-7, pp. 89-93.

(*16*) *Feeding Experiment.*

Object: The comparative value of whole corn and corn meal for feeding hogs.

Plan: Two lots of pigs, three in each lot; first period lot 1 fed whole corn, lot 2 fed same weight corn meal; second period lot 1 fed corn meal; lot 2 fed whole corn. In each period same quantity of potatoes and skimmed milk fed each lot.

Time: Fall and winter, 1886-7.

Results published: Report M. E. S., 1886-7, pp. 97-99.

(*17*) *Feeding Experiment.*

Object: The comparative feeding value of corn meal, and corn and cob meal for hogs.

Plan: The feeding of two lots of pigs, three in each lot; lot 3 received corn meal, potatoes and milk, and lot 4, a weight of corn-cob meal containing same amount of kernel as the pure meal of lot 3, and same amount of potatoes and milk.

Time: Winter of 1887.

Results published: Report M. E. S., 1886-7, pp. 99-100.

(*18*) *Feeding Experiment.*

Object: The relative feeding value of raw and boiled potatoes.

Plan: Two lots, of three pigs each, to be fed in same weights of potatoes, corn meal and skimmed milk, only with one lot the potatoes to be boiled before feeding.

Time: Winter of 1886-7.

Results published: Report M. E. S., 1886-7, pp. 100-101.

(*19*) *Feeding Experiment.*

Object: The profitable composition of rations for growing poultry.

Plan: The feeding of a pure corn ration against a ration consisting of a mixture of corn and some highly nitrogenous material. Two lots of cockerels, of twelve each.

Time: Fall, 1886.

Results published: Report M. E. S., 1886-7, pp. 101-104.

(20) *Dairy Experiment.*

Object: The effect of varying temperature at which milk is set for cream raising. (1) Upon volume of cream. (2) Upon composition of cream. (3) Upon quantity of cream to each pound of butter. (4) Upon fat left in skimmed milk. Other minor points are considered.

Plan: The setting of equal weights of same milk at different temperature, the milk, cream and skimmed milk to be analyzed, and the cream and butter weighed.

Time: Spring and summer, 1887.

Results published: Report M. E. S., 1886-7, pp. 107-119.

(21) *Available Nitrogen.*

Object: Relative value of organic nitrogen in different fertilizers.

Plan: Treatment of fertilizers with an artificial pepsin solution, and determination of undissolved nitrogen.

Time: Spring, 1887.

Results published: Report M. E. S., 1886-7, pp. 124-126.

(22) *Digestion Methods.*

Object: The comparison of artificial digestion of protein, with results obtained by experiments with animals; also errors for protein of natural method.

Plan: Treatment of foods used in digestion experiments with animals with artificial solutions of pepsin and pancreas, and treatment of fæces with such solvents as will remove the "stoff-wechsel producte," and not act upon the undigested food residue.

Time: Fall and winter 1886-7.

Results published: Report M. E. S., 1886-7, pp. 127-135, and this report.

(23) *Test of Varieties.*

Object: Test of comparative value of different varieties of oats.

Plan: The sowing of equal areas with the different varieties under similar conditions, the main facts of growth, yield and bushel weight to be recorded.

Time: Spring, 1886.

Results published: First year, Report M. E. S., 1886-7, pp. 105-6; second year, this report.

(*24*) *Test of Varieties.*

Object: Test of comparative value of different varieties of barley.

Plan: Same as experiment No. 23.

Time: Spring, 1886.

Results published: First year, Report M. E. S., 1886-7, p. 106; second year, this report.

(*25*) *Test of Varieties.*

Object: Test of comparative value of different varieties of potatoes.

Plan: The planting of equal number of hills seeded alike, under similar conditions with record of growth and yield.

Time: Spring, 1886.

Results published: First year, M. E. S., 1886-7, pp. 104-105. Second year, this report.

(*26*) *Digestion Experiment.*

Object: Determination of composition and digestibility of different species of grasses and other forage plants.

Plan: Collected at same stage of growth, subsequent analysis and digestion experiments.

Time: 1887.

Results published: First year, this report.

(*27*) *Culture Experiment.*

Object: The effect of hilling potatoes as compared with flat culture.

Plan: The cultivation of equal areas of potatoes under similar conditions, only certain plots hilled, and certain plots given flat culture, to be tried with both deep and shallow planting.

Time: Summer, 1887.

Results published: This report.

(*28*) *Feeding Experiment.*

Object: See experiment No. 16.

Plan: See experiment No 16.

Time: Summer, 1887.

(*29*) *Feeding Experiment.*

Object: The economy of feeding grain to growing steers while at pasture.

Plan: The feeding of two lots of steers, one on grass alone and the other on grass and corn meal, the rations to be alternated between the two lots.

Time: Summer, 1887. (Failure).

EXPERIMENTS OR INVESTIGATIONS ALREADY UNDERTAKEN OR PLANNED.

(30) *Study of Breeds.*

Object: A study of the characteristics and economy of different breeds of cows for dairy purposes.

Plan: The use of four breeds, two cows of each, Holstein, Shorthorn, Ayrshire and Jersey, a record of the amount and composition of foods, the weight and composition of milk, weight and composition of cream, and weights of butter; also a study of physical characteristics of milk and chemical and physical properties of butter.

Time: 1888, and continuing.

(31) *Study of Breeds.*

Object: Study of relative production of beef with different breeds.

Plan: The use of three breeds, two steers of each, Hereford, Shorthorn and Holstein, to be grown from calves under similar conditions and feeding.

Time: 1888, and continuing.

(32) *Feeding Experiment.*

Object: The economical composition of a ration of beef production.

Plan: The dividing of steers used in experiment 31 into two lots, one steer of each breed in each lot, one lot to be fed a ration such as can be compounded without the purchase of highly nitrogenous foods, the other to receive an equal weight of food containing a certain proportion of cotton seed meal (or linseed).

Time: 1888, and continuing.

(33) *Fodder Investigation.*

Object: A study of the relative feeding value of Timothy, cut at different stages of growth.

Plan: Determination of weights, composition, digestibility and growth produced, of Timothy from plots cut at different stages of growth. Piece divided into six plots, three cut when in bloom, and three cut about two weeks later.

Time: 1888.

(*34*) *Fodder Investigation.*

Object: The relative amounts and composition of dry matter produced by different varieties of corn grain for ensilage.

Plan: The growing of the different varieties of corn on equal areas under similar condition of soil, manuring and cultivation. Two acres divided into twelve equal plots, four plots being planted to each variety of corn, southern white, common field corn and sweet corn.

Time: 1888.

(*35*) *Feeding Experiment.*

Object: The feeding value of ensilage as compared with hay.

Plan: The feeding to milch cows and growing steers the same amounts of digestible material in ensilage and hay. The other parts of the ration being alike.

Time: Fall and winter, 1888-9.

(*36*) *Feeding Experiment.*

Object: The determination of the actual maintenance ration.

Plan: Feeding steers with hays, record to be kept of weight and composition of foods fed, change in weights of animals, and weights and composition of excretions.

(*37*) *Feeding Experiment.*

Object: The relative value of skimmed milk and corn meal as foods for growing swine.

Plan: The feeding to two lots of pigs, of two animals each, the same amounts of digestible material, to come more largely from skimmed milk than in the other, a small amount of bone meal to be fed to each lot. Pigs from same litter.

Time: 1888.

(*38*) *Feeding Experiment.*

Object: The effect of a large amount of drink on the growth of pigs.

Plan: Tho feeding of two lots of pigs, of two each, the same amounts of digestible material, in one case the amount of drink to satisfy the thirst of the animal, and in the other the animal to be induced to drink more than necessary.

(*39*) *Feeding Experiment.*

Object: The use of nitrogenous foods in the growing of pigs.

Plan: The feeding of two lots of pigs on same amounts of digestible material, the ration to be more nitrogenous in one case than in the other, drink and all other conditions to be similar.

(*40*) *Fertilizer Pot Experiment.*

Object: The study of the availability of different forms of phosphoric acid.

Plan: The growing of plants in sand, different plots being manured with different forms of P2 O5, all other elements of plant food being supplied in abundance, and conditions of temperature, moisture, being the same for all plots. Galvanized iron pots used.

Time: 1888.

(*41*) *Fertilizer Box Experiment.*

Object: Same as No. 40.

Plan: Same as No. 40, only plants grown in boxes three feet square, set ground, no bottoms, and filled with ordinary soil.

Time: 1888.

(*42*) *Fertilizer Box Experiment.*

Object: A study of the availability for plant growth of different forms of nitrogenous material.

Plan: Same as No. 41.

Time: 1888.

ACKNOWLEDGEMENTS.

The publishers of the following named papers have kindly placed this station upon their complimentary list, for which grateful acknowledgement is hereby made:

American Analyst, 19 Park Place, N. Y.; American Cultivator, Boston, Mass.; American Grange Bulletin, Cincinnati, Ohio; American Rural Home, Rochester, N. Y.; Delaware Farm Home, Wilmington, Del.; Eastern Farmer, Waterville, Me.; Farmers' Advocate, London, Ont.; Farmers' Club Journal, Hornellsville, N. Y.; Farm and Fireside, Phila., Pa.; Farm and Home, Springfield, Mass.; Farmer's Home, Dayton, Ohio; Farm Journal, Phila., Pa.; Farmers' Review, Chicago, Ill.; Hoard's Dairyman, Fort Atkinson, Wis.; Jersey Bulletin, Indianapolis, Ind.; Mirror and Farmer, Manchester, N. H.; Maine Farmer, Augusta, Maine; Massachusetts Ploughman, Boston, Mass.; National Farmer, Augusta, Maine; New England Farmer, Boston, Mass.; New York Weekly Tribune, New York, N. Y.; Ohio Farmer, Cleveland,

Ohio; Orange County Farmer, Port Jervis, N. Y.; Philadelphia Weekly Press, Phila., Pa.; Practical Farmer, Phila., Pa.; Southern Cultivator, Atlanta, Ga.; The Husbandman, Elmira, N. Y.

Lewis & Cowles of Catskill, N. Y., very generously presented the Station with a Lewis Combination Force Pump, some account of the use of which is given in this report by Prof. Harvey. Thanks are also due to Hon. E. E. Parkhurst of Maysville Center, Me., for the present of a thorough-bred short horn bull calf. Several fertilizer manufacturers have very kindly offered to supply the Station with quantities of their goods, sufficient for field experiments, but the offers have been declined for obvious reasons.

W. H. JORDAN,
Director.

MAINE STATE COLLEGE,
AGRICULTURAL EXPERIMENT STATION,
Orono, Maine, Jan. 1st, 1889.

ANALYSES OF MUCK.

During the year 1887 several samples of muck were sent to the station from different parts of the State, and these have been analyzed with a view to determining their absorbent and fertilizing value.

These samples were as follows:

No. of Sample—278. From William Downs, So. Sebec.
" " 279. " L. H. Blossom, Turner.
" " 280. " S. L. Holbrook, Brunswick.
" " 281. " A. C. Chandler, New Gloucester.
" " 282. " D. B. Johnson, Freedom.

The tables below show the pounds of organic matter and mineral matter in 100 lbs. of the dry substance of the muck, the composition of the mineral part, and the nitrogen and mineral substances in 100 lbs. water-free muck.

	278	279	280	281	282
Water in fresh muck	83.24	75.05			
Water in air dry muck	51.60	41.90	41.12	23.35	24.80
Ash in air dry muck	6.32	12.27	2.22	32.25	26.61
Organic matter in 100 lbs. water free muck	86.94	78.88	96.19	57.93	65.39
Mineral matter in 100 lbs. water free muck	13.06	21.12	3.81	42.07	34.61
	100.00	100.00	100.00	100.00	100.00
COMPOSITION OF MINERAL MATTER.					
Insoluble part, sand silica, &c	2.85	81.33	57.88	84.50	68.61
Iron oxide and alumina	2.72	-	7.80	8.39	7.35
Lime	50.16	3.42	6.51	4.46	10.59
Magnesia	2.37	-	4.10	.37	.37
Potash	.17	.33	4.50	.10	.80
Soda	2.35	-	4.45	.33	.10
Sulphuric acid (S O3)	5.38	.82	2.69	.81	2.38
Phosphoric acid (P2 O5)	1.27	5.46	7.01	.61	5.69
Carbonic acid, coal, &c	32.73	-	5.06	.43	4.11
	100.00		100.00	100.00	100.00

	278	279	280	281	282	Stable. Manure
Nitrogen of organic matter in 100 lbs. water free muck...	2.77	1.29	1.98	1.15	1.51	1.75
Mineral matter in 100 lbs. water free muck, containing:						
Sand, silica, &c............	.37	17.17	2.20	35.53	23.74	36.70
Iron oxide and alumina.....	.35	–	.30	3.53	2.54	2.44
Lime......................	6.55	.72	.25	1.88	3.67	1.75
Magnesia..................	.31	–	.15	.15	.12	1.05
Potash.....	.02	.07	.17	.04	.27	1.40
Soda......................	.30	–	.17	.14	.03	.35
Sulphuric acid.............	.70	.17	.10	.34	.82	.35
Phosphoric acid	.17	1.15	.27	.26	1.97	1.75
Carbonic acid, coal, &c......	4.29	–	.20	.20	1.45	1.06
Total..............	13.06		3.81	42.07	34.61	46.85

The above figures show what the five samples of muck would contain if entirely free from water. It is never the case that muck is entirely dry. It is very retentive of moisture, and even when shoveled out of the pit and allowed to lie in a heap until the dry season—August, for instance—it would then probably contain as much as 50 per cent. of water. When first shoveled out of the bed, 100 lbs. of muck contain 75 or 80 pounds of moisture, sometimes more.

Now, if these mucks were at their best, and held but 50 per cent of moisture, 100 lbs. would contain only half the quantities of nitrogen and mineral ingredients given above, or, if fresh and holding 80 per cent of water, only one-fifth these quantities. The figures given for stable manure are also based on water-free substance, and as this makes up about one-fourth the weight of the manure, 100 lbs. would have one-fourth the pounds mentioned.

It is important to notice the great differences in the several samples of muck.

First, there is a great variation in the amount of organic (vegetable) matter, sample 280 having over one-third more than sample 281. As it is upon the organic matter that the absorbent power of the muck depends, sample 280 is evidently greatly superior for use on the tie-up floor, or under swine.

Again, the several mucks differ in the quantities of manurial ingredients which they contain. Sample 278 has over twice the nitrogen found in samples 279 and 281, while samples 279 and 282 are especially rich in phosphoric acid. Compared with stable manure the average for nitrogen is nearly the same, but the mucks are inferior in the quantities of mineral compounds. It should not be forgotten that the ingredients of the stable manure are much more available than those of the mucks. Until the muck is composted we may believe that it will furnish but little food to a growing plant. If, however, by treatment with lime, or under the influence the fermentation of the manure pile the nitrogen it contains is largely rendered available, the muck bed may be made a not insignificant source of plant food. The whole matter of its use turns upon the cost of getting it to the barn, and from the barn to the field, as compared with what is saved by its use as an absorbent, plus the value of the small amount of plant food which it contains. The latter factor would not average over $2 per ton in the case of the five samples analyzed, reckoning the nitrogen, phosphoric acid and potash at such prices as these ingredients would cost in coarse bone, raw South Carolina rock and muriate of potash, and it is doubtful if these ingredients are as valuable in the muck as in the materials named. This, at least, is plainly taught by these analyses—that each muck bed must be judged upon its own merits. There is muck and muck.

EXPERIMENTS WITH FERTILIZERS.

Prof. Walter Balentine.

Many of the problems connected with manuring have been definitely settled for years. We teach in our agricultural schools that phosphoric acid, potash, magnesia, etc., are essential to plant life with the same assurance that the simple facts of geography are taught in our common schools. We believe as implicitly that the atmosphere is the chief source of carbon to the plant as we do that the earth revolves on its axis.

The chief problems in plant nutrition to-day are not what plants need for their nourishment, but how to supply that nourishment in the cheapest and most effective manner.

The present method of treating rock phosphates to make its phosphoric acid available quadruples the cost of the phosphoric acid to the consumer.

The field for investigation in the direction of reducing this cost, by the means of less expensive methods of preparation, is a promising one.

The successful experiments in the use of the "Thomas Slag" as a source of phosphoric acid certainly gives encouragement to work in this direction. That some plants can obtain nourishment from sources that are not available to other plants seems to be well established.

Investigations as to what plants are especially well adapted for extracting phosphoric acid and potash from their most insoluble compounds should be prosecuted vigorously.

It does not seem improbable that facts might be brought to light from such investigations that would be of great use in devising systems of crop rotation in which ground phosphatic rock and feldspar might be made the chief source of phosphoric acid and potash. The researches of Dr. Atwater on the atmosphere as a source of nitrogen to plants were followed by results which warrant a further investigation of the subject. If there is any class of plants which will gather any considerable quantity of nitrogen from the atmosphere during their growth, they should be made to contribute to the supply of nitrogenous manures.

The number of lines of investigation in feeding plants which may possibly lead to valuable practical results is great, but the most important are those which have for their object cheaper fertilizers for the farmers.

Box Experiments with Fertilizers.

The station has commenced experiments which we hope will aid in solving some of the problems concerning fertilizers, alluded to above.

In 1887, boxes three feet square and one foot high, without bottoms, were procured and set in the earth in the open field. In the spring of 1888 three boxes were filled with loam that had been piled up in a heap and shoveled over many times in order to make it as uniform as possible. One set of these boxes was left without the application of fertilizing material of any kind. The remaining boxes each received an application of 37.5 grammes of muriate of potash, and 50 grammes of sulphate of ammonia. This amount was added that there should be no deficiency in potash or nitrogen to interfere with the success of the experiment. To one set of three boxes which had received the above application of muriate of potash and sulphate of ammonia, 37.5 gr. of dissolved bone black was added to each box. To another set of three boxes there was added to each box 41.1 gr. of finely ground South Carolina rock. To another set of three boxes was added 31.2 grs. of finely ground Aruba phosphate. To another set, 42 grams of finely ground Caribbean Sea guano. To another set 30.7 gr. of powdered Canadian apatite. To another set 33.5 gr. of finely ground Vivorella phosphate, and a set of two was left without the addition of any phosphatic material.

The dissolved bone black was applied at the rate of about 400 lbs. to the acre and carried 16 per cent of soluble phosphoric acid. The application of crude phosphatic material was arranged so that the total phosphoric acid in the crude phosphate should be double the amount of soluble phosphoric acid in the dissolved bone black. The fertilizing material was evenly mixed with four inches of the surface soil, and then, in each box, 260 oat kernels were planted. The boxes were watered with rain water whenever they needed it. Below is given a table showing the analyses of the phosphatic materials used in the experiment, and another table showing the results of the experiment.

Name of Phosphate.	Total Phosphoric Acid	Insoluble Phosphoric Acid.	Available Phosphoric Acid.
Dissolved bone black................	-	-	16.00 per cent.
South Carolina rock, fine ground.....	28.64 per cent	24.17 per cent.	4.47 "
Aruba fine ground.....	35.51 "	32.86 "	2.65 "
Caribbean Sea guano, fine ground....	28.58 "	20.98 "	7.60 "
Apatite, fine ground...............	39.12 "	38.51 "	0.71 "
Vivorella, fine ground.............	35.88 "	26.34 "	9.54 "

Fertilizers.	Number of box.	Yield of grain in grams.	Yield of straw in grams	Average yield of grain per box in grams.	Average yield of straw per box in grams.	Average yield of grain and straw per box in grams.	Av yield of boxes in excess of the average of the boxes to which muriate of potash and sulphate of ammonia alone was applied -grams
Nothing	1 2 3	163.1 154.9 159.3	234 203 260	159.1	232.3	391.4	16.0
Dissolved bone black, 37.5 gr Muriate of potash, 37.5 gr.. Sulphate of ammonia, 50 gr.	4 5 6	304.6 242.6 180.0	500 409 300	242.4	403.0	645.4	270.0
South Carolina rock, 41.1 gr Muriate of potash, 37.5 gr. Sulphate of ammonia, 50 grs	7 8 9	219.1 196.1 213.7	302 350 289	209.6	313.7	523.3	197.9
Aruba, 31.2 gr .... Muriate of potash, 37.5 gr.. Sulphate of ammonia, 50 gr.	10 11 12	257.8 152.8 199.7	389 339 250	203.4	326.0	529.4	204.0
Caribbean Sea guano, 42 gr.. Muriate of potash, 37.5 gr.. Sulphate of ammonia, 50 gr.	13 14 15	176.7 382.2 * 70.2	352 400 377	209.7	376.3	586.0	210.6
Canadian apatite, 30.7 gr... Muriate of potash, 37.5 gr.. Sulphate of ammonia, 50 gr.	18 19 20	129.5 137.1 151.5	239 289 279	139.4	269.0	408.4	33.0
Vivorella, 33.5 gr .... Muriate of potash, 37.5 gr.. Sulphate of ammonia, 50 gr.	21 22 23	250.1 212.6 152.6	385 350 287	205.1	340.7	545.8	170.4
Muriate of potash, 37.5 gr.. Sulphate of ammonia, 50 gr	25 26	142.9 171.8	229 207	157.4	218.0	375.4	

* The low yield of grain obtained from box 15 probably results from a loss of grain from shelling.

This experiment leaves little room to doubt but all of the crude phosphates, except the apatite, cause a large increase in the crop. In the case of the Vivorella there was an increase of 45 per cent over the boxes which were fertilized with muriate of potash and sulphate of ammonia alone. With the Caribbean Sea guano the increase amounted to 59 per cent. The aruba gave an increase of 54 per cent, and the South Carolina rock 52 per cent.

These experiments in boxes will be continued, and to them will be added pot experiments, in which the only source of phosphoric acid will be the crude phosphates.

FIELD EXPERIMENTS WITH FERTILIZERS.

In 1886 the station instituted a series of field experiments with the object of gaining information on the following points, viz :

(1) The comparative value of phosphoric acid in its various forms available for use.

(2) The use of a partial as compared with a complete fertilizer.

(3) The relative profits resulting from the use of different quantities of fertilizers.

(4) The comparative results from the use of stable manure and commercial fertilizers.

The field selected for these experiments is a clayey loam adapted to grass and grain. Previous to 1885 it had been three years in grass, having been well manured with ashes and stable manure when seeded down. In 1885 a crop of barley was taken off without the addition of fertilizers of any kind.

The field was divided into thirty-six plots, arranged in two tiers of eighteen plots each. The plots extended east and west, and were eight rods long by one rod wide. The plots were separated by a strip of land eight feet wide, in which was a ditch deep enough to remove all surface water.

To diminish the errors due to inequalities in the field, three plots in different portions of the field receive the same treatment. In 1886 the land was sown to oats. In 1887 the oats were sown again, and the ground seeded to grass, and in 1888 a crop of hay was taken off.

During the years 1886 and 1887 the field received fertilizers in the proportions indicated in the following tables. There was no application of manure of any kind in 1888.

The tables below give the average yield in grain and hay of three plots receiving the same treatment.

For further information see Station Report, 1886-7.

METHODS OF MANURING.

Table I.

Kind of Fertilizer.	Quantity of Fertilizer per Acre.	Av'age yield of Grain per plot, 1886.	Av'age yield of Grain per plot, 1887.	Average yield of Hay per plot, 1888.
Nothing	-	83.5 lbs	40. lbs.	128 3 lbs.
Dissolved bone black Muriate of potash Sulphate of ammonia	400 lbs 100 " 200 "	12.43 "	58. "	121.7 "
Fine ground bone Muriate of potash Sulphate of ammonia	360 " 100 " 140 "	11.43 "	47.8 "	140.0 "
Fine ground S. C rock Muriate of potash Sulphate of ammonia	300 " 100 " 200 "	108.3 "	53.2 "	128.3 "
Muriate of potash Sulphate of ammonia	100 " 200 "	96.8 "	52.6 "	116.7 "
Stable manure	40,000 lbs	110.8 "	57. "	205. "

Table II.

Nothing	-	78.7 "	42.3 "	81.7 "
Dissolved bone black	400 lbs.	82.8 "	42.1 "	108.3 "
Dissolved bone black Muriate of potash	400 " 100 "	81.5 "	36.6 "	103.3 "
Dissolved bone black Muriate of potash Sulphate of ammonia	200 " 50 " 60 "	86.3 "	45. "	108.3 "
Dissolved bone black Muriate of potash Sulphate of ammonia	300 " 100 " 120 "	103.5 "	42.9 "	88.3 "
Dissolved bone black Muriate of potash Sulphate of ammonia	400 " 150 " 180 "	102. "	60.7 "	118.7 "

It will be noticed from the results of these experiments given in Table I., dissolved bone black, with potash and ammonia salts, give the highest yield of grain, fine ground bone standing next, while fine ground South Carolina rock and stable manure produce about the same results. In 1888, without the further addition of manure, the stable manure stands far ahead of the others in its yield of hay, while the fine ground bone stands next.

In the experiment with partial and complete fertilizers, the results of which are given in Table II., those plots which were fertilized with the complete fertilizer gave the largest yield in grain; and while the heaviest application does not seem to be necessary to produce the maximum yield of grain the first year, the heaviest application is felt in increased yield in the hay crop.

From some unaccountable reason the medium application of the complete fertilizer fails to increase the yield of the grain the second year, and the yield of hay the third year is correspondingly low.

Field Experiments with Fertilizers by Farmers.

In the spring of 1886, the Station sent to farmers located in different parts of the State experimental sets of fertilizers, which were to be used according to certain directions given by the Station, the results of the experiments to be reported to the Station.

The objects in view in cooperating with farmers in this sort of experimental work were the following:

(1.) To stimulate habits of inquiry and observation.

(2.) To render farmers more familiar with the composition of fertilizers.

(3.) To add something, if possible, to our stock of knowledge in regard to the profitable use of commercial fertilizers.

It was hoped to secure these results not only through the observations and experience of the farmers conducting the experiments, but also through the interest that the experiments might excite among other farmers in the localities to which the experimental sets of fertilizers were sent.

Fourteen farmers undertook experiments. With six of these the work resulted in utter failure, in most cases due to a drouth, which either prevented the proper germination of the seed or so dwarfed the crop from lack of water as to prevent any beneficial effect the fertilizers might otherwise have had.

Eight carried their experiments through successfully, and the results were reported in the Station Report for 1886–87.

In 1887 experimental sets were again sent out to various farmers, ten of whom have reported their results to the Station.

These reports are presented in the following tables.

Directions for Field Experiments with Fertilizers.

1. Select land that is as uniform in character as possible, and which has received no manure for several years (run-out land if you have it).

2. The required dimensions of the whole piece are 8x11⅛ rods, or 132x183 feet.

3. Before the plots are laid out, plow the whole piece, and pulverize thoroughly.

4. Make the size of each plot one-twentieth of an acre, and the dimensions one rod wide and eight rods long.

5. Measure off the plots, and drive a stake at each corner, leaving a strip of land two feet wide between the plots. If the land is inclined, the length of the plots should be up and down the slope.

6. Number the plots 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.

7. Put *no* fertilizer on plots 1 and 6, and no fertilizer on any plot except that contained in the bags.

8. Put the fertilizers on the plot numbered to correspond to the numbers on the bag. Put Bag No. 2 on Plot No. 2, etc., etc.

9. Apply the fertilizers in the manner which you have practiced, only be careful that no fertilizer comes in contact with the seed.

10. Make the same number of rows on each plot, with the same number of hills in each row. This can be easily done by cross marking.

11. Put the same amount of the same kind of seed on each plot.

12. Plant the seed (or sow) on the same day on all the plots.

13. Cultivate the plots while the crop is growing, as nearly at the same time as possible.

14. Weigh the crop carefully on each plot, both grain and straw if grain is sown, both corn and fodder if corn is planted, that is, find weight of grain and straw separately.

15. Carefully report any misfortune to the crop on any plot, and keep a record of the appearance of each plot.

It is gratifying to be able to state that the experimenters were painstaking in their efforts to follow the above directions, and that where the experiments escaped unavoidable misfortunes the results were satisfactory, in some cases highly so.

The sets of fertilizers were alike in all respects. Each set consisted of eight bags, containing the materials stated below.

Bag 2.	Dissolved bone black,	20 lbs.
Bag 3.	Dissolved bone black, Muriate of potash,	20 lbs. 5 "
Bag 4. *	Dissolved bone black, Muriate of potash, Sulphate of ammonia,	20 lbs. 5 " 5 "
Bag 5.	Fine ground bone,	20 lbs.
Bag 7.	Same as Bag 2.	
Bag 8.	Same as Bag 3.	
Bag 9.	Same as Bag 4.	
Bag 10.	Same as Bag 5.	

Experiment of S. L. Holbrook, Brunswick. Soil, sandy, exhausted, had not been plowed for forty years. Crop, potatoes.

Plot.	Fertilizer Applied.	Amount of Fertilizer per acre	Yield per plot.			Yield per acre.		
			Large, pounds.	Small, pounds.	Total, pounds.	Large, bushel.	Small, bushel.	Total, bushel.
1	No fertilizer	-	26.0	48.0	74.0	8.6	16.0	24.6
2	Dissolved bone black	400	71.0	35.0	106.0	23.6	11.6	35.2
3	Dissolved bone black Muriate of potash	400 100	67.0	5.5	18.5	23.3	17.1	39.5
4	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	105.0	54.0	159.0	35.0	18.0	53.0
5	Fine ground bone	400	37.0	35.	72.0	12.3	11.6	24.0
6	No fertilizer	-	23.0	41.8	64.8	7.6	13.9	21.6
7	Dissolved bone black	400	60.0	37.0	97.0	20.0	12.3	31.3
8	Dissolved bone black Muriate of potash	400 100	61.0	46 0	107.0	20.3	15.3	35.6
9	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	109.0	59.0	168.0	36.3	19.6	56.0
10	Fine ground bone	40(	41.0	38.0	79.0	13.6	12.6	26.2
11	Superphosphate	400	159.0	71.0	23 0	53.	23.6	76.6

The cost per acre of these fertilizers is given for the benefit of those who wish to study the results of the following experiments from a financial point of view. These figures include only the cost of the materials delivered in Orono, the small expense of mixing, and the freight paid for re shipping to the various experimenters not being taken into account. The prices which the Station paid for these materials are lower than the retail prices quoted for small lots, but are applicable to lots of several tons.

Bag 2	$ 6.50 per acre.
Bag 3	9.00 "
Bag 4	13 00 "
Bag 5	7.60 "

*Complete fertilizer.

AVERAGE.

		Yield per plot.			Yield per acre.		
		Large, pounds.	Small, pounds.	Total, pounds	Large, bushels	Small, bushels.	Total, bushels
No fertilizer		24.5	44.8	69.3	8.2	14.5	23.1
Dissolved bone black, containing phosphoric acid		65.5	36.0	101.5	21.8	11.9	33.8
Dissolved bone black, Muriate of potash	Containing phosphoric acid and potash	64.0	48.5	112.5	21.8	16.2	27.6
Dissolved bone black, Muriate of potash, Sulphate of ammonia.	Containing phosphoric acid, potash and nitrogen.	107.0	56 5	163.5	35.6	18.8	54.4
Fine ground bone	Containing phosphoric acid and nitrogen.	98.0	36.5	75.5	12.9	12.1	25.0

Experiment of H. L. Leland and W. E. Leland, East Sangerville. Soil, medium clay, slate, loam: has been exhausted by cropping for many years without manuring. Previous hay crop, one-half ton per acre. Crop, potatoes. Season unfavorable.

Plot.	Fertilizer Applied.	Amount of fertilizer per acre	Total yield per plot.	Total yield per acre.
		lbs.	lbs	bush.
1	No fertilizer	... .	195	65.0
2	Dissolved bone black	400	193	64.3
3	Dissolved bone black Muriate of potash	400 100	191	63.6
4	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	262	87.3
5	Fine ground bone	400	190	63.3
6	No fertilizer	......	125	41.6
7	Dissolved bone black	400	155	51.6
8	Dissolved bone black Muriate of potash	400 100	222	74.0
9	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	285	95.0
10	Fine ground bone	400	116	38.6

AVERAGE.

	Total yield per plot.	Total yield per acre.
	lbs.	bush.
No fertilizer	160	53.3
Dissolved bone black, containing phosphoric acid	174	57.9
Dissolved bone black, Muriate of potash, — Containing phosphoric acid and potash	206	68.8
Dissolved bone black, Muriate of potash, Sulphate of ammonia, — Containing phosphoric acid, potash and nitrogen	273	91.1
Fine ground bone, containing phosphoric acid and nitrogen	153	50.9

Experiment of J. F. Purrington, West Bowdoin. Soil, moist, sandy loam, badly run out. Crop, potatoes. Season unfavorable.

Plot.	Fertilizer Applied.	Amount of fertilizer per acre.	Yield per plot.			Yield per acre.		
			Large.	Small.	Total.	Large.	Small.	Total.
		lbs.	lbs	lbs.	lbs.	bu	bu	bu.
1	No fertilizer	.....	3.3	21.5	24.8	1.0	7.1	8.1
2	Dissolved bone black	400	20.0	24.3	44.3	6.6	8.1	14.7
3	Dissolved bone black Muriate of potash	400 100	27.0	32.0	59.0	9.0	10.6	19.6
4	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	74.3	33.5	107.8	24.7	11.1	35.8
5	Fine ground bone	400	33.0	20.0	53.0	11.0	6.6	17.6
6	No fertilizer	......	35.0	16.3	19.8	1.1	5.4	6.5
7	Dissolved bone black	400	53.0	30.0	83.0	17.6	10.0	27.6
8	Dissolved bone black Muriate of potash	400 100	73.0	26.5	99.5	24.3	8.8	33.1
9	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	194.0	24.0	21.8	64.6	8.0	72.6
10	Fine ground bone	400	45.0	30.5	75.5	15.0	10.1	25.1

		Yield per plot.			Yield per acre.		
		Large.	Small	Total.	Large.	Small.	Total.
		lbs.	lbs.	lbs.	bu.	bu.	bu.
No fertilizer....................................		3.3	18.8	22.0	1.5	6.2	7.7
Dissolved bone black, containing phosphoric acid...		36.5	27.1	63.6	12.1	9.0	21.1
Dissolved bone black, Muriate of potash,	Containing phosphoric acid and potash,	50.0	29.2	79.2	16.6	9.7	26.3
Dissolved bone black, Muriate of potash, Sulphate of ammonia,	Containing phosphoric acid potash and nitrogen,	134.1	28.7	162.8	44.6	9.5	54.1
Fine ground bone,	Containing phosphoric acid and nitrogen,	39.0	25.2	64.2	13.0	8.3	21.3

D. B. JOHNSON, Freedom.

Crop, *beans*. The experimental field has been in grass for six years. Soil very uniform.

Plot.	Fertilizer Applied.	Amount of Fertilizer per acre.	Yield per acre.		Yield per acre.	
			Beans.	Vines.	Beans.	Vines.
		lbs.	lbs.	lbs.	bush.	lbs
1	No fertilizer..............................	....	27.3	24.8	9.1	495
2	Dissolved bone black	400	32.5	31.5	10.8	630
3	Dissolved bone black............... Muriate of potash...............	400 100	24.3	19.8	8.0	395
4	Dissolved bone black............... Muriate of potash............... Sulphate of ammonia...............	400 100 100	35.5	38.3	11.8	765
5	Fine ground bone....................	400	31.0	31.0	10.3	620
6	No fertilizer..............................	....	28.0	23.8	9.3	475
7	Dissolved bone black................	400	34.5	33.8	11.5	675
8	Dissolved bone black............... Muriate of potash...............	400 100	32.0	31.3	10.6	625
9	Dissolved bone black............... Muriate of potash............... Sulphate of ammonia...............	400 100 100	40.0	38.8	13 3	775
10	Fine ground bone..	400	2[illegible].3	32.5	9.4	650

AVERAGE.

Fertilizer Applied.	Yield per plot.		Yield per acre.	
	Beans.	Vines.	Beans.	Vines.
	lbs.	lbs.	bush.	lbs.
No fertilizer	27.6	24	9.14	485
Dissolved bone black, containing phosphoric acid	33.5	33	11.1	652
Dissolved bone black, Muriate of potash, — Containing phosphoric acid and potash,	28.1	26	9.3	510
Dissolved bone black, Muriate of potash, Sulphate of ammonia, — Containing phosphoric acid, potash and nitrogen,	37.7	38	12.5	770
Fine ground bone	29.6	32	9.8	635

Experiment of WILLIAM DOWNS, So. Sebec.

Crop, *beans*. Land had had no manure for six years. Soil uniform.

Plot.	Fertilizer Applied.	Amount of Fertilizer per acre.	Yield per plot	Yield per acre.
			Beans.	Beans.
		lbs.	lbs	bush.
1	No fertilizer	....	50.0	16.6
2	Dissolved bone black	400	60.0	20.0
3	Dissolved bone black Muriate of potash	400 100	71.5	23.8
4	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	84.0	28.0
5	Fine ground bone	400	43.0	14.3
6	No fertilizer	....	37.	12.3
7	Dissolved bone black	400	42.5	14.1
8	Dissolved bone black Muriate of potash	400 100	55.5	18.5
9	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	74.5	24.8
10	Fine ground bone	400	46.0	15.3

AVERAGE.

Fertilizers Applied.	Yield per plot — Beans.	Yield per acre. — Beans.
	lbs	bush.
No fertilizer	43.5	14.4
Dissolved bone black, containing phosphoric acid	51.2	17.0
Dissolved bone black, Muriate of potash, — Containing phosphoric acid and potash.	63.5	21.1
Dissolved bone black, Muriate of potash, Sulphate of ammonia, — Containing phosphoric acid, potash and nitrogen,	79.3	26.4
Fine ground bone	44.5	14.8

Experiment of W. H. Keith, Winthrop. Soil, sandy loam, clay subsoil. The field had not been plowed for nine years. Crop, barley. The grain only was weighed.

Plot.	Fertilizers Applied.	Amount of fertilizer per acre.	Yield per plot—grain.	Yield per acre—grain
		lbs.	lbs.	bush.
1	No fertilizer	....	29	12.0
2	Dissolved bone black	400	25	10.4
3	Dissolved bone black Muriate of potash	400 100	33	13.7
4	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	47	19.5
5	Fine ground bone	400	30	12.5
6	No fertilizer	....	20	8.2
7	Dissolved bone black	400	24	10.0
8	Dissolved bone black Muriate of potash	400 100	36	15.0
9	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	44	18.3
10	Fine ground bone	400	30	12.5

AVERAGE.

	Yield per plot—grain.	Yield per acre—grain.
	lbs.	bush.
No fertilizer	24.5	10.1
Dissolved bone black, containing phosphoric acid	24.5	10.2
Dissolved bone black, Muriate of potash, — Containing phosphoric acid and potash.	34.5	14.3
Dissolved bone black, Muriate of potash, Sulphate of ammonia, — Containing phosphoric acid, potash and nitrogen.	45.5	18.9
Fine ground bone, containing phosphoric acid and nitrogen	30.0	12.5

Experiment of J. A. TOLMAN, Rockland.

Soil gravelly loam, had been cropped for ten years without manure.

Crop, *barley*, sown for fodder.

Plot.	Fertilizer Applied.	Amount of fertilizer per acre.	Yield per plot.	Yield per acre.
		lbs.	lbs	lbs.
1	No fertilizer	....	136	2720
2	Dissolved bone black	400	99	1980
3	Dissolved bone black Muriate of potash	400 100	81	1620
4	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	129	2580
5	Fine ground bone	400	110	2200
6	No fertilizer	....	90	1800
7	Dissolved bone black	400	116	2320
8	Dissolved bone black Muriate of potash	400 100	108	2160
9	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	114	2280
10	Fine ground bone	400	86	1720

AVERAGE.

	Yield per plot.	Yield per acre.
	lbs.	lbs.
No fertilizer....	113.	2260
Dissolved bone black, containing phosphoric acid....	107.5	2150
Dissolved bone black, Muriate of potash, — Containing phosphoric acid and potash, ...	94.5	1890
Dissolved bone black, Muriate of potash, Sulphate of ammonia, — Containing phosphoric acid, potash and nitrogen, ...	121.5	2430
Fine ground bone, containing phosphoric acid and nitrogen	98.	1960

Experiment of G. M. Douglass, Cornish. Soil sandy and run out. Crop, corn.

Plot.	Fertilizer Applied	Amount of fertilizer per acre.	Yield per plot.			Yield per acre.		
			Grain.	Fodder.	Total.	Grain.	Fodder.	Total.
		lbs.	lbs.	lbs.	lbs	bush	lbs.	lbs.
1	No fertilizer....	......	103.5	116.0	219.5	27.6	2320	4390
2	Dissolved bone black....	400	106.0	119.5	225.5	28.3	2390	4510
3	Dissolved bone black.... Muriate of potash....	400 100	84.0	145.8	229.8	22.4	3915	4595
4	Dissolved bone black.... Muriate of potash.... Sulphate of ammonia	400 100 100	151.0	201.0	352.0	40.3	4020	7080
5	Fine ground bone....	400	106.0	116.0	222.0	28.3	2320	4440
6	No fertilizer....	... ..	103.5	108.0	211.0	27.6	2160	4220
7	Dissolved bone black	400	102.0	140.0	242.0	27.2	2800	4840
8	Dissolved bone black .... Muriate of potash....	400 100	93.5	144.5	238.0	25.0	2890	4760
9	Dissolved bone black .... Muriate of potash.... Sulphate of ammonia....	400 100 100	135.5	186.0	321.0	36.1	3720	6420
10	Fine ground bone....	400	94.5	110.8	205.3	25.0	2214	4108

AVERAGE.

		Yield per plot.			Yield per acre		
		Grain.	Fodder.	Total.	Grain.	Fodder.	Total.
		lbs.	lbs.	lbs.	bu.	lbs.	lbs.
No fertilizer		113.5	114.0	215.0	27.6	2243.0	4305
Dissolved bone black, containing phos. acid		104.0	128.5	233.7	28.0	2595 0	4675
Dissolved bone black, Muriate of potash,	Containing phos. acid and potash.	88.5	145.3	233.8	24.0	2902.5	4677
Dissolved bone black, Muriate of potash, Sulphate of ammonia,	Containing phosphoric acid, potash and nitrogen.	143.5	193.5	336.5	38.4	3870.0	6750
Fine ground bone..	Containing phos. acid and nitrogen	100.5	113.3	213.6	27.0	2267.5	4272

Experiment of A. L. MOORE. Soil, gravelly loam, very poor from long cropping. Crop, corn

Plot.	Fertilizer Applied.	Amount of fertilizer per acre.	Yield per plot.			Yield per acre		
			Grain.	Fodder.	Total.	Grain.	Fodder.	Total.
		lbs.	lbs.	lbs.	lbs.	bush.	lbs.	lbs.
1	No fertilizer	......	120	100	220	32	2000	4400
2	Dissolved bone black	400	108	112	220	28	2240	4400
3	Dissolved bone black Muriate of potash	400 100	128	140	268	34.1	2800	5360
4	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	172	272	444	45.9	5440	8880
5	Fine ground bone	400	96	100	196	20.6	2000	3920
6	No fertilizer	......	84	100	184	22.4	2000	3680
7	Dissolved bone black	400	100	100	200	26.7	2000	4000
8	Dissolved bone black Muriate of potash	400 100	100	140	240	26.7	2800	4800
9	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	152	240	392	20.5	4800	7840
10	Fine ground bone	400	128	240	368	34.1	4800	7360

AVERAGE.

		Yield per plot.			Yield per acre.		
		Grain.	Fodder.	Total.	Grain.	Fodder.	Total.
		lbs.	lbs.	lbs	bu.	lbs.	lbs.
No fertilizer		102	100	202	27.2	2000	4040
Dissolved bone black, containing phosphoric acid		104	106	210	27.0	2100	4200
Dissolved bone black, Muriate of potash,	Containing phosphoric acid and potash,	114	140	254	30.0	2800	5080
Dissolved bone black, Muriate of potash, Sulphate of ammonia,	Containing phosphoric acid, potash and nitrogen,	162	256	418	33.0	5120	8360
Fine ground bone,	Containing phosphoric acid and nitrogen.	112	170	282	27.0	3400	5640

Experiment of J. E. Shaw, Hampden. Soil, gravel loam. Had been cropped eight years. Cut about 500 lbs. of hay in 1886. Crop, corn.

Plot	Fertilizers Applied.	Amount of fertilizer per acre.	Yield per plot.			Yield per acre.		
			Grain.	Fodder.	Total.	Grain.	Fodder.	Total.
		lbs.	lbs	lbs.	lbs	bush.	lbs	lbs.
1	No fertilizer	.....	87	125	206	21.6	2500	4120
2	Dissolved bone black	400	68	104	17	17 3	2080	3440
3	Dissolved bone black Muriate of potash	400 100	108	172	280	28.3	3440	5600
4	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	126	200	326	33.6	4000	6520
5	Fine ground bone	400	80	136	216	21.3	2720	4320
6	No fertilizer	....	-	75	75	-	1500	1500
7	Dissolved bone black	400	15	95	110	4.0	1900	2200
8	Dissolved bone black Muriate of potash	400 100	77	175	252	44.5	3500	5040
9	Dissolved bone black Muriate of potash Sulphate of ammonia	400 100 100	100	225	325	26.5	4500	6500
10	Fine ground bone	400	106	215	321	28.3	4300	6420

AVERAGE.

	Yield per plot.			Yield per acre.		
	Grain.	Fodder.	Total.	Grain.	Fodder.	Total.
	lbs	lbs.	lbs	bu.	lbs.	lbs.
No fertilizer.	40.5	100.0	140.5	10.5	2000	2810
Dissolved bone black, containing phosphoric acid	41.5	99.5	141.0	10.7	1990	2820
Dissolved bone black, Muriate of potash, — Containing phosphoric acid and potash	92.5	173.5	266.0	34.2	3470	5320
Dissolved bone black, Muriate of potash, Sulphate of ammonia, — Containing phosphoric acid, potash and nitrogen.	113.0	212.5	325 5	30.0	4250	6510
Fine ground bone, containing phosphoric acid and nitrogen	93.0	175.5	268.5	25 0	3570	5370

In these experiments the Complete Fertlizer or bag No. 4, produced the largest crop. In three experiments none of the fertilizers produced gains large enough to pay for the fertilizers. In seven experiments bag No. 4 caused gains large enough to pay for the fertilizers. In one case, that of the experiment by Mr. Shaw, bag No. 3 was the most profitable fertilizer.

In general, the complete fertilizers are the most profitable. There are a few cases in which partial fertilizers are more economical for the time being.

FOODS.

GENERAL EXPLANATIONS.

The general object of the analyses and experiments which have been undertaken during 1887 and 1888 was to make progress in ascertaining the comparative composition and digestibility of the cattle foods that are available for the use by Maine farmers, and to test in a practical manner the efficiency and economy of certain combinations of food ingredients in the production of milk and meat.

The composition of our principal cattle foods of American production is now quite well known, and yet it is very evident that to this, and especially to the digestibility of our fodder plants, more study should be given. If we except timothy and the clovers, only a few analyses have been made of our hay producing plants, while the number of determinations of their digestibility is scarcely worth mentioning. For instance, Dr. Jenkin's tables of American feeding stuffs, which are intended to be a full compilation, show but one analysis of Red Top and one of Orchard Grass, the names of several other valuable upland grasses not appearing. Our knowledge of the feeding value of some of our native grasses seems to be especially meagre. For these reasons it is proposed to do something each year at the Maine Experiment Station in learning more about our hays and coarse fodders, so far as this can be done by analyses and digestion experiments. We have quite generally assumed that our fodders have the same average digestibility as are given in the German tables. It is very probable that this assumption is not correct in all cases. This is explained by the fact that our cattle foods are grown in a climate and with cultivation different from what exist in Europe, and while the laws controlling animal nutrition are the same everywhere, this difference in the character of our food stuffs may render the averages of the analyses and coefficients of digestibility of foreign materials inapplicable to practice in this country. Work was begun in this direction in 1885, and has been kept up more or less continuously until the present time. In 1887, the work was considerably enlarged. In that year all the species of hay-producing plants found on the College Farm that could be obtained in sufficient quantity unmixed were gathered, carefully dried and stored, their composition and digestibility, being subsequently determined.

Again, quite a large variety of cattle foods are found in the markets which are bye products, either from milling or from the manufacture of oils, such as the brans, fine feed, damaged flour, oil meals, etc.

The composition of each of these feeding stuffs is characteristic, and is less subject to large variations than is the case with coarse foods, but is affected somewhat by the processes of manufacture and unfavorable conditions of storage. Samples of quite a variety of such of these materials as are sold in Maine have been collected by the Station, the analyses of which will appear in the near future.

But a knowledge of the composition and digestibility of cattle foods has practical value only to the extent that we can apply it to methods of feeding in such a way as to cheapen production. Such a use of the information gained by laboratory investigations is the object of the practical feeding experiments carried on by the

Station. The aim is to reduce cattle feeding to a system, so that there shall be no waste, or in other words, so that the maximum production shall be obtained from a given weight of food. The basis of such a system must be *a knowledge of the proper combinations of food ingredients*, for the various purposes of stock feeding. When possessed of this knowledge the farmer can then select his supply of purchased foods with reference to his needs, and from the cheapest sources. The following explanations of the nature and office of the ingredients of cattle foods are offered as an aid to understanding the analytical and experimental data given farther on.

*Explanations.** The analysis of any plant or animal substance with reference to its use as a cattle food does not go so far as to determine the percentage of every single ingredient in the material analyzed, but only aims to learn the percentage of certain classes of compounds, the members of each class having a close resemblance in composition and in nutritive effect. Thus we have in all fodder tables several columns of figures headed by the following terms: Water, Ash, Protein, Crude Fiber, Nitrogen-free Extractive Matter, and Fats. As these terms are in constant use, not only in this report but in all agricultural literature, they are made the subject of such explanations as seem necessary in order to show their relation to animal nutrition.

The *water* or *moisture* of cattle foods, of which all contain more or less, is measured by the loss of weight which takes place when the substance is dried for some time at the temperature of boiling water, or 212° Fahrenheit. The percentage of water is very large in green crops, sometimes constituting more than nine-tenths their weight, and comparatively small in all dried materials. In all feeding stuffs which exist in the air-dry condition, the percentage of moisture varies somewhat according to the state of the atmosphere, so that in rainy or moist weather a given quantity of hay or grain that is at all exposed to the air will weigh more than during a time of dryness. Freshly cured hay and newly harvested grain contain more water than old hay and grain, the difference being an important consideration in buying or selling by weight. While the water in cattle foods has no nutritive value above water that an animal drinks, its presence or absence often has a marked influence upon the palatableness of feeding stuffs.

*These explanations will not appear in future bulletins and reports.

The *ash*, or mineral part of any food stuff, is that which is left after the combustible portion is burned away, and includes quite a number of compounds. The amount of ash in plants is influenced in a marked manner by their age, and conditions of growth, such as locality, soil, kind of manuring. The mineral compounds of cattle foods fill an important place in furnishing entirely the material for building up the bony framework of the animal.

Protein is a collective term that includes quite a variety of compounds, which are distinguished from the members of the other important classes of substances in feeding stuffs by the fact that they contain nitrogen. Protein includes two general classes of compounds, viz., *albuminoids* and *amides*.

Such compounds as egg albumen, the muscular tissue of animals and the caseine of milk are *albuminoids*, and to these animal substances the albuminoids of plants bear a close resemblance both in chemical properties and in food value. The protein of feeding stuffs cannot be directly determined with accuracy. The estimation is an indirect one, and is based upon the fact that all albuminoids contain approximately 16 per cent of nitrogen. If, therefore, the percentage of nitrogen in any feeding stuff be multiplied by 6.25, the percentage of albuminoids is obtained with sufficient accuracy for all practical purposes. The important and peculiar office which albuminoids fill in serving the uses of the animal kingdom is that they constitute the only source of material for the formation of muscular tissue, hair, horn, the caseine of milk, and all other organic nitrogen compounds of the animal body.

Plants contain other nitrogenous compounds called *amides* that occur most abundantly in fodder and root crops, the amount varying at different periods of growth, while in the grains the nitrogen exists almost wholly in the form of albuminoids. Fodder tables generally give as the percentage of protein the product of the total percentage of nitrogen by 6.25.

A given amount of protein, as stated for hay in tables of fodder analyses, is not quite the same thing, therefore, as the same amount occurring in the grains, because in the former case much more of the nitrogen belongs to the non-albuminoid, or amide form.

The true value of amides in animal nutrition is not well defined. That they are wholly like albuminoids in office seems hardly probable, at least previous investigations do not show this.

Crude fiber is the woody part of plants, and is that which remains undissolved after treating vegetable substance with weak acids and alkalies. Paper and cotton fiber are good examples of nearly pure crude fiber.

The *nitrogen-free extractive matter* includes all the non-nitrogenous compounds of feeding stuffs, excepting crude fiber and the fats, the most important and best known members of this class being starch and the sugars.

The *fats* or vegetable oils are extracted from plant substance by ether, which also takes out more or less chlorophyl, wax, etc., especially in the case of hays and coarse fodders. Olive, linseed and cotton-seed oils are good examples of vegetable fats.

The starch, sugar and fats can play no part in the formation of flesh or the caseine of milk, but are alike in being a source of animal fat and heat.

It has been assumed that the digestible portion of crude fiber has a feeding value similar to starch and sugar, but the investigations of the past few years throw a doubt on this assumption. It is also probable that all the compounds included in the term, "nitrogen-free extractive matter," have not equal nutritive value, the starch and sugars being the only substances of which definite statements can be made.

FODDER ANALYSES.

The only fodder analyses that are presented in this report are those of samples of grasses and other plants, which were collected on the College Farm in the summer of 1887.

In that year all the species of hay producing plants, found on the College Farm that could be obtained unmixed in sufficient quantity for analysis and digestion experiments were gathered, carefully dried and stored. With one exception, samples of all the species analyzed were selected while the plants were in full bloom, the orchard grass being somewhat past bloom when cut. The time of cutting was during the first ten days of July, except in case of the blue joint, which was gathered later.

The composition and digestibility of these grasses were thoroughly studied and the results of this work are presented in as plain and concise a manner as possible.

The first table following shows the composition of the fodders in the air-dry condition as they would be fed, and also what the composition would be if they contained no water. The terms used in the table are explained on the previous pages.

Table of Fodder Analyses.

Station Number.	Description of Samples.	In 100 parts of air-dry substance.						In 100 parts of water-free substance.				
		Water	Ash.	Protein.	Crude Fiber.	Nitrogen-free extractive matter.	Fats.	Ash	Protein.	Crude Fiber	Nitrogen-free extractive matter.	Fats
XLI....	Alsike clover. *Trifolinun hybridum*, 1887. In full bloom..	12.55	7.86	12.69	27.86	35.63	3.41	8.99	14.51	31.86	40.74	3.90
XLII...	White clover *Trifolinun repens*, 1887. In bloom for some time.......... ..	12.39	7.42	15.12	24.91	36.49	3.67	8.47	17.26	28.43	41.65	4.19
XLIII..	Blue joint. *Calamagrostis Canadansis*, 1887. Cut late in July..... ...	8.62	5.46	9.19	33.10	40.81	2.82	5.97	10.06	36.22	44.66	3.09
XL.....	Orchard grass. *Dactylis glomerata*, 1887. Past bloom 7 to 10 days.........	0.95	6.25	7.50	33.02	39.25	3.03	7.02	8.42	37.08	44.08	3.40
L.......	Red top. *Agrostis vulgaris*, 1887. In full bloom...	11.60	4.47	8.56	27.38	44.78	3.21	5 06	9 69	30 98	50.64	3 63
XLIV ..	Timothy. *Phleum pratense*, 1887 In full bloom.	8.32	4.20	7.50	29.94	46.74	3.30	4.58	8.18	32.60	50.98	3.60
LI......	" " " From large lot of hay somewhat past bloom.	12.60	4 52	6.85	28.05	44.84	3.14	5.17	7.84	32.10	51.30	3.59
XLV ...	Wild oat grass. *Danthonica spicata*, 1887. In bloom.......	8.33	3.49	6 87	31.26	47.38	2.67	3.81	7.49	34.10	51.74	2.86
XXXIX	Witch grass. *Triticum repens*, 1887. In bloom	10.85	4.83	8 50	33.94	38.52	3.36	5.41	9.53	38.07	43.21	3.78
XLVI .	Buttercup. *Ranunculus acris*, 1887. In full bloom	10.43	6.01	9.06	30.44	40.71	3.35	6.71	10.11	33.97	45.47	3.74
XLVII .	White weed. *Leucanthemum vulgare*, 1887. In full bloom..	9.63	6.85	8.44	29.00	41.72	4.36	7.58	9.34	32.09	46.17	4.82

The samples from which these analyses were made were grown on the same farm, under quite similar conditions of climate and soil, and so any differences in the composition of the various species of clovers, grasses, etc., would seem to be characteristic, so far as they are not occasioned by cutting at unlike stages of growth. In all but one instance, however, the samples were taken as nearly as possible while the plants were in the period of full bloom.

From the above analyses it is not apparent that wild oat grass, blue joint, buttercup, and white weed have a composition inferior to the more highly prized timothy and red top, in fact the former plants are more nitrogenous than the latter.

The popular impression is different nevertheless, and if farmers are correct in their conclusions we must look farther than the ordinary analysis of a fodder in order to learn its feeding value, for most certainly stock feeders are not willing to allow that blue joint is more valuable than good upland grasses like timothy and red top, as the analyses seem to show. We need more information than is given by the figures of an ordinary table of fodder analyses.

We should remember that in estimating protein by the formula Nx6.25, we learn nothing of the character of the nitrogen compounds in different feeding stuffs, that the nitrogen-free-extractive matter is determined by difference, with no knowledge whether the amounts present of the more valuable carbohydrates like starch and sugar are relatively the same in all, and that the nutrition to be derived from a food depends as much upon its digestibility as upon its composition. It may be that after we learn all that we can on these points we shall come to the conclusion that farmers are very much influenced by the palatableness of a food in forming their opinions of its value, and it may be that some of our feeding stuffs commonly regarded as inferior, simply need to be rendered palatable in order to become efficient cattle foods. We have no evidence showing that fodders are necessarily nutritious in proportion as they are relished by cattle.

In fact the qualities which render a cattle food palatable have no direct connection with its capacity for sustaining animal life.

The composition of the eleven samples mentioned in the above tables of analyses has been studied somewhat more thoroughly than is usual.

Attention was given to two points:

(1) The amount of non-albuminoid material which by the usual method is reckoned as part of the protein.

(2) The composition of the nitrogenous-free extractive matter, so far as it can be learned by a direct determination of the sugars, starch and gums.

THE ALBUMINOID AND AMIDE NITROGEN.

The albuminoid nitrogen was determined in nine of the eleven samples grown in 1887.

	TABLE II.	In 100 parts of Dry Air Substance. Total nitrogen.	Albuminoid nitrogen	Non-albuminoid nitrogen.	Per cent. of total nitrogenous material in albuminoid form.
		%	%	%	%
XLI	Alsike Clover.................. ..	2.03	1.77	.26	87.2
XLII.	White Clover	2.42	2.03	.39	84.6
XLIII	Blue Joint	1.47	1.30	.17	88.4
XL	Orchard Grass...	1.20	1.15	.05	95.8
XLIV	Timothy	1.20	1.07	.13	89.2
XLV ..	Wild Oat Grass.	1.10	.99	.11	90.0
XXXIX ..	Witch Grass.	1.36	1.24	.12	91.2
XLVI .. .	Buttercup...	1.45	1.37	.08	94.5
XLVII ...	White Weed......................	1.35	1.27	.08	94.1

So far as we can judge by these determinations, there were no marked differences in the nitrogenous compounds of these fodders, but it is possible for the protein of one fodder to be essentially unlike that of another, without this being shown by the mere separation of the albuminoid from the non-albuminoid, (amide) nitrogen.

The figures show, however, that the protein of these feeding stuffs existed largely in the more valuable, or albuminoid, form.

COMPOSITION OF THE NITROGEN-FREE EXTRACTIVE MATTER.

As before stated, the non-nitrogenous part of fodders, excluding the crude fiber and fats, is made up of quite a variety of compounds. Among these are the sugars and starch, of whose composition and nutritive properties we have definite knowledge. The gums are also included in this class of compounds, and as they, like starch, are inverted to sugar by the action of an acid, it is fair to suppose that they, like starch, are changed to sugar in the process of digestion, and that they have a value in nutrition very similar to starch. Beyond the compounds mentioned, the nitrogen-free extractive matter is, in the case of fodder plants, made up of substances of which we have very little definite knowledge. Enough is known, however, to make it reasonably certain that the carbohydrates (sugar, starch and gums) are the most valuable part of the non-nitrogenous compounds of a hay, the fats excepted, and therefore, that the larger the percentage of the nitrogen-free extractive matter, which exists as carbohydrates, the more valuable the fodder, other things being equal. Consequently, it is reasonably certain that the nitrogen-free extractive matter of the grains has a greater nutritive value than that of the coarse fodders, because in the former case it is made up almost wholly of starch and the sugars.

If it were found then that one species of grass, or grass cut at a particular time, was comparatively rich in starch and sugar, it might safely be considered a point in its favor. With a portion of these fodders an attempt has been made to ascertain the percentages of the more valuable carbohydrate material, viz., that which, after taking out the ordinary percentage of crude fiber, exists as the sugars, and as starch and other compounds that by treatment with an acid are changed to sugar.

The following table contains the percentages of the sugars, and starch in the fodders. The term "starch" is intended to include all material, not sugar, that is inverted by the treatment with an acid.*

*On following pages of this report can be seen the methods employed by Mr. Bartlett in the determination of the sugars and starch. The method used for starch and other material subject to inversion to sugar by an acid seems to have especial merit, as it provides that the production of sugar from crude fiber shall be no more and no less than is the case in crude fiber determinations, and that all other carbohydrate compounds shall be completely inverted.

NITROGEN-FREE EXTRACTIVE MATTER.

		In 100 parts Water-Free Substance.						
		Total nitrogen-free extractive matter	Sucrose	Glucose.	Starch	Total sugars and starch.	Nit-free extractive matter not sugars and starch.	Per cent of total nitrogen-free extractive matter as sugar and starch.
		%	%	%	%	%	%	%
XLI......	Alsike Clover	40.74	1.49	3.09	10.64	15.22	25.52	37.36
XLII.....	White Clover....	41.65	.39	2 73	15.77	18.89	22.76	45.35
XLIII....	Blue Joint	44.66	2.23	3.53	14 49	20 25	24.41	45.34
XL.......	Orchard Grass	44.08	1.54	4.05	16.53	22.12	21.96	50.18
L.........	Red Top.....	50.64	3.14	4.25	16.58	23.95	26 69	47.29
XLIV ..	Timothy..	50.98	3.70	6.76	16.17	26.63	24.35	52.24
LI... .. .	Timothy..	5 .30	3.25	6.48	14.92	24.65	26.6[illegible]	48.06
XLV	Wild Oat Grass.......	51.74	1.78	3.76	17.46	23.00	28.74	44.46
XXXIX ..	Witch Grass..	43 21	2.57	5 09	16.66	24.32	18.89	56.29
XLVI	Buttercup........ ...	45.47	.[illegible]0	4.65	9.15	14.40	31.07	31.66
XLVII ...	White Weed	46.17	.79	4.39	10.77	15.95	30.22	34.54

The above figures show that the true carbohydrates form a much larger part of the nitrogen-free extractive matter of some plants than of others. For instance, the white weed has nine-tenths as much non-nitrogenous material as the timothy (No. XLIV), but of sugar the latter has twice as much, and of starch one and a half times as much, as the former. In other words, more of the nitrogen-free extractive matter of the white weed consists of compounds of which we have some reason to suspect a nutritive value inferior to starch and sugar. Just what these compounds are in composition and in nutritive value we do not know. They form in these instances from a fifth to a quarter of the dry substance of the plant, and in general constitute an unknown factor in the compounding of rations involving the use of coarse fodders.

DIGESTION EXPERIMENTS.

GENERAL CONSIDERATIONS.

The composition alone of any feeding stuff is a very imperfect standard by which to judge its food value. Of the food consumed by an animal, only that portion which is digested, *i. e.*, that which is dissolved by the several digestive fluids and passes into the blood, can serve to maintain the vital functions, or to produce growth. Consequently, certain cattle foods, by being much more digestible than others, are much more completely utilized.

The main facts of digestion, and those upon which the methods of digestion experiments are based, are the following: A portion of the food which an animal eats is dissolved by the several digestive fluids with which it comes in contact, viz., the saliva, gastric juice, pancreatic juice, etc. That which is dissolved, or digested, is absorbed by certain vessels which are distributed over the lining of the stomach and intestines, passes into the blood, and is then used to maintain and build up the animal body. The undissolved or undigested portion of the food is carried along the alimentary canal, passes from the body as the feces or dung, and constitutes that part of the food which is useless for the purposes of the nutrition. The method of ascertaining the digestibility of any cattle food is simple in principle. An animal is fed a weighed quantity of food, of which the composition is determined by analysis. The solid excrement is collected, weighed and analyzed, and the amount digested is the difference between that which is fed and that which is excreted. From the data thus obtained is calculated the percentage that is digested of each ingredient, these several percentages being called the *coefficients of digestibility*. As the process of digestion is slow, it is necessary to feed the animal on the weighed ration several days before collecting any excrement, in order that the contents of the intestines may become wholly freed from the residue of the previous food, so that the dung collected shall come wholly from the food tested. On account of the irregularity with which dung is voided, it is collected for several days, and from the total amount the average for one day is calculated.

The digestibility of these fodders was studied through digestion experiments with sheep and by treating them with artificial solutions of pepsin and pancreas.

EXPERIMENTS WITH SHEEP.

In the digestion experiments with sheep the animals used were full grown wethers in all cases. They were confined during the time the experimental rations were fed, in stalls large enough to allow comfortable lying down, but small enough to oblige the animal to feed in such a way as to prevent loss. The feed boxes were zinc lined, and projected up around the head in front and at the sides so that none of the finely cut fodder could easily be scattered out. The feces were collected in rubber lined bags closely attached to the animal by a light leather harness, and any loss of either fodder or dung could be easily detected.

The feeding period with each food was twelve days, during the last five of which the feces were collected, the preliminary feeding of the first seven days being considered necessary to entirely free the digestive apparatus from any residue of former food. Fortunately the rations were completely consumed, except in two instances, where the amounts uneaten were too small to materially affect the results. The feces were collected twice each day, weighed on a balance sensitive to one-half gram, and from the whole amount, carefully mixed, one-tenth was taken and dried for analysis.

The data needed for calculating the coefficients of digestibility are:

(1) The composition of the foods eaten.

(2) The composition of the feces.

(3) The weight of food eaten and dung excreted.

The composition of the fodders has already been given. That of the feces follows. The second contains the weights of food consumed, and of solid excrement voided.

COMPOSITION OF FECES.

	From	Water.	Water-free Substance	In 100 parts water-free.				
				Ash.	Protein.	Crude Fiber.	Nitrogen-free extractive matter.	Fats.
		%	%	%	%	%	%	%
XLI ...	Alsike clover	74.76	25.24	11.08	13.70	40.94	27.65	6.63
XLII ...	White clover	58.19	41.81	10.30	13.55	32.84	37.24	6.07
XLIII ..	Blue joint	65.45	34.55	8.97	7.28	38.27	42.22	3.26
XL. ..	Orchard grass	65.27	34.73	10.03	7.66	34.54	44.15	3.62
L.......	Red top	59.16	40.84	9.01	9.06	28.33	48.81	4.79
XLIV	Timothy	55.02	44.98	7.75	9.45	35.95	44.79	5.06
LI	Timothy	58.61	41.39	8.10	9.50	33.80	43.55	5.05
XLV ...	Wild oat grass	57.72	42.28	7.86	9.55	29.55	48.66	4.38
XXXIX	Witch grass	67.29	32.71	8.05	8.54	38.76	40.84	3.81
XLVI ..	Buttercup	64.56	35.44	7.93	9.69	45.53	34.22	2.63
XLVII .	White weed	64.57	35.43	8.64	9.24	41.37	36.40	4.35

WEIGHTS EATEN AND EXCRETED.

		*Total fodder consumed in five days.		Total feces excreted in five days.	
		Air dry.	Water-free substance.	Fresh.	Water-free substance.
		grams.	grams.	grams.	grams
XLI	Alsike Clover	3500	3060.7	4624	1166.9
XLII	White Clover	3500	3066.3	2498	1044.5
XLIII	Blue Joint	3500	3198.3	5568	1922.2
XL	Orchard Grass	3500	3116.7	4093	1421.7
L	Red Top	3500	3094.0	3203	1308.0
XLIV	Timothy	3500	3208.8	2452	1102.9
LI	†Timothy	3000	2622.0	2907	1203.2
XLV	‡Wild Oat Grass	2800	2566.8	2448	1034.6
XXXIX	Witch Grass	3500	3120.2	3826	1251.4
XLVI	Buttercup	3500	3135.0	3887	1377.6
XLVII	White Weed	3500	3163.0	3768	1335.1

*Except in cases noted, 700 grams daily.

†Only 600 grams daily.

‡Only four days.

We now have all the figures necessary for calculating the digestibility of the fodders, and this done in the following table.

CALCULATIONS OF THE DIGESTIBILITY.

Table	Dry substance.	Organic matter.	Ash.	Protein.	Crude fiber	Nitrogen-free extractive matter.	Fats.
XLI—Alsike Clover.							
Total fed, 700 grams daily.......	612.1	557.	55.1	88.8	195.0	249.4	23.9
" excreted, 924.8 grams daily	233.4	207.5	25.9	32.0	95.5	64.5	15.5
" digested	378.7	349.5	29.2	56.8	99.5	184.9	8.4
Per cent digested..............	61.9	62.7	53.	64.0	51.	74.1	35.1
XLII—White Clover.							
Total fed, 700 grams daily..	613.3	561.4	51.9	105.8	174.3	255.4	25.7
" excreted, 499.6 grs. daily..	208.9	187.4	21.5	28.3	68.6	77.9	12.7
" digested	404.4	374.0	30.4	77.5	105.7	177.5	13.0
Per cent digested...............	66.	66.6	58.5	73.2	60.6	69.5	50.6
XLIII—Blue Joint							
Total fed, 700 grams daily	639.7	601.5	38.2	64.3	231.7	285.6	19.8
" excreted, 1113.6 grs daily.	384.4	350.0	34.4	28.0	147.1	162.3	12.5
" digested............... ..	255.3	251.5	3 8	36.3	84.6	123.3	7.3
Per cent digested.	39.9	41.8	10.	56.5	36.5	43.2	37.
XL—Orchard Grass.							
Total fed, 700 grams daily.......	623.3	579.6	43.7	52.5	230.9	274.8	21.1
" excreted, 818.6 grs. daily..	284.3	255.9	28.4	21.8	98.2	125.5	10.3
" digested..	339.0	323.7	15.3	30.7	132.7	149.3	10.8
Per cent digested.	54.4	55.8	35.	58.5	57.5	54.4	51.2

	Dry substance.	Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extractive matter.	Fats.
L—Red Top.							
Total fed, 700 grs daily.	616.8	585.6	31 2	59.8	191.1	312.3	22.4
" excreted, 640 6 grs daily..	261.6	238.0	23.6	23.7	74.1	127.7	12.5
" digested daily	355.2	347.6	7.6	36.1	111.0	184.6	9.9
Per cent digested.............	57.6	59.3	24.3	60.4	61.2	59.1	44.2
XLIV—Timothy.							
Total fed, 700 grs daily........	641.8	612.4	29.4	52.5	209.6	327.1	23.1
" excreted, 490.4 grs. daily..	220.6	203.5	17.1	20.8	79.3	92.2	11.2
" digested daily.............	421.2	408.9	12.3	31.7	130.3	234.9	11.9
Per cent digested.............	65.7	66.8	41.8	60.4	62.1	71.8	51.5
LI—Timothy.							
Total fed, 600 grs. daily....	524.4	497.3	27.1	41.1	168.3	269.0	18.8
" excreted, 581.4 grs. daily..	240.6	221.1	19.5	22.8	81.3	104.8	12.1
" digested daily......... ..	283.8	276.2	7.6	18.3	87.0	164.2	6.5
Per cent digested.............	54.1	55.5	28.0	44.5	51.7	61.0	34.6
XLV—Wild Oat Grass.							
Total fed, 700 grs. daily. ..	641.7	617.2	24.5	48.0	218.8	332.0	18.3
" excreted, 612 grs daily	258.6	238 3	20.3	24.7	76.4	125.8	11.3
" digested daily.	383.1	378.9	4.2	23.3	142.4	206.2	7.0
Per cent digested..............	59.6	61.2	17.1	48.6	65.1	62.1	38.2
XXXIX—Witch Grass.							
Total fed, 700 grs. daily.	624.	590.3	33.7	59.5	237.5	269.7	23.6
" excreted, 765.2 grs daily..	250.3	230.2	20.1	21.3	97.0	102.2	9.5
" digested	373.7	360.1	13 6	38.2	140.5	167.5	14.1
Per cent digested.	59.9	61.	40.3	64.2	67.6	62.1	60.
XLVI—Buttercup.							
Total fed, 700 grs. daily.........	627.	585.	42.	63.4	213.	285.1	23.5
" excreted, 777.4 grs. daily..	275.5	253.7	21.8	26.7	125.4	94.3	7.2
" digested............... ...	351.5	331 3	20.2	35.7	87.6	190.8	16.3
Per cent digested..............	56.1	56.6	48.1	56.3	41.1	66.9	69.7
XLVII—White Weed.							
Total fed, 700 grs daily.........	632.6	584.7	47.9	59.1	203.	292.	30.5
" excreted, 753.6 grs. daily..	267.	244.	23.	24.6	110.5	97.2	11.6
" digested.................	365.6	340.7	24.9	34.5	92.5	194.8	18.9
Per cent digested..	57.8	58.3	52.	58.4	45.5	66.7	62.

For the sake or convenience in comparing the digestibility of the different fodders, the coefficients of digestibility are arranged in the following table:

COEFFICIENTS OF DIGESTIBILITY.

		Dry substance.	Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extractive matter.	Fats.
XLI....	Alsike clover............	61.9	62.7	53	64.0	51.	74 1	35.1
XLII...	White clover	66.	66.6	58.5	73.2	60.6	69.5	50.6
XLIII..	Blue joint	39.9	41.8	10.	56.5	36.5	43.2	37.
XL. ...	Orchard grass............	54.4	55.8	35.	58.5	57.5	54.4	51.2
L.......	Red top................	57.6	59.3	24.3	60.4	61.2	59.1	44.2
XLIV ..	Timothy................	65.7	66.8	41.8	60.4	62.1	71.8	51.5
LI......	Timothy	54.1	55 5	28.	44.5	51.7	61.	34.6
XLV ...	Wild oat grass............	59.6	61.2	17.1	48.6	65.1	62.1	38.2
XXXIX	Witch grass	59.9	61.	40.3	64.2	67.6	62.1	60.
XLVI ..	Buttercup................	56.1	56.6	48.1	56.3	41.1	66.9	69.7
XLVII .	White weed............	57.8	58.3	52.	58.4	45.5	66.7	62.
	PREVIOUS EXPERIMENTS.							
XXIV ..	*Alsike clover............	54.9	56.2	–	55.5	46.2	64.1	53.3
XIV	†Timothy................	–	59.3	–	42.1	52.	65.7	47.6
XXIII ..	*Timothy	51.6	52.4	–	45.2	42.8	58.9	55.
XXVII..	*Oat straw............	50.3	52.	–	?	57.6	53.2	38.3

*See report of Maine Experiment Station, 1886-7.

† Ibid, 1885-6.

In order to see more closely the differences in the digestible material of the several feeding stuffs we must construct a table, showing the actual pounds of the various ingredients digested out of 100 lbs. of the food. This is done by multiplying the pounds of each ingredient in a hundred pounds of the food by the percentage (or coefficient) of digestibility.

QUANTITIES OF NUTRIENTS DIGESTED.

		From 100 lbs. air-dry food.				
		Total organic matter	Protein.	Crude fiber.	Nitrogen-free extractive matter.	Fats.
XXIV ..	Alsike clover	46.4	5.58	14.03	25.1	1.58
XLI	" "	49.9	8.12	14.2	26.4	1.20
XLII ...	White clover	54.8	12.85	13.68	25.97	2.39
XLIII ..	Blue joint	36.3	5.75	12.83	16.54	1.15
XL. ...	Orchard grass	46.2	3.38	18 98	21.35	1.55
XXVII	Oat straw	44.9	?	21.85	22.3	1.16
XIV	Timothy	50.4	2.95	15.9	25.7	1.12
XXIII ..	"	44.5	2.68	12.36	27.9	1.47
XLIV ..	"	58.4	4.53	18.6	33.5	1.70
LI......	"	46.	3.05	14.50	27.3	1.08
XLV ...	Wild oat grass	54.	3.33	20.35	29.42	1.55
XXXIX	Witch grass	52.4	5.53	20.28	24.72	1.89
XLVI ..	Buttercup	48.5	5.43	12.03	28.29	3.07
XLVII .	White weed	50.4	4.87	14.15	28.57	2.54

Digestibility of Nitrogen-Free Extractive Matter.

With a part of these fodders an attempt has been made to ascertain the digestibility of the more valuable carbohydrate material, viz., the sugars, and starch and other compounds that by treatment with an acid are changed to sugar, crude fiber excepted. In order to compare the digestibility of these compounds with that of the total nitrogen-free extractive matter, determinations of the sugars, starch and other non-nitrogenous material capable of inversion to sugar have been made in the feces from several of the fodders, by a method exactly similar to that used for the hays.

The following tables contain the percentages of starch in the feces, and a comparison of the calculated digestibility of the carbohydrates with that of the total nitrogen-free extractive matter. The term starch is intended to include all material, not sugar, that is inverted by the treatment with an acid.

	Feces from	In 100 parts water-free substance			Percentage of nitrogen-free extractive matter as starch.
		Total nitrogen-free extractive matter.	Starch.	Compounds not starch.	
XLI	Alsike clover	27.65	6.44	21.21	23.29
XLII	White clover	37.24	13.74	23.50	36.89
XLIII	Blue joint	42.22	10.73	31.49	25.41
XL	Orchard grass	44.15	10.50	33 65	23.78
L	Red top	48.81	12.44	36.37	25.49
XLIV	Timothy	41.79	11.38	30.41	27.23
LI	Timothy	43.55	11.67	31.88	26.80
XLV	Wild oat grass	48.66	12.85	35.81	26.41
XXXIX	Witch grass	40.84	11.94	28.90	29.23
XLVI	Buttercup	34.22	5.98	28.24	17.47
XLVII	White weed	36.40	5.64	30.76	15.49

NITROGEN-FREE EXTRACTIVE MATTER.

		Fed in one day.			Excreted in one day.			Digested in one day.			Digested from 100 parts fed of		
		Sugar and starch.	Not sugar and starch.	Total.	Starch.	Not starch.	Total.	Sugar and starch.	Not sugar and starch.	Total.	Sugar and starch.	Not sugar and starch	Total.
XLI	Alsike clover.	93.1	156.2	249.3	15.0	49.5	64.5	78.1	106.7	184.8	85.9	68.3	74.1
XLII.....	White clover...	115.8	139.5	255 3	28.7	49.1	77.8	87.1	90.4	177.5	75.2	64.8	69.5
XLIII...	Blue joint	129.5	156.1	285.6	41.2	120.9	162.1	88.3	35.2	123.5	68.2	22 5	43.2
XL.......	Orchard grass..	137.9	136.9	274.8	29.8	95.7	125.5	108.1	41.2	149.3	78.4	30.1	54.4
L.........	Red top	147.7	164.6	312.3	32 5	95.1	127.6	115.2	69.5	184.7	78.0	42.2	59.1
XLIV ...	Timothy	170.9	156.3	327.2	25.1	67.1	92.2	145.8	89.2	235.0	85.3	57.1	71.8
LI	Timothy	150.8	163.0	313.8	32.7	89.5	122.2	118.1	73.5	191.6	78.4	45.1	61.0
XLV	Wild oat grass.	147.6	184.4	332.0	33.2	92.6	125.8	114.4	91.8	206.2	77.5	49.7	62.1
XXXIX ..	Witch grass....	151.8	117.9	269.6	29.9	72.3	102.2	121.9	45.6	167.5	80.6	38 7	62.1
XLVI	Buttercup	90.3	194.8	285.1	16.5	77.8	94.3	73.8	117.0	190.8	81.7	60.0	66.9
XLVII ...	White weed....	100.9	191.2	292.1	15.1	82.1	97.2	85.8	109.1	194.9	85.1	57.1	66.7

The above figures show that sugar, starch, and other compounds that are inverted to sugar by the action of an acid, are found in larger quantity in some fodders than in others, in proportion to the total non-nitrogenous material, and moreover, that these carbohydrates whose value as nutrients is well established constitute the most digestible part of the total nitrogen-free extractive matter. These facts seem to explain in part why the bare statement of the analysis of a fodder as given in fodder tables does not constitute a definite measure of its value.

SUMMARY.

Some of the practical lessons to be drawn from the facts previously presented, are summarized below:

(1) The upland grasses,* so far as analyzed, do not differ greatly in composition.

(2) The different species of upland grasses were found to differ very little from one another, and from Alsike clover, in digestibility. The Blue Joint, in the one experiment made, had a low comparative rate of digestibility.

(3) While the total amount of dry substance digested out of 100 lbs. of the hay from the true grasses, such as Timothy, Witch Grass, etc., and from Alsike clover, was very nearly the same in all cases, the character of the material from the clover differed materially from that digested out of the grasses, being much more nitrogenous, and therefore better adapted than the grasses to the nutrition of an animal forming albuminoids rapidly, such as a milch cow or a young growing animal.

(4) The fodders proved to be quite unlike in the percentages of sugar and starch which they contained, and which was digestible. The cases observed so far are too few to allow general conclusions, but there seems to be good reason for the assertion that the analyses of our fodders would much more fully give a measure of nutritive value if they showed what are the ingredients of the non-nitrogenous portion of the plant. For instance, the White Weed has as much non-nitrogenous material as the Timothy (XLIV), 31 per cent of this being sugar and starch in one case, and 52 per cent in the other. Any analysis that stops short of showing these facts fails to give data that are important in judging of nutritive value.

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*The term grasses is used strictly in a botanical sense. The clover are not true grasses.

WHOLE CORN *vs.* CORN MEAL.

On pages 97 and 98 of the Maine Experiment Station Report for 1886-7, can be seen the results of a feeding experiment with whole corn against corn meal, which shows no difference in the feeding value of the two foods.

This experiment was repeated with somewhat older animals, under very similar conditions.

A lot of western corn was purchased, one-half of which was ground. Six pigs of quite uniform quality and size were selected from the same litter, and at the time the experiment was begun they were about five months old. They were divided into two lots, as equal as possible in size and quality, and were fed eighty-four days. The first period of feeding occupied forty days and the last forty-four. In the first period Lot 3 was fed meal, and Lot 4 whole corn. In the second period this order was reversed, Lot 3 getting the whole corn.

The rations were as follows:

Period 1.

Lot 3.	Lot 4.
12 pounds corn meal. Water.	12 pounds whole corn. Water.

Period 2.

Lot 3.	Lot 4.
18 pounds whole corn. Water.	18 pounds corn meal. Water.

The two lots of pigs gained as shown in the next table.

	Meal—Lot 3.	Whole Corn—Lot 4.
Period 1, weight October 9th	511 pounds.	478 pounds.
weight November 17th	616 "	612 "
Gain in 40 days	105 pounds.	134 pounds.
	Lot 4.	Lot 3.
Period 2, weight November 17th	616 pounds.	612 pounds.
weight December 31st	763 "	749 "
Gain in 44 days	147 pounds	137 pounds.
Total gain with whole corn	281 pounds.	
Total gain with meal	242 "	

The results of the two years' experiments are certainly favorable to feeding whole corn, for it seems to produce as much gain, pound for pound, as meal, and the cost of grinding is at least saved. Does it pay to even shell corn when that raised on the farm is fed?

THE COMPOUNDING OF RATIONS FOR THE DIFFERENT CLASSES OF FARM ANIMALS.

The economical use of cattle foods is a matter to which farmers are very properly giving much attention.

Concerning the most efficient and economical rations for this or that kind of stock, our agricultural papers contain numerous inquiries and answers. In fact, the feeding for milk and meat production is a department of farm practice to which the aid of scientific facts and principles are called to such an extent as to encourage the belief that farmers are beginning in some measure to reap the fruit of scientific investigations made in their behalf.

While there is still a large field for inquiry in the domain of cattle feeding, and many problems yet unsolved, we already possess a mass of organized facts in regard to the composition and digestibility of a large variety of feeding stuffs, the functions of the different nutrients, and the practical effect of certain combinations of foods, that can be made valuable to the intelligent and thoughtful farmer. There are many farmers in the state to whom these facts are not available, or if so, they are distributed through such an amount of literature as to make their possession a laborious task.

It is proposed, therefore, to give in this connection the data and explanations necessary to the calculation of a ration for any specified purpose.

What an efficient and economical ration is, and how to obtain it.

(1) An efficient ration must be sufficient in quantity.

An animal may be very fitly compared to a machine. If we wish to run a machine we must apply force enough to move its various parts, and then if we use it to perform work we must add to this force in proportion to the work done. In the case of the mowing machine, for instance, it requires a certain amount of exertion on the part of the horses to start and keep it in motion, even when no grass is cut, but when the knives are cutting grass the horses must put forth an additional amount of muscular force. So, if an animal is kept alive, gaining nothing and losing nothing, doing no work either as a draft animal or as a producer of milk or meat, yet maintaining an undiminished bodily condition, a certain amount of food will be required to simply run the machine. When the animal is put at some labor, or is used to produce something, then the food must be increased in proportion as the demands upon it are greater.

(2) A ration that is both efficient and economical must not only be sufficient in quantity, but so compounded that there shall be no waste in any direction. It is safe to assert that for a specified purpose, milk production for instance, there is some particular combination of food ingredients that to a greater extent than any other secures a utilization of the food eaten. When a milch cow consumes a ration in which the amount of digestible protein bears such relation to the amount of digestible non-nitrogenous material that each class of nutrients just fills the place to which it is best adapted, we say we have a well balanced ration. If the protein is fed either in a greater or a less relative quantity, the ration becomes either insufficient or wasteful.

The truth of these statements will be more clearly seen if we consider the matter somewhat in detail.

The food which an animal eats is used for several distinct purposes. These are:

(1) The production of new material, either that in the milk or that stored in the body, the latter including the growth of the fœtal young.

(2) The supply of the waste caused by muscular activity.

(3) As fuel, which is consumed in keeping up the bodily warmth.

What relation do the various parts of the food sustain to this work? The ingredients of cattle foods, as before enumerated and explained, are the ash (mineral matter), protein (nitrogenous substance), fats or oils, and sugar, starch, gums, &c.

Here we have on the one hand the work to be done, and on the other the means with which to do it. We must first consider whether all the above kinds of material are necessary for running the animal machine, or whether any one of the ingredients named can perform the variety of work that is demanded. In other words, have the ash, albuminoids, fat and starch peculiar parts to play in the animal economy, or can they be used indifferently in any direction where they seem to be most urgently needed?

The investigations of physiologists and chemists have answered this question, and the following may be stated as safe conclusions:

(1) The chief office of the ash of plants is to furnish the bony framework of the animal, besides which it supplies certain mineral compounds that take part in the digestive processes, and that are distributed in small quantities throughout the flesh.

(2) Protein (albuminoids) is the only source of lean meat, hair, horn, hoof or any other nitrogenous substance that becomes incorporated into the animal body. Fat is formed from it, in some instances chiefly perhaps, as in the case of butter fat. It also plays an indispensable, but not fully explained, part in the maintenance of muscular activity, and its decomposition must contribute something to the heat supply of the body. In fact, experience shows that in the absence or deficiency of the other food ingredients, except the mineral compounds, albuminoids can, for a time at least, serve to maintain all those vital processes which otherwise would wholly or in part be supported by the fats and carbohydrates.

(3) The vegetable oils and the carbohydrates are alike in being fat and heat formers. Their combustion is also somehow connected with the maintenance of muscular activity.

In the matter of quantity the fats or oils are relatively unimportant as compared with carbohydrates, and in the case of ordinary cattle foods, the latter class of compounds makes up a very large part of the nutritive substance. The carbohydrates serve to supply the most of the needed fuel, and are important as a source of fat.

We have seen that protein is an indispensable ingredient of cattle foods. Are the fats and carbohydrates? If from the protein can come all the new material, energy and heat needed to nourish and sustain animal life, why be particular about the amount fed, or why take pains to secure a certain relation between the quantities of the different ingredients of the food provided enough is fed? In answering these questions we can appeal partly to the physiological facts and partly to experience. One reason why a diet, consisting mostly or entirely of albuminoids, would not be advisable, even if possible, is that the excretory organs would be unnecessarily burdened in throwing off waste products occasioned by the decomposition of the albuminoids, thus causing disease perhaps.

Moreover, experience shows that even a carnivorous animal will not continue long in a healthful condition if fed a diet of pure albuminoids, and that the food of herbiverous animals can easily be made so nitrogenous as to create a tendency toward disease.

While the terms "flesh formers," as applied to albuminoids, and "heat formers," as applied to carbohydrates, do not express the whole truth, yet it is a fact that fat, starch, sugar and allied compounds are the natural and economical source of a large part of animal heat, and to some extent of animal fat and muscular power. Science and experience both clearly indicate that these are the peculiar offices of the non-nitrogenous constituents of cattle foods, and that the mixture of food ingredients for which nature has so evidently arranged in the composition of plants, best harmonizes with the laws regulating the maintenance and growth of the animal body. Granting all that goes before, then it is certain, as before stated, that there must be some mixture of food ingredients which secures less waste of material than any other.

Generally speaking we can feel assured that it is rational to feed carbohydrates to the full extent to which they can prevent the use of protein for any purpose to which it is not indispensable. The unnecessary use of protein would in general increase the cost of feeding, with no corresponding returns.

On the other hand, if a ration contains less than the quantity of indispensable protein, production will be limited in proportion to the deficit.

There is, in fact, much less of over-feeding with nitrogenous foods than of under-feeding, although the former mistake may sometimes be made where cotton seed meal is freely used. All these facts force the conclusion that an ill-balanced ration is easily possible, and that there is as good an opportunity to use economy in compounding cottle foods as in buying the materials with which to build a house. It may occur to some to ask whether a farmer, using the ordinary cattle foods at his command, is likely to feed a wasteful or inefficient combination.

For instance, a ration of coarse fodders, roots, corn, meal and bran is not an unusual one, and yet very good evidence can be cited to show that for young animals or milch cows, the same weight of a different mixture would be more economical.

It is well known to every farmer that nothing excels young stock and fattening animals.

This is explained, in part at least, by the fact that such grass is comparatively rich in digestible protein, much richer than the mature plant. But it is the latter which is stored for winter feeding, and this furnishes a much less nitrogenous ration than the grazing animal selects when given the power of choice.

In subjecting our domestic animals to conditions somewhat artificial, placing them as we do entirely at our mercy in the matter of food, the practice has been, especially when we have depended wholly upon the resources of the farm, to feed much less protein proportionally than is supplied by pasture grass, or any other young and succulent material. This is true of even our better class of farmers.

What shall be said then of those who sell their good hay and feed that which comes from inferior low ground grasses, whose cattle eat straw and corn fodder which have been robbed of their protein to produce the grain that is sold?

The writer believes that no mistake in the use of cattle foods has been more general than that of feeding so little digestible protein as to sufficiently meet the requirements for generous growth or milk production.

This defect can be remedied. It is possible, now that the markets offer so great a variety of foods, for those who depend largely upon purchased grain to make good the deficit of home raised materials, to buy that which will balance the ration.

The German Feeding System.

The German feeding standards, as they have come to be called, are an attempt to state in extract terms the quantities of digestible materials of different kinds that the daily rations of the various classes of farm animals should contain in order to secure the best results.

The standards were calculated by Dr. Emil Walff and others from the data furnished by German investigations and experiments, and they represent a large amount of observation and experience. They are in no sense guess-work ; neither should it be said of them that they are wholly theoretical.

It is claimed by some that they should be revised, and it seems probable that not only the actual but the relative amounts for which these standards call will sometimes be modified by fuller investigations and larger experience.

So far as we have any hints of what these changes will be, they indicate lower figures for the total digestible material, and a smaller proportion of potein in some cases. Such would certainly be the changes if these standards were made to imitate the practice in vogue among a large percentage of American farmers, for as they now stand they call for very liberal feeding, more liberal, perhaps, than is in all cases profitable. Nevertheless, so long as feeding insufficiently for generous production is a very prevalent fault, it is better, perhaps, that the standards we set should err, if at all, on the side of too generous rather than too small rations.

The quantities stated in these German standards are the amounts of digestible material of different kinds that should be fed daily for each 1000 pounds of live weight. If an animal weighs more or less than one thousand pounds, the ration is to be increased or diminished in proportion.

It is important to notice that not only the amounts, but the kind of digestible material varies with the kind of animal.

This is but a recognition of the obvious fact that the demands upon the food for the various kinds of production are greatly different.

The amounts, and also the proportions, of the several food elements required to maintain a resting animal, or to sustain labor, or to produce rapid growth, or to keep up a liberal flow of milk, are quite unlike.

The differences in total amount of nutrients as shown, are easily seen. In order to express the relation in quantity of the digestible protein to the digestible non-nitrogenous material, there is given in the last column of the following table what is called the *nutritive ratio.*

As an example of how this ratio is calculated, the standard ration for a milch cow is selected. This calls for 2.5 lbs. digestible protein, 12.5 lbs. digestible nitrogen-free extractive matter and fiber, and .40 lbs. digestible fat.

The fat has a greater value per pound than sugar or starch, and in order to reduce the figures to the same basis, we multiply the percentage of fat by $2\frac{1}{2}$, because for heat production a pound of fat is equal to $2\frac{1}{2}$ pounds of the carbohydrates.

$$12.5 + (.40 \times 2\tfrac{1}{2}) = 13.5. \quad 13.5 \div 2.5 = 5.4.$$

The nutritive ratio is therefore 1 : 5.4.

A—POUNDS PER DAY PER 1,000 POUNDS LIVE WEIGHT.

	KIND OF ANIMAL.	Total organic matter.	Albuminoids, or Proteio.	Nitrogen-free extract and fiber.	Fat.	Total nutritive substances.	Nutritive ratio.
	Horse at light work	21.0	1.5	9.5	0.40	11.40	1: 7.0
	" average work	22.5	1.8	11.2	0.60	13.60	1: 7.0
	" hard "	25.5	2.8	13.4	0.80	17.00	1: 5.5
	Oxen at rest in stall	17.5	0.7	8.0	0.15	8.85	1:12.0
	" ordinary work	24.0	1.6	11.3	0.30	13.20	1: 7.5
	" hard "	26.0	2.4	13.2	0.50	16.10	1: 6.0
	" fattening, first period	27.0	2.5	15.0	0.50	18.00	1: 6.5
	" " second period	26.0	3.0	14.8	0.70	18.50	1: 5.5
	" " third "	25.0	2.7	14.8	0.60	18.10	1: 6.0
	Milk cows	24.0	2.5	12.5	0.40	15.40	1: 5.4
	Sheep, wool-producing (coarser breeds)	20.0	1.2	10.3	0.20	11.70	1: 9.0
	" " " (finer breeds)	22.5	1.5	11.4	0.25	13.15	1: 8.0
	" fattening, first period	26.0	3.0	15.2	0.50	18.70	1: 5.5
	" " second period	25.0	3.5	14.4	0.60	18.50	1: 4.5
	Swine, fattening, first period	36.0	5.9	27.5		32.50	1: 5.5
	" " second period	31.0	4.9	24.0		28.00	1: 6.0
	" " third period	23.5	2·7	17.5		20.20	1: 6.5
	GROWING CATTLE						
Age—mos.	Average live weight per head—						
2.3	150 pounds	22.0	4.0	13.8	2.0	19.8	1: 4.7
3 6	300 "	23.4	3.2	13.5	1.0	17.7	1: 5.0
6.12	500 "	24.0	2.5	13.5	0.6	16.6	1: 6.0
12.18	700 "	24.0	2.0	13.0	0.4	15.4	1: 7.0
18.24	850 "	24.0	1.6	12.0	0.3	13.9	1: 8.0
	GROWING SHEEP.						
5.6	56 pounds	28.0	3.2	15.6	0 8	19.6	1: 5.5
6.8	67 "	25.0	2.7	13.3	0.6	16.6	1: 5.5
8.11	75 "	23 0	2.1	11.4	0 5	14.0	1: 6.0
11.15	82 "	22.5	1.7	10.9	0.4	13.0	1: 7.0
15.20	85 "	22.0	1.4	10.4	0.3	12.1	1: 8.0
	GROWING PIGS.						
2.3	50 pounds	42.0	7.7	30.0		37.5	1: 4.0
3.5	100 "	34.0	5.5	25.0		30.0	1: 5.0
5.6	125 "	31.5	4.3	23.7		28.4	1: 5.5
6.8	170 "	27.0	3.4	20.4		23.8	1: 6.0
8.12	250 "	21.0	2.5	16.2		18.7	1: 6.5

B—POUNDS PER DAY PER HEAD.

Kind of Animal.	Total organic matter.	Albuminoids or protein.	Nitrogen-free extract and fiber.	Fat.	Total nutritive substance.	Nutritive ratio
Growing Cattle.						
Age—mos. / Av. live weight per head.						
2.3 ....150 pounds.	3.3	0.6	2.1	0.30	3.00	1:4.7
2.6 ....300 "	7.0	1.0	4.1	0.30	5.40	1:5.0
6.12.........500 "	12.0	1.3	6.8	0.30	8.40	1:6.0
12.18.........700 "	16.8	1.4	9.1	0.28	10.78	1:7.0
18.24.........850 "	20.4	1.4	10.3	0.26	11.96	1:8.0
Growing Sheep						
5.6 .... 56 pounds.	1.6	0.18	0.87	0.045	1.095	1:5.5
6.8 .... 67 "	1.7	0.17	0.85	0.040	1.060	1:5.5
8.11......... 75 "	1.7	0.16	0.85	0.037	1.047	1:6.0
11.15 .... 82 "	1.8	0.14	0.89	0.032	1.062	1:7.0
15.20 .... 85 "	1.9	0.12	0.88	0.025	1.047	1:8.0
Growing Pigs						
2.3 .... 50 pounds.	2.1	0.38	1.50		1.88	1:4.0
3.5 ....100 "	3.4	0.50	2.50		3.00	1:5.0
5.6 ....125 "	3.9	0.54	2.96		3.50	1:5.5
6.8 ....170 "	4.6	0.58	3.47		4.05	1:6.0
8.12 ....250 "	5.2	0.62	4.05		4.67	1:6.5

How is a cattle feeder to learn whether his rations compare with the above standards? He must ascertain the composition of his foods and their digestibility; in other words, he must know how much of different ingredients his cattle are eating and what proportion of them is available for use. It is not possible for each farmer to have his feeding stuffs analyzed, but we have tables giving the average composition of a large list of cattle foods as determined by numerous analyses, and the same for the percentages of digestibility, and a calculation made for any given food by means of these averages is perhaps accurate enough for practical purposes.

The Composition of American Feeding Stuffs.

It was but a few years ago that we were obliged to depend upon German analyses for a knowledge of our cattle foods, but so much work has lately been done in this country in the way of investigating agricultural products that we are now well informed in regard to the composition of many American feeding stuffs. Dr. E. H. Jenkins of the Connecticut Experiment Station has published a much needed compilation of American analyses, and here follow his tables as given in the report of the Connecticut Experiment Station for 1887. Under the head of each ingredient can be seen the minimum, maximum and average percentages as found by the several analyses made. For instance, in the case of protein in timothy hay, the left hand column shows that fifty-three analyses have been made, and the column headed *protein* shows that the lowest percentage found was 4.2, the highest 9.6, and the average 6.06.

Name.	Analyses	Total Dry Matter. Min.	Total Dry Matter. Max.	Total Dry Matter. Average.	Albuminoids or Protein. Min.	Albuminoids or Protein. Max.	Albuminoids or Protein. Average.	Crude Fat. Min.	Crude Fat. Max.	Crude Fat. Average.	Nitrogen-free Extract. Min.	Nitrogen-free Extract. Max.	Nitrogen-free Extract. Average.	Fiber. Min.	Fiber. Max.	Fiber. Average.	Ash.
GREEN FODDER.																	
Maize fodder	48	7.1	30.9	19.02	.6	3.0	1.63	.1	.9	.41	3.2	19.7	10.62	1.9	11.4	5.28	1.13
Maize fodder, ensilaged	57	13.0	28.4	19.48	.7	2.8	1.49	.2	1.8	.68	5.1	18.3	10.26	3.0	10.0	5.68	1.31
Sorghum	7	13.6	28.4	21.66	.9	1.4	1.10	.2	.5	.36	5.3	27.0	13.08	4.7	8.5	6.25	.87
Sorghum, ensilaged	5	22.0	28.1	21.17	.6	.9	.75	.1	.4	.28	13.8	19.0	15.82	5.9	6.8	6.28	1.04
Rye fodder	6	21.9	25.3	24.72	2.3	3.0	2.61	.2	.7	.56	4.9	12.4	6.94	4.9	14.9	12.73	1.88
Rye fodder, ensilaged	1	-	-	19.25	-	-	2.42	-	-	.27	-	-	9.18	-	-	5.76	1.62
Oat fodder	2	21.4	28.8	25.10	1.5	2.0	1.77	.4	.7	.57	10.8	14.6	12.70	7.1	9.	8.27	1.79
Clover	1	-	-	26.67	-	-	4.09	-	-	.69	-	-	11.61	-	.5	8.12	2.16
Clover, ensilaged	3	21.5	27.4	23.73	3.0	3.8	3.34	.9	1.1	1.02	8.1	11.4	10.21	5.1	8.6	6.66	2.50
Cow-pea vines, green and succulent	2	14.0	17.9	15.93	3.0	3.3	3.12	.6	.6	.60	5.3	8.5	6.90	2.9	4.1	3.48	1.83
Beet leaves	1	-	-	11.16	-	-	2.74	-	-	.60	-	-	2.49	-	-	2.50	2.83
Carrot leaves	1	-	-	16.70	-	-	4.26	-	-	.86	-	-	5.99	-	-	2.25	3.34
Cabbage ensilage	1	-	-	12.39	-	-	1.19	-	-	.93	-	-	4.52	-	-	1.59	4.16
HAY AND DRY COARSE FODDER.																	
Clover hay	33	78.2	93.9	88.63	6.9	20.8	12.55	1.5	4.3	2.44	35.0	49.0	40.55	15.6	35.7	26.86	6.23
Hay containing much clover	10	85.5	89.8	86.68	6.3	14.4	10.33	1.5	3.1	2.52	31.8	45.2	40.46	19.7	35.1	28.07	5.30
White clover hay	2	91.4	92.9	92.12	14.1	20.0	17.03	2.1	5.8	3.95	38.2	40.6	39.38	20.3	27.3	23.75	8.00
Alsike clover hay	4	91.6	94.8	92.63	11.4	16.1	13.50	1.6	4.2	2.35	36.5	43.5	40.86	27.7	29.5	28.61	7.31
Lucerne hay	3	92.5	94.4	93.52	15.0	18.6	17.04	1.8	2.4	2.05	35.5	39.2	37.12	26.2	33.0	30.21	7.10
Timothy hay (*Pleum pratense*)	53	84.5	92.9	89.76	4.2	9.6	6.06	1.0	3.4	2.12	39.2	58.5	47.10	22.7	38.5	30.37	4.11
Red top hay (*Agrostis vulgaris*)	1	-	-	90.16	-	-	7.25	-	-	1.95	-	-	46.52	-	-	27.45	6.99
Timothy and red top	10	85.7	91.8	87.64	4.8	9.0	6.52	1.5	2.7	2.00	38.5	48.9	44.15	24.7	38.4	30.17	4.80
Orchard grass hay (*Dactylis glomerata*)	4	88.2	93.5	91.87	3.6	8.2	6.33	1.1	2.4	1.93	33.5	48.6	44.45	29.7	38.3	33.81	5.35
Hungarian grass hay	13	91.0	95.2	92.85	5.0	12.3	7.22	1.5	3.5	2.14	44.4	53.0	49.41	23.6	31.3	28.25	5.83
Barley hay, seed in milk	1	-	-	89.75	-	-	9.21	-	-	2.47	-	-	47.49	-	-	26.14	4.44
Oat hay	3	86.3	91.3	89.32	7.8	9.9	8.53	2.1	3.1	2.52	36.2	48.0	41.93	25.1	33.6	29.92	6.42
High meadow hay	2	88.7	89.4	89.02	6.8	8.3	7.57	2.0	2.5	2.25	46.9	47.5	47.19	24.3	25.2	25.78	6.23

Hay from mixed meadow grasses	9	81.0	87.0	84.52	4.9	7.9	6.24	1.4	2.7	2.05	34.4	47.3	40.43	23.7	35.9	31.09	4.71
Low meadow hay	10	85.5	93.6	89.50	4.6	10.4	7.70	.7	3.6	2.20	39.8	55.2	43.60	21.4	40.0	30.20	5.80
Hay from salt marsh grasses	13	81.4	92.8	89.89	4.0	7.8	5.69	1.6	3.1	2.31	31.1	54.3	41.10	25.1	37.9	30.51	7.28
Baled hay, extra fine	1	–	–	84.05	–	–	6.20	–	–	2.19	–	–	45.13	–	–	26.60	3.93
Maize fodder, field cured	4	60.6	77.1	65.02	3.8	4.6	4.23	.6	1.6	1.08	30.5	40.8	33.79	18.7	24.7	21.27	4.65
Maize stover, field cured	9	63.5	83.8	77.17	3.8	8.3	5.38	1.1	1.9	1.45	35.8	46.2	40.30	19.1	29.5	25.18	4.86
Maize stover, dried	11	87.0	92.4	90.43	3.4	8.5	5.02	.8	1.5	1.10	45.3	52.9	49.17	26.6	33.6	29.92	5.23
Buckwheat straw	3	89.6	91.0	90.09	3.3	7.8	5.15	.7	1.7	1.26	32.1	38.9	35.16	37.2	46.8	42.98	5.54
Oat straw	12	87.5	93.5	91.26	2.3	6.9	3.82	1.0	3.2	2.22	26.4	51.4	38.89	29.5	56.0	41.52	4.81
Rye straw	8	87.5	93.7	92.24	2.2	6.9	3.46	1.0	2.7	1.40	35.7	52.9	38.35	34.2	43.3	45.25	3.78
Wheat straw	6	82.1	93.5	91.22	2.9	5.0	3.45	.8	1.8	1.29	31.0	50.6	37.33	34.3	42.7	44.99	4.16
Cow-pea vines	6	86.0	90.7	85.95	13.6	19.8	15.68	1.1	4.1	2.87	34.9	46.4	42.17	17.2	23.7	19.80	8.41
Roots, Bulbs, Tubers and other Vegetables and Fruits.																	
Beets, red	2	10.5	12.3	11.43	1.5	1.7	1.60	.2	.2	.18	7.2	7.6	7.40	.6	1.7	.12	1.08
Beets, sugar	8	9.2	16.4	13.03	1.7	2.9	2.01	.1	.2	.10	5.7	12.0	9.15	.7	1.1	.87	.90
Mangolds	6	5.6	11.7	8.68	1.0	1.9	1.52	–	.5	.16	2.4	8.4	5.00	.8	1.0	.84	1.16
Rutabagas	1	–	–	12.92	–	–	1.15	–	–	.09	–	–	9.11	–	–	1.16	1.41
Turnips	2	7.6	8.2	7.92	.8	1.3	1.02	.1	.2	.18	5.8	4.2	5.03	.8	1.2	1.04	.68
Carrots	6	8.9	13.5	11.70	.9	2.0	1.16	.2	.7	.42	5.1	10.4	7.68	1.0	2.3	1.38	1.06
Onions	6	6.5	18.4	12.45	.8	2.3	1.41	.2	.4	.26	3.8	14.6	9.53	.6	.8	.69	.56
Potatoes	7	19.4	21.1	21.90	1.1	3.0	2.19	–	.2	.10	15.3	26.0	18.19	.3	.9	.54	.88
Sweet potatoes	5	26.6	34.0	29.37	.5	3.4	1.55	.3	.6	.38	18.0	29.7	25.09	.6	2.5	1.36	.99
Cabbage	2	6.5	10.2	8.28	1.8	2.0	1.95	.2	.5	.33	2.0	3.5	2.75	1.4	3.0	2.21	1.04
Squash	2	4.8	5.4	5.12	.6	[illegible]	.66	.2	.3	.28	2.9	[illegible]	3.24	.5	.5	.54	.40
Pumpkin	1	–	–	7.73	–	–	1.11	–	–	.16	–		4.34	–	–	1.49	.63
Apples	5	15.9	22.7	18.22	.2	1.2	.69	.3	.6	.41	12.6	20.0	15.31	.9	2.9	1.49	.32
Grain and Other Seeds																	
Barley	9	87.4	92.7	89.08	8.6	15.7	12.39	1.5	3.1	1.86	66.7	73.9	69.88	1.2	4.1	2.57	2.38
Buckwheat	8	85.1	89.1	87.40	8.6	11.1	10.00	2.2	2.4	2.25	62.6	65.4	64.50	7.8	9.4	8.70	2.00
Oats (raised in Connecticut)	7	86.5	90.7	89.06	8.0	10.1	9.32	4.7	5.8	5.29	59.0	63.2	61.55	8.0	12.9	9.95	2.95
Oats	25	86.5	91.1	89.06	8.0	14.4	11.38	3.4	5.8	4.81	50.8	66.9	60.05	1.5	19.4	9.85	2.97
Rye	6	86.8	91.3	88.40	9.5	12.1	10.60	1.4	2.1	1.70	70.7	73.9	72.60	1.4	2.1	1.60	1.90
Wheat, winter	242	83.8	92.9	89.48	8.3	16.6	11.73	1.3	3.9	2.11	68.1	76.6	72.01	.4	2.9	1.77	1.86
Wheat, spring	13	86.6	91.9	89.63	8.1	15.4	12.51	1.8	2.5	2.20	66.1	78.6	71.19	1.3	2.3	1.82	1.91
Wheat, unclassified	55	87.6	90.9	89.31	9.8	14.7	11.96	1.6	2.8	2.10	68.5	74.7	71.50	1.2	3.1	1.92	1.83
Wheat, average of all analyses	310	83.8	92.9	89.46	8.1	16.6	11.80	1.3	3.9	2.11	66.1	78.7	71.89	.4	3.1	1.80	1.86

Name.	Analyses.	Total Dry Matter. Min.	Total Dry Matter. Max.	Total Dry Matter. Average.	Albuminoids or Protein. Min.	Albuminoids or Protein. Max	Albuminoids or Protein. Average	Crude Fat. Min.	Crude Fat. Max.	Crude Fat. Average.	Nitrogen-free Extract. Min.	Nitrogen-free Extract. Max.	Nitrogen-free Extract. Average.	Fiber. Min.	Fiber. Max.	Fiber. Average.	Ash.
Grain and Other Seeds.																	
Maize, dent	80	85.9	93.7	89.91	7.5	12.1	10.33	3.8	6.9	5.10	66.2	75.7	70.66	1.2	4.8	2.28	1.54
" flint	70	80.4	93.4	88.93	7.0	13.7	10.57	3.4	7.1	4.96	65.0	74.6	70.31	.7	2.9	1.65	1.44
" sweet	26	89.1	94.0	91.18	9.5	15.3	11.62	3.8	11.9	8.14	61.8	72.4	66.70	1.5	5.2	2.80	1.92
" "Western corn"	3	79.3	93.6	80.90	7.8	8.6	8.30	3.6	3.9	3.70	64.9	68.2	66.00	1.7	1.8	1.75	1.20
" averages of all analyses	192	79.3	94.0	89.49	7.0	15.3	10.55	3.4	11.9	5.45	61.8	75.7	69.85	.7	5.2	2.09	1.54
Sorghum seed	9	83.2	90.7	87.48	7.6	11.2	8.88	2.1	4.6	3.65	66.8	73.6	71.26	1.4	3.2	1.88	1.80
Cotton seeds, hulls and kernels	1	-	-	92.28	-	-	15.72	-	-	18.56	-	-	29.09	-	-	25.73	3.16
Cow pea	5	79.2	89.9	85.21	19.3	23.0	20.77	1.3	1.6	1.43	48.1	61.9	55.75	3.3	5.0	4.06	3.20
Soy bean	4	86.9	93.9	91.53	34.6	40.2	37.22	12.3	19.0	16.52	26.2	30.5	28.21	3.7	5.0	5.12	4.46
Flour and Meal.																	
Barley meal	3	83.8	86.0	84.90	8.8	13.9	11.80	.7	2.2	1.70	-	-	70.90	-	-	.10	.50
Buckwheat flour	4	82.4	87.2	85.46	4.2	8.1	6.89	.7	1.8	1.44	71.1	79.4	75.79	.2	.5	.34	1.00
Oat meal	6	91.1	93.8	92.15	12.9	16.2	14.66	6.1	8.8	7.06	66.6	68.9	67.57	.6	1.2	.86	2.00
Rye flour	4	86.4	87.7	86.90	6.0	7.1	6.65	.8	.9	.84	77.6	79.1	78.28	.4	.5	.41	.72
Wheat flour, from winter wheat	1	-	-	87.04	-	-	8.56		-	1.19	-	-	76.59	-	-	.17	.53
" " spring wheat	6	86.5	89.7	87.68	8.6	14.1	10.68	.6	2.0	1.11	68.3	78.1	75.00	-	1.2	.22	.61
" " unclassified	21	86.4	88.8	87.52	9.7	13.3	11.25	.8	1.9	1.16	69.5	76.9	74.33	.1	1.0	.25	.53
" averages of all varieties	25	86.4	89.7	87.44	8.6	14.1	11.28	.6	2.0	1.20	68.3	78.1	74.13	.0	1.2	.27	.56
Graham flour	3	86.3	87.9	86.90	11.3	12.4	11.70	1.5	1.9	1.70	69.8	70.0	69.80	1.8	2.1	1.90	1.80
Maize meal	56	74.5	92.0	84.15	7.1	10.3	9.16	2.2	5.1	3.81	57.0	74.0	67.84	.5	2.8	1.80	1.46
Hominy	2	86.4	86.6	86.50	8.1	8.4	8.25	.4	.5	.44	77.1	77.2	77.12	.3	.3	.32	.38
Sorghum meal, mostly decorticated	1	-	-	86.84	-	-	8.25	-	-	3.85	-	-	71.27	-	-	1.88	1.59
Pea meal	2	87.0	91.2	89.54	19.1	21.4	10.23	.9	1.5	1.19	50.2	52.0	51.09	11.1	17.7	14.33	2.64

By Products and Refuse.																	
Apple pomace	7	22.1	27.4	22.94	1.0	1.7	1.40	.6	2.0	1.36	12.6	17.6	15.63	2.0	5.9	4.01	.54
Brewers' grains, wet from brewery	15	20.6	31.4	24.99	4.3	7.7	5.57	.8	2.9	1.68	10.1	15.7	12.86	3.0	5.6	3.87	1.01
" dried	3	88.1	93.8	91.81	19.2	20.2	19.89	4.2	6.5	5.56	46.1	56.8	51.75	10.2	11.6	11.01	3.58
" kiln dried	1	-	-	97.43	-	-	20.30	-	-	6.40	-	-	54.89	-	-	11.79	3.97
" from silo	3	26.1	33.2	30.18	5.8	7.1	6.64	1.8	2.5	2.11	13.6	16.8	15.58	3.9	5.4	4.64	1.21
Brewers' swill	1	-	-	5.70	-	-	1.90	-	-	.80	-	-	2.00	-	-	.70	.30
Malt sprouts	3	88.0	92.7	89.72	21.0	25.9	22.95	1.1	2.9	1.79	45.4	50.3	48.60	9.3	11.9	10.72	5.67
Cotton seed meal	29	81.5	94.2	91.68	23.3	50.8	42.39	10.2	18.0	13.37	12.7	38.6	22.97	2.7	11.7	5.69	7.26
Linseed meal, old process	12	87.4	93.9	90.97	27.7	38.2	32.33	5.1	11.6	8.24	30.8	41.9	35.22	7.1	13.3	9.31	5.87
" new "	12	86.6	93.2	89.25	27.1	37.1	32.85	1.3	4.4	3.08	35.2	48.0	38.29	7.6	14.0	9.46	5.57
" oil not removed	1	-	-	91.67	-	-	22.97	-		30.26		-	25.48	-	-	9.60	3.36
Palm nut meal	3	89.1	93.8	91.71	13.5	16.0	14.39	6.4	18.7	13.30	33.8	41.6	33.88	18.7	23.9	21.40	3.74
Rye bran	6	86.3	91.8	88.51	11.5	16.8	15.28	1.8	4.9	2.46	59.8	67.6	63.66	2.5	4.1	3.52	3.59
Wheat bran	63	84.2	91.8	87.72	7.5	16.9	15.07	1.5	5.9	3.78	50.0	67.6	54.26	2.4	17.8	8.71	5.70
" middlings	27	84.0	91.5	88.00	10.1	19.2	15.17	1.3	12.7	4.01	53.0	70.9	60.99	2.1	5.9	4.57	3.26
" shorts	8	84.5	89.0	87.26	11.1	16.1	13.83	2.5	5.3	4.14	53.3	67.0	57.59	5.8	10.5	7.45	4.25
Hominy chops, hominy feed, Baltimore meal, white meal	11	86.5	91.9	88.86	7.9	11.2	9.85	4.6	11.2	8.43	61.0	71.1	64.49	2.5	4.8	3.59	2.50
Gluten meal	11	88.3	92.7	90.61	25.0	35.0	29.58	4.2	8.7	6.31	44.7	58.5	52.64	.7	3.8	1.34	.74
Maize cob	13	85.6	92.8	90.67	1.2	3.7	2.50	.1	.9	.45	45.3	66.4	55.99	28.2	38.2	30.36	1.33
Starch feed, refuse from starch manufacture	8	27.8	37.7	34.34	3.6	7.7	5.73	1.3	4.3	3.02	18.7	28.9	22.21	1.6	4.3	3.17	.21
Sugar feed, kiln dried, refuse from glucose	2	89.6	93.4	91.50	13.1	13.5	13.30	5.9	11.2	8.60	54.9	61.4	58.10	8.4	10.7	9.50	2.00
Sorghum bagasse	4	11.3	16.6	14.50	.6	.7	.65	-	-	.	-	-	10.20	2.8	3.3	3.10	.60

6

Digestibility of American Feeding Stuffs.

Very few determinations of the digestibility of American products have yet been made, and so we are still obliged to use German figures. These are sufficiently accurate, without doubt, so far as they apply to the grains and such by products as bran, cotton seed meal, &c., but in the case of the hays, coarse fodders and similar materials, the percentage as stated for European products will probably be modified.

DIGESTIBILITY OF FEEDING STUFFS—DIGESTION COEFFICIENTS.

	No. samp's tes'd	No. of experiments.	Total dry organic matter.			Albuminoids or Protein.			Crude Fat			Nitrogen free extract.			Fiber.		
			Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min	Max.	Aver.	Min.	Max.	Aver.
Green Fodder																	
Pasture grass	3	6	75	78	77.00	72	70	75.00	63	69	66.00	75	84	78.00	72	80	75.00
Meadow grass (experiments with horses)	10	13	43	62	50.00	54	69	61.00	9	42	21.00	49	66	57.00	33	57	41.00
Meadow rowen	6	30	62	71	64.00	61	68	62.00	31	56	46.00	63	74	66.00	59	68	64.00
Pasture clover, very young	1	2	-	-	75.00	-	-	78.00	-	-	64.00	-	-	78.00	-	-	67.00
Red clover, just before blossoming	6	15	59	74	66.00	60	76	66.00	58	74	64.00	63	83	73.00	47	60	53.00
Lucerne, before flowering and in flower	9	28	55	67	60.00	67	83	74.00	29	55	39.00	61	73	67.00	34	48	43.00
Vetches	-	-	-	-	-	73	80	76.00	50	66	60.00	63	67	65.00	51	58	54.00
Lupine	-	-	-	-	-	73	76	74.00	16	45	30.00	57	66	62.00	67	80	73.00
Maize fodder (very good)	1	1	-	-	70.00	-	-	73.00	-	-	75.00	-	-	67.00	-	-	72.00
Sorghum	1	1	-	-	73.00		-	62.00	-	-	85.00	-	-	78.00	-	-	59.00
Beet leaves (ensilaged)	1	2	-	-	57.00	-	-	65.00	-	-	60.00	-	-	54.00	-	-	54.00
Beans, peas, cabbage																	
Turnip leaves, parsnip leaves	-	-	-	-	-	-	-	71.00	-	-	60.00	-	-	100.00			
Fodder rye, fodder oats																	
Beet leaves, carrot leaves, buckwheat	-	-	-	-	-	-	-	58.00	-	-	46.00	-	-	100.00			
Meadow hay	38	104	46	71	62.00	42	72	62.00	10	63	52.00	49	76	64.00	46	71	57.00
Meadow hay (very good)	14	42	56	71	65.00	57	70	64.00	31	63	50.00	52	76	68.00	55	71	62.00
Meadow hay (medium)	24	62	46	69	60.00	42	72	57.00	10	63	48.00	49	73	62.00	46	66	58.00
Hay.																	
Meadow hay (inferior)	7	18	46	59	55.00	42	56	51.00	10	57	41.00	49	61	58.00	46	61	54.00
Meadow hay (very good, experiments on horse)	3	4	49	55	52.00	63	66	64.00	14	42	24.00	52	62	57.00	36	46	43.00
Meadow hay (medium, experiments on horse)	5	6	43	51	48.00	54	62	58.00	16	33	23.00	49	61	55.00	33	40	37.00
Clover hay (very good)	6	12	58	63	61.00	55	69	62.00	44	72	60.00	67	72	70.00	39	52	47.00
Clover hay (medium)	6	19	54	62	57.00	43	61	55.00	35	70	51.00	58	67	65.00	39	52	45.00
Clover hay (experiments on horse)	4	6	49	55	51.00	51	60	56.00	28	31	29.00	61	67	64.00	35	39	37.00
Lucerne hay (very good)	9	28	55	67	60.00	67	83	74.00	29	55	39.00	61	73	66.00	34	48	43.00
Hay of fodder vetches (before blossom)	1	6	-	-	65.00	-	-	76.00	-	-	60.00	-	-	66.00	-	-	54.00
Lupine hay (in blossom)	1	2	-	-	-	-	-	74.00	-	-	30.00	-	-	62.00	-	-	74.00

DIGESTIBILITY OF FEEDING STUFFS—DIGESTION COEFFICIENTS.

	No. samp's tes'd.	No of experiments.	Total dry organic matter.			Albuminoids or Protein.			Crude Fat.			Nitrogen free Extract.			Fiber.		
			Min.	Max.	Aver.	Min.	Max.	Aver	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.
Roots.																	
Potatoes	3	23	83	90	88.00	64	67	65.00	-	-	-	89	96	93.00			
Potatoes (experiments with pigs)	5	8	-	-	93.00	-	-	73.00	-	-	-	-	-	98.00	-	-	55.00
Sugar beets	2	28	84	93	89.00	56	68	62.00	-	-	-	95	96	95.00			
Mangolds	2	16	87	88	88.00	66	86	76.00	-	-	-	94	96	95.00			
Turnips	1	8	-	-	78.00	-	-	57.00	-	-	-	-	-	89.00			
Grains.																	
Oats	6	31	62	74	68.00	68	86	77.00	75	97	82.00	67	79	74.00	-	26	17.00
Oats (experiment with horse)	1	5	-	-	72.00	-	-	86.00	-	-	78.00	-	-	76.00	-	-	24.00
Barley	1	2		-	81.00	-	-	77.00	-	-	100.00	-	-	87.00			
Barley (experiment with horse)	1	-	-	-	87.00	-	-	80.00	65	-	42.00	-	-	87.00	-	-	100.00
Barley (experiments with pig)	4	8	82	85	83 00	75	80	78.00	-	77	68.00	89	91	90.00	-	27	12.00
Maize	1	2	-	-	89.00	-	-	79.00	-	-	85.00	-	-	91.00	-	-	62.00
Maize (experiments with horse)	1	1	-	-	91.00	-	-	78.00	76	-	63.00	-	-	94.00	-	-	160.00
Maize (experiments with pig)	3	4	90	95	92.00	84	88	86.00	65	77	76.00	93	96	95.00	19	57	40.00
Field beans	5	18	83	94	89.00	81	95	88.00	-	100	87.00	88	95	92.00	25	92	72.00
Field beans (experiment with horse)	1	4	-	-	87.00	-	-	86.00	-	-	-	-	-	93.00	-	-	69.00
Peas	1	2	-	-	90.00	-	-	89.00	-	-	75.00	-	-	93.00	-	-	66.00
Peas (experiment with horse)	1	1	-	-	80.00	-	-	83.00	36	-	67.00	-	-	89.00	-	-	8.00
Peas (experiments with pigs)	5	10	88	95	91.00	85	90	88.00	-	67	49.00	95	99	96.00	55	89	71.00
By Products and Refuse.																	
Wheat bran (fed dry)	5	12	67	78	72.00	71	89	78.00	50	80	69.00	70	82	77.00	20	39	33.00
Rye bran (experiments with pigs)	1	2	-	-	67.00	-	-	66.00	-	-	58.00	-	-	75.00	-	-	4.00
Malt sprouts	1	3	-	-	84.00	-	-	82.00	-	-	49.00	-	-	88.00	-	-	95.00
Brewer's grains	1	2	-	-	63 00	-	-	73.00	-	-	84.00	-	-	64.00	-	-	39.00
Rape meal (oil extracted)	1	1	-	-	6.00	-	-	84.00	-	-	-	-	-	85.00			
Rape cake	2	7	56	75	66.00	76	86	81.00	69	88	79.00	74	78	76.00	-	16	8.00

Linseed meal (oil extracted)	1	8	-	-	71.00	-	-	82.00	-	-	91.00	-	-	73.00			
Linseed cake	2	10	78	83	81.00	84	87	86.00	89	91	90.00	70	91	80.00	26	62	44.00
Palm nut meal (oil extracted)	2	3	89	93	91.00	89	100	95.00	89	100	95.00	92	96	94.00	72	92	82.00
Cotton seed cake (decorticated)	1	2	-	-	80.00	-	-	85.00	-	-	88.00	-	-	95.00	72		
Cotton seed cake (not decorticated)	1	4	-	-	50.00	-	-	73.00	-	-	91.00	-	-	46.00	-	-	23.00
Cocoanut cake	1	2	-		78.00	-	-	76.00	-	-	100.00	-	-	81.00	-	-	62.00
Cocoanut cake (experiments with pigs)	1	2	-	-	80.00	-	-	74.00	-	-	83.00	-	-	89.00	-	-	60.00
Flesh meal	1	2	-	-	95.00	-	-	95.00	-	-	98.00						
Flesh meal (experiments with pigs)	1	8	-	-	95.00	-	-	97.00	-	-	87.00						
Blood meal	1	2	-	-	63.00	-	-	62.00	-	-	100.00	-	-	100.00			
Blood meal (experiments with pigs)	1	1	-	-	72.00	-	-	72.00	-	-	-	-	-	92.00			
Fish guano	1	2	-	-	-	-	-	90.00	-	-	76.00						
STRAW.																	
Wheat straw	2	3	45	48	46.00	8	26	17.00	27	44	36.00	37	40	39.00	52	59	56.00
Wheat straw (experiments with horse)	1	2	-	-	23.00	-	-	19.00	-	-	49.00	-	-	17.00	-	-	27.00
Rye straw	2	9	42	51	46.00	17	25	21.00	-	-	32.00	35	38	37.00	49	70	60.00
Oat straw	4	8	48	56	51.00	24	48	41.00	20	49	30.00	39	45	46.00	55	64	60.00
Barley straw	2	5	51	55	53.00	17	24	20.00	41	43	42.00	51	57	54.00	55	56	56.00
Pea straw (very good)	1	2	-	-	59.00	-	-	61.00	-	-	46.00	-	-	64.00	-	-	52.00
Bean straw	1	3	-	-	50.00	-	-	51.00	-	-	55.00	-	-	63.00	-	-	36.00
Lupine straw	1	2	-	-	55.00	-	-	37.00	-	-	30.00	-	-	65.00	-	-	51.00

The figures given in the foregoing tables have cost a great deal in time and money, and they should be made useful. It seems to be the custom for farmers to request those familiar with these tables and their use to make up for them from certain specified materials a ration adapted to a particular purpose. This is not necessary. A person who has had the average training in mathematics which our public schools give can by the use of the previous tables calculate a new ration, or ascertain how the one he is feeding compares with the standard.

Perhaps the following calculations may serve to make plain the manner in which this is done. It is a question we will suppose whether the following ration is correct for a one thousand pound milch cow.

40 lbs. maize ensilage,
10 " Timothy hay,
4 " corn meal,
2 " wheat bran.

Looking in the table of fodders analyses we find what is the composition of ensilage, and in the table of digestibility of feeding stuffs under green fodder we find the digestibility of green maize fodder, which differs but little, if any, from the digestibility of ensilage. Using these two sets of figures we can calculate the pounds of digestible material in 100 pounds of the food.

	Ensilage In 100 lbs.		Per cent Digestible.		Pounds in 100.
Organic matter	18 2	×	70	=	12.74
Protein	1 50	×	73	=	1.09
Fat	68	×	75	=	.51
Nitrogen free extractive matter	10.26	×	67	=	6.87
Crude fiber	5.68	×	72	=	4.09

By the same method we ascertain the digestible material in a hundred pounds of the other feeding stuffs in our ration, and these are as follows:

DIGESTIBLE IN ONE HUNDRED POUNDS.

	Organic Matter.	Protein	Fat	Nitrogen Free Extractive Matter.	Crude Fiber.
Ensilage	12.74	1.09	.51	6.87	4.09
Timothy Hay	39.39	3.45	1.03	29.20	17.61
Corn Meal	78.67	8.16	4.33	64.30	1.41
Wheat Bran	60.48	11.75	2.61	41.78	2.87

These are the quantities of digestible ingredients in 100 pounds of the different feeding stuffs. A determination of what our ration will furnish is now a simple matter. For instance 40 pounds of ensilage contains four-tenths as much as 100 pounds, so we have:

Organic matter....................	12.74 × 4-10 = 5.10
Protein..........................	1.09 × 4-10 = .436
Fats.............................	.51 × 4-10 = .20
Nitrogen-free extractive matter.........	6.87 × 4-10 = 2.75
Crude fiber.......................	4.09 × 4-10 = 1.64

A similar calculation for the hay, meal and bran gives the following figures:

DIGESTIBLE MATERIAL IN PROPOSED RATION.

	Organic matter.	Protein.	Fats.	Nitrogen-free extractive matter.	Crude fiber.
Ensilage, 40 lbs.	5.10	.436	.20	2.75	1.63
Timothy hay, 10 lbs.	5.13	.345	.10	2.92	1.76
Corn meal, 4 lbs................	3.15	.326	.17	2.57	.06
Wheat bran, 2 lbs...............	1.18	.235	.05	.84	.06
Total......................	14.56	1.342	.52	9.08	3.51

A comparison shows this ration to be widely different from the German standard.

	Proposed ration.	German ration.
Organic matter (total nutrients)	14.45	15.40
Protein..........................	1.32	2 5
Nitrogen-free extract and fiber.......	12.59	12 5
Fats.............................	.52	.40
Nutritive ratio.....................	1:10 3	1:5.4

The proposed ration differs from the German standard mainly in having a much less quantity of digestible protein, the total digestible material being somewhat less also.

While it is doubtful if feeding 2.5 pounds of protein, would be good economy, but little over half that amount is undoubtedly too small a quantity to secure the most profitable results. It is evident that the thing to do is to feed for a portion of the grain ration some material more nitrogenous than the corn meal or bran. Cotton-seed meal, linseed meal, pea meal and gluten meal are of some of the foods, any one of which would serve to amend the ration. Let us calculate the ration with three pounds of cotton-seed meal put in the place of two of the four pounds of corn meal.

DIGESTIBLE MATERIAL IN AMENDED RATION.

	Organic matter.	Protein.	Fats.	Nitrogen-free extractive matter.	Crude fiber.
Ensilage, 40 lbs.	5.10	.436	.20	2.75	1.63
Timothy hay, 10 lbs.	5.13	.345	.10	2.92	1.76
Corn meal, 2 lbs.	1.57	.163	.08	1.28	.03
Cotton seed meal, 3 lbs.	2.20	1.07	.35	.66	
Wheat bran, 2 lbs.	1.18	.235	.05	.84	.06
Total	15.18	2.249	.78	8.45	3.48

Even now our ration is not strictly in accordance with the standard, but it is probably as nitrogenous as is advisable. In fact, the practical tests of the German feeding standards which have been made within the past few years, show that a ration may be very efficient when it differs from them considerably. These standards furnish a good working basis, however, not only for practical feeding experiments, but also for scientific investigation in matters pertaining to the feeding of farm animals. Fixed standards for the guidance of cattle feeders may certainly be made useful, and whether the German formulas are approximately correct or not, they surely are a long step in the direction of practice based upon scientific principles. It is because of the prominent place the so-called German rations have in the current discussions concerning the feeding of live stock, and because these rations furnish valuable suggestions to stock growers and dairymen, that they are given here and their use explained. The farmer who understands the purpose and meaning of these rations, and the general principles upon which they are based, is prepared to quickly grasp and apply the better knowledge to which they may lead,

TESTS OF VARIETIES.

The Experiment Station tested in the summer of 1886 a number of varieties of potatoes, oats and barley. (See Station Report 1886-7, pp. 104, 107.) The same varieties, with some additions were again grown in 1887 and 1888, also a large number of varieties of peas. The results of the year 1887 were reported in Experiment Station Bulletin No. 24. But as they have not appeared in the annual report of the station they are reported here with the trials of 1888.

POTATOES.

Report of Trials in the Year 1887.

The varieties of potatoes were planted on a loam, somewhat lighter and less clayey, than the college farm in general, a soil uniform in character and well adapted to hoed crops. This piece of ground was manured, after plowing the previous fall, with about ten cords of good stable manure per acre, and in the spring a small quantity (300 lbs. per acre) of a mixture of dissolved bone black and muriate of potash was spread broad-cast. Each variety occupied a row ninety feet long, containing sixty hills, the hills being eighteen inches apart and the distance between the rows, three and one-half feet. In each hill was planted a piece of potato having three good eyes. All the rows were carefully cultivated at the same time and in the same manner.

Injury by the potato beetle was carefully guarded against by the use of Paris green, and it can be said that the trial was not disturbed by mishap of any kind, the growth of the plants being very uniform and satisfactory.

In the tables which follow are recorded:

(1) The date on which each variety was first noticed to blossom, this being an indication of the time of maturing.

(2) The yield of large and small potatoes per row, and per acre (calculated), also the total yield.

The date of planting was May 18th and 19th. It was intended to record the date at which the tops began to die as an indication of ripeness, but this was rendered impossible by the fact that the tops of all the varieties remained green until the date of digging, September 12th and 13th. All the varieties were comparatively free from scab or rot, and all presented a fine appearance when dug. No test of quality for eating has been made of these varieties, but the coming season an attempt will be made to do this.

No	Potatoes. Name of Variety.	First Blossoms Seen.	Yield per Plot. Large.	Yield per Plot. Small.	Yield per Plot. Total	Yield per Acre. Large.	Yield per Acre. Small.	Yield per Acre. Total.
			lbs.	lbs.	lbs.	bush.	bush.	bush.
1	Thorburn	June 27	97	25	122	223	58	281
2	Clark's No. 1	July 1	91	10½	101½	210	24	234
3	Rose Magnum Bonum	" 4	50¾	15½	66.25	117	35	152
4	Early Ohio	" 6	89¼	8¼	97.50	207	19	224
5	Early Maine	" 4	62½	12	74.5	144	27	171
6	Early Vermont	June 27	73½	11¼	84.75	169	25	195
7	Watson's Seedling	July 4	68½	11	19.5	157	25	183
8	Vanguard	" 18	86	9½	95.5	199	21	220
9	Eight Weeks	" 16	120	18	138	276	41	317
10	Early Sunrise	" 18	59¾	11	70.75	137	26	163
11	Pearl of Savoy	" 1	91½	13¾	105.25	210	32	242
12	Hale's Early Peach Blow	" 8	70½	5	75.5	162	12	174
13	Triumph	" 11	112	13½	225.5	258	31	289
14	Early Essex	" 4	83½	19	102.5	192	41	236
15	Beauty of Hebron	" 4	86½	23	109.5	199	53	252
16	Orange Co. White	" 21	151	8	159	348	18	366
17	Dunmore	" 30	148	11½	159.5	341	26	367
18	Queen of the Roses	" 4	99	23	122	228	53	281
19	Rural Blush	" 18	136	5¼	141.5	313	12	325
20	Garfield	" 4	159	7½	166.5	366	17	383
21	Improved White Rose	" 18	97	9	106	223	21	244
22	White Star	" 20	114	3	117	262	7	269
23	St. Patrick	" 11	119½	6½	126	275	15	290
24	Vermont Champion	" 28	129	9¼	138.5	297	21	318
25	Belle	" 11	112	4½	116.5	258	11	269
26	Rochester Favorite	" 20	70	3	73	161	7	168
27	Perfect Peach Blow	" 13	82	9	91	189	20	209
28	Charter Oak	" 11	96½	7	103.5	222	16	238
29	Great Eastern	" 30	125½	7	132.5	289	16	305
30	Dictator	" 30	81	7½	88.5	186	18	204
31	Empire State	" 5	89	11½	100.5	205	26	231
32	Burbank Sport	" 18	107½	5½	113	247	13	260
33	Dakota Red	" 6	112½	5	117.5	259	11	270
34	Thorburn's Late Rose	" 6	112	4½	116.5	158	10	268
35	Late Beauty of Hebron	" 4	104½	10¾	115.2	240	25	265
36	O. K. Mammoth Prolific	" 29	126½	10	136.5	291	23	314
37	White Elephant	" 6	138	5	143	318	11	329
38	Red Elephant	" 21	85	5	90	196	11	207
39	Jumbo	" 29	126	6	132	290	14	304
40	White Seedling	" 18	143	1½	144.5	330	3	333
41	Monroe Co Prize	" 14	158½	3	161.5	365	7	372
42	Roses New Giant	" 12	132	13	145	304	30	334
43	Roses Beauty of Beauties	" 28	125½	9½	135	289	22	311
44	Jackson White	" 18	77	3	80	177	7	184
45	Early Goodrich	" 18	130	5½	135.5	299	13	312
46	Morning Star	" 11	185½	5	190.5	428	11	439
47	Gregory's (No Name)	" 18	36¾	1½	38.25	253	10	263

REPORT OF TRIALS FOR 1888.

The varieties of potatoes were planted this year in soil similar in character to that on which the potatoes were planted in 1887. The land had been cropped the previous year. At the time of planting 600 pounds of a reliable superphosphate were applied per acre.

The varieties were planted in rows three feet apart and 180 feet long, each row representing one-eightieth of an acre. Otherwise the conditions were the same as for the preceding year.

Number.	Potatoes—Variety.	Date of planting.	Date of blossoming.	Date of tops dying.	Date of harvesting.	Weight of large potatoes.	Weight of small potatoes.	Total weight.	Total yield per acre in bushels.
						lbs.	lbs	lbs.	
1	Thorburn	May 24,	July 14,	Tops remained green up to September 7, when they were killed by frost.	Sept. 24,	109½	22½	132	176
2	Clark's No. 1	" "	" 16,		" "	110	11	121	161⅓
3	Rose Magnum Bonum	" "	" 14,		" "	119½	9½	129	172
4	Early Ohio	" "	" 19,		" 25,	104	8½	112½	150
5	Early Maine	" "	" 16,		" "	82	14	96	126
6	Early Vermont	" "	" 16,		" "	74	20	94	125⅓
7	Watson's Seedling	" "	" 14,		" "	102	11	113	150⅔
8	Vanguard	" "	" 13,		" "	101	18	119½	159⅓
9	Eight Weeks	" 25,	" 19,		" "	142½	16	158½	211⅓
10	Early Sunrise	" "	" 13,		" "	108½	20	128½	171⅓
11	Pearl of Savoy	" "	" 13,		" "	165½	15	180½	240⅔
12	Hale's Early Peach Blow	" "	" 19,		" "	104	3½	107½	143⅓
13	Triumph	" "	Aug. 4,		" "	91	17	108	144
14	Early Essex	" "	July 13,		" "	95	27	122	162⅔
15	Beauty of Hebron	" "	" 13,		" "	62	27	89	118⅔
16	Orange County White	" "	" 21,		" "	134½	10½	145	193⅓
17	Dunmore	" "	Aug. 7,		" "	247	17	264	352
18	Queen of the Roses	" "	July 14,		" 26,	163	22	185	246⅔
19	Rural Blush	" "	" 19,		" "	202	11	213	284
20	Garfield	" "	" 16,		" "	201	18½	219½	292⅔
21	Improved White Rose	" "	" 21,		" "	131½	16	145½	194
22	White Star	" "	Aug. 1,		" "	146	9	155	206⅔
23	St. Patrick	" "	July 16,		" "	186	10	196	261⅓
24	Vermont Champion	" "	Aug. 3,		" 28,	157½	22	179½	239⅓
25	Belle	" "	July 17,		" "	142½	17	159½	212⅔
26	Rochester Favorite	" "	Aug. 1,		" "	121½	9	130½	176
27	Perfect Peachblow	" "	July 20,		" "	139	19	158	210⅔
28	Charter Oak	" "	" 23,		" "	165	25	190	253⅓
29	Great Eastern	" "	Aug 6,		" "	190½	18	208½	278
30	Dictator	" "	" 8,		" "	150½	12½	163	217⅓
31	Empire State	" "	July 14,		" "	169½	16	175½	234
32	Burbank Sport	" "	" 17,		" "	154	8½	162½	216⅔
33	Dakota Red	" "	" 23,		" "	165	5	170	226⅔
34	Thorburn's Late Rose	" "	" 16,		" "	210½	9	219½	292⅔
35	Late Beauty of Hebron	" "	" 16,		" "	182	7	189	252
36	O. K. Mammoth Prolific	" "	Aug. 7,		" 29,	176½	20	196½	262
37	White Elephant	" "	July 23,		" "	195	12½	207½	276⅔
38	Red Elephant	" "	" 16,		" "	184	11½	195½	260⅔
39	Jumbo	" "	Aug. 6,		" "	152½	23	175½	234
40	White Seedling	" "	July 21,		" "	189½	12	201½	268⅔
41	Monroe County Prize	" "	" 23,		" "	201	6	205	272⅓
42	Rose's New Giant	" 26,	" 23,		" "	196½	7	203½	271⅓
43	Rose's Beauty of Beauties	" "	Aug. 1,		" "	127½	22	147½	196⅔
44	Early Goodrich	" "	July 20,		" "	167	7	174	232
45	Jackson White	" "	Aug. 1,		" "	202	8	210	280
46	Morning Star	" "	July 20,		" "	164	7	171	228
47	Delaware	" "	" 17,		" "	223	12	235	313⅓
48	*Stray Beauty	" "	–		" "	51	1	56	
49	*Bonanza	" "	July 25,		" "	19½	1	20½	
50	*New Wide Awake	" "	–		" "	10	1½	11½	
51	*Windsor's No. 1	" "	July 25,		" "	11	2	13	
52	*John Emerson's Seedling	June 6,	Aug. 1,		" "	4	½	4½	

*Of the Stray Beauty, only 35 hills were planted; of the Bonanza, 14 hills; of the new Wide Awake, 23 hills; of Windsor's No. 1, 16 hills; of John Emerson's Seedling, 5 hills.

OATS.

Report of Trials for 1887.

Each variety of oats was sown broadcast on a fortieth acre plot, two quarts of seed to each plot. The seed was sown May 17th, on much the same kind of soil, manured in the same way, as in the case of the potatoes. In the next table can be seen a record of the

(1) Date when the heads first began to show.

(2) Date of cutting, which indicates date of ripening.

(3) Yield of each variety per plot and per acre.

(4) Weight of a measured bushel of each variety. It is important to notice that a few varieties have a weight per bushel that marks them as being of superior quality. Some of these varieties having different names are undoubtedly the same.

No.	Oats—Name of Variety.	Heads began to show.	Date of cutting ripe.	Yield per plot.	Yield per acre.	Weight of a measured bushel.
				lbs.	bush.	lbs.
1	Triumph................	July 14	Aug. 17	24	32	18
2	Welcome................	" 11	" 8	36	48	33
3	White Probestier..........	" 12	" 15	46½	62	24
4	Mold's Ennobled..........	" 15	" 17	32½	43.3	21
5	Clydesdale..............	" 11	" 8	35½	47.3	34
6	Russian White............	" 18	" 20	41	54⅔	28
7	Surprise................	" 12	" 15	42½	56.6	24½
8	Hopetown	" 22	" 20	19	25⅓	18½
9	Henderson's Clydesdale ...	" 10	" 8	34½	46	33
10	New Raco Horse..........	" 11	" 10	35	46.6	34
11	White Belgian............	" 11	" 12	34¼	45.6	31½
12	Black Tartarian..........	" 13	" 17	37¾	50.3	26
13	White Schoener...........	" 13	" 15	38¼	51	25
14	White Australian.........	" 12	" 15	41	54.6	26
15	White Victoria...........	" 11	" 10	35	46.6	32½
16	Harris	" 2	" 1	31½	42	20
17	Hogan..................	" 11	" 10	34½	46	26
18	Challenge............ ...	" 12	" 10	28	37.3	29
19	Wide Awake.............	" 12	" 15	32	42.6	22
20	Japan	" 15	" 17	29¾	39.6	25½
21	White Centennial.........	" 20	" 20	17½	23.3	19
22	White Seizure............	" 11	" 8	22¾	30.3	33

TRIALS FOR 1888.

The trials for 1888 were made under the same conditions as those for 1387 except as to manuring which was 600 pounds of superphosphate per acre sown broadcast.

Number.	Oats—Variety.	Date of sowing.	Date at which heads commenced to show.	Date of harvesting.	Weight of grain in pounds and ounces.	Yield per acre in bushels	Weight of a measured bushel.
					lbs.		lbs.
1	Triumph	May 23	July 12	Sept. 6	22.00	29.3	28
2	Welcome	" "	" 16	Aug. 27	36.00	48.0	36
3	White Probestier	" "	" 19	" "	21.00	28.0	32
4	Mold's Ennobled	" "	" 23	Sept. 6	22.50	30.0	32
5	Clydesdale	" "	" 16	Aug. 27	19.00	25.3	34
6	Russian White	" "	" 17	Sept. 6	28.75	38.3	34.5
7	Surprise	" "	" 17	Aug. 28	59.50	79.3	33
8	Hopetown	" "	" 23	Sept. 6	37.00	49.3	33.5
9	Henderson's Clydesdale	" "	" 16	Aug. 23	44.50	59.3	38
10	New Race Horse	" "	" 16	" "	43.00	57.3	36.5
11	White Belgian	" "	" 17	" "	39.00	52.0	37
12	Black Tartarian	" "	" 19	Sept. 6	51.00	68.0	31
13	White Schoener	" "	" 19	" 3	51.75	69.0	32.5
14	WhiteAustralian	" "	" 19	" 3	39.50	52.6	32
15	White Victoria	" "	" 16	Aug. 23	30.75	41.0	37
16	Harris	" "	" 10	" "	30.50	40.6	25.5
17	Hogan	" "	" 17	" "	41.25	55.0	30
18	Challenge	" "	" 16	" "	40.00	53.3	35
19	Wideawake	" "	" 17	Sept. 3	53.50	71.3	31.5
20	Japan	" "	" 19	" 6	44.50	56.0	34
21	White Centennial	" "	" 25	" 13	20.00	26.6	28
22	Seizure	" "	" 16	Aug 25	43.75	58.3	36

The light weight and small yield of the Triumph, Harris, White, Centennial place them among the worthless varieties.

BARLEY.

Report of Trials for 1887.

The plots on which the barley was sown were of the same size, and were treated in the same way as the oat plots. The same observations were made, also in regard to the growth and yield.

No.	Barley. Name of Variety.	Heads began to show.	Date of Cutting Ripe.	Yield per Plot.	Yield per Acre.	Weight of a Measured Bushel.
				lbs.	bush.	lbs.
1	Imperial	July 4	Aug. 2	23	17.1	38
2	Menshury	" 4	" 2	20	16.7	36
3	Chevalier	" 12	" 10	23½	19.6	37
4	Nepaul	" 3	" 1	36	32.5	49
5	Melon Barley	" 12	" 10	22½	18.8	37
6	Purple Hulless	" 2	" 1	29¾	24.6	53
7	Champion Two-Rowed	" 5	" 8	41¾	34.8	43

Report of Trials for 1888.

The barley trials for 1888 were made under the same conditions as to size of plots, manuring, etc., as the oat trials for that year.

Number.	Barley—Variety.	Date of sowing.	Date at which heads commenced to show.	Date of harvesting.	Weight of grain in pounds.	Yield per acre in bushels by weight.	Weight per measured bushel.
1	Imperial	May 23	July 12	Aug. 25	25.00	20.8	36.0
2	Mensury	"	" 10	"	39.75	33.1	36.0
3	Chevalier	"	" 13	Sept. 3	60.50	50.4	39.0
4	Nepaul..................	"	" 13	Aug 28	38.00	31.2	49.0
5	Melon	"	" 17	Sept. 3	41.00	34.2	41.0
6	Purple Hulless.........	"	" 10	Aug. 28	28.00	25.0	53.5
7	Champion Two Rowed...	"	" 9	"	56.50	46.7	41.5

Attention is called to the fact that only two of the varieties of barley are up to the standard weight of 48 pounds per bushel.

PEAS.

Report of Trial for 1887.

The soil on which the peas were planted was similar to that used for the varieties of potatoes and grains and it was manured in the same way.

Each variety occupied a row forty feet long, the rows being three and one-half feet apart. The seed was sown so as to secure about the same number of plants in each row, consequently as the peas differed much in size the amount of seed used varied greatly with the different varieties. The length of time required to produce marketable peas, productiveness and quality are the main considerations in studying varieties of peas. It was not possible to test the quality for table use of all of these varieties, but information on the other two points is obtained by noticing the

(1) Date of first blossoms and at which some pods were ready for the market, and

(2) The weight of dry peas produced. (The dry peas were weighed in March, 1888). The color, size and shape of the different peas are in general a fairly good test of quality, the small, smooth, white varieties being as a rule, least palatable, and the large, wrinkled, green varieties, most so.

No.	Peas—Name of Variety.	Date of planting.	First blossoms seen.	Some Peas large enough for market.	Vines pulled ripe.	Yield of dry Peas.	Description.
						lbs. oz.	
1	King of the Dwarfs	May 19	June 24	July 11	August 1	4-5	Medium, green, wrinkled.
2	Wm. Hurst	"	" 30	" 18	" 10	2-14	Small, white, nearly smooth.
3	American Wonder	"	" 24	" 8	" 1	3 15	Medium, green, wrinkled.
4	Earliest of All	"	" 22	" 7	" 1	4-13	Small, green, nearly smooth.
5	Minimum	"	" 25	" 9	" 1	2 2	Small, white, wrinkled
6	Improved Tom Thumb	"	" 24	" 8	" 1	3-8	Medium, white, nearly smooth.
7	McLean's Little Gem	"	" 27	" 11	" 8	4-12	Medium, green, wrinkled.
8	McLean's Blue Peter	"	" 25	" 9	" 1	3-7	Medium, green, nearly smooth.
9	Henderson's First of All	"	" 24	" 8	" 1	4 4	Small, white, smooth.
10	Dominion	"	" 24	" 8	" 1	4-4	Small, green, nearly smooth.
11	Day's Early Sunrise	"	" 28	" 18	" 16	5-11	Large, white, wrinkled.
12	Laxton's Prolific Long Pod	"	July 14	" 20	" 16	6-2	
13	Alaska	"	June 21	" 7	" 1	3-10	Small, green, smooth.
14	Delicious	"	July 4	" 26	" 20	3-4	Large, green, wrinkled
15	Bliss' Abundance	"	June 30	" 19	" 16	5-0	Large, green, wrinkled.
16	Bliss' Ever-Bearing	"	July 5	" 21	" 19	4-12	Large, green, wrinkled.
17	Horsford's Market Garden	"	June 30	" 19	" 19	4 0	Medium, green, wrinkled.
18	Dwarf Champion	"	July 5	" 23	" 19	5-2	Large, green, wrinkled.
19	Maud S	"	June 24	" 8	" 1	3-8	Small, white, smooth.
20	John Bull	"	July 5	" 23	" 29	4-0	Large, green, wrinkled.
21	Carter's Pride of the Market	"	" 6	" 22	" 20	4-5	Large, green, some wrinkled.
22	Hancock	"	June 24	" 8	" 1	3 6	Small, white, smooth.
23	Fill Basket	"	July 5	" 21	" 16	7-1	Medium, green, somewhat wrinkled.
24	Kentish Invicta	"	June 24	" 8	" 1	3-4	Small, green, nearly smooth.
25	Laxton's Alpha	"	" 24	" 11	" 8	2-4	Small, green, wrinkled.
26	McLean's Advancer	"	" 27	" 13	" 8	3-10	Medium, green, wrinkled.
27	Hair's Dwarf Mammoth	"	July 6	" 23	" 29	3-14	Large, green, wrinkled
28	Brown's Dwarf Marrowfat	"	" 4	" 20	" 20	5–	Medium, white, smooth.
29	Yorkshire Hero	"	June 28	" 20	" 19	3-18	Large, green, wrinkled.
30	Carter's Stratagem	"	July 6	" 22	" 20	4-11	Large, green, wrinkled.

31	Eugenie	"	June 28	" 20	" 19	4-10	Large, white, wrinkled.
32	Prince of Wales	"	July 4	" 21	" 19	4-15	Large, white, wrinkled.
33	Walker's Perpetual-Bearing	"	" 13	Aug. 1	Sept. 10	2-8	Large, white, wrinkled.
34	Tall Butter Sugar	"	" 1	July 19	Aug. 29	3 0	Medium, white, smooth.
35	Telegraph	"	" 4	" 20	" 16	5-0	Large, green, somewhat wrinkled.
36	Laxton's Superlative	"	" 5	" 22	" 16	6-12	Medium, green, somewhat wrinkled.
37	Dwarf Sugar	"	June 30	" 18	" 8	4 8	Very small, white, smooth.
38	Champion of England	"	July 6	" 26	" 19	5 0	Large, green, wrinkled.
39	Black-Eyed Marrowfat	"	" 11	" 26	" 20	7-15	Large, white, smooth.
40	Large White Marrowfat	"	" 11	" 26	" 29	7-6	Large, white, smooth.
41	Telephone	"	" 5	" 20	" 29	4-15	Large, green, wrinkled.
42	Blue Imperial	"	" 6	" 25	" 29	7-1	Large, green, slightly wrinkled.
43	Forty-Fold	"	" 4	" 20	" 29	5-9	Large, green, wrinkled.
44	Vetches Perfection	"	" 6	" 23	" 29	5 2	Large, green, wrinkled.
45	Laxton's Marvel	"	" 7	" 26	" 29	5 9	Large, white, wrinkled.
46	British Queen	"	" 12	Aug. 1	Sept. 10	3-10	Large, white, wrinkled.
47	Bishop's Dwarf	"	" 6	July 23	Aug. 20	7-5	Small, white, smooth.
48	Bishop's Long Pod	"	" 6	" 22	" 20	7 0	Large, white, smooth.
49	French Canner	"	June 30	" 20	" 16	7-10	Small, white, smooth.
50	Early Frame	"	" 24	" 8	" 1	4 0	Small, white, smooth

Report of Trials for 1888.

The soil on which the peas were planted in 1888 was similar to that on which they were grown the year before. The manuring was like that for the potatoes, oats and barley for the same year.

The peas were planted in rows three feet apart and forty feet long. Each variety occupied a single row.

Number.	Peas Variety.	Date of Planting.	Date of Blossoming.	Date at which Peas were ready for market	Date of harvesting.	Weight of Dry Shelled Peas.	Description.
						lbs oz	
1	King of the Dwarfs	May 24	June 27	July 19	Sept. 6	3- 9	Medium, green, wrinkled
2	William Hurst.	"	July 4	" 25	"	3 14	Small, white, nearly smooth.
3	American Wonder	"	June 27	" 16	Aug. 29	3 0	Medium, green, wrinkled
4	Earliest of All	"	June 26	July 14	"	5-11	Small, green, nearly smooth
5	Minimum	"	"	"	"	3- 0	Small, white, wrinkled
6	Improved Tom Thumb	"	"	"	"	3-10	Medium, white, nearly smooth.
7	McLean's Little Gem	"	"	"	"	5- 1	Medium, green, wrinkled.
8	McLean's Blue Peter	"	"	July 13	Aug. 20	3- 3	Medium, green, nearly smooth
9	Henderson's First of All	"	"	"	"	3-12	Small, white, smooth.
10	Dominion	"	"	"	Aug 29	4-11	Small, green, nearly smooth.
11	Day's Early Sunrise	"	July 2	July 21	Sept. 6	5-12	Large, white, smooth.
12	Laxton's Prolific Long Pod	"	" 7	" 30	"	6- 8	— — — —
13	Alaska	"	June 25	" 11	Aug. 20	3-13	Small, green, smooth
14	Delicious	"	July 10	Aug. 1	Sept. 14	5- 0	Large, green, wrinkled
15	Bliss' Abundance	"	" 5	July 25	"	4- 8	" "
16	Bliss' Ever Bearing	"	" 13	Aug. 1	"	4-12	" "
17	Horsford's Market Garden	"	" 5	July 27	Sept. 6	5- 6	Medium, green, wrinkled.
18	Dwarf Champion	"	" 13	Aug. 1	" 14	4- 7	Large, green, wrinkled
19	Maud S.	"	June 26	July 13	Aug. 20	2-12	Small, white, smooth.
20	John Bull	"	July 13	Aug. 1	Sept. 14	3-14	Large, green, wrinkled.
21	Carter's Pride of the Market	"	"	"	"	2-12	Large, green, some wrinkled.
22	Hancock	"	June 26	July 13	Aug. 20	2-13	Small, white, smooth.
23	Fill Basket	"	July 12	Aug 1	Sept. 6	5 11	Medium, green, some wrinkled.
24	Kentish Invicta	"	June 26	July 13	Aug. 29	4- 4	Small, green, nearly smooth.
25	Luxton's Alpha	"	"	" 16	"	3- 3	Small, green, wrinkled
26	McLean's Advance	"	July 3	" 21	"	4- 2	Medium, green, wrinkled.
27	Hair's Dwarf Mammoth	"	" 9	" 30	Sept. 14	3 12	Large, green, wrinkled.
28	Brown's Dwarf Marrowfat	"	" 9	" 30	"	4 12	Medium, white, smooth.
29	Yorkshire Hero	"	" 10	" 31	"	2-14	Large, green, wrinkled

Number.	Peas. Variety.	Date of Planting.	Date of Blossoming.	Date at which Peas were ready for market.	Date of harvesting.	Weight of Dry Shelled Peas.	Description
						lbs oz	
30	Carter's Strategem	May 24	July 12	Aug 1	Sept. 14	3– 3	Large, green, wrinkled.
31	Eugenie	"	June 30	July 21	"	4 12	" "
32	Prince of Wales	"	July 9	" 30	Sept. 6	5-10	Large, white, wrinkled.
33	Walker's Perpetual Bearing	"	" 20	Aug. 14	" 21	3 1	" "
34	Tall Butter Sugar	"	" 4	July 25	" 14	3 10	Medium, white, smooth.
35	Telegraph	"	" 9	" 30	" 14	4- 2	Large, green, some wrinkled
36	Laxton's Superlative	"	" 10	" 31	" 6	6-12	Medium, green, some wrinkled.
37	Dwarf Sugar	"	" 2	" 21	" 6	5- 3	Very small, white, smooth
38	Champion	"	" 13	Aug. 1	" 14	4 10	Large, green, wrinkled.
39	Black Eyed Marrowfat	"	" 16	" 3	" 14	5-13	Large, white, smooth.
40	Large Marrowfat	"	" 16	" 3	" 4	5 6	" "
41	Telephone	"	" 13	" 1	" 14	3– 7	Large, green, wrinkled.
42	Blue Imperial	"	" 9	July 30	" 14	4 11	Large, green, slightly wrinkled
43	Forty fold	"	" 9	"	" 14	6 1	Large, green, wrinkled.
44	Vetches' Perfection	"	" 12	Aug. 1	" 14	3 13	" "
45	Laxton's Marvel	"	" 13	"	" 14	4 1	Large, white, wrinkled.
46	British Queen	"	" 19	Aug. 6	" 24	5- 0	" "
47	Bishop's Dwarf	"	" 12	" 1	" 14	4 15	Small, white, smooth.
48	Bishop's Long Pod	"	" 12	" 1	" 6	5 7	Large, white, smooth.
49	French Canner	"	" 13	" 1	" 6	6 0	Small, white, smooth.
50	Early Frame	"	June 26	July 13	Aug. 20	3 8	" "
51	*Prize Taker	"	July 13	Aug. 2	Sept 14	5-10	Large, green, somewhat wrinkled.
52	*Rural New Yorker	"	June 26	July 13	Aug 29	3- 2	Small, white, smooth.
53	*Emerald Gem	"	July 4	" 21	Sept 24	0 12	Small, green, wrinkled

*Numbers 51, 52 and 53 were from the U. S Department of Agriculture. Only a portion of 53 germinated.

REPORT OF BOTANIST AND ENTOMOLOGIST.

Prof. F. L. Harvey.

GERMINATION EXPERIMENTS.

It is well known that seeds often fail to germinate, causing great loss to the planter. To what extent poor seed is offered for sale in this state is not known. Farmers do not usually take the trouble to sprout seed before planting. The germinating power of seed cannot readily be told by its appearance, and there is opportunity for dishonest dealers to mix old seed with fresh, and sell an inferior quality, without danger of being detected. Reliable dealers may sell a poor quality of seed without knowing it. If the quality of seed offered for sale in our markets could be improved, it would be a great saving to farmers. Published accounts of the germinating power of seeds offered for sale by seedsmen will make them more careful of the quality of seed sold, and also help protect reliable dealers from disreputable ones.

Failure to germinate may be due to imperfections in the seed, or result from improper management of it by the planter.

Seed, to be reliable, should be mature and plump when gathered; properly dried and kept from changing conditions of heat, cold and moisture until planted; should not be too old; true to name; entirely free from insect depredations and the seeds of noxious weeds. When possible, select seed from the same or from a more northern latitude. Lightness in weight indicates immaturity or weakness. Low germinating power may be due to immaturity or weakness, improper care of seed after it is gathered, or to great age. Insect depredations and the presence of foreign seeds can usually be detected by a pocket lens. To determine whether a seed is true to name it has to be grown, or, more quickly, it may be compared with a correctly named sample.

To properly germinate, seeds require heat, moisture and free access of air. The relative amount differs with different seeds.

Proper time, depth and method of planting; and the conditions of soil as regards heat, moisture and porosity, are almost as important to the planter as good seed.

Seeds with a small chit or embryo start slowly and suffer more from vicissitudes than those with a large, strong embryo. In general, small seeds demand shallow planting and larger ones more depth of soil. Nothing is gained by planting before the soil is warm enough or properly drained, but the seed is frequently lost. Seeds buried in a cold, moist soil any length of time are liable to rot. The soil should be dry enough to work, porous, allowing access of air to the seed. Seeds planted early should be more lightly covered, so as to secure necessary warmth.

So complex and variable are the conditions due to the season, soil and seed, that no invariable rules for planting can be formulated. The planter has largely to rely upon his experience and judgment, even when his seed is first class.

To remove or lessen one cause of failure would require more careful farming. The other cause of failure can be lessened by a careful, systematic inspection of seeds. To determine to what extent the failure of seeds to germinate is due to inferior quality, the station will conduct germination tests from year to year; and, as was indicated in bulletin No. 24, May, 1888, inspect seeds sent by the farmers of the state as to their purity and germinating power.

For the germination tests conducted this season, there were selected for examination and comparison, seeds offered for sale by wholesale dealers in the state; those kept at stores to be sold on commission; those obtained direct from wholesale houses outside the state, and those distributed by the Department of Agriculture.

The material for this season's work was obtained from the following sources: Edwin Chick & Co., Bangor, Me., direct; R. B. Dunning & Co., Bangor, Me., direct; Kendall & Whitney, Portland, Me., direct; B. Walker McKeen, Fryeburg, Me., direct; E. W. Burbank, Fryeburg, Me., direct; Thos. W. Emerson & Co., Boston, Mass., Dunning, Bangor; D. M. Ferry & Co., Detroit, Mich., direct; David Landreth & Sons, Philadelphia, Pa., direct; James M. Thorburg & Co., New York, N. Y., direct; Iowa Seed Co., Des Moines, Iowa, Department of Agriculture; Department of Agriculture, Washington, D. C., direct.

GERMINATORS.

The germinator used was a galvanized tray eight inches deep covered with a dome shaped lid. On the inside of the tray, on two sides, and one inch from the top, were soldered waving shelves, in the groves of which rods to support pockets or folds of canton flannel cloth were placed.

Near the top of the tray, above the shelves, was a row of one-half inch holes for admitting fresh air. Water to the depth of two inches was placed in the tray. The pockets were provided with two free ends of cloth which extended below into the water, carrying moisture to the seed by capillary attraction. The pockets were three inches deep and two inches from the water. The greater depth of water in the tray, than is commonly used, secured a more uniform temperature. Very small seeds were germinated in porous flower pot saucers, set in water in the bottom of the tray, deep enough to keep them moist. To sterilize the trays and pockets they were scalded after each experiment. *The above apparatus was satisfactory.*

In all the tests *one hundred* seeds were used. They were counted and weighed, and then put into the pockets without being soaked and spread so as not to touch each other. They were examined daily and those sprouted were removed, counted and recorded. The experiments were continued two weeks, if any sound seeds remained that length of time unsprouted, and then the sound seeds left were counted.

The following tables are a record of the results of experiments conducted the past season. Seeds of the same kind are grouped together for the purposes of comparison.

It is well known that with the uniform conditions maintained in germination tests that usually a larger per cent of seeds will sprout than would vegetate under the variable conditions of out door planting. Yet it does not follow that the testing of seeds is useless.

Seed showing a high germination per cent would almost invariably be reliable for planting, while those that do not start with favorable conditions would be worthless.

RESULTS OF GERMINATION TESTS—GARDEN SEEDS.

Serial number.	Station number.	Description.	Weight of 100 seeds in grams.	Per cent. of impurities by weight.	No. of seeds sprouted each day. 1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	Sound seeds left	Per cent. sprouted.	No. of days required for one-half to sprout.
		LETTUCE.																			
1	1	Early White Cabbage, Chick	.141	1	–	–	99	–	–	–	–	–	–	–	–	–	–	–	–	99	3
2	14	Boston Curled, Dunning	.087	1	–	–	64	–	10	2	–	1	–	–	–	–	–	–	22	77	3
3	38	" " Emerson..................	.096	–	–	–	–	10	–	–	–	–	–	–	–	–	–	–	90	10	
4	47	Ferry's Early Prize, Ferry	.137	–	–	–	95	–	–	1	–	1	–	1	–	–	–	.	–	98	3
5	163	White Chavigne, Dep't Agriculture	.120	–	–	33	34	14	5	–	–	–	–	–	–	–	–	–	–	86	3
6	164	White Paragon, " "	.146	–	68	25	–	1	–	–	–	–	–	–	–	–	–	–	–	94	1
		TURNIP																			
7	2	Skirving's Ruta Baga, Chick	.242	–	–	–	51	5	7	3	5	4	–	1	–	–	–	–	9	76	3
8	17	Ruta Baga, Dunning......................	.329	–	–	–	–	5	6	5	5	2	3	1	1	1	–	–	45	29	
9	37	" " Emerson.....................	.256	–	–	–	94	0	3	–	–	–	–	–	–	–	–	–	3	97	3
10	46	" " Ferry.........................	.275	–	–		56	4	3	4	2	–	–	–	–	–	1	1	22	71	3
		CABBAGE.																			
11	3	Fottler's Improved Brunswick, Chick	.331	–	–	–	60	–	3	2	3	1	–	–	–	–	–	–	6	69	3
12	16	Drumhead, Dunning...	.326	–	–	–	75	5	3	–	2	1	–	–	–	–	–	2	6	88	3
13	36	Fottler's Improved Brunswick, Emerson. ..	.331	–	–	–	83	–	4	–	–	3	1	–	–	–	–	1	3	92	3
14	42	Large Drumhead, Ferry	.346	–	–	–	66	3	2	1	–	–	–	–	–	–	1	–	2	73	3
15	155	Extra Early Pointed Market, Dep't Agr.....	.387	–	–	42	29	2	3	1	–	–	1	–	–	–	1	–	20	79	3
16	156	Buncome, Dep't Agr...	.325	–	20	54	8	3	–	–	–	–	–	–	–	–	1	–	3	86	2
17	157	Berkshire Beauty, Dep't Agr..............	.435	–	–	56	26	7	3	2	–	–	1	–	–	–	–	–	1	95	2
18	158	Stone Mason, Dep't Agr..................	.320	–	–	16	9	2	16	7	4	1	2	–	–	–	–	1	38	61	6

		Parsnip.																			
19	4	Long Smooth, Chick	.438	1	–	–	–	10	–	23	3	–	5	–	3	–	–	–	50	44	
20	18	Long Dutch, Dunning	.421	–	–	–	–	–	1	3	5	3	4	7	4	3	4	–	58	34	
21	39	Hollow Crown, Emerson	.476	–	–	–	–	–	7	10	7	6	8	4	4	–	1	2	41	49	
22	45	Long White Dutch, Ferry	.400	–	–	–	–	–	7	10	14	26	5	3	3	2	–	1	26	70	8
		Celery.																			
23	5	Boston Market, Chick	.015	–	–	–	–	–	–	–	3	3	–	4	4	5	6	2	70	27	
24	19	" " Dunning	.017	–	–	–	–	–	–	3	4	6	–	21	7	10	8	3	36	62	12
25	44	" " Ferry	.042	–	–	–	–	–	–	4	6	10	13	7	5	–	2	1	47	48	
		Onion																			
26	6	Yellow Danvers, Chick	.390	–	–	48	19	3	2	1	1	–	–	–	–	–	–	–	20	74	
27	12	" " Dunning	.370	–	–	20	27	9	3	1	–	2	–	–	–	–	–	–	25	62	4
28	35	" " Emerson	.344	–	–	33	37	17	3	3	2	–	–	–	–	–	–	–	–	95	3
29	43	" " Ferry	.412	–	–	17	30	8	4	3	1	3	1	–	–	–	–	–	25	67	4
		Beet																			
30	7	Dewing's Early Turnip, Chick	1.937	–	–	3	32	14	2	2	2	3	2	–	1	1	1	–	35	63	5
31	13	" " " Dunning	1.633	–	–	–	–	1	3	2	4	1	3	2	1	1	–	–	82	18	
32	34	" " " Emerson	2.230	–	–	7	38	18	5	4	2	2	1	–	–	–	–	–	20	77	4
33	40	Early Blood " Ferry	2.022	–	–	1	41	24	3	3	2	2	–	–	–	–	–	–	22	76	4
34	149	New Market Gardner's, Iowa Seed Co.	2.468	–	–	1	12	22	18	–	–	–	–	–	–	–	–	–	40	60	5
35	150	Osborn's Selected, Dep't Agr	1.560	–	–	3	52	16	12	2	–	1	–	–	–	–	1	–	13	87	3
36	151	Eclipse, Dep't Agr	1.282	–	–	2	11	22	9	5	2	3	1	2	1	1	–	–	41	59	7
37	145	Lane's Imperial Sugar, Dep't Agr	2.226	–	–	–	–	14	18	5	4	1	2	–	1	–	1	–	54	46	
38	146	Improved Imperial Sugar, Dep't Agr	2.618	–	–	–	26	19	12	4	5	–	–	1	1	1	1	–	30	70	5
39	147	Villimorin's Sugar, Dep't Agr	2.430	–	–	–	45	34	14	–	–	–	–	1	–	–	–	–	6	94	
40	148	Excelsior " " "	2.093	–	–	–	2	14	15	6	3	1	–	–	–	–	–	–	59	41	4
		Carrot																			
41	15	Long Orange, Dunning	.125	2	–	–	4	7	17	19	1	2	–	1	–	–	–	–	23	51	8
42	33	Prize Long Orange, Emerson	.153	–	–	–	3	28	14	2	1	–	–	–	–	–	–	–	50	48	
43	41	Improved Long Orange, Ferry	.110	–	–	–	14	16	13	6	1	5	1	2	1	1	–	–	25	60	7
		Tomato																			
44	159	Reed's Island Beauty, Dep't Agr	.310	–	–	2	52	27	9	1	–	–	–	1	–	–	–	1	1	93	3
45	160	Beauty, Dep't Agr	.320	–	2	26	50	9	2	–	–	2	–	–	–	–	–	–	4	91	3
46	161	Early Advance, Dep't Agr	.278	–	–	1	–	3	6	3	4	1	1	–	1	–	–	–	80	20	

RESULTS OF GERMINATION TESTS—GARDEN SEEDS.—(CONTINUED).

Serial number.	Station number.	Description.	Weight of 100 seeds in grains	Per cent of impurities by weight.	No. of seeds sprouted each day. 1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	Sound seeds left.	Per cent. sprouted.	No. of days required for one-half to sprout.
		TOMATO.																			
47	162	Boston Market, Dep't Agr.	.280	-	-	-	2	5	7	3	5	-	3	1	2	-	-	-	72	28	
		SWEET CORN.																			
48	48	Common, B. W. McKeen	18.920	-	-	-	10	42	20	17	1	-	-	-	-	-	-	-	-	90	4
49	152	Perry's Hybird, Dep't Agr.	24.20[illegible]	-	-	-	4	25	28	23	2	1	-	-	-		-	-	-	83	5
50	153	Breck's Perrennial, Dep't Agr.	23.578	-		-	11	27	25	10	2	6	1	-	-	-		-	-	82	5
51	154	Burbank's Improved, E. W. Burbank	28.084	-	-	-	0	11	30	42	12	3	-	-	-	-	1	-	-	99	6
		LEGUMES—CLOVER.																			
52	8	Common Red, *Trifolium pratense*, Chick	.164	-	-	-	9[illegible]	-	-	-	-	-	-	-	-	1	-	-	7	93	3
53	25	Pea Vine, " Dunning	.154	-	-	-	97	-	-	-	-	-	-	-	-	-	-	-	2	97	3
54	27	Primo Medum, " "	.166	-	-	-	9[illegible]	-	-	-	-	-	-	-	-	-	-		3	96	3
55	88	Common Red, " Thorburn	.148	-	70	13	3	-	-	-	-	-	1	-	-	-	-	-	11	87	1
56	91	Pea Vine, " "	.160	-	48	39	3	1	-	-	-	-	-	-	-	-	-	-	5	91	2
57	113	" " Kend & Whit.	.160	-	53	36	4	1	-	-	-	-	-	-	-	-	-	-	-	94	1
58	114	North New York, " "	.160	-	64	27	1	-	-		-	-	-	-	-	-	-	-	3	92	1
59	115	Michigan, " "	.157	-	27	52	2	-	-	.	-	-	-	-	-	-	-	-		81	2
60	11	Alsike, *Trifolium pratense, hybridum*, Chick	.060	-	2	39	2[illegible]	12	2	2	-	-	2	-	2	-	1	-	4	88	3
61	24	" " " Dunning	.065	-	1	11	10	8	10	14	6	5	3	1	3	-	-	-	8	72	6
62	86	" " " Thorburn	.066	.	57	11	-	-	1	-	-	-		-		-	-	-	31	69	1
63	116	" " " Kend & Whit.	.068	-	22	30	4	5	5	1	-	-	-	-	1	-	1	-	23	69	2
64	125	" " " Landreth	.070	-	36	26	6	7	2	1	-	-	-	-	-	5	-	-	15	78	2

65	10	White, *Trifolium pratense, repens,* Chick..	.057	-	-	3	15	26	7	15	7	2	3	-	-	-	-	-	18	78	4
66	26	" " " Dunning....	.054	-	-	-	85	-	1	-	1	-	-	-	-	-	-	-	8	87	3
67	92	" " " Thorburn...	.060	-	55	27	3	-	-	-	-	-	-	-	-	-	-	-	13	85	1
68	117	" " " K. & W	.065	-	27	48	4	2	1	1	-	-	-	-	-	-	-	-	13	83	2
69	97	Incarnate, " *incarnatum,* Thorburn...	.368	-	95	5	-	-	-	-	-	-	-	-	-	-	-	-		100	1
		LEGUMES.																			
70	95	Yellow Trefoil, Thorburn.	.175	-	41	40	3	-	1	-	-	-	-	-	-	-	-	-	-	85	2
71	124	" Landreth..	.173	-	12	59	7	5	-	-	-	-	-	-	-	-	-	-	-	83	2
72	94	Alfalfa or Lucerne, *Medicago sativa,* Thorburn..	.220	-	21	34	6	1	-	-	-	-	1	-	-	1	1	-	36	65	2
73	118	" " Landreth..	.226	-	40	49	2	1	-	-	-	1	-	-	-	-	-	-	3	93	2
74	87	Bokhara or S Clover, *Melilotus alba,* Thorburn.	.056	-	33	6	2	27	-	-	-	-	-	-	-	1	-	-	25	69	4
75	89	Bush Clover, *Lespedeza striata,* Thorburn.....	.103	-	-	3	8	35	20	5	-	1	-	-	1	-	-	-	20	73	5
76	85	Furze, *Ulex Europeaeus,* Thorburn...	.668	-	92	1	-	0	-	-	-	-	-	-	-	-	-	-	2	93	1
77	90	Cow Peas, *Dolichos sinensis,* Thorburn	19.890	-	-	12	30	45	9	4	-	-	-	-	-	-	-	-	-	100	4
78	94	Sainfoin, *Onobrychis sativa,* Thorburn	1.963	-	-	0	7	15	4	11	12	8	7	3	2	1	-	-	6	70	7
79	119	" " Landreth........	2.064	-	-	0	2	10	14	7	14	6	3	5	-	2	1	-	19	64	8
		MISCELLANEOUS.																			
80	82	*Madia sativa,* Thorburn	.732	-	1	88	7	-	-	-	-	-	-	-	-	-	-	-	-	97	1
81	96	Spurrey, *Spergula arvensis,* Thorburn........	.091	-	-	26	9	8	5	1	2	2	1	-	2	-	1	-	24	57	7
		GRASSES—MILLET																			
82	22	Golden, *Panicum miliaceum,* Dunning........	.010	-	-	-	85	-	1	-	-	-	-	-	-	-	-	-	2	87	
83	110	" " Kend. & Whit ..	.232	-	4	54	30	3	-	-	-	-		-	-	-	-	-	8	91	3
84	122	Southern, Landreth	.190	-	4	86	2	-	-	-	-	-	-		-	-	-	-	-	92	2
85	81	Pearl, Thorburn.......	.560	-	10	50	3	-	2	-	-	-	-	-	-	-	-	-	14	65	2
86	21	Hungarian, *Panicum Germanicum,* Dunning ..	.223	-	-	-	78	-	2	1	1	-	1	-	-	-	-	-	5	82	2
87	84	" " Thorburn ..	.184	-	-	20	6	-	-	1	-	-	-	-	-	-	-	-	50	27	3
88	112	" " K. & W	.181	-	3	53	6	4	-	-	-	1	1	-	-	-	-	-	22	68	2
89	126	" " Landreth...	.212	-	-	64	2	2	-	-	-	-		-	-	-	-	-	13	68	2
		GRASSES.																			
90	9	Timothy, *Phleum Pratense,* Chick	.040	-	-	-	30	50	2	-	-	-	-	-	-	-	-	-	10	88	4
91	20	" " Dunning.........	.040	-	-	-	8	24	9	-	-	-	-	1	-	1	-	-	5	95	5
92	66	" " Thorburn	.040	-	-	-	25	51	3	-	-	-	-	-	-	-	-	-	10	91	4
93	111	" " Kend & Whit....	.034	.	-	-	0	7			-	-	-	-	-	-	-	-	2	96	6
94	23	Fancy Red Top, Dunning	.010	-	-	-	10		1	3	-	3	-	1	-	-	-	-	20	80	4
95	109	Fancy Red Top, Kend. & Whit ...	.009	-	-	-	2	10	14	7	14	6	3	5	-	2	1	-	19	64	8

RESULTS OF GERMINATION TESTS—GARDEN SEEDS.—(CONCLUDED).

Serial number.	Station number	Description.	Weight of 100 seeds in grams.	Per cent. of impurities by weight	Number of seeds sprouted each day.														Sound seeds left.	Per cent. sprouted.	No. of days required for one-half to sprout.
					1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th			
		GRASSES.																			
96	22	Red Top, *Agrostis vulgaris*, Dunning	.008	84	-	-	1	7	6	4		1	1	-	-	-	-	-	80	20	
97	57	" " " Thorburn	.010	-	-	-	-	2	12	5	4	1	-	-	1	-	-	-	75	25	
98	31	Rhode Island Bent, *Agrostis canina*, Dunning.	.009	-	-	-	23	37	7	10	2	1	-	1	-		-	-	19	81	4
99	49	" " " " Thorburn	.006	77	-	-	-	4	12	18	7	8	1	-	1	1	-	-	48	52	9
100	102	" " " " K & W..	.009	3	-	-	-	-	4	10	16	9	4	-	2	2	-	-	50	47	
101	52	Creeping Bent, *Agrostis stolenifera*, Thorburn .	.006	-	-	-	-	4	12	18	7	8	1	-	1	1	-	-	48	52	9
102	30	Fowl Meadow, *Poa serotina*. Dunning	.010	70	-	-	-	-	4	5	1	-	2	-	-	-	-	-	88	12	
103	77	" " " Thorburn	.010	50	-	-	-	-	-	1	-	-	1	1	-	-	-	-	97	3	
104	104	" " " Kend. & Whit. ..	.014	90	-	-	-	-	-	2	9	11	2	2	9	12	2	1	50	50	14
105	129	" " " Ferry	-	90	-	-	-	-	-	1	2	1	1	2	9	13	2	1	68	32	
106	28	Kentucky Blue, *Poa pratensis*, Dunning.. ...	.018	-	-	-	-	-	-	-	1	-	-	3	1	-	-	-	95	5	
107	68	" " " Thorburn.....	.023	-	-	-	-	-	-	-	-	1	-	5	1	2	2	1	88	12	
108	100	" " " Kend & Whit	.021	1	-	-	-	-		-	1	2	5	1	4	2	2	-	83	17	
109	70	Wood Meadow, *Poa nemoralis*, Thorburn	020	-	-	-	-	1	-	1	2	3	4	1	2	1	0	-	85	15	
110	128	" " " Ferry	.018	-	-	-	-	-	-	-	1	1	2	1	3	3	2	1	86	14	
111	63	Water Meadow, *Poa aquatica*, Thorburn	.024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100		
112	71	Rough Stalked Meadow, *Poa trivialis*, "	.019	10	-	-	-	3	1	1	1	-	-	1	4	1	1	-	87	13	
113	75	Canada Blue, *Poa compressa*, "	.020	-	-	-	-	-	-	1	-	4	1	4	-	-	1	-	89	12	
114	29	Orchard, *Dactylis Glomerata*, Dunning.	.059	-	-	-	-	-	-	1	-	4	1	4	-	-	1	-	89	12	
115	69	" " " Thorburn	.066	-	-	-	-	-	7	-	9	5	2	6	4	-	3	2	60	38	
116	98	" " " Kend. & Whit..	.075	-	-	-	-	2	24	10	5	5	6	-	2	-	1	2	40	57	9
117	61	Fall Meadow Oat, *Avena elatior*, Thorburn..	.292	-	-	-	-	-	15	3	13	5	8	2	-	-	2	2	50	50	14
118	99	" " " " Kend & Whit.	.175	-	-		2	6	33	4	1	1	-	-	1	-	-	-	50	48	

119	127	" " " " Ferry.......	.222	-	-	-	9	35	8	6	-	-	-	-	1	-	1	-	40	60	5
120	64	S. Vernal, *Anthoxanthum adoratum*, Thorburn	.054	-	-	-	-	-	5	4	-	1	1	1	-	1	1	-	80	14	
121	103	" " " K. & W..	.058	-	-	-	-	2	4	6	2	-	1	-	1	2	1	-	80	19	
122	123	" " " Landreth.	.044	-	-	-	-	3	6	2	2	1	-	-	1	-	-	-	85	15	
123	54	Meadow Fescue, *Festuca pratensis*, Thorburn.	.141	-	-	-	-	-	3	4	-	3	-	-	1	1	-	1	87	13	
124	105	" " " K. & W..	.082	-	-	-	-	-	1	2	1	-	-	.	-	2	-	-	90	6	
125	130	" " " Ferry....	.151	1	-	-	-	16	34	12	3	3	3	2	-	-	-	-	20	73	5
126	57	Tall Fescue, *Festuca elatior*, Thorburn.... ...	.099	-	-	-	-	2	12	5	4	1	-	-	1	-	-	-	75	25	
127	107	" " Kend. & Whit...	.174	-	-	-	-	2	7	4	4	-	2	-	-	-	4	2	75	25	
128	55	Various-leaved Fescue, *Festuca heterophylla*, Thorburn	.095	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	97	3	
129	56	Sheep's Fescue, *Festuca ovina*, "	.045	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	97	3	
130	58	Slender Fescue, *Festuca tenuifolia*, "	.022	-	-	-	-	-	9	8	3	2	1	1	1	2	1	2	70	30	
131	74	Hard Fescue, *Festuca duriuscula*, "	.055	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	90	3	
132	60	Italian Rye, *Solium Italicum*, Thorburn.....	.225	-	-	-	52	14	3	22	4	-	-		1	-	-	-	2	96	3
133	120	" " Landreth... ..	.144	-	-	-	5	10	8	4	3	2	-	3	-	-	-	-	65	35	
134	73	Perennial Rye, *Solium perenne*, Thorburn ...	.170	-	-	-	-	12	20	3	3	1	4	-	2	-	-		55	45	
135	106	" " Kend. & Whit.	.165	.	-	-	-	17	9	7	-	1	1	1	-	-	-	-	57	36	
136	121	" " Landreth.....	.202	-	-	-	30	32	11	3	6	-	-	-	1	-	-	-	10	84	4
137	72	Johnson, *Sorghum halapense*, Thorburn.......	.408	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	98	2	6
138	131	" " Ferry..........	.242		-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-
139	108	Lawn (mixture), Kend & Whit.	022	2	-	-	-	2	20	53	8	1	-	-	-	-	-	-	15	84	6
140	50	Slender Foxtail, *Alopecurus agrestis*, Thorburn	.212	2	-	-	-	27	11	8	4	2	1	-	-	-	-	-	43	53	7
141	53	Wood Hair, *Aira flexuosa*, "	.041	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	99	1	
142	62	Rescue, *Bromus Schraderi*, "	1.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	
143	65	Meadow Brome, *Bromus pratensis*	.451	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	
144	79	Soft Chess, " *mollis*	.284	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	57	2	
145	59	Beach, *Ammophila arenaria*, Thorburn...	.396	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	97	3	
146	67	Meadow Soft, *Halcus lanatus*, Thorburn	.054	5	-	-	-	1	1	12	4	1	-	-	3	-	-	-	74	22	
147	76	Reed Canary, *Phalaris arundinacea*, Thorburn.	.062	-	-	-	-	-	4	1	1	-	-	-	-	-	-	-	94	6	
148	78	Crested Dogstail, *Cynosurus cristatus*, "	.034	-	-	-	-	-	-	-	-	4	2	1	2	2	-	-	89	11	
149	80	Teosinte, *Reana luxurians*, Thorburn	6.822	-	-	-	3	2	1	2	-	-	-	-	-	-	-	-	92	8	
150	83	Kaffir Corn.	2.488	-	-	93	5	-	-	-	-	-	-	-	-	-	-	-	-	98	2

Comparative Results of Garden Seeds Germinated.

Name.	Chick's seed in bulk.		Dunning's seed in bulk.		Emerson's commission seeds in packets.		Ferry's seeds in packets.		Iowa Seed Company's seeds in packets.		Dept Ag— seeds in packets.	
	Varieties tested	Average per cent germinated	Varieties tested.	Average per cent germinated.	Varieties tested.	Average per cent germinated.	Varieties tested.	Average per cent germinated.	Varieties tested.	Average per cent germinated.	Varieties tested.	Average per cent germinated.
Lettuce......	1	99	1	77	1	10	1	98	–	–	2	90
Turnip..	1	76	1	29	1	97	1	71				
Cabbage.....	1	69	1	88	1	92	1	73	–	–	4	80
Parsnip.....	1	44	1	34	1	49	1	70				
Celery.	1	27	1	62	1	48						
Onion........	1	74	1	62	1	95	1	67				
Beet.	1	63	1	18	1	77	1	76	1	60		
Carrot	–	–	1	51	1	48	1	60			6	66
Tomato	–	–	–	–	–	–	–		–		4	58

The complaint about commission garden seeds is hardly sustained by our experiments. Emerson's seeds, the only ones tested, make a fair average showing. The lettuce seed was very poor, only ten per cent sprouted. The turnip seed was the best examined and the cabbage and beet seed were excelled only by varieties from the department of agriculture. The onion seeds were superior. The carrot seed was the poorest examined and the tardy germination showed it was old. The freshness of the garden seeds from the department of agriculture is shown by their early germination and good germination per cent.

The garden seeds, Nos. 1 to 51, vary considerably. Farmers and gardeners find it difficult to get these kind of seeds to "come up" well Although at times it may be due to unfavorable conditions of the soil or weather, it is more often due to the seed. If poor seeds are planted, poor results are certain. Beet seed is one of the hardest to sprout. By comparing the beet seed of different dealers, we find the range from 18, to 94, more than five times as many in one case, as in the other, and of greater vitality, as is shown by the number of days of germination. The lowest, No. 31, was given two trials in the germinator, and one in wet sand, 18 per cent being the most sprouted. We found in this case, as well as in others, that the largest seeds gave the best results. Notice the weight of seeds given in the table, and it will generally be found that the heaviest are the best. On the whole the garden seeds show a fair rate of vitality, the exceptions can be easily seen.

By looking in the column marked "Per Cent Sprouted," it will be seen that the range is as wide as is possible, being 100 in the cow-peas, and incarnate of scarlet clover, and 0 in four of the grasses. As the conditions were very nearly the same in each case, it plainly shows the difference in seed. By comparing the grasses one will see that in the more common kinds, for instance Timothy, the per cent germinated is high, 88 to 95, while in those rarely sown it is low. This is easily explained, as seed for which there is but a slight demand, would remain on sale for a long time, so that the greater the demand the newer the seed. This is a good illustration of the difference between new and old seed, as the per cent sprouted varies from 95 to 0, and from the more common to the less common kinds. The clovers show a high per cent of germination, throughout, some of them sprouting 95 per cent, in twenty-four hours from the time they were put in the germinator. In studying the tables notice the number of days before the seeds began to sprout, as rapid sprouting shows high vitality.

The conclusions we draw from these experiments put into rules to aid in purchasing seed, would be, see that seeds look new and fresh, notice whether they are plump or shriveled, and whether or not they are uniform in size. If some are large and some small, only the former will grow. Also see that they are free from foul seeds, as many troublesome weeds are introduced in this way. Buy of some reliable dealer, and continue to do so as long as the seeds are satisfactory. Buy seeds grown in our own State or from localities as far north. Farmers can easily test seeds, by putting them between damp cloths, or sheets of blotting paper.

Experiments with Forage Plants.

Sixty-six plots were sown last spring with grass seed and the seeds of other forage plants. A report will be made of these experiments another season. The station has started a collection of seeds, and steps are also being taken to form an herbarium of grasses and other forage plants.

POTATO SCAB.

This important disease of the potato has been studied somewhat the past season to determine if possible whether it is due to a fungus parasite. Quite extended microscopical examination failed to show any evidence of mycelium or spores in the tissues about the scabs, that would account for the effect. The withered tissue in the scabs in some cases was mouldy but this was secondary not primary. The only organic form observed excepting mould was animal, viz: *Nematode worms*, not unlike the vinegar eel. These were not always present and when found were probably there to feed upon the fermenting starch The disease is certainly local in the scabs, the adjoining tissue being perfectly normal and not even discolored. The disease is confined to the cortical and sub-cortical cells and has all the appearance of having resulted from mechanical injury, which has ruptured the skin, the wound being healed by the shriveling of the adjacent tissue or the formation of a layer of cork cells under the scabs. Though variable in size the scabs are so characteristic they must be due to a common cause. Extensive experiments conducted at the Massachusetts Experiment Station seem to show that the disease is not propagated by the seed, scabby seed producing healthy tubers and vice versa.

Those who have made this disease a careful study believe it is not due to animal or plant parasites, but is caused by the conditions of growth. Experiments conducted at the N. Y. Experiment Station to test the effects of soil, excessive moisture, chemical fertilizers and fresh stable manure upon the production of scab, seem to show that fresh manures and excessive moisture increase the disease. It appears that conditions favoring rapid growth also favor the production of scab. Much moisture in the spring followed by drought is believed to increase the disease, also a dry spring followed by a wet fall has the same effect. Uniform conditions during the season should decrease the disease, if the above is correct. It has been observed that potatoes grown in a moist atmosphere will have formed on their surface warty prominences. The skin of the potato is made of what botanists call *cork tissue.* It does not cover the tuber but at intervals there are minute structures called *lenticels* through which gases pass in and out of the potato. When the potato is exposed to excessive moisture these lenticels increase in size and the skin thickens near them, causing the warts spoken of above. If the conditions continue this warty tissue begins to decay and a scab is formed.

The loose tissues which compose these warts would be more easily affected than other portions of the skin by corroding substances or organic compounds that happen to be in the soil. Some believe the bite of an insect or mechanical injury of any kind will produce scabs. This may be true but some more uniform and general cause is necessary to account for the disease. There is quite a general belief in this State that chip-manure, excess of ashes, sawdust manure, lime or fresh manure will cause the disease but opinions are quite conflicting. It is probable that the most of these are apparent instead of real causes. The station desires to study this disease carefully and will be pleased to have potato growers who may be interested answer the following questions: *kind of soil*, *location*, *drainage*, *old or new; crops the last two or three years*; *method of culture; fertilizers used and amount; kind of seed*, *scabby or not*, *time of planting and harvesting crop*, *product scabby or not. What conditions have you observed that seem to cause the disease.*

From what has been observed it would be advisable to drain well the soil upon which potatoes are to be grown and keep it loose and porous. Avoid an excess of fertilizers that would produce in the soil corroding organic compounds. Harvest the potatoes as soon as matured.

INJURIOUS PLANTS.

APPLE SCAB OR BLACK SPOT.

(*Fuisicladium dendriticum*,)

Attention has been called to this fungus parasite as doing considerable damage to apples in the State. Apples marketed in Orono and Bangor have been examined and the disease found to be common in this region. We also learn that it is prevalent in other portions of the State. The disease is widespread over the country destroying in some of the States annually from one-half to one-sixth of the crop.

This fungus attacks the twigs, buds, leaves and fruit, but is most noticeable on the fruit, appearing as olive green spots, with a circular outline, which become velvety as they get older. When the fungus attacks the twigs and leaves it affects the vitality of the tree. The greatest injury is done to the fruit, the marketable product. An early attack causes the fruit to shrivel and drop—a later attack produces a withered stunted growth, while a late attack upon the full grown fruit discolors its surface and depreciates its marketable value, making it liable to rot under the scab spots when stored. The disease is worse in damp, cold seasons. It starts in the spring from germs that have lived over winter or from the plant body, which has retained its vitality in the twigs, fruit or fallen leaves. The cold, damp spring weather causes a rapid growth of spores which establish themselves upon the young fruit and leaves. The warm, dry summer weather arrests the growth which is continued again during the damp, cooler autumn months. The fungus shows some preference for certain varieties, but in bad seasons all are more or less affected. The parasite has a wonderful vitality and the plant body is probably perennial. We have now, January first, apples covered with the fungus in a vigorous growing condition. Specimens apparently dead when taken from the barrel kept moist a few days begin growth. It has been shown that the spores will germinate in about eight hours at the low temperature of 50° F., insuring an early start in the spring.

The successful treatment of this disease may be regarded as an open question but on account of the annual injury done it should be carefully studied. The station wishes to conduct some experiments next season upon this disease and will be pleased to correspond with orchardists in different parts of the State where the disease was bad the past season and co-operate with them.

The life history of this fungus would suggest the application of some chemical by the spraying pump, early in the spring before the leaves start, to kill the spores as formed and prevent them attacking the young fruit and leaves.

Mr. Goff of the New York Experiment Station has tried spraying the trees early in the season with a solution of 1 pound of hyposulphite of soda to 10 gallons of water with good results.

Prof. Scribner suggests for trial the following treatment:

(1) Spray the trees early in the spring before the buds start with a solution made from 1 pound iron sulphate (copperas) and 1 gallon of water.

(2) After the fruit sets spray again with Bordeaux mixture prepared by dissolving 16 pounds copper sulphate (blue stone) in 22 gallons of water. In another vessel mix 30 pounds of lime with 6 gallons of water. After the latter cools pour the two preparations together and thoroughly mix them. It is best to prepare this mixture several days before it is needed and stir it well before applying

it. If the season is cold and damp a second application should be made later in the season. The spraying pump used to apply copper solutions should be made of copper and the valves of rubber.

To determine whether the spraying does good the application should be made only to alternate trees in the row or to one side of each tree. The effects upon the trees ca thus be readily compared.

INJURIOUS INSECTS.

Quite a number of letters have been received at the station the past season asking information about insects doing injury in the State.

These letters in most cases were accompanied by specimens and were answered, when necessary in detail, giving habits, description and known remedies.

The number of letters received and the apparent want of information regarding insects doing damage to fruit and fruit trees in the State have convinced the writer that a condensed account of the characters, life history and known remedies of some of our common pests, would be acceptable to the fruit growers and farmers of the State.

In the account of insects given below we have gleaned the information from various sources and claim no originality, the object being to place in the hands of those who have not access to the writings of entomologists the means of identifying our common insects in all their stages and thus enable an intelligent warfare to be waged against them.

The cuts used to illustrate the insects considered were obtained from J B. Lippincott & Co., of Philadelphia, and are electros after figures occurring in Saunder's Insects Injurious to Fruits.

Below is given a list of the insects that were reported and considered, together with the injuries attributed to them.

The most important of these have received attention in detail, while unimportant ones have not been illustrated and receive only passing notice.

List of Insects Reported and Examined.

	Common Name.	Scientific Name.	Depredations.
1	Round-headed Apple-tree Borer	Saperda candida, Fabr	Trunk of apple trees.
2	Flat-headed Apple-tree Borer	Chrysobothris femorata, (Fabr.)	" "
3	Oyster-shell Bark Louse	Mytilaspis pomorum, Bouche	Branches of apple trees.
4	Apple-tree Tent-caterpillar	Clisiocampa Americana, Harris	Foliage "
5	Forest Tent-caterpillar	" sylvatica, "	" "
6	Fall Canker worm	Anisopteryx pometaria, "	" "
7	Eye-spotted Bud-moth	Tmetocera ocellana, (Schiff.)	" "
8	Apple-tree Aphis	Aphis mali, Fabr	" "
9	Codling Moth	Carpocapsa pomonella, (Linn)	Fruit of "
10	Apple Maggot	Trypeta pomonella, Walsh	" "
11	Ash-gray Pinion	Lithophane antennata, (Walker)	" "
12	Pear-tree Slug	Selandria cerasi, Peck	Foliage of cherry and plum trees.
13	Indian Cotonia	Euphoria Inda, (Linn)	Injuries not mentioned.
14	Plum Curculio	Conotrachelus nenuphar, (Herbst.)	Fruit of the apple tree.
15	Cherry-tree Plant-louse	Myzus cerasi, (Fabr.)	Foliage of cherry trees.
16	Imported Currant-worm	Nematus ventricosus, Klug	" currant bushes.
17	Ivy Scale Insect	Aspidiotus Nerii, Bouche	" English ivy.
18	Black Swallow-tail Butterfly	Papilio Asterias, Cramer	Leaves of carrots and parsnips.
19	Eyed Elater	Alaus occulatus, (Linn)	Larva in apple-tree trunks.
20	Hawthorn Tingis	Corythuca arcuata	Foliage of butternut trees.
21	Mourning Cloak Butterfly	Vanessa antiopa, Linn	" elm trees.
22	Meal-worm Beetle	Tenebrio molitor, Linn	Larva in corn meal.

EXPLANATIONS.

By a *perfect insect* (*Imago*) is meant the form that lays the eggs. It is usually provided with wings, though the females of the bark lice and most plant lice, and the females of the fall canker-worm are wingless. The egg hatches into the *larva*, i. e., the caterpillar, worm, grub or maggot, as the case may be. The larva changes to the *pupa* or *chrysalis*, which is the inactive or resting stage, and from the pupa the perfect insect comes forth. An insect in making a complete life history, would pass through four stages; the egg, larva, chrysalis and imago. The larva is the form that usually does the damage. Unless otherwise stated the cuts shown are natural size. When the insect is shown enlarged the natural size is usually indicated by hair lines.

THE ROUND-HEADED APPLE-TREE BORER.

Saperda candida, Fabr.

Complaints of injuries done by this common pest have been received from various parts of the State. One writer stated that he had taken fifteen larvæ from a single tree. The Round-headed Apple-tree Borer is a native of America and though it seems to prefer the apple, is known to affect the native crab, sugar-pear, thorn bushes, pear, quince and mountain-ash. It is widely distributed and does much damage unless carefully watched.

DESCRIPTION.

Perfect insect—A beetle about three-fourths of an inch long, with two broad white strips above running the whole length of the body—hoary white below, light brown above—legs and antennae gray. (Fig. 1, c.)

Larva—One inch long when full grown—footless. Whitish with a round chestnut colored head, polished and hornlike and armed with two black jaws. (Fig. 1, a.)

FIG. 1.

Chrysalis—Lighter colored than the larva and with transverse rows of minute spines on the back. (Fig. 1, b.)

LIFE HISTORY.

The perfect insect makes its appearance in June and July, and remaining concealed during the day is not commonly seen. It becomes active at dusk and lays its eggs, one by one, on the bark, near the base of the tree. The eggs hatch in about two weeks, and the young worms begin at once to gnaw into the tree. The larva is three years changing to the beetle and injures the trees that length of time. The first year the larva works in the sapwood and inner bark, producing flat cavities filled with sawdust like castings. The second summer it is about half grown and does great damage to the sapwood. At the close of the third season, it bores deeper into the wood making a cylindrical channel upward and then outward to the bark, filling the upper part with a powdery material. It retreats to the deepest part of the channel, fills up the passage below, turns around and waits until the following spring when it sheds its skin and becomes the chrysalis. (Fig. 1. b.) In two or three weeks the chrysalis changes to the beetle form, which opens the upper part of the channel, gnaws a hole through the bark, escapes, and in due time lays eggs, completing the life history.

REMEDIES.

The dark colored spots made in the bark where the young worms enter should be scraped until the light colored bark below is exposed and the larva found and destroyed. The best time to examine is early in September or a little later in our climate Sometimes the bark of the dark colored spots cracks and the sawdust like castings fall out or protrude showing the location of the worm. The earlier the worm is detected the better, as it is more easily removed when young, and less injury is done to the tree. The burrow becomes larger and deeper as the worm grows and can then be best reached by thrusting a stout wire into the hole, or opening it above and pouring in scalding water slowly, until it reaches the insect and kills it. The practice of digging out the larva from a deep channel is not to be recommended, as it does much injury to the tree. A preventive remedy is the best, if an effective one can be found. Various substances have been applied to the trunk of the tree to prevent the beetle from depositing eggs. Entomologists are agreed that alkaline washes are the best. The following are cheap and effective remedies: Reduce soft soap to the consistence of a thick cream by adding a strong watery solution of washing soda. Lime is sometimes used with the soap, and glue may be added to give adhesiveness. A solution of soap and carbolic acid has been highly recommended. Whatever solution is used should be applied thoroughly to the base of the tree and to the trunk as high as the crotches. The best time to make the application is during dry warm weather, so the solution will thoroughly dry before a rain. There should be two applications, one early in June and another early in July. The solution may be applied with an old broom or a whitewash brush.

The natural enemies of this insect are few. Woodpeckers are said to destroy them.

THE FLAT-HEADED APPLE-TREE BORER.

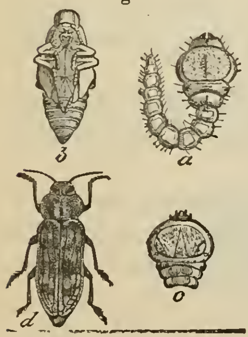
Chrysobothris femorata, (Fabr.)

This pest is very common in Maine, and the injury attributed to the *round-headed borer* is frequently due to it.

It is a native of America and besides being the worst borer affecting the apple tree, is known to attack the pear, plum, and peach; also the oak, box alder, hickories, and maples. It loves the light and may frequently be seen about the orchard on the trees. It is very active and hard to catch, quickly taking wing.

DESCRIPTION.

Fig. 2.



Chrysobothris femorata, Fabr. Flat-headed Apple-tree borer; a, larva; c, head of larva, underside; b, pupa; d, beetle.

Perfect insect—A beetle variable in size but usually about one-half inch long—oblong flattish is shape—of a dark, dull greenish color with a coppery reflection—under side and legs brilliant coppery color—feet green. On each wing case are two irregularly oblong impressed transversed spots of deeper copper color than the remainder of the wing, dividing the wing cases into nearly three equal portions. The upper surface appears as though sprinkled with an ash colored powder. The beetle somewhat enlarged is shown in (Fig. 2, d)

Eggs—Pale yellow, varied, with one end flattened, irregularly ribbed and 0.02 of an inch long.

Larva—Soft, flesh-like, pale yellow ; head small, deeply set ; jaws black ; third segment twice as broad as any of the posterior ones, and bearing on its upper surface a large oval callous like projection covered with numerous raised brown points. (Fig 2, a and c.)

Chrysalis—Lighter colored than the larva and with transverse rows of minute spines on the back and a few at the extremity of the body (Fig. 2. b.)

LIFE HISTORY.

The beetle makes its appearance in June or July in our latitude and lays probably about one hundred eggs. The female fastens the eggs, singly or in groups, to the loose flakes of bark or in the crevices, by means of a glutinous substance. The eggs soon hatch and the young worms gnaw through the bark and live on the sap wood making flat channels next to the bark, sometimes girdling the tree. As they get older they bore upward into the solid wood and when ready to change to the *chrysalis* gnaw to the bark and nearly through it. They then change to the chrysalis (Fig. 2, b,) and in about three weeks the beetles come forth. The larvæ attack the trunk and larger branches and are supposed to remain in the tree but one year.

REMEDIES.

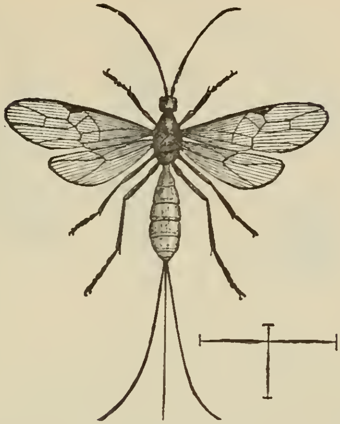
Examine the trees early in the fall for dark flattened spots, exudation of sap, or sawdust-like castings, and if found remove the worm with a knife.

Catch and kill the beetles when possible. Paint the *trunk* and *larger branches* with the solution recommended for the *round-headed borer*.

Keep the trees as vigorous and healthy as possible as this borer prefers sickly trees and those recently transplanted or too severely pruned.

Remove the flakes and moss from the trunk and keep it as smooth as possible. This beetle is said to be worse in high sandy soil than in rich, low ground. Anything that tends to give vigor to the tree lessens the danger of attack.

FIG 3.



This pest is held in check by woodpeckers and insect parasites. Several species of four-winged flies called Ichneumons are known to prey upon the larvæ. In Fig 3 is shown one of these parasites magnified, the crossed lines showing the natural size.

THE OYSTER-SHELL BARK-LOUSE

Mytilaspis pomorum, Bouché.

This pest is quite common about Orono, and letters have been received during the season regarding it from other parts of the State. It is a native of Europe introduced into this country on nursery stock nearly a hundred years ago, and is now widely distributed, doing great damage to the apple tree, and is known to affect the pear, plum and currant. It can be detected with the naked eye as minute brownish or greyish scales nearly the color of the bark. These scales are about one-sixth of an inch long, shaped somewhat like an oyster shell, and placed on the branches or twigs lengthwise with the small end usually upward. (Fig. 4.)

FIG 4

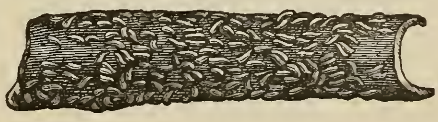
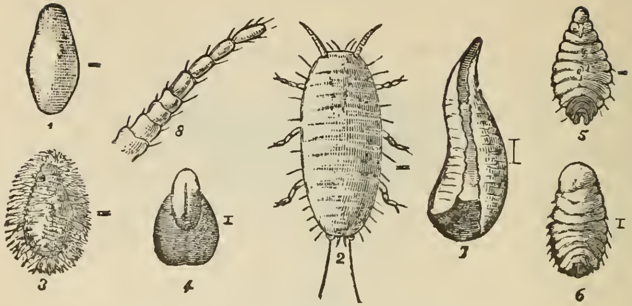


Fig. 5-7 shows the under side of the female scale enlarged. As shown in the figure the bark is sometimes densely covered with the insects, producing great injury to the tree.

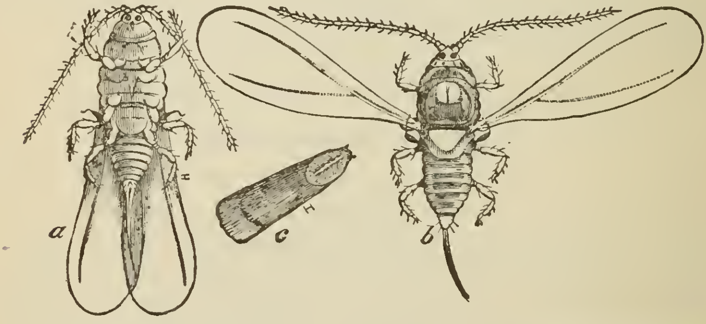
FIG. 5



DESCRIPTION

Perfect Insect—The female louse is shown much magnified (Fig. 5-2.) The real length is about one hundredth of an inch, and they appear to the naked eye as mere specks. The *male* insect and its scale are shown in Fig. 6, much magnified.

FIG. 6.



The scales of the male are much smaller than the female scales and occurring more commonly on the leaves, are rarely seen. Eggs from twenty to one hundred are found under each scale. Early in winter they are white but toward the hatching time change to a yellowish hue. Fig. 5-1, shows the egg much magnified. The eggs remain under the scales unchanged for nearly nine months, there being but one brood each season in the Northern States.

LIFE HISTORY.

Female.

The eggs hatch late in May or early in June. If the weather is cold the lice remain under the scales until warmer weather, and then may be seen running about the twigs for a location to attach themselves.

The most of these soon fix themselves around the base of the side shoots of the twigs by means of their tiny, slender beaks and live upon the sap of the tree. They gradually undergo changes shown in Fig. 5—3, 4, 5 and 6. Before the close of the season the louse secretes the scale under which it lives and perfects itself.

By the middle of August the female becomes a bag of eggs, which are deposited in a mass under the scale, the body of the louse shriveling, as the eggs are laid, until it is a mere speck at the small end of the scale. These eggs remain under the scale, if not destroyed, until the following spring and then hatch, completing the life history.

How this pest is spread from tree to tree is not well made out, but it is supposed that birds carry them on their feet and that large insects may transport them, or that the wind may blow them about. They are probably introduced into young orchards on the nursery stock and multiply.

REMEDIES.

Inspect carefully the nursery stock before setting and remove any scales that may be found. During the winter, examine the trees in the orchard and scrape off the scales found on the larger branches and twigs. In the spring watch for the young lice which may be seen crawling about on the twigs, and then brush the trees with the soap and soda solution mentioned for borers, or spray the trees with a solution of one-half pound of soda to a pail of water.

This pest is held in check by quite a number of insect parasites. At least four small Chalcid Ichneumon flies are known to prey upon it. A species of mite so small that it can hardly be seen without a lens preys upon the louse and its eggs, and has done much to hold

it in check. The lady bird shown in Fig. 7, and its larva eat large numbers of the lice. (This small beetle has black wings with a blood red spot on each. The larva is a grayish worm covered with bristles and very active.) Insectivorous birds are supposed to eat some of the lice and their eggs.

THE APPLE-TREE TENT CATERPILLAR.

Clisiocampa Americana, Harris.

This insect has been very abundant the past season. As many as a dozen webs were counted on a single tree. The insect and its web are so conspicuous it is not difficult to keep it in check. There is no excuse for allowing the trees to be stripped of their foliage before the colony is destroyed.

The apple-tree tent caterpillar is a native of the northern Atlantic States and has been distributed to other parts of the country on nursery stock. It is now widely known and feeds upon the foliage of the plum, black cherry, apple and other trees.

FIG. 8.

FIG. 9.

DESCRIPTION.

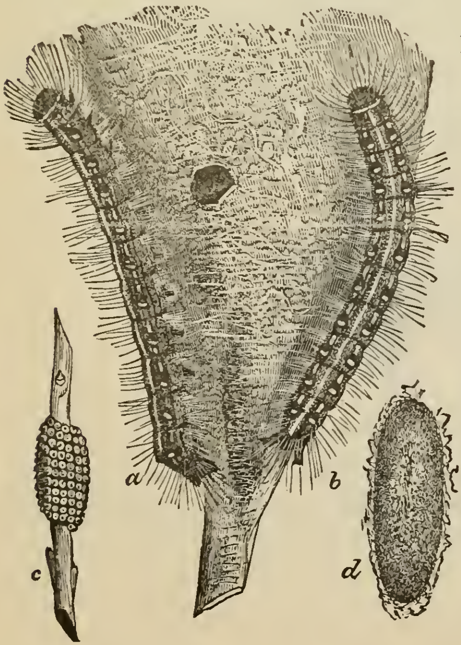
Perfect insect—A moth of a pale dull reddish or reddish brown color. The fore wings are crossed by two oblique parallel dirty white lines. The female is larger than the male. Their relative size is shown in Figs. 8 and 9. The male has feathery antennæ. The moth has no power of taking food and lives only a few days. Its office is to lay the eggs.

Eggs—From one to two hundred in number are laid, in clusters, composed of from ten to twenty rows, upon the smaller twigs. The eggs are conical and about one-twentieth of an inch long. The clusters are covered over with a tenacious varnish that keeps out the rain. Fig. 10 shows an egg cluster with the varnish on, and Fig. 11, c, shows the arrangement of the eggs on the twig.

FIG. 10

Larva—The young larvæ are fully formed in the eggs in the fall and remain dormant until the first warm days of spring and then hatch. They can be made to hatch in the winter by bringing the clusters to the fire. When first hatched they eat the gummy portions of the egg cluster covering, and if the leaves have not appeared can go several days without food. Worms hatched last spring in the house wandered about the twig for over a week before they died, after having eaten all the varnish, leaving the egg-shells bare. The larvæ early begin to construct their web which is increased in size by additional layers of silk as the worms grow, until it is sometimes ten inches or more across. The worms remain in the tent at night, during stormy weather and when not feeding, unless the weather is warm, when they may be seen upon the outside literally covering the web. They march in military order twice a day from the nest to feed, once in the morning and once in the afternoon. They pave their roads with silk and follow along them to the leaves. When mature each worm will consume two leaves a day and an average of five hundred leaves would be required for a colony. There are often several webs in a tree. The effects are to rapidly defoliate the tree and draw heavily upon its vitality to produce new leaves. The caterpillars require about six weeks to mature and are then about an inch and three-fourths long, and have the appearance shown in Fig. 11, a and b. The worms have a "white line along the back; then a yellow line dotted with black; then a black stripe marked with blue and yellow dots; then a wavy yellow line dotted with black; then a blue stripe dotted with yellow; then a broken white line; head black; under side of body black; the body covered with yellowish or whitish hairs."

FIG. 11.



When mature, the larvæ leave the trees and wander about in search of a place to spin their cocoons. They prefer the loose bark of trees, the under side of fence caps and will enter sheds and porches and climb the sides of houses and transform under the edge of clapboards, window caps and eaves. When the orchard is near they become a nuisance by entering the house.

Cocoon — Oblong, oval, light yellow, formed of a loosely woven outer covering and a dense tough inner coat. The larva enclosed becomes a brown chrysalis and in about two to three weeks the moth comes forth. The cocoon is shown in Fig. 11, d.

LIFE HISTORY.

The moths appear early in July and in a few days lay their eggs upon the twigs as described above. Early in the spring when the buds are opening, the eggs hatch. The caterpillars live on the leaves and require about six weeks to mature. They then spin their cocoons from which the moths emerge in two or three weeks completing the life history.

REMEDIES.

Pick off the egg clusters during the winter. Should any colonies hatch in the spring, as soon as the web is noticed, remove it late in the evening or early in the morning when the caterpillars are at rest. The nest may be reached with a ladder and taken off with a gloved hand and the larvæ crushed ; or a bunch of rags can be tied to the end of a pole and the nest removed. The orchard should be examined from time to time for a month or six weeks. The worms should be killed or they will climb the trees again. This pest has quite a number of natural enemies which keep it in check.

A minute Ichneumon fly only one twenty-fifth of an inch long is parasitic on the eggs. One cluster of eggs examined last spring hatched only about a dozen caterpillars and in a few days nearly seventy-five of these Ichneumon flies emerged.

FIG. 12.

Fig. 12 represents a large Ichneumon fly that preys upon the caterpillars. We hatched last spring from a cocoon an Ichneumon fly shown in Fig. 13.

FIG. 13.

There is shown enlarged in Fig. 14 a species of two-winged fly known as a *Tachina fly*, which preys upon the catapillars.

FIG 14.

The above parasites deposit their eggs in the eggs, or upon, or within the bodies of the living caterpillars, destroying them. Several species of ground beetles eat the caterpillars.

FIG 15.

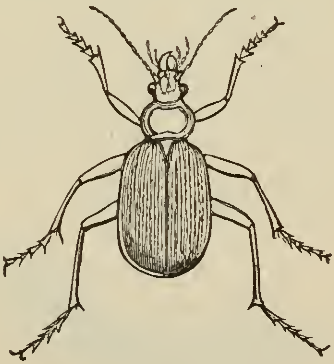


Fig. 15 represents one of these, the Green Caterpillar Hunter, which may be distinguished by its large size and bright green wing covers.

FIG. 16.

In Fig. 16 is shown the Copper-Spotted Calosoma, which feeds upon the caterpillars. It may be known by its large size and three rows of copper-colored spots on each wing cover.

There is a mite similar to the one that eats the eggs of the Oyster-shell Bark-louse that feeds upon the eggs of this species. Insectivorous birds eat the larvæ. This season we noticed the White-eyed Vireo capture and eat eight half-grown caterpillars at one feeding. It would approach the tent and while on the wing seize a caterpillar and retire to a branch close by and eat it, and soon return again.

THE FOREST TENT CATERPILLAR.

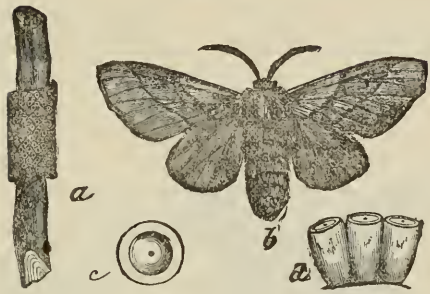
Clisiocampa sylvatica, Harris.

This species closely resembles the tent caterpillar of the apple tree, and like it constructs a web. They are often found on the same tree in the orchard. This insect feeds on the hickory, walnut, rose, oak, poplar, ash and other forest trees and also on the apple, plum, peach and cherry. It is a voracious feeder and does much damage to the foliage of forest and fruit trees.

DESCRIPTION.

Perfect insect—A moth which expands an inch and a half or more. Wings, brownish yellow. The fore wings with two oblique lines as in the apple-tree tent caterpillar, but brown instead of white and the space between them darker than the rest of the wing. Fig. 17, b.

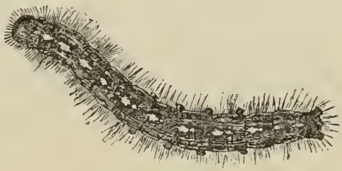
FIG. 17.



Eggs—White—one twenty-fifth of an inch long, tapering toward the base; margin at the top rimmed, centre with a depressed spot; deposited around the twigs like the eggs of the above species and distinguished from them by the cluster being square at the ends and uniform in diameter; clusters contain three or four hundred eggs. (Fig. 17, e) shows an egg cluster, (Fig. 17, c and d) eggs, both magnified. The eggs are stuck together and to the twig by a brown varnish.

Larva—Pale blue tinged with greenish low down on the sides and everywhere sprinkled over with black points and dots. Along the middle of the back is a row of white spots and on each side of these an orange yellow or tawny reddish stripe, and a pale cream yellow stripe lower down on each side. These stripes and spots are margined with black. Each segment has two elevated black points on the back from each of which arise four or more coarse black hairs. Back clothed with fox colored hairs, sides low down clothed with whitish hairs. Head,. dark bluish, freckled with black dots and clothed with black and fox colored hairs. Legs black, clothed with whitish hairs.

FIG. 18.



When full grown, the larva spins a cocoon closely resembling that of the ordinary tent caterpillar. It usually spins the whitish yellow cocoon in the shelter of a leaf, but if leaves cannot be had it is placed under loose bark of trees, about fences or under rubbish. The *chrysalis* is formed in the cocoon in two or three days and is of a reddish brown color, densely clothed with short pale yellowish hairs.

LIFE HISTORY.

The eggs hatch about the time the buds burst and like the previous species the larvæ can go for some time without food. While young, they spin a slight web upon the trunk or branches which is not usually noticed. The larvæ while young manifest a propensity to military movements, marching about in single or double file, and when older wander about for exercise and food. They become full grown in six weeks and soon spin cocoons as mentioned above, from which the moths appear in two or three weeks and soon lay their eggs, completing the life history.

REMEDIES.

Pick the egg clusters in winter. Knock the trees and the young larvæ will suspend themselves by threads and can be removed by swinging a stick to which the threads become attached. Put cotton bands about the trunks to keep the wandering caterpillars from ascending other trees. The natural enemies are numerous and hold them in check. The colonies, when at rest, can be removed with the hand or sprayed with kerosene emulsion, Paris green or soapsuds.

THE FALL CANKER-WORM.

Anisopteryx pometaria, Harris.

The eggs and female of this species were received at the station this season. The female was taken in the act of depositing eggs on an apple tree. The moths were quite plentiful about Orono last fall. This species has been known for a long time to feed on the foliage of the apple tree, and also to attack the elm, cherry, peach, &c. The females being wingless and not able to travel far, this pest is usually local in its attacks. Whether it does much damage in Maine we do not know, but regard it important that its habits be known.

DESCRIPTION.

Perfect insect—(Male.) A moth provided with wings. The fore wings, brownish gray, glossy, crossed by two whitish irregular bands, the outer one enlarging into a large pale spot at the apex.

Hind wings greyish brown with a white band crossing them, and in the centre a faint blackish dot. Fig. 19, a.

Female—Wingless; uniform shining ash color above, gray beneath; length three to four-tenths of an inch. The female has a sluggish movement and a spider like appearance.

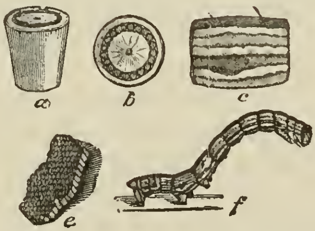
FIG. 19.

Fig. 19, b. represents the female natural size.

Eggs—Grayish, flattened above, with a central puncture and a brown circle near the border. Each female lays 100 or 200 eggs in rows arranged in clusters on the twigs or branches, usually in exposed situations.

In Fig. 19 d. and Fig. 20 e. are shown egg clusters natural size. The eggs magnified are shown in Fig. 20 a. and b.

FIG. 20.



Larva—Pale olive green when young, but varying in color, when grown, from greenish yellow to dark brown. Dorsal band broad, brownish; lateral lines three, white, the middle one paler; broad brown bands below the lateral lines, and below that a broad white band. Under side, flesh-colored; head brown.

These caterpillars belong to the group of inch or measuring worms, because they alternately loop and extend the body in moving. When at rest they sometimes assume the position shown in Fig. 20, f. and can hardly be told from twigs. Fig. 20, c. shows one of the segments of the body magnified, and Fig. 20 f. the larva full grown. When full grown they are about one inch long. When mature they crawl down the trunk or let themselves to the ground by a silken thread, and burrow to a depth of from two to six inches. They make a tough cocoon of buff colored silk interwoven with earth, and in twenty-four hours turn into the chrysalis.

The *Chrysalis* is light grayish brown and about half an inch long. The *male* chrysalis slender and provided with wing cases; the *female* larger and without wing cases.

LIFE HISTORY.

The eggs hatch about the time the buds on the apple trees expand. The young worms feed upon the tender leaves, seeking shelter within the expanding flowers or buds when the weather is wet or cold. They eat holes in the leaves while young, but when older devour the whole pulp of the leaf leaving only the veins and midrib. They feed for about four weeks, and when plentiful so destroy the foliage as to give the trees the appearance of having been scorched with fire. They have done great damage to foliage trees along highways. While letting themselves down to the ground they are often swept off by carriages and carried long distances.

The larvæ enter the ground, spin cocoons, are converted immediately into the chrysalis state, from which during the fall, winter and following spring they emerge in the perfect form, completing the life history.

REMEDIES.

Destroy the egg clusters when seen. Kill the moths when found about the orchard. Jar the trees and destroy the larvæ that suspend themselves by threads.

Prevent the wingless females from ascending the trees, and the larvæ from descending or ascending. This may be done by means of sticky substances bandaged to the tree, by troughs filled with oil, or by collars of metal, wood or glass fastened to the tree and sloping downward like an inverted funnel. Among the sticky substances that have been used are included tar mixed with oil, refuse molasses, printer's ink, lard and sulphur and slow drying varnishes. The best way to apply these is to put them on a strip of stiff paper or canvas six inches wide tied by the middle around the tree a few inches above the ground.

Troughs can be made of rubber, tin or lead, and put around the trunk and kept full of oil. A good collar can be made from a tin band somewhat larger than the trunk, to the top of which is attached a piece of cotton cloth by which it is fastened to the tree making an inverted funnel.

Whatever apparatus is used care should be taken to stop any holes made by irregularities of the bark or trunk. Cotton batting, straw or rags can be used for this purpose. When sticky substances are applied they should be renewed occasionally during the time the moths ascend or the larvæ descend. This involves considerable time but pays.

Fall plowing has been recommended to expose the cocoons to the weather and birds. Hogs are said to root up the chrysalids and eat them. Hens eat the larvæ.

Canker worms are preyed upon by a species of mite, by ichneumons, a tachina fly, a wasp, a soldier bug, and by several species of pedaceous beetles, which help hold them in check. Insect eating birds devour them.

THE EYE-SPOTTED BUD-MOTH.

Tmetocera ocellana, (Schiff).

Attention was called last spring to an insect doing injury to the terminal buds of apple trees in the college orchard, and about a hundred larvæ were taken from a single tree, part of which were allowed to transform and proved to be the species named above. We also noticed in the orchard of Mrs. A. A. Sutton of Orono several young trees so badly affected by this insect that nearly all the terminal clusters had turned brown. If as plentiful elsewhere it must do considerable damage. It does not confine its depredations to the leaf clusters but will attack the flower clusters and even the newly-formed fruit; also the small twigs from which the blossoms come, tunneling them down the center, causing their death. It does not confine its mischief to the apple, but attacks also the cherry and plum.

Perfect insect—A moth of an ash gray color which expands half an inch. Fore wings banded across the middle with whitish gray,

and each wing bearing two small eye-like spots, one near the tip, composed of four little black marks on a light brown ground, the other formed of three minute black spots arranged in a triangle and located near the hind angle. Hind wings dusky brown. The moth natural size is shown in Fig. 21.

Eggs—We do not know the eggs of this species but presume they are laid by the moth on the twigs or terminal buds and hatch early in the spring.

Larva—Three-fourths of an inch long, cylindrical, naked, pale dull brown, body bearing warts from which arise fine short hairs; head and top of next segment black. The larva occupies a dry blackened leaf, portions of which are drawn together so as to make a case which is lined with silk. Within this case the larva changes to a dark brown chrysalis in June. The larva is shown in Fig. 21.

LIFE HISTORY.

Eggs laid on the terminal buds or twigs in the summer and remain until the next spring, hatching about the time the leaves expand. The larvæ attack the terminal leaf clusters, flower clusters, young fruit or twigs and feed upon them until full grown in June, when they spin cocoons within the cases and emerge perfect moths early in July, completing the life history.

REMEDIES.

Hand pick the clusters of injured leaves which can readily be seen on the trees in June, being changed in color and drawn together by silken threads. Spraying the trees, for the codling moth would probably destroy this insect.

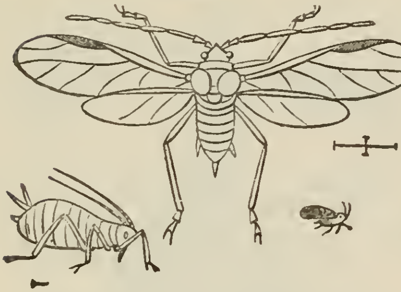
THE APPLE-TREE APHIS.

Aphis mali, Fabr.

Several complaints have been received the past season of depredations by the above species, and we judge it is quite widely distributed in the State. It is an insect that feeds upon the juices of the foliage and when at all abundant must seriously affect the vitality of the tree. This insect was originally from Europe, but is now a pest in apple orchards throughout the Northern United States and Canada. *Perfect insect* (*male*)—Head, thorax and antennæ black, neck usually green; abdomen, short, thick, oval, bright green; sides with row of black dots; nectaries and tail-like appendages black; wings transparent with dark brown veins. The *winged female* resembles the males in color.

Perfect insect (*wingless female*)—Length less than one-tenth inch; body oval, pale yellowish green, often striped with deeper green; eyes and tail appendages black; honey tubes green.

FIG. 22.



The winged male and wingless female are shown highly magnified in Fig 22. The real size is indicated by hair lines.

Eggs—Minute, oval, light yellow or greenish when first laid, but gradually changing to shining black.

Young insects—Produced alive, nearly white when born but soon become yellowish green.

LIFE HISTORY.

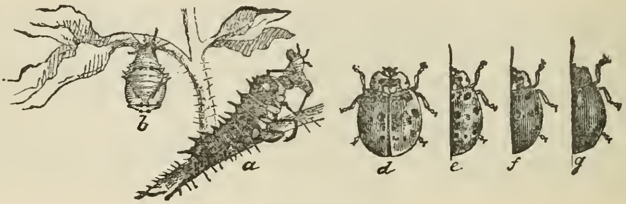
The eggs are deposited in the autumn in the cracks of the bark of twigs and at the base of the buds. The eggs hatch when the buds begin to expand and the lice locate themselves on the young buds and leaves by means of their beaks and feed upon the juices. The spring brood is composed of females and is about ten days reaching maturity. Each louse gives birth to living young, producing about two a day for two or three weeks and then dies. These young become mothers in about ten days. This process is continued through the season, there being many generations mostly wingless females, and without the appearance of males. Winged females are sometimes produced and migrating to other trees spread the pest. Late in the season males are produced with the females and eggs are laid to perpetuate the species, thus completing the life history.

REMEDIES.

Spray the trees, about the time the buds are expanding, with strong soap suds, or a decoction of tobacco stems or leaves one pound to a gallon of water. Spraying for the codling moth with Paris Green would probably destroy some of the plant lice. The presence of plant lice is indicated by ants which ascend the trees to feast upon the honey-dew secreted by the lice. The plant lice have two projections, one from each side of the hinder part of the body, called nectaries or honey tubes from which a sweet fluid is secreted in some quantity. Ants gather in great numbers to feed upon it and will even stroke the lice with their antennæ causing them to give out the fluid. The normal use of this fluid is probably to feed the young lice.

The natural enemies of plant lice are many. Several species of lady-birds prey upon them. One of these, the Fifteen-spotted Lady-bird is shown in Fig. 23, where the larve (a), chrysalis (b).

FIG. 23.



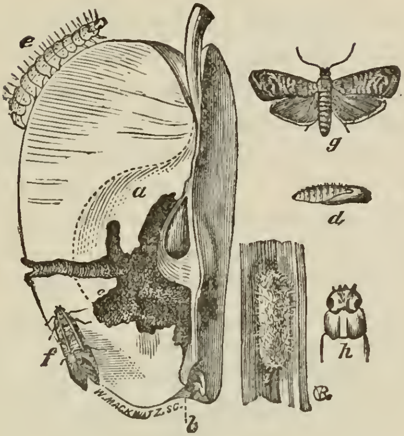
and several forms of the perfect insect (d, e, f, g) are represented. The larvæ of Lace-winged or Golden-eyed Flies feed upon plant lice. These flies may be known by their light green gauzy wings and offensive odor when disturbed. Their eggs are raised on little stalks and are found in clusters. The larvæ of Syrphus Flies also devour plant lice. These flies deposit their eggs among the plant lice and the blind larvæ hatched from them wander about devouring any lice they chance to meet. These flies may be known by their black color, clear wings and yellow stripes crossing the body. A tree affected by plant lice can be distinguished, the twigs and leaves being distorted and twisted backward. The lice find shelter under the distorted leaves. Scraping the loose bark from the trunks, and branches in winter and washing with soap suds will help destroy the eggs.

THE CODLING MOTH.

Carpocapsa pomonella, (Linn.)

The habits of this pest are too well known to need detailed description. We give a figure which shows the perfect insect (g)

FIG. 24.



expanded and the same with closed wings at (f). The larva is shown at (e) full grown. At d. is shown the chrysalis; at (i) the cocoon, at (h) the head of the larva enlarged. The entrance of the larva at the calyx of the apple is shown at (b). The dark shaded portions of the figure represent the borings of the larva and the hole at the side the place where the full grown larva escaped.

LIFE HISTORY.

First Brood.—The eggs are laid singly in the eye of the apple when about the size of a pea, or occasionally at the stem end or even on the cheek. Sometimes two or more larvæ occupy the same fruit. The eggs hatch in about a week and the larvæ bore toward the core, feeding upon the material round it, finally escaping through the side. The larvæ require about four weeks to mature. The fruit affected falls prematurely. If the larvæ attain their growth before the fruit falls, they let themselves to the ground by a silken thread or crawl down the branches to the trunk. Those that let themselves down or fall with the fruit generally crawl along the ground to the trunk, where they with the others conceal themselves in the crevices or cracks of the bark, spin cocoons which they cover with small pieces of bark or other available material. The change to the chrysalis takes place in about three days. The moths emerge in about two weeks, are capable of laying about fifty eggs, which are deposited from time to time for two weeks or more.

The *Second brood* is generally on the wing the latter part of July. The moths of the first brood not appearing all at the same time, and the great length of time required for the female to lay her eggs, would give larvæ of all ages and cause the broods to lap over each other. The second brood generally deposit their eggs in the late apples, and if the larvæ are matured before gathering time they leave the fruit and spin cocoons as mentioned above, but when taken to the cellar they spin their cocoons between the staves and hoops of the barrels or about the bins.

The fall brood remains in the larval form within the cocoon until spring, when it emerges, completing the life history.

It would seem from the investigations of Mr. Charles G. Atkins, recorded in Agriculture of Maine, 1883, p. 356, that in this State we sometimes have but one brood of the Codling Moth. My observations the past season indicate two broods, lapping over each other so as to indicate that eggs are deposited in July, August, September and the first part of October. Larvæ one-half grown were found in November.

REMEDIES.

The modern and perhaps best way to hold in check this pest is to spray the trees, about the time the apples are forming, with Paris Green suspended in water, by means of a force pump. There should be at least two applications covering the time of emergence of the moths of the first brood and the period of laying eggs. If there is but one brood or only a feeble second brood, this method would be more efficient in Maine than where two broods occur. As most of the larvæ escape from the apples before they fall, the custom of gathering windfalls to destroy this insect cannot prove effectual, though it is recommended as a help. The apples should, however, not be allowed to remain long on the ground. They harbor the larvæ of other insects which would be destroyed at the same time.

About the first of June fasten around the trunks of the trees bandages of straw, cloth or paper. The larvæ will seek these bands to spin their cocoons. The bands should remain until after the second brood spins, and be examined for worms and cocoons every few days. The bands should also be used when spraying is done, as a means of destroying the second brood, should it appear.

Barrels in which apples have been stored should be examined and the cocoons destroyed. The natural enemies are few, though ichneumon flies, ground beetles and other insects and insectivorous birds, help keep them in check.

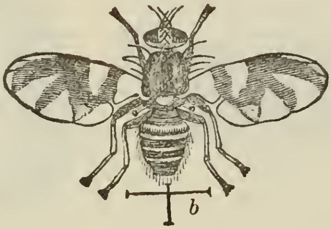
THE APPLE MAGGOT.

Trypeta pomonella, Walsh.

Extensive observations were made the past season on this troublesome insect and considerable knowledge gained of its life history. As our investigations are not completed we defer an exhaustive consideration until another time.

That the two-winged fly which lays the eggs may be known we figure it and describe it.

FIG. 25.



The perfect insect is a two-winged fly from one-fifth to one-fourth inch long, and is easily recognized by the black bands across the wings, the rust-red head, green eyes, white spot on the back part of the thorax and white bands on the abdomen. The female is shown enlarged in Fig. 25. The flies appear on the wing in July in this region. The minute larvæ, just hatched, were observed about August first, when the apples were nearly an inch in diameter. We would like to have those who are interested in the matter note the appearance of this fly and report, sending live specimens if possible enclosed in a small bottle or box.

REMEDIES.

As the larvæ go through their transformations near the surface of the ground and often do not enter the ground at all but hide under sticks and about the roots of grass it would seem that plowing would destroy a great many by covering them so deep they would not be able to reach the surface. The larvæ do not leave the apples before the windfalls drop, and therefore the gathering of them would destroy a great many.

We do not think spraying when the apples are small, as is done for the Codling Moth, would do any good, as the fly does not deposit its egg until the apples are of considerable size.

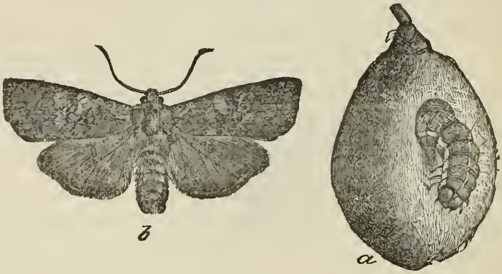
To leave the apples of affected trees ungathered, or to turn upon the ground those found to be infested would multiply the pest.

THE ASH-GRAY PINION.

Lithophane antennata, (Walker.)

Though not abundant we found quite a number of apples the past season apparently injured by this insect. The perfect insect is a moth. It is the larva that does the injury by boring into the young fruit.

FIG. 26.



In Fig. 26 is shown the moth and the larva at work. The moth is dull ash-gray color with variegated fore wings. The larva pale green, spotted with cream color and with a broad lateral band of the same shade. Hand picking is the only remedy we know or can suggest.

THE PEAR TREE SLUG.

Selandria cerasi, Peck.

Specimens of the above insect were received the past season and reported as doing great injury to the foliage of cherry and plum trees. Mr. Eben Bickford of South Newburgh says "they appeared on my cherry trees about ten or twelve years ago and destroyed my trees in two or three years. *Eternal vigilence* has been the price of cherries since. I have found no one who has seen anything like them, and I send them to you in hopes you will be able to name them and suggest a remedy. They will live on and destroy Damson plum trees when they cannot get cherry, but I have not seen them on any other. They do not travel far, as my neighbors, only twenty or thirty rods off do not have them."

This pest was fully considered in 1790 by Prof. Peck of Mass., in an article entitled "Natural History of the Slug worm" which was awarded a premium of fifty dollars and a gold medal by the Massachusetts Agricultual Society. This insect has spread over the greater portion of the United States and Canada and feeds upon the foliage of the pear, quince, plum and cherry doing more or less injury. Though called the pear slug it seems to prefer the foliage of the cherry.

FIG. 27.

FIG. 28.

DESCRIPTION.

Perfect insect—A four-winged fly of a glossy black color. The wings are transparent with brownish veins and the fore wings crossed by dusky markings; legs dull yellow with black thighs, excepting the hind pair which is yellow in the middle and black at the extremities. The female is about one-fifth inch long and the male smaller. The perfect insect is shown in Fig. 27, enlarged.

The *eggs* are small and deposited singly within semi-circular incisions made in the skin of the leaf upon the upper or under side.

The *larva* or slug when grown is about half an inch long, slimy, blackish or olive brown; head end smaller; head small, reddish, and nearly concealed under the first segment of the body. The young larva is white, but soon becomes olive colored and slimy. The last time it molts it elongates, loses its slimy appearance and becomes clear yellow or reddish yellow, and soon crawls or falls to the ground, buries itself from one to four inches and changes to the *chrysalis stage*. It does not spin a cocoon but forms an oval cavity in the earth and cements it together with slime, thus forming a chamber within which it transforms. The larva is shown natural size and enlarged in Fig. 28.

LIFE HISTORY.

The flies appear the last of May or early in June and deposit their eggs as described above. The eggs hatch in about two weeks. The slugs change their skin four or five times and come to maturity in about a month, crawl into the ground, change to the chrysalis state, from which the flies emerge in two weeks. These flies immediately lay eggs for a second brood, which hatches early in August. These larvæ mature in due time, enter the ground where they remain during the winter and emerge the following spring, completing the life history.

REMEDIES.

The flies feign death when disturbed and can be shaken from the trees and caught on cloth and destroyed. The best time to shake trees is early in the morning or late in the evening.

Spray the trees with hellebore and water, one ounce to a pailful. Dust the trees with air slacked lime. Sand, ashes and road dust seem to be of no value. If the trees are not bearing, the first brood could be killed by spraying with Paris Green and the second brood could always be killed that way, as the larvæ hatch after the fruit is gathered. The slugs are so slimy and have such a disgusting odor they are not eaten by birds and have few natural enemies, though the maggot of a small species of ichneumon fly is parasitic on the eggs. These flies are usually local in their injuries and much more common some years than others.

THE PLUM CURCULIO.

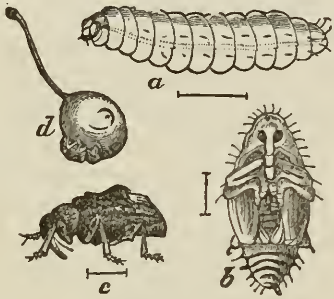
Conotrachelus nenuphar, (Herbst.)

This insect which is well known as the worst enemy to plum growers was observed the past season as doing considerable damage to apples. From ten to twenty-five per cent of the early apples examined in July showed the characteristic cut of this insect.

Quite a large number of apples of the earlier varieties, examined for the apple maggot, were found punctured and infested by the larva of the above species. After the first of August the cuts we found made by this insect were few and we are led to believe they prefer the earlier varieties and that the apples punctured do not mature. We found also that a very large per cent of the larvæ which hatched did not reach maturity, as quite a number of dead larvæ were found in the fruit and but very few reached maturity and transformed. We however succeed in transforming enough to identify the species. It would seem that the plum curculio does not flourish well in the apple and attacks it in the absence of its favorite fruit. The decline in the cultivation of plums due to the ravages of this pest and the black knot will account for its attacking apples.

When the trees are full the apples that are punctured and drop would not injure the crop, but with light bearers and in seasons when the bloom is scarce the damage would be considerable. This insect is known to infest the plum, peach, nectarine, apricot, cherry, apple and pear. The plum curculio is a native of this country, and originally fed upon wild plums, and still infests them. The males and females both puncture the fruit to feed on it, but only the latter make the crescent shaped cuts.

FIG. 29.



DESCRIPTION.

Perfect Insect—A beetle belonging to the family of insects known as weavils or snout beetles. It is blackish or grayish, rough, with a black, shining hump on each wing case near the middle, behind which is a dull ochre-yellow band marked with whitish about the middle; each thigh has two small teeth on the under side; snout short. Length of insect about one-fifth of an inch. Shown in Fig 29 c. enlarged.

Egg—Oblong-oval, pearly white, visible to the naked eye, and can be found readily by examining the crescent-shaped cut made by the female.

Larva—When young, tiny, soft, footless; head distinct, horny. When full grown it is usually of a glossy yellowish-white, but varies in color with the food; head light brown or yellowish, along each side is a light line, below which is a row of black bristles and above it a less distinct one, and toward the hind extremity a few pale hairs; length about two-fifths of an inch. Shown enlarged in Fig. 29 a. The larva is so transparent the internal organs are plainly seen through the skin, imparting a reddish color to the central parts of the body.

The chrysalis is shown enlarged in Fig. 29 b.

LIFE HISTORY.

The beetles hybernate in secluded spots during the winter and appear on the wing about the time the plum trees blossom, and, as soon as the young fruit forms, begin to deposit their eggs. The female, when about to lay an egg makes a minute incision with her jaws, and then, inserting the snout, enlarges the hole sufficiently to hold the egg, turns around, deposits the egg, thrusts it to the bottom of the hole with the snout, then cuts a crescent-shaped incision around one side of the opening, as shown in Fig. 28, d.

Only one egg is laid in a place, though on the apple several punctures may occur on the same fruit. Each beetle lays from fifty to one hundred eggs, and deposits from five to ten a day. The time of depositing eggs by early and late beetles probably occupies about two months. The first apples examined July first were badly punctured, and no new cuts were found after the twentieth of the month. The eggs hatch in a few days and the larva is full grown in from three to five weeks. The infested apples or plums usually drop to the ground before the larva is grown, and when mature it leaves the fruit, enters the ground four to six inches, forms an oval cavity, changes to the chrysalis and in from three to six weeks the perfect insect is formed and makes its way to the surface, completing the life history. There seems to be some reason for believing a few remain in the ground all winter. The specimens we transformed appeared in September, about four weeks from the time the larvæ were mature. We are inclined to believe that those apples in which the eggs hatch and the larvæ grow, drop early. Abortive cuts shrivel and deface the fruit and check its growth, but it may mature.

REMEDIES.

Jar the trees and catch the beetles that fall on sheets spread under the trees. The jarring should begin early, as the beetles appear with the blossoms, and be continued morning and evening for a month, or until the beetles become scarce. Dr. Hull of Illinois devised a "Curculio Catcher" which consists of an inverted umbrella on a wheelbarrow and provided with a slit in one side to receive the trunk of the tree. The machine is provided with a padded bumper in front and is driven against the tree with force enough to dislodge the beetles and cause them to fall into the umbrella, from which they are collected and destroyed.

Gather the fallen fruit as soon as it drops, or turn hogs in to devour it. Poultry allowed to run in the orchard will destroy a good many. Keep the ground clean under the trees as the beetles hybernate under rubbish. If the ground is clean, chips, pieces of cloth or shingles can be placed under the trees and examined occasionally for the beetles that hide under them. Plum orchards should be as far from groves of timber as possible, as the beetles find shelter in the woods and are apt to be more numerous than in open ground.

Prof. S. A. Forbes in Trans. Department of Agriculture, Illinois, Vol. 23, 1885, p. 26 in the Appendix, records experiments with Paris Green and lime suspended in water, to determine their usefulness in protecting apples from the attacks of the plum curculio; 2418 apples from trees sprayed with Paris Green were compared with 2964 apples from check trees not sprayed, and it was found that 27.3 per cent of those poisoned had been infested by curculios while of those not poisoned 51.3 per cent were affected. This would seem to show that the spraying saved nearly one-half of those that would have been injured. This method has the advantage of destroying a great many codling moths at the same time, as well as other insects. The experiments with lime seemed to show the destruction of about 25 per cent of the curculios, making it less efficient than Paris Green.

Quite a number of insect enemies help hold this pest in check. Among these are two or three species of ground beetles, the larvæ of the common soldier beetle, larvæ of the lace-wing flies, minute yellow Thrips and two species of ichneumon flies. The larvæ of the ground beetles, soldier beetle and lace-wing flies, and the ichneumon flies, prey upon the larvæ of the plum curculio. The Thrips mentioned devour the egg.

THE CHERRY TREE PLANT LOUSE.

Myzus cerasi, (Fabr.)

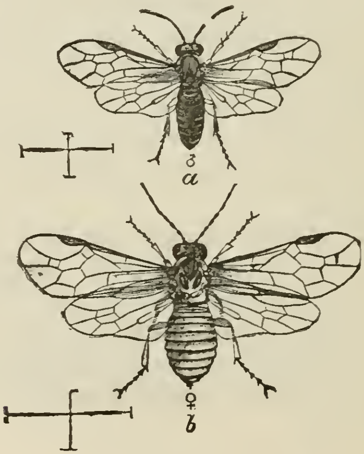
Specimens of this insect were received the past season with complaints of its doing injury to the foliage of cherry trees. The leaves and stems sent us were literally black with the lice. This species like all the plant lice multiplies rapidly. Dr. Fitch estimated that there were at least twelve millions of these insects on a single small cherry tree. The life history is essentially the same as that given for the apple tree aphis and the natural enemies and remedies about the same. Spraying the trees with weak lye, soap suds or tobacco water about the time the leaves are unfolding, and again later if necessary, would kill the most of them. The spray should be directed under the leaves as much as possible so as to reach them. Spraying with Paris Green early in the season would probably kill the lice as well as other insects. Some have tried colonizing lady-birds upon the trees with satisfactory results.

THE IMPORTED CURRANT-WORM.

Nematus ventricosus, Klug.

Attention has been called to this insect as doing injury to gooseberry bushes. We give cuts of the perfect insect (Fig. 30) which

FIG. 30.



is four winged and known as a saw fly, the larvæ at work on the leaves (Fig. 31.) and a leaf (Fig. 32) showing holes made by the young larvæ.

FIG. 31.

FIG. 32.

The consideration of this and other insects doing injury to currants and gooseberries is deferred, until we have more data. The station will be pleased to receive specimens of insects doing injury to the above plants. Below we give the remedies known for the currant worm. Spray the bushes well with powdered hellebore in water, one ounce to the pailful. Shower the bushes with water a little hotter than the hand can bear and destroy the worms that are dislodged and drop to the ground. Hand pick the leaves when the larvæ are young and grouped on them. The young larvæ are to be found usually on the lower leaves of the bushes and can be detected by holes in the leaves as shown in Fig. 31. The application of hot water would probably destroy a great many plant lice which are said to be doing considerable damage to the gooseberry bushes in the nursery rows in Aroostook county. Several natural enemies keep the currant worms in check. A small ichneumon fly is known to be parasitic on the eggs, and other species destroy the larvæ.

FIG. 33.

a

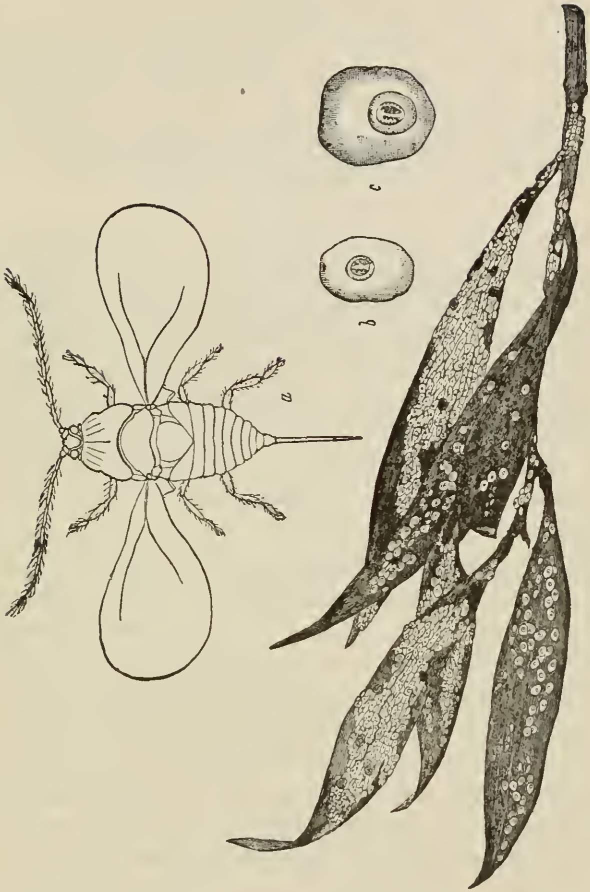
The placid Soldier-bug shown in Fig. 33, a, enlarged, and natural size below, is known to destroy them. This insect or one related to it is reported by Mr. E. W. Merritt of Houlton, Me., as feeding upon the larvæ, piercing them with its short beak and then sucking them dry. This insect should not be destroyed. It may be known by the following description: Head, thorax and legs black; abdomen, red, with an elongated black spot in the middle, crossed by a white line.

THE WHITE SCALE.

Aspidiotus nerii, Bouché.

Specimens of this insect were received upon leaves of the English Ivy. The plants were so badly infested that the leaves were nearly white with the scales. The lady sending the specimens stated that she had some time before placed leaves with the white spots on them, which came from a neighbor's, on a shelf near her plant, which would account for the attack. This insect attacks the orange and lemon trees in Southern California and Florida besides a number of other trees and plants. The Fig. 34 we give shows an acacia twig infested by this insect, the scales showing natural size.

FIG. 34.



The female scale is shown (Fig. 34, c) enlarged. The real size is about one-twelfth of an inch and the color whitish or light gray.

The male scale (Fig. 34, b.) is about one twenty-fifth of an inch long and white with a tinge of yellow.

The winged male is shown (Fig. 34, a) highly magnified. It is yellow, mottled with reddish brown and has transparent wings.

REMEDY.

Wash the stems and leaves with whale-oil soap and water, or by means of a sponge apply occasionally a thin coating of kerosene or sweet oil to the leaves and stems.

THE BLACK SWALLOW-TAIL.

Papilio Asterias, Cramer.

The larva of this insect was received from two parties with complaints of its ravages upon parsnips, carrots and celery. It is commonly known as the Parsley worm but feeds upon many plants cultivated and wild that belong to the Parsley family.

DESCRIPTION.

The perfect *male* insect is a black butterfly with a double row of yellow spots on its back; a broad band composed of yellow spots across the wings and a row of yellow spots near the hind margin; hind wings tailed, having seven blue spots between the yellow band and the outer row of yellow spots, and near the inner angle an orange spot with a black center. Paler below and spotted with orange. The *female* has only a few indistinct yellow spots on the under side of the wings. Expanse of wing three and a half to four inches.

Larva when full grown is about an inch and a half long and of a delicate apple green or greenish-yellow color above, paler on the sides and whitish below. The body is transversely banded with black, each band bearing a row of six yellow spots. When disturbed the caterpillar thrusts out from the first or second segment of the head, an orange Y shaped organ, which emits a disagreeable odor.

Pupa an inch and a quarter long, pale green ochre yellow or ash gray in color; there are two short ear-like projections above the head. Pupa attached by the tail to a pad of silk and supported across the middle of the body by a loop of silk.

LIFE HISTORY.

The butterflies appear in June and lay their eggs upon carrots, parsnips, celery, caraway and other umbelliferous plants. The worms, after several molts, are mature in about a month, leave the plants and finding a suitable place on a fence, building, or trunk of a tree, make the silken pad and loop, and in a day or so change to the pupæ. In from nine to fifteen days, depending on the weather, the butterflies emerge, and in due time lay eggs which hatch. These larvæ mature and enter the pupa state in the fall and remain in this condition until the following spring, when the butterflies emerge, completing the life history.

REMEDIES.

Hand pick the larvæ and pupæ and destroy them. Chickens and insectivorous birds will eat them.

THE EYED ELATOR.

Alans oculatus, (Linn.)

We received from Mr. E. W. Shepherd of Jefferson, Me., the past season what seems to be the half-grown larva of the above species, said to have been taken from the trunk of a small apple tree. This insect belongs to the spring beetle family, the larvæ of which usually are found under the bark of trees, or boring in decaying wood. To find one boring in sound wood is unusual and for *this* species novel so far as we know. The above species is the largest of the family and the perfect insect a handsome beetle over an inch long, of a grayish color with two prominent black eye-like spots on the thorax. Smaller species of the same family are common and they all attract attention by their power to spring when placed on their backs. The above species is not liable to do much injury.

THE HAWTHORN TINGIS.

Corythuca arcuata,

This species was found in abundance feeding upon the foliage of butternut trees in the western part of the State. They are not likely to do much damage and deserve only a passing notice. By cleaning the ground under the trees in the fall and burning the rubbish a great many of them would be destroyed.

THE MOURNING-CLOAK BUTTERFLY.

Vanessa antiopa, Linn.

The larva of this species was quite abundant the past season about Orono and in other portions of the State, feeding upon the foliage of the elm. This species feeds also on the willow and poplar but attracts more attention when devastating our favorite shade tree.

DESCRIPTION.

The *perfect insect* is a beautiful butterfly with two and a half to three inches expanse of wing. It may be known by the purplish or reddish brown wings bordered by a yellowish or buff band, within which is a row of violet blue spots. *Eggs* pale yellow and ribbed. A dozen or more are deposited on the stem near the petiole of a leaf.

The *larva* when mature is about one and three-fourths inches long; black, minutely dotted with white and appearing grayish; back marked by a row of eight bright brick red spots. The body is armed with from four to seven stiff branching spines on each segment except the first, giving the caterpillar a formidable appearance. The *larvæ* are social in their habits feeding in groups on the foliage. *Chrysalis* dark brown, with large tawny spots around the tubercles on the back.

LIFE HISTORY.

The butterflies hybernate in some sheltered place and are on the wing in the spring before the snow is gone, and lay their eggs for the first brood, which in this region hatches in June, and the larvæ are mature late in July or early in August, enter the chrysalis state and the butterfly emerges in ten or twelve days.

This brood soon lays eggs, which hatch and the larvæ mature; enter the pupa state and emerge before fall, producing the hybernating brood, completing the life history.

REMEDIES.

We find but few remedies suggested in the writings of entomologists but see no reason why they might not be destroyed by Paris Green on smaller trees and the branches of larger ones within reach of the spraying pump. The colonies could be hand picked.

The natural enemies of this insect help to keep it in check. Out of half a dozen chrysalids put away to transform by Mr. Briggs, only two butterflies emerged and from all others there came numerous small ichneumon flies. From one of the chrysalids over one hundred and fifty came forth. Some of the specimens were sent to Mr. Howard of the Agricultural Department at Washington, and he called them *Pteromalus puparum*. We do not know of this species having been found before parasitic on the larva of this butterfly, though another species, *Pteromalus vanessæ*, Harris, with this habit is recorded.

THE MEAL WORM.

Tenebrio molitor, L.

The perfect insect of this species was received from Mr. George L. Coffin, Winthrop, Me., who "found large quantities in corn meal." The perfect insect is a plain black beetle six-tenths of an inch long. The larva is about an inch long, cylindrical, smooth, glossy, hard, and of a yellowish brown color. It is known to infest corn meal, rye meal, boxed crackers, biscuits, &c., and is often found where grain is stored. We know of no remedy for them beyond killing as many of the beetles and larvæ as possible when found.

BENEFICIAL INSECTS.

All insects are not injurious. The indiscriminate killing of insects should be guarded against, as one's friends are as likely to suffer as his enemies. A large number of parasitic insects render great service to the farmer and fruit grower by feeding on injurious insects. These should be recognized when seen, protected and encouraged.

Attention is called to the *lady birds*, *ichneumon flies*, *tachina flies* and *ground beetles* illustrated in this report. The lady birds are small, *turtle shaped* beetles usually with spots on the wing covers. The beetles and their larvæ destroy the eggs of a number of injurious insects. They should be protected. Two forms are shown, Fig. 7 and Fig. 23.

Ichneumon flies have four wings and are related to the wasps and bees. There are numerous minute forms that prey upon the eggs and larvæ of injurious insects, and larger forms that deposit their eggs in caterpillars, destroying them. Figs 3, 12 and 13, will show the nature of these beneficial insects. The two-winged flies are sometimes parasitic on injurious insects. A tachina fly with that habit is shown in Fig. 14.

The predaceous beetles are carnivorous, feeding upon the larvæ and perfect form of other insects. They are quick moving beetles with long legs and generally metallic or black color. Two forms are shown in Figs. 15 and 16.

INSECTICIDES.

Experiments have been made the last season with the following insecticides, viz: Paris Green, London Purple, Hammond's Slug

Shot, Peroxide of Silicates, and Doyen's Potato-bug Preventive, to determine their relative value in destroying the potato beetle. The Paris Green was applied with an ordinary water sprinkler, using one teaspoonful to two gallons of water, with satisfactory results. The London Purple was applied in the same way, but one tablespoonful to two gallons of water. Results not as satisfactory as with Paris Green. The Peroxide of Silicates and Hammond's Slug Shot were sifted on the potatoes from a small box with a fine wire screen bottom, at the rate of sixty pounds to the acre. The former scorched the leaves. Both killed the beetles. A partial analysis was made of *Doyen's Potato-bug Preventive* but no experiments were performed with it at the station, though some of it was tried about Orono with negative results.

In all of these the poisonous ingredient must be arsenious acid (oxide) or its compounds, so that in each case the value of the preparation as an insecticide is determined approximately by the amount of arsenious acid present. The following are the results of the analyses of the above named materials.

	Paris Green, Per cent	London Purple, Per cent.	Hammond's Slug Shot, Per cent.	Peroxide of Silicates.	Doyen's Potato Bug Preventive.
Arsenious Oxide (white arsenic)......	47.68	55.35	1.20	1.61	19.09
Cupric Oxide..........................	27.47				7.41
Calcium Oxide (lime)................	-	26.23	29.41	34.75	
Sulphuric Acid (anhydride)..........	.78	.22	42.05	49.66	
Carbonic Acid........................	-	.27			
Acetic Acid...........................	7.16				
"Dead oil" (by difference)*...... ..	-	-	5.00		
Insoluble residue....................	2.34				
Water of hydration (calculated)	-	-	18.91		
Moisture..............................	1.35	5.29	3.43		

* Also determined approximately.

The Paris Green is mainly an aceto-arsenite of copper, or in other words, a compound of acetic acid, arsenious acid and copper. The London Purple is composed mainly of arsenite of lime, containing, besides, quite an amount of coloring matter. It is quite variable in composition.

Hammond's Slug Shot does not make a good showing as over nine-tenths (exactly 90.37 per cent) of it appears to be nothing but plaster. It contains only 1.2 per cent of arsenious acid, and approximately 5.00 per cent of a heavy oil.

Peroxide of Silicates contains only 1.61 per cent of arsenious acid and 84.41 per cent of calcium sulphate. A large part of the calcium sulphate is anhydrous and may have been added either as the mineral Anhydrite or as Plaster of Paris.

Doyen's Potato-bug Preventive contains 19.09 per cent of arsenious acid and 7.41 per cent of copper oxide. The remainder consists chiefly of starch in large fragments. The presence of copper oxide and the green color of the mixture indicates that the arsenic was added in the form of Paris Green.

Paris Green contains about forty times as much arsenious acid as Hammond's Slug Shot and the London Purple analyzed over forty-six times as much. Peroxide of Silicates is but little better than Hammond's Slug Shot. A mixture equally as strong as Hammond's Slug Shot can be made by mixing two and three-fourths lbs. of Paris Green with one hundred lbs. of plaster, and a mixture as good as Peroxide of Silicates by mixing three lbs. of Paris Green with one hundred lbs. of plaster. The heavy oil in Hammond's Slug Shot is probably no benefit, as the mixture contains enough arsenious oxide to kill the beetles without it.

Doyen's Potato-bug Preventive cannot be compared with the others, as the directions require a different method of application. This insecticide is put up in small wooden boxes holding an ounce and a half of what appears to be merely a mixture of about four parts of starch and one part of Paris Green. It is retailed at the modest sum of fifty cents per box. A similar mixture could be prepared from four parts of flour and one part of Paris Green, at a cost of less than one cent per box. Flour, which is cheaper than starch and just as good, has long been used as a carrier for Paris Green. The novelty of this insecticide is the method of application as shown by the following directions pasted on each box :

"A HALF HOUR'S WORK TO THE ACRE SAVES THE CROP.

Directions for use—Take two tablespoonfuls of the powder and put it into a ten quart pail; then add three quarts of boiling water. Fill the pail with potatoes cut in small pieces; then fill the pail with water so as to cover the potatoes, and let stand over night or longer. Just before the potatoes come up, scatter the pieces over the ground. This is enough for one acre. Price 50 cents."

The millennium in potato raising would certainly be here, if by "a half hour's labor to the acre" at a cost of "fifty cents" we could "save the crop" from the ravages of the "potato bug."

If potato beetles would all come out of the ground before the potato tops appear, and could be assembled to partake of the inviting feast spread for them, their destruction would be inevitable. But as they prefer not to appear much before early potatoes are up, and continue to emerge for a month or six weeks; and as they fly a long way in search of their favorite food and will not eat the tubers when young tops are to be had, there seems to be great difficulty in fulfilling the necessary conditions. As it might be difficult to induce the beetles to change their tastes and habits probably the safest and most economical plan would be to use the cheaper mixtures of Paris Green and apply them in the ordinary way. This insecticide was tried by two parties at Orono without any apparent "substantial benefit," as the usual applications of Paris Green had to be made later in the season.

RELATIVE COST.

Hammond's Slug Shot, 100 lbs.,	\$5.00
Peroxide of Silicates, 100 lbs.,	4.00
London Purple, 2 lbs. 40 cts., 100 lbs. plaster 50 cts =	.90
Paris Green, 3 lbs. 70 cts., 100 lbs. plaster 50 cts. =	1.25
Paris Green, 2 lbs. 50 cts., 100 lbs plaster 50 cts. =	1.00
Paris Green, 1 lb. 25 cts., 100 lbs. plaster 50 cts. =	.75
Paris Green, ½ lb. 15 cts., 100 lbs. plaster 50 cts. =	.65

Hammond's Slug Shot and Peroxide of Silicates will kill insects effectually. It is not a question of efficiency, however, but one of relative cost. For garden use, where only a few pounds are needed, many would prefer to pay a good price for an insecticide than to take the trouble to prepare one. Most farmers, who use considerable quantity, rather buy the plaster and Paris Green and mix them, than pay three or four dollars per hundred pounds to have it done for them.

In the above table we have for the sake of comparison of cost used two pounds London Purple to one hundred pounds of plaster, and three pounds of Paris Green to one hundred pounds of plaster. Experience shows that these strong mixtures are unnecessary, scorch the leaves and are a waste of material. Economy would suggest the use of as weak an insecticide as possible and yet secure good results.

Hammond's Slug Shot and Peroxide of Silicates contain considerable more arsenious acid than is necessary to kill the beetles.

One pound of London Purple to one hundred pounds of plaster is the strongest mixture advisable and the work can be done with less.

The strongest mixture of Paris Green advised would be two pounds to one hundred pounds of plaster, and there is good reason for believing that one pound to one hundred or even two hundred pounds of plaster, when thoroughly mixed and well applied, is sufficient.

The cheapest and most efficient poison for potato beetles is *Paris Green* applied with plaster or in suspension in water.

If plaster is not useful as a fertilizer on the land, the cost could be still further reduced by applying the Paris Green in water, at the rate of one pound to eighty gallons. This method has the advantages of less cost, greater rapidity of application, more equable distribution and no danger of inhaling the poison. The Paris Green is insoluble in water and has to be kept thoroughly stirred if an even application is desired. This is easily accomplished with as little trouble as mixing the Paris Green and plaster. An ordinary sprinkler with a *fine spray* serves a good purpose in making the application.

SPRAYING TREES.

Spraying fruit trees with insecticides in solution, or suspension in water about the time the young fruit is forming, has become a common practice, and has been attended with good results. Paris Green, suspended in water, one pound to eighty gallons, applied thoroughly with a spraying pump with a spray nozzle, two gallons to the tree, has given good results. The ravages of the codling moth, cankerworm, plum curculio and other insects are said to be materially checked by this treatment at a cost of ten cents per tree.

The station has tried "Lewis's Combination Hand Force-Pump" manufactured by Lewis & Cowles, Catskill, N. Y., and finds it a handy instrument well adapted to the uses of the farm and orchard. It is a brass pump and will readily throw water to the top of orchard trees from the ground or from a wagon. It can be used as a veterinary or agricultural syringe, or as a force pump. The instrument retails at six dollars. Every farmer or fruit grower should own some kind of a force pump.

REMEDY FOR ANTS.

Inquiries have been made for a way to exterminate field ants. Below we give the method advised, thinking it may be useful to others.

With a crowbar or some other instrument make three or four holes in different parts of the nest, extending to the bottom. By means of a tin tube, which any tinman can make, pour a few tablespoonfuls of kerosene oil to the bottom of each hole. Stop the holes with dirt and when convenient throw some dirt over the hill to keep the ants in. The kerosene oil will volatilize, permeate the chambers of the nest and kill the ants. When Bi-sulphide of Carbon can be obtained, perhaps it would serve a better purpose, being more volatile.

REMARKS.

The Entomologist for the station desires to become acquainted with insects doing injury in the State to farm and garden crops, orchards and forest trees, also parasites upon domestic animals, or any insects in the State whether injurious, beneficial or neutral in their habits. Correspondence in regard to insects is cordially solicited and any one finding specimens not known is invited to send them here for determination. Below we give directions for sending specimens.

DIRECTIONS FOR SENDING SPECIMENS.

All inquiries about insects, injurious or otherwise, should be accompanied by specimens, the more the better. Such specimens if dead, should be packed in some soft material, as cotton or wool, and enclosed in a stout tin or wooden box. They will come by mail for one cent per ounce. INSECTS SHOULD NEVER BE ENCLOSED LOOSE IN THE LETTER. Whenever possible, larvæ (*i. e.* grubs, caterpillars, maggots, etc.) should be packed alive in a tight box—the tighter the better, as air-holes are not needed—along with a supply of their appropriate food sufficient to last them on their journey; otherwise they generally die on the road and shrivel up. Send as full an account as possible of the habits of the insect respecting which you desire information; for example, what plant or plants it infests, whether it destroys the leaves, the buds, the twigs, or the stem; how long it has been known to you; what amount of damage it has done, etc. Such particulars are often not only of high scientific interest, but of great practical importance. In sending soft insects or larvæ that have been killed in alcohol, they should be packed in cotton saturated with alcohol. In sending pinned or mounted insects, always pin them securely in a box to be inclosed in a larger box, the space between the two boxes to be packed with some soft or elastic material, to prevent too violent jarring. PACKAGES SHOULD BE MARKED WITH THE NAME OF THE SENDER, and addressed to the Entomologist of the Experiment Station, Orono, Me.

ABSTRACT

OF

Report of Commissioners on Contagious Diseases of Cattle—1887.

To His Excellency, S. S. Marble, Governor of Maine:

The Commissioners appointed by our late lamented Governor, under an act entitled "An Act to extirpate contagious diseases among cattle," to be known and designated as the "State of Maine Cattle Commission," beg leave to report that the Commissioners met at Bangor on May 3d, 1887, for organization and the election of officers as follows:

F. O. Beal, Bangor, President; W. W. Harris, Portland, Secretary; Geo. H. Bailey, V. S., Portland, Veterinary Inspector.

Voted, To adopt the following rules and regulations:

An Act to extirpate contagious diseases among cattle, passed by the last Legislature of Maine, is now in force, and the following rules and regulations have been adopted.

Chapter 138, sections 4, 5 and 7, are as follows:

SECTION 4. That any person or persons who shall knowingly and wilfully refuse permission to said Commissioners, or either of them, to make, or who knowingly and wilfully obstructs said Commissioners, or either of them, in making all necessary examinations of animals supposed by said Commissioners to be diseased as aforesaid, or in destroying the same, or who knowingly attempts to prevent said Commissioners, or either of them, from entering upon the premises and other places hereinbefore specified where any of said diseases are by said Commissioners supposed to exist, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, or of either of the acts in this section prohibited, shall be punished by fine not exceeding one hundred dollars, or by imprisonment, at the discretion of the court.

SECT. 5. That any person who is the owner of or who is possessed of any interest in any animals affected with any of the diseases named in section two of this act, or any person who as agent, common carrier, consignee or otherwise, is charged with any duty in regard to any animal so diseased, or exposed to the contagion of such disease, or any officer or agent charged with any duties under the provisions of this act, who shall knowingly conceal the existence of such contagious disease, or the fact of such exposure to said contagion, or who shall knowingly and wilfully fail, within a reasonable time, to report to the said Commissioners, their knowledge or their information in regard to the existence and location of said disease, or of such exposure thereto, shall be deemed guilty of a misdemeanor, and shall be punishable as provided in section four of this act.

SECT. 7. That no person or persons owning or operating any railroad, nor the owner or owners, or masters of any steam, sailing or other vessels within the State, shall receive for transportation or transport from one part of the State to another part of the State, or to bring from any other State or foreign country affected with any of the diseases named in section two of this act, or that have been exposed to such diseases, especially the disease known as tuberculosis, knowing such cattle to be affected or to have been so exposed; nor shall any person or persons, company or corporation, deliver for such transportation to any railroad company, or to the master or owner of any vessel, any cattle, knowing them to be affected with or to have been exposed to any of the said diseases; nor shall any person or persons, company or corporation, drive on foot or transport in private conveyance, from one State to another part of the State, any cattle, knowing the same to be affected with or to have been exposed to any of said diseases.

Any person or persons violating the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by fine not exceeding the sum of two hundred dollars, or by imprisonment not exceeding six months, or by both fine and imprisonment.

Whenever the Commissioners shall inspect and condemn an animal as diseased, they will cause the appraisal of the animals affected with, or that have been exposed to said diseases, and the same shall be destroyed and paid for as provided in section 10, out of the moneys appropriated by this act, upon requisition made by the Commissioners or a majority of their board. Whenever the Commissioners shall decide animals to be diseased, or to have been exposed to contagion, and the owner refuses to accept the sum authorized to be paid under the appraisement provided for in this act, the Commissioners will declare and maintain a rigid quarantine of such animals at the expense of the owner, and also of the premises or places where such cattle may be found. All notices of diseases among cattle provided for in this act shall be made directly to the veterinary inspector of this board, who will by himself or some other member of the board, give the same immediate attention.

A summary of the whole number of cases reported to the Commissioners in 1887 will be found to number sixty-five, embracing cities and towns distributed from the western boundary of our State to Aroostook County. Of these, forty-eight herds of cattle were inspected, and sixteen stables and "lumber camps." Thirteen head of cattle were condemned and destroyed at an expense of $309.75; and eleven horses also condemned and destroyed at an expense of $626.50, making a total of $936.25.

When we come to consider the valuation of live stock in this State is rising $16,500,000, and that but thirteen head valued at but $309.75, have been affected with contagious disease, and that among our rapidly increasing stock of horses, but four cases of glanders, valued at $189.25, have been discovered, outside of one lumber camp, where seven horses prove to have been all inoculated from a "single case," taken together with the fact that but a single notice remained in the hands of any of the Commissioners on the first of January, is "proof positive" that Maine is justly entitled to a "clean bill of health" for her "flocks and herds," such as can be claimed by no other State in the Union.

The whole amount appropriated by the last Legislature to carry on the work of the cattle commission, was $5,000, but $2,500 of which would be available in 1887, and of this amount it was found $1,100 had been charged up against the new commission, in settling up the business of the previous year, so that but the $1,400 remained to carry on the business of the year. The Commissioners, in their endeavors to keep the expenses of carrying on this important work, restricted to the amount appropriated, have found themselves entirely unable to carry on some investigations that perhaps should have received their attention, and we are decidedly of the opinion that more money should be provided to properly carry on the work, or that a more stringent limit should be placed upon the amount of appraisal in cases of condemned animals.

By reference to section 2, chapter 138 of the new law, it will be found that in cases of animals condemned and destroyed by order of the Commissioners "the owner or owners thereof can recover three-fourths of their value, as determined upon the basis of health before infection, and the full appraised value in cases of animals exposed to either of such diseases but not themselves actually diseased, out of any moneys appropriated by the Legislature for that purpose; provided, however, that they shall not pay more than two hundred dollars for an animal with pedigree recorded or recordable in the recognized herd books of the breed in which the animal destroyed may belong, nor more than one hundred dollars for an animal which has no pedigree."

It will thus readily be seen that upon the appearance of any contagious disease in such valuable herds of pedigreed animals as these of our late Governor, or Hall C. Burleigh and many others, the entire appropriations of the year would be "wiped out" in the payment for a single herd, leaving the Commissioners powerless to provide for emergencies only too liable to arise.

We believe the "new cattle bill" should receive the prompt attention of the next Legislature of Maine, and in several important particulars be re-constructed or modified so as to meet all reasonable demands in this State, in protecting our domestic animals against contagious diseases, and in maintaining that "high standard" of health which they now enjoy.

F. O. BEAL,
W. W. HARRIS,
GEO. H. BAILEY, V. S.
State of Maine Cattle Commissioners.

1888.

To His Excellency, the Governor of Maine:

The commissioners appointed under the act entitled "An act to extirpate contagious diseases among animals," to be known and designated as the "State of Maine Cattle Commission," beg leave to present their annual report.

In closing this last inspection of the year we are able to report that all of the expenses of the commission, including the amount paid for horses and cattle, for the years 1887 and 1888, have been kept well within the appropriation.

Received from the State, 1887 and 1888	$3,822 10
Outstanding bills January 1st 1888	700 00
	$4,522 10
Amount less than appropriation	477 90
	$5,000 00

A summary of the whole number of cases reported to the commissioners in 1888, will be found to number fifty-three, embracing cities and towns distributed from the sea-board at Portland, to the backwoods of Maine. Eighteen herds of cattle were inspected, and thirty-five stables and "lumber camps." Two head of cattle were condemned and destroyed at an expense of $85.84, and nineteen horses were also condemned and destroyed at an expense of $1,300.50, making a total of $1,386.34 as compared with 1887, forty-eight herds of cattle were inspected, and thirteen head of cattle were destroyed at an expense of $309.75, while eleven horses were destroyed (seven of them being traced to one lumber camp) at an expense of $626.50, making a total of $936.25.

It will be observed that the number of cattle destroyed has so materially decreased from last season, that but three cases of tuberculosis have developed during the year out of the whole number inspected, while among horses the number affected with glanders has increased from eleven head in 1887, to nineteen head in 1888. In tracing the history of this unusual number of cases of glanders and farcy in this State, the most significant fact has developed, that but two of these horses were bred in Maine, while five of them were broncos, three came from Canada, one from the Provinces, one from New Hampshire and seven of them came to us from Massachusetts. This showing conclusively proves that glanders does not prevail among horses in this State, together with a strong probability that what cases do develop among them, are caused by inoculation from horses brought into Maine, that had been previously exposed, if they had not actually developed the disease when brought here, although we have been unable to verify this fact but in a single instance.

The greatly improved condition of our "flocks and herds" over that of previous years, showing as it does an almost absolute absence of any contagious disease among our cattle, may well be deemed sufficient warrant for the opinion that tuberculosis is practically stamped out of Maine, while it would be perhaps unreasonable to expect that isolated cases may not again make their appearance in the future history of our State.

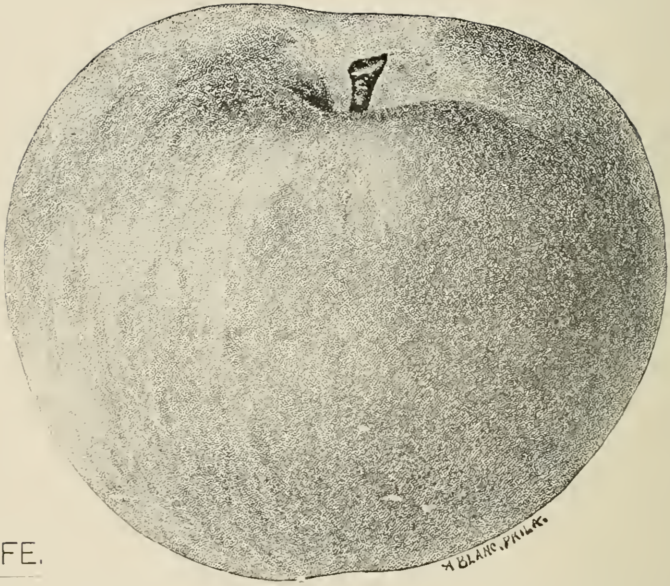
The new cattle bill passed at the close of the last session of the legislature, entitled "an act to extirpate contagious diseases among cattle" should, in the opinion of our Board, be so changed or modified as not to give in certain sections of the law, especial prominence to the disease known as tuberculosis, to which the public mind had at that time been pointedly directed in consequence of the unprecedented outbreak of the disease at the State College farm at Orono. At the time the report of the Orono cases was published (although the entire herd had then been disposed of and destroyed), there were still outstanding quite a number of young animals (mostly bulls) that had been sold from time to time from the College herd, that by order of the Committee of Investigation, were afterwards inspected, and being found in almost every instance thoroughly diseased, were also destroyed, so that we are now able to report the State free from any suspicious cases that trace directly to the College herd, with possibly the exception of a single bull in the town of Lee, that was out of one of the diseased and condemned cows at Orono.

In view of this fact we have to recommend that there be left out of section 1, chapter 138, the words "especially tuberculosis," and out of sections 2, 5, 6 and 7, such portions as recommend the "quarantine and destruction of such animals as have been exposed to the disease known as tuberculosis, but not themselves actually diseased," as being contrary to all well recognized authorities and precedents in dealing with and disposing of cases of tuberculosis among cattle. It has been repeatedly proven in this State that some one or more cases may be found present in a large herd, (which being destroyed) no other cases ever afterwards developed, and the three cases destroyed the present year show conclusively that although summered and wintered with other cattle, no suspicious cases remain in the herds from which they came, while should a single case of contagious pleuro-pneumonia be discovered in a herd of cattle, the only rational means to insure its extermination would not only be to destroy such an animal, but all others that had been herded with it. The frightfully contagious nature of this disease, and its treacherous and fatal character, have long since proved that to be the most economical and only certain manner of extermination. In several instances in the past our board have been notified of supposed cases of contagious pleuro-pneumonia, and it should, perhaps, be stated in this connection that an animal affected with common lung fever or pneumonia presents appearances so nearly identical with those of the contagious form, that it is often impossible to distinguish them as different while the animal is living, but that by a post-mortem it at once becomes apparent. Up to the present time, however, no case of *contagious pleuro-pneumonia has ever* *made its appearance in this State*, and it is believed that if the same watchful care and prudent legislation be exercised and continued in the future as in the past, this dread disease will never make its appearance in Maine.

The lung plague of the West, however, is no less dangerous than that which may be imported from Europe, and if we should allow this scourge to reach this State, it will matter little whether it come from Liverpool or New York, its virulent and deadly effect will be all the same, and we believe it to be a matter of honor and consistency, as well as self-protection, to prohibit the introduction of such cattle from infected States.

By the present quarantine regulations of Canada, cattle from the United States, en route to foreign ports, are required to be held for ninety days, and it would be of great service to American stockmen to have this embargo removed. We are just in receipt of a letter from Sioux City, Iowa, requesting the facts as to the present health and condition, as well as brief history of any past general or special unhealthfulness of cattle within our State, as the Senate's special committee upon commercial relations with Canada will soon call up the matter, and enquire for evidence, and we have taken great pleasure in replying, to be able to furnish the information embodied in this report, as the best evidence we could possibly give of the "high standard" of health that is now enjoyed among the "flocks and herds" of Maine.

F. O. Beal, *President*,
W. W. Harris,
Geo. H. Bailey,
State Veterinary Surgeon.



ROLFE.

A Maine seedling. See Pomological Report, page 120, for history and description.

MAINE STATE POMOLOGICAL SOCIETY.

Transactions for the Year 1888-9.

There are so many ways in which our Society is doing a magnificent work in behalf of the various industries it represents, it is extremely difficult to gather the fragments and arrange them in intelligble form for publication. It may be an easy matter to set in order the papers read at our meetings, and to spread out before the reader the various discussions which form so important a feature of our public gatherings. The official action of the Society, so far as it may become a matter of record, may be readily shown in its list of officers, the votes passed, reports of committees, etc. The annual exhibition as announced in premium lists looks well, and so do the tables of fruits and flowers, but the list of awards is all we are able to publish in connection with it. These represent what we may call the visible work of the Society.

Beyond all these the Society is the means of disseminating useful information to the public which none can correctly measure. During the year the officers have been in frequent correspondence not only with Maine fruit growers, but with other persons outside the State, and with other kindred societies. There have been frequent calls for our annual volume of Transactions and for information regarding varieties of fruits and cultural directions. So far as possible it has been a pleasure to respond to these inquiries, though in the absence of any extended publication the answers have necessarily been brief. The extent of the unorganized work is the feature most difficult to determine. To illustrate:—Our last exhibition was one of the best arranged we have ever held. Many of its details are published elswhere, but the taste shown in the displays of fruits and flowers is the æsthetic feature and can not be shown in print. The harmony of colors in the floral designs was studied by many, and the skill of the designers in producing the effect will be copied by hundreds who saw them and admired their beauty. About the fruit tables and the officers large throngs of fruit growers were attracted. They were in search of knowledge and were busy seeking it of others who happened to be near them. New varieties were examined with closest scrutiny, their merits discussed, and many a one "made a note of" what they had learned. "Jack Spratt" and "Nelson" failed to draw the fruit growers from these pleasant surroundings.

Particular attention is invited to the annual address of President Pope, especially to those portions in which are outlined the work of the Society during the past year.

Regarding the present volume the plan of arrangement is somewhat different from that of previous volumes, but it is believed it will make the contents more valuable to the reader. The business transactions of the Society are under one general head instead of being scattered through the book. The papers and discussions are, so far as possible, arranged according to subjects. The fruit list prepared by the Society's Committee on Revision of Fruit Catalogue, though not complete will be found reliable, and it is hoped may prove helpful to those in search of the information it contains.

D. H. K.

OFFICERS FOR 1888.

President.

CHARLES S. POPE, Manchester.

Vice Presidents.

D. J. BRIGGS, South Turner.

O. C. NELSON, New Gloucester.

Secretary.

D. H. KNOWLTON, Farmington.

Treasurer.

A. S. RICKER, Turner.

Executive Committee.

The President and Secretary, *ex-officio;* H. W. Brown, Newburg; L. H. Blossom, Turner Centre; 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. Andrews, Gardiner.
Knox	"	Elmas Hoffses, Warren.
Lincoln	"	H. J. A. Simmons, Waldoboro'.
Oxford	"	C. H. George, South Paris.
Penobscot	"	S. C. Harlow, Bangor.
Piscataquis	"	H. L. Leland, East Sangerville.
Sagadahoc	"	H. S. Cary, Topsham.
Somerset	"	James S. Hoxie, North Fairfield.
Waldo	"	D. B. Johnson, Freedom.
Washington	"	Dr. A. R. Lincoln, Dennysville.
York	"	B. F. Pease, Cornish.

Committee on Nomenclature.

Z. A. Gilbert, North Greene; W. P. Atherton, Hallowell; D. P. True, Leeds Centre.

Committee on New Fruits.

D. H. Knowlton, Farmington; L. H. Blossom, Turner; J. W. True, New Gloucester.

Committee on Revision of Fruit List.

D. H. Knowlton, Farmington; D. J. Briggs, South Turner; D. P. True, Leeds Centre; Henry McLaughlin, Bangor; E. W. Dunbar, Damariscotta.

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
*Atherton, H. N..............Hallowell
Atherton, W. P...............Hallowell
Atkins, Charles G............Bucksport
Atwood, Fred.. ....Winterport
Averill, David C................Temple
Bennoch, John E.................Orono
Boardman, Samuel L...........Augusta
Briggs, D. J ....South Turner
Briggs, John.....................Turner
Burr, John......................Freeport
Butler, Alonzo....................Union
Carter, Otis L.......................Etna
Chase, Henry M.........North Yarmouth
Chase, Martin V. B ....Augusta
*Clark, Eliphalet..............Portland
Cole, Horatio G...........Boston, Mass.
Crafts, Moses....................Auburn
*Crosby, William C..............Bangor
Dana, Woodbury S.............Portland
DeRocher, Peter.......Bradentown, Fla.
Dirwanger, Joseph A...........Portland
Dunham, W. W.............North Paris
Dyer, Milton............ Cape Elizabeth
*Emerson, Albert................Bangor
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
*Godfrey, John E................Bangor
Hackett, E. C...........West Gloucester
Hanscom, John......................Saco
Harlow, S. C.......................Bangor
*Harris, N. C ....Auburn
Harris, N. W...................... Auburn
Harris, William M...............Auburn
*Hersey, T. C....................Portland
Hopkins, Miss S. M............Gardiner
Hoxie, James S..........North Fairfield
Hobbs, M. C...........West Farmington
Hoyt, Mrs. Frances.............Winthrop
Ingalls, Henry..................Wiscasset
*Jewett, George.................Portland
Johnson, Isaac A .... Auburn
Jordan, Francis C............Brunswick
Knowlton, D. H...............Farmington
Low, Elijah.........................Bangor
Low, S. S...........................Bangor
Lapham, E. A....................Pittston
McLaughlin, Henry..............Bangor
Merrill, T. M. ....West Gloucester
*Metcalf, M. J...............Monmouth
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, Charles S..............Manchester
Pulsifer, D. W....................Poland
Purington, E. F ....West Farmington
*Richards, F. G .... Gardiner
Richards, John T..............Gardiner
Ricker, A. S......................Turner
*Richardson, J. M.............Gardiner
Roak, George M................ Auburn
Robinson, Henry A.............Foxcroft
Rolfe, Samuel...................Portland

*Deceased.

LIFE MEMBERS—CONCLUDED.

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, Isaiah................Bangor
Stilphen, Asbury C ....Gardiner
Stanley, Charles...............Winthrop
Stanley, O. E..................Winthrop
Strout, S. F..............Cape Elizabeth
Strattard, Mrs. A. B ....Monroe
Sweetser, S. R ....Cumberland Center
*Taylor, Joseph................Belgrade
Taylor, Miss L. L...(Lakeside) Belgrade
Thomas, William W., Jr........Portland
Tilton, William S ....Boston, Mass.
True, Davis P.............Leeds Center
Varney, James A.....The Dalles, Oregon
Vickery, James................Portland
Vickery, John...................Auburn
Wade, Patrick.................Portland
*Weston, James C................Bangor
Wharff, Charles S. ....Gardiner
Whitney, Edward K ....Harrison
Woodman, George W...........Portland

ANNUAL MEMBERS, 1888.

Berry, M. B ....New Gloucester
Chandler, S. H..........New Gloucester
Chipman, A. B.... .....New Gloucester
Davis, Jacob L ....Upper Gloucester
Fogg, Chas. N.......... New Gloucester
Nelson, O. C...........Upper Gloucester
True, John W...........New Gloucester
Ward, John H...........New Gloucester
Whittier, Phineas......Farmington Falls

ANNUAL MEMBERS, 1889.

Bickford, James.................Carmel
Blossom, L. H............Turner Centre
Chase, Geo. C ....Lewiston
Davis, Jacob L........Upper Gloucester
Dudley, J. W................Castle Hill
Dunbar, E. W.............Damariscotta
Dunton, John...... ....Lewiston
Gurney, Lemuel...................Hebron
Hawkins, M.....................Auburn
Hoffses, Elmas..................Warren
Hopkins, John................Newcastle
Judkins, H. P. ....Chesterville
Kenniston, J P........Simpson's Corner
King, S. M..................South Paris
Leech, H. T ....East Monmouth
Leech, S. E.............East Monmouth
Luce, Willis A ....South Union
Merritt, E. W.....................Houlton
Nelson, O. C...........Upper Gloucester
North, M. J ....Wilton
Perkins, L. J ....Portland
Pulsifer, D. M..............East Poland
Skillings, Laurinda............Lewiston
Stetson, Everett............Damariscotta
Towle, Willis O...........West Gardiner
True, J. W..............New Gloucester
Wharff, W. R ....Gardiner
Young, W. H....................Auburn

*Deceased.

Annual Statement for the Year Ending December 31, 1888.

Receipts.

Cash from Manufacturers' National Bank	$400 00	
State Treasurer, bounty, 1887	500 00	
Life members	40 00	
Annual members	40 00	
State Agricultural Society	450 00	
		$1,430 00

Expenditures.

Cash paid—Secretary's salary	$75 00	
clerk	8 00	
expenses	53 91	
Executive committees' expenses	158 75	
stationery, printing and binding	62 77	
interest	6 20	
Peoples' Trust Company, note	350 00	
L. F. Starrett	3 65	
Carl Braun	20 00	
overpaid by last Treasurer	2 56	
paid S. L. Boardman	32 95	
overpaid premiums, 1887	10 00	
paid premiums, 1888	584 75	
in treasury	61 46	
		$1,430 00

Financial Condition of the Society Dec. 31, 1888.

Assets.

Due from the State bounty, 1888	$500 00	
Property owned by Society, estimated	150 00	
Permanent fund deposit	365 85	
Balance due from State Agricultural Society, 1888	50 00	
		$1,065 85

Liabilities.

Due Manufacturers' National Bank	$400 00	
Outstanding orders and accounts, so far as known	35 00	
		$435 00

Permanent Fund.

Cr.

By fees of 91 life members to Dec. 31, 1887	$910 00	
4 " received 1888	40 00	
		$950 00

Dr.

To amount in deposit with Wiscasset Savings Bank	$365 85	
Balance due fund	584 15	
		$950 00

A. S. RICKER, *Treasurer.*

TURNER, February 12, 1889.

The foregoing accounts of the Treasurer have been examined and found correct.

CHARLES S. POPE,
L. H. BLOSSOM,
H. W. BROWN,
J. W. TRUE,
D. H. KNOWLTON,
} *Executive Committee.*

DAMARISCOTTA, Feb. 14, 1889.

Maine State Pomological Society.

Report of the Sixteenth Annual Exhibition Held in Lewiston, September 11, 12, 13 and 14, 1888.

By invitation of the trustees of the Maine State Agricultural Society the executive committee of this society met them in Lewiston, and perfected arrangements for holding the society's sixteenth annual exhibition in connection with the exhibition of their society. The arrangements made were definitely understood and recorded by both societies. There was perfect harmony of action between the two societies, and, we are glad to state, the most friendly relations have continued to the present. The exhibition was accordingly held in the exhibition hall in the State Fair Park, Lewiston, September 11, 12, 13 and 14, 1888.

The executive committee gave the revision of the society's premium list most careful attention, and after fully discussing the premises decided to reduce the number of premiums offered on single varieties of apples and to increase the amount of premiums offered for our three leading winter fruits for market, namely, the Baldwin, Rhode Island Greening, and Roxbury Russet. The premiums offered for each variety were $5 for the first, $3 for the second and $2 for the third. In this department each plate consisted of just twelve specimens of fruit. At first there were some doubts about the wisdom of this plan, but as the season advanced it seemed to be approved by fruit growers, and when the fruit tables at the exhibition were put in order there was spread out before the public a display of winter fruit never surpassed in Maine. For the Baldwin premiums there were forty-two plates of fruit, for the Rhode Island Greening thirty-one, and for the Roxbury Russet twenty-five.

There were county exhibitions of fruit from all the counties except Hancock, Piscataquis, Washington and York. It was a pleasure to have so large a part of the State represented, but we ought not to be content till our tables are laden with fruit from every county. Hon. Parker P. Burleigh from Linneus made an excellent display of fruit grown by him. From the fine specimens of apples in his collection we are convinced that Aroostook will soon produce an abundance of apples.

The exhibition was a surprise to many, for the fruit was not only more abundant than anticipated, but it proved to be far better in quality also.

There was a large number of varieties of fruit exhibited for name, and special care was taken to have these apples carefully examined by the committee on nomenclature and other fruit growers. Names were given so far as known, but some specimens could not be identified. This feature of the exhibition proved to be one of the most valuable.

There was a very good exhibition of pears, and they were of excellent quality, too. Fruit growers are confident in the belief that Maine can grow her own pears, and the annual exhibitions show a very large increase each year.

The exhibition of flowers was large in spite of the frost, though many tender varieties of open air plants were conspicuous by their absence. Mr. George M. Roak of Auburn had an excellent and attractive display of greenhouse plants.

The executive officers took special care to have every part of the exhibition well cared for, and to show every attention possible to the exhibitors and the thousands of visitors.

The fruit of several exhibitors was placed at the disposal of the secretary of the society. The ladies representing the Women's Charitable Association of Lewiston and Auburn were presented with the fruit in behalf of the exhibitors. They informed the secretary that the fruit was of value to them, as from its sale they were able to secure funds for the noble work of their organization. Before the fair closed, the ladies formally extended to the secretary and the donors their thanks for the fruit.

The General Rules of the exhibition were essentially the same as last year, and as they were published in the premium lists, they are omitted in the Transactions of the society this year.

List of Premiums Awarded at the Sixteenth Annual Exhibition, 1888.

Class I—APPLES.

Entries for *all premiums* in this division must consist of five specimens of each variety exhibited.

By "named varieties" is meant such as are named and described in some standard work on Pomology or have been named and approved by some National or State Horticultural Society.

In adopting 20 as the number of varieties required in the general and County collections, the Society does not intend to encourage the multiplication of varieties; and the committee will be instructed in awarding the premiums to have regard to quality and value rather than to the number of varieties, and will be authorized to recommend gratuities for meritorious collections embracing less than the number of varities required.

Awards. Best exhibition of fruit grown by exhibitor: Rufus Prince, So. Turner, $5.00; J. S. Hoxie, No. Fairfield, $3.00.

Best general exhibition of apples grown by exhibitor in any part of the State: W. R. Wharff, Gardiner, $12.00; C. I. Perley, Sewards', $8.00; Miss L. L. Taylor, Lakeside, $5.00.

Best general exhibition of apples grown by exhibitor in Androscoggin county: John Dunton, Lewiston, $8.00; A. S. Ricker, Turner, $6.00; Nathan W. Harris, Auburn, $4.00.

For the same in Aroostook county: Parker P. Burleigh, Linneus, $6.00

For same in Cumberland county: J. W. True, New Gloucester, $8.00; S. R. Sweetser, Cumberland Centre, $6.00; Milton Dyer, Cape Elizabeth, $4 00.

For same in Franklin county: H. P. Judkins, Chesterville, $8.00;

E. F. Purington, West Farmington, $6.00; David C. Averill, Temple, $4.00.

For same in Kennebec county: H. G. Fairbanks, North Monmouth, $8.00; Willis O. Towle, West Gardiner, $6 00; Charles S. Pope, Manchester, $4.00.

For the same in Knox county: Alonzo Butler, Union, $8.00.

For the same in Lincoln county: E. W. Dunbar, Damariscotta, $8.00.

For the same in Oxford county: C. H. George, Hebron, $8 00; Lemuel Gurney, Hebron, $6.00; S. M. King, South Paris, $4 00.

For the same in Penobscot county: C. A. Arnold, Arnold, $8.00; H. W. Brown, Newburg, $6.00; J. P. Kenniston, Simpson's Corner, $4.00.

For the same in Sagadahoc county: H. S. Cary, Topsham, $8.00; A. P. Ring, Richmond, $6.00; Fred Wright, Bath, $4.00.

For the same in Somerset county: J. S. Hoxie, North Fairfield, $8.00.

For the same in Waldo county: Moses Bartlett, East Dixmont, $8.00; George Bartlett, East Dixmont, $6.00; Mrs. A. B. Strattard, Munroe, $4.00.

For the best collection of apples for home use, for the entire year, in eight varieties: D. J. Briggs, South Turner, $5 00; L. H. Blossom, Turner Centre, $3.00; S. R. Sweetser, Cumberland Centre, $2.00.

For the best collection of crab apples: James Bickford, Carmel, $1.00; J. P. Kenniston, Simpson's Corner, 50c.

Second Division.

Entries for best dish of Baldwins, Rhode Island Greenings and Roxbury Russets, consisting of twelve specimens each.

Baldwins: James Bickford, $5.00; W. E. Rose, $3.00; D. M. Pulsifer, $2.00.

Rhode Island Greenings: C. I. Perley, $5.00; H. G. Fairbanks, $3.00; A. S. Ricker, $2.00.

Roxbury Russets: H. T. & S. E. Leech, $5.00; C. I. Perley, $3.00; Mrs. M. L. Robbins, $2.00.

Alexander: John E. Haley, $1.00; C. H. Bradford, 50c.

American Golden Russet: H. P. Judkins, $1.00; I. T. Waterman & Sons, 50c.

Ben Davis: I. T. Waterman & Sons, $1.00; C. I. Perley, 50c.

Benoni: H. W. Brown, $1.00; J. S. Hoxie, 50c.
Black Oxford: H. W. Brown, $1.00; H. P. Judkins, 50c.
Deane: M. J. North, $1.00; S. R. Leland, 50c.
Duchess of Oldenburg: D. P. True, $1.00; E. G. Woodside, 50c.
Early Harvest: J. S. Hoxie, $1.00; E. F. Purington, 50c.
Fall Harvey: Miss L. L. Taylor, $1.00; H. P. Judkins, 50c.
Fall Pippin: R. H. Gardiner, $1.00; A. B. Chipman, 50c.
Fameuse: C. H. George, $1.00; C. I. Perley, 50c.
Garden Royal: C. I. Perley, $1.00; M. J. North, 50c.
Gravenstein: T. M. Merrill, $1.00; E. G. Woodside, 50c.
Grimes' Golden: H. W. Brown, $1.00; J. S. Hoxie, 50c.
Hubbardston Nonesuch: H. T. & S. E. Leech, $1.00; Miss L. L. Taylor, 50c.
Hunt Russet: H. W. Brown, $1.00; F. A. Rogers, 50c.
Jewett's Fine Red: C. I. Perley, $1.00; D. M. Pulsifer, 50c.
King of Tompkin's County: Miss L. L. Taylor, $1.00; W. R. Wharff, 50c.
King Sweeting: H. P. Judkins, $1.00; G. A. Pike, 50c.
Large Yellow Bough: Laurinda Skillings, $1.00; F. H. L. Sleeper, 50c.
McIntosh Red: E. F. Pnrington, $1.00.
Mother: Miss L. L. Taylor, $1.00; H. T. & S. E. Leech, 50c.
Munson Sweet: D. H. Knowlton, $1.00; S. R. Sweetser, 50c.
Northern Spy: W. H. Young, $1.00; R. H. Gardiner, 50c.
Orange Sweet: H. P. Judkins, $1.00; J. S. Hoxie, 50c.
Peck's Pleasant: R. H. Gardiner, $1.00; J. S. Hoxie, 50c.
Pomme Royale; C. H. George, $1.00.
Porter: E. G. Woodside, $1.00; R. H. Gardiner, 50c.
President: I. T. Waterman & Sons, $1.00; Horace True, 50c.
Primate: E. F. Purington, $1.00; J. S. Hoxie, 50c.
Pumpkin Sweet: H. S Cary, $1.00; H. P. Judkins, 50c.
Red Astrachan: H. P. Judkins, $1.00; E. F. Purington, 50c.
Red Canada: Willis O. Towle, $1.00; Laurinda Skillings, 50.
Rolfe: S. R. Sweetser, $1.00.
Stark: E. F. Purington, $1.00.
Somerset: Miss L. L. Taylor, $1.00; H. G. Fairbanks, 50c.
Starkey: C. I. Perley, $1.00.
Talman's Sweet: I. T. Waterman & Sons, $1.00; C. I. Perley, 50c.
Tetofsky: J. S. Hoxie, $1.00; S. M. King, 50c.

Wagener: Nathan W. Harris, $1.00; H. P. Judkins, 50c.
Wealthy: S. R. Sweetser, $1.00; O. H. Merrill, 50c.
Williams' Favorite: H. S. Cary, $1.00; J. S. Hoxie, 50c.
Winthrop Greening: M. J. North, $1.00; Horace True, 50c.
Yellow Bellflower: R. H. Gardiner, $1.00; Mrs. I. V. McKinney, 50c.
Russell: David C. Averill, $1.00; M. J. North, $1.00.
Yellow Transparent: S. R. Sweetser, $1.00.

Class II.—PEARS.

Best general exhibition of pears: Samuel Rolfe, Portland, $10.-00; L. J. Perkins, Portland, $8.00; C. I. Perley, Sewards', $5.00.
Best five autumn varieties: George C. Chase, $3.00; D. P. True, $2.00.
Bartlett: George C. Chase, $1.00; H. T. & S. E. Leech, 50c.
Belle Lucrative: Alonzo Butler, $1.00; J. S. Hoxie, 50c.
Beurre d' Anjou: D. P. True, $1.00; C. I. Perley, 50c.
Beurre Clairgeau: D. J. Briggs, $1.00.
Beurre Diel: D. J. Briggs, $1.00.
Buffum: D. P. True, $1.00; C. I. Perley, 50c.
Clapp's Favorite: George C. Chase, $1.00; H. T. & S. E. Leech, 50c.
Doyenne Boussock; C. I. Perley, $1.00.
Duchesse d' Angouleme: Geo. C. Chase, $1.00; A. B. Chipman, 50c.
Eastern Belle: J. S. Hoxie, $1.00.
Flemish Beauty: Miss L. L. Taylor, $1.00; H. H. & H. B. Whitman, 50c.
Fulton: L J. Perkins, $1.00.
Glout Morceau: D. J. Briggs, $1.00.
Goodale: C. I. Perley, $1.00; T. M. Merrill, 50c.
Howell: C. I. Perley, $1.00; J. S. Hoxie, 50c.
Lawrence: C. H. George, $1.00; John Dunton, 50c.
Louise Bonne de Jersey: D. P. True, $1.00; Geo. C. Chase, 50c.
Nickerson: Miss L. L. Taylor, $1.00; D. P. True, 50c.
Seckel: D. J. Briggs, $1.00; Mrs. I. V. McKinney, 50c.
Sheldon: Geo. C. Chase, $1.00; Mrs. I. V. McKinney, 50c.
Souvenir du Congres: L. H. Blossom, $1.00.

Pratt: D. J. Briggs, 50c.
Napoleon: D. J. Briggs, 50c.
Beurre d' Amates: S. M. King, 50c.
Seedling: C. I. Perley, 50c.

No entries were made for grapes.

Class IV—PLUMS.

Best general exhibition of plums: John Dunton, Lewiston, $6.00; E. W. Dunbar, Damariscotta, $4.00; D. P. True, Leeds Centre, $2.00.

Coe's Golden Drop: Geo. C. Chase, $1.00.
Green Gage: E. W. Dunbar, $1.00; James Dunning, 50c.
Prince Imperial Gage: Geo. C. Chase, $1.00; E. W. Dunbar, 50c.
Purple Gage: E. W. Dunbar, $1.00.
Red Gage: D. P. True, $1.00; R. H. Gardiner, 50c.
Yellow Gage: James Dunning, $1.00; D. P. True, 50c.
Jefferson: R. H. Gardiner, $1.00.
Lawrence: D. P. True, $1.00.
Lombard: C. H. George, $1.00; I. T. Waterman & Sons, 50c.
Magnum Bonum: M. P. Hawkins, $1.00.
McLaughlin: D. P. True, $1.00; Alonzo Butler, 50c.
Moore's Arctic: James Dunning, $1.00; F. W. Chase, 50c.
Smith's Orleans: E. W. Dunbar, $1.00
Washington: E. G. Woodside, $1.00; E. F. Purington, 50c.
Yellow Egg: Lemuel Gurney, $1.00; R. H. Gardiner, 50c.
Niagara: E. W. Dunbar, $1.00; Laurinda Skillings, 50c.
Bradshaw: R. H. Gardiner, $1.00; W. H. Young, 50c.
Prince English: R. H. Gardiner, $1.00.
Duane Purple: Lemuel Gurney, 50c.
Purple Damson: J. W. True, $1.00.

Class V.—MISCELLANEOUS.

For best variety of canned fruits, preserves, pickles, etc., made and put up by the exhibitor: Mrs. W. H. Waterman, Auburn, $8.00; Mrs. Frances Hoyt, Winthrop, $5.00.

For best specimen of canned peaches: Mrs. Frances Hoyt, 50c.; Mrs. W. H. Waterman, 25c.

Canned plums: Mrs. D. P. True, 50c.

Canned strawberries: Mrs. D. P. True, 50c.; Myrtie V. Averill, 25c.

Canned raspberries: Mrs. E. F. Purington, 50c.; Mrs. W. H. Waterman, 25c.

Canned blackberries: Mrs. W. H. Waterman, 50c.; Myrtie V. Averill, 25c.

Canned gooseberies: Mrs. E. F. Purington, 50c.

Canned blueberries: Myrtie V. Averill, 50c.; Mrs. E. F. Purington, 25c.

Canned cherries: Myrtie V. Averill, 50c.; Mrs. D. P. True, 25c.

Canned quinces: Mrs. Frances Hoyt, 50c.

Preserved quinces: Mrs. Frances Hoyt, 50c.

Preserved apples: Myrtie V. Averill, 50c.; Mrs. W. H. Waterman, 25c.

Preserved plums: Mrs. Frances Hoyt, 50c.

Preserved pears: Mrs. W. H. Waterman, 50c.; Myrtie V. Averill, 25c.

Preserved strawberries: Mrs. W. H. Waterman, 50c.; Myrtie V. Averill, 25c.

Preserved raspberries: Mrs. D. P. True, 50c.

Preserved currants: Mrs. E. F. Purington, 50c.

Preserved cherries: Mrs. W. H. Waterman, 50c.; Mrs. D. P. True, 25c.

Best jar assorted pickles: Mrs. Frances Hoyt, 50c.

Best bottle tomato catsup: Mrs. Frances Hoyt, 50c.

Best jar quince jelly: Mrs. Frances Hoyt, 50c.

Apple jelly: Myrtie V. Averill, 50c; Mrs. W. H. Waterman, 25c.

Currant jelly: Myrtie V. Averill, 50c.

Strawberry jelly: Mrs. W. H. Waterman, 50c.; Mrs. Frances Hoyt, 25c.

Raspberry jelly: Myrtie V. Averill, 50c.; Mrs. Frances Hoyt, 25c.

Rhubarb jelly: Mrs. W. H. Waterman, 50c.; Mrs. Frances Hoyt, 25c.

Class VI.—FLOWERS.

FIRST DIVISION.

Best display of cut flowers: Mrs. Chas. Stanley, Winthrop, $10.00; Miss Cora E. Ring, Richmond, $8.00; Mrs. A. B. Strattard, Monroe, $5 00; Mrs. Frances Hoyt, Winthrop, $3.00.

For best exhibition of roses: Geo. M. Roak, $5.00; John Burr, $3.00.

Dahlias: Mrs. Chas. Stanley, $2.00; Miss Abby E. Ring, $1.00.

Chinese Pinks: Mrs. Chas. Stanley, $1.00; Mrs. Frances Hoyt, 50c.

Asters: Miss L. M. Pope, $1.00; Mrs. Chas. Stanley, 50c.

Pansies: Lucy A. Chandler, $1.00; Mrs. A. B. Strattard, 50c.

Zinnias: Miss Cora E. Ring, $1.00.

Phlox Drummondii: Mrs. W. H. Waterman, $1.00; Mrs. Frances Hoyt, 50c.

Stocks: Mrs. Chas. Stanley, $1.00; Miss Cora E. Ring, 50c.

Balsams: Miss Abby E. Ring, $1.00; Mrs. Chas. Stanley, 50c.

Petunias: Miss Lucy A. Chandler, $1.00; Mrs. A. B. Strattard, 50c.

Gladioli: Miss Cora E. Ring, $2.00; Miss Lucy A. Chandler, $1.00.

Verbenas: Mrs. Chas. Stanley, $2.00; Miss Lucy A. Chandler, $1.00.

Wild Flowers: Geo. M. Chase, $2.00.

SECOND DIVISION.

Parlor bouquet (professional): Geo. M. Roak, $2.00.

Parlor bouquet (amateur): Mrs. Frances Hoyt, $1.00.

Wall bouquet (professional): Geo. M. Roak, $2 00.

Wall bouquet (amateur): Miss Lucy A. Chandler, $1.00; Mrs. Frances Hoyt, 50c.

Hand bouquet (professional): Geo. M. Roak, $2.00.

Hand bouquet (amateur): Miss Lucy A. Chandler, $1.00; Mrs. H. H. Briggs, 50c.

Floral design (professional): Geo. M. Roak, $8.00; John Burr, $5.00.

Floral design (amateur): Miss Lucy A. Chandler, $5.00.

Floral wreath: Geo. M. Roak, $2.00; Mrs. A. B. Strattard, $1.00.

Floral dinner table decoration: Miss L. M. Pope, $2.00; Geo. M. Roak, $1.00.

Dish of cut flowers: Geo. M. Roak, $2.00.

Basket of cut flowers: Miss L. M. Pope, $2.00; Geo. M. Roak, $1.00.

Dried grasses: Mrs. Chas. Stanley, $2.00; Mrs. W. S. Haskell, $1.00.

Everlasting flowers: Mrs. Chas. Stanley, $1.00; Mrs. Frances Hoyt, 50c.

THIRD DIVISION.

For best exhibition of greenhouse plants: Geo. M. Roak, $15.00.

For best exhibition of pot plants: Mrs. Chas. Stanley, $8.00.

Ferns: Geo. M. Roak, $3.00.

Geraniums: Geo. M. Roak, $2.00.

Begonias: Geo. M. Roak, $2.00.

Coleus: Geo. M. Roak, $2.00.

Best specimen plant of Tuberose: Geo. M. Roak, 50c.

Dracæna: Geo. M. Roak, 50c.

Double Geraniums: Geo. M. Roak, 50c.

Single Geraniums: Geo. M. Roak, 50c.

Salvia Splendens: Geo. M. Roak, 50c.

Foliage Begonia: Geo. M. Roak, 50c.

Flowering Begonia: Geo. M. Roak, 50c.

Coleus: Geo. M. Roak, 50c.

Fuchsia: Geo. M. Roak, 50c.

Carnation: Geo. M. Roak, 50c.

Best single pot plant: Geo. M. Roak, $1.00.

Rustic stand filled with choice plants: Miss L. M. Pope, $3.00.

Best floral design by girl or boy under 15 years of age: Ellen B. Roak, $3.00; Lucy B. Burr, $2.00.

Business Transactions.

March 14, 1888. A meeting of the Executive Committee was called for this date, but in consequence of a severe snow-storm only the Secretary was able to be present.

April 6th the committee met in Lewiston to revise the premium list, and the following assignments were made for the exhibition:

Collections for home use, single varieties and displays of fruit, grown by exhibitor, H. W. Brown.

Collective exhibitions, general and county, L. H. Blossom.

Grapes, plums and miscellaneous articles, J. W. True.

Flowers, plants, etc., Charles S. Pope.

April 16. By appointment the President and Secretary met the Trustees of the Maine State Agricultural Society in Lewiston, and perfected arrangements for the annual exhibition.

September 11, 12, 13 and 14, Annual Exhibition.

September 12. The Annual Meeting of the Society was held in the exhibition building on the State fair grounds, at 6.30 o'clock, P. M. Only a small number being present, the election of officers was postponed to the time of the winter meeting for the year 1889.

December 14. The Executive Committee met in Lewiston, the Secretary of the Board of Agriculture being present by invitation. Arrangements were perfected for holding the winter meeting in Damariscotta in connection with the State Board of Agriculture. The premiums awarded, as per schedule presented by the Secretary, were ordered paid, and the accounts of the Society for the current year were closed up.

February 12, 1889. Winter meeting of the Society in Damariscotta, President Pope in chair. The officers of the Society made their annual reports. [See Treasurer's report and President's annual address.] Officers were elected for the current year. [See list of "officers for 1889."] Committee on revision of Society's Fruit Catalogue reported. [See Report of Committee, Fruit List.]

The papers read during these meetings and the discussions on the same appear in other parts of the "Transactions" under their respective subjects.

February 13. J. W. True, D. J. Briggs and Chas. S. Pope were appointed a committee to examine the fruit on exhibition and report on the same. D. H. Knowlton, D. J. Briggs and E. W. Dunbar were appointed a committee to prepare and present resolutions bearing on the duty of State Experiment Station to horticulture and pomology.

February 14. The committee on exhibition of fruits reported as follows:

Report on Fruits Exhibited.

We find 165 plates of fruit on exhibition, all of which are creditable to the producers.

Lincoln County had some very fine specimens presented by E. W. Dunbar, W. A. Jones, Joseph Day, W. H. Hurne, Ephraim Taylor, John Hopkins, Miles M. Hall, Joseph C. Rollins, Henry Ingalls, S. K. Given and George A. Hopkins.

Knox County. W. A. Luce showed some fine specimens consisting of 17 varieties.

Aroostook County. J. W. Dudley, Castle Hill, had some very fine specimens of apples for any latitude, a variety which originated on his farm. E. W. Merritt, Houlton, had a display of ten varieties, some of which were seedlings originating with him.

Androscoggin County. Two collections were noticed by your committee.

Franklin County. Phineas Whittier of Chesterville showed seven varieties of choice fruit deserving special mention, also a case of evaporated apples of fine quality. D. H. Knowlton some good specimens. E. K. Lord of Farmington presented a plate of particularly fair specimens of russet seedlings.

Kennebec County. Chas. S. Pope exhibited some fine specimens. We also noticed a jar of raspberries presented by Mrs. C. S. Pope put up without cooking. The fruit was well preserved.

Cumberland County. O. C. Nelson, as usual, presented fine sorts, ten in number. J. W. True also had fine specimens. J. L. Davis offered ten plates of well selected fruit.

PENOBSCOT COUNTY. Henry W. Brown, Newburg, had twelve varieties on the tables.

There were several jars of good fruit, pickles, jelly and evaporated cider exhibited by S. K. Given, Newcastle, and they added much to the appearance of the tables.

In testing the fruit, we find it a little off in flavor, but large in size and of good color.

J. W. TRUE,
D. J. BRIGGS,
CHAS. S. POPE, } *Committee.*

Committee on new fruits reported, through Mr. L. H. Blossom [see New Fruits].

The committee on resolutions bearing on the State Experiment Station, reported resolutions as follows:

WHEREAS, The general and State governments have established and liberally endowed an agricultural experiment station in connection with our State College; we congratulate the State upon the possession of an experiment station within its own borders, believing that the possibilities it offers for obtaining reliable and valuable information relating to the successful development and prosecution of our various agricultural industries are inestimable, and that every intelligent farmer should encourage the station in the prosecution of its experimental work; and as horticulture and fruit culture are among the most important of our agricultural industries, and in the future are destined to increase largely as the knowledge of varieties and culture becomes better known; therefore,

Resolved, That we most respectfully solicit the aid of the experiment station in the future development of horticulture and fruit culture, believing that these industries, in consequence of their importance to the agricultural interests of the State, should receive special attention in the experimental work of the station.

Resolved, That inasmuch as the results sought in the line of horticulture and fruit culture are frequently remote, and the experiments necessary to reach them require so great skill and perseverance, in our opinion the work should be first undertaken at the station, under the immediate oversight of the director.

Resolved, That as the work at the home station is perfected, we believe it may be profitably extended so as to reach other parts of the State, and that the results thus ascertained will prove of inestimable value to the industries we represent.

Voted, That the time and place of holding the annual exhibition be referred to the executive committee, together with the necessary arrangements for the same.

On motion of O. C. Nelson, the following vote of thanks was unanimously passed:

That the thanks of this Society be and hereby are extended to the Lincoln County Agricultural Society and the citizens of Damariscotta and New Castle for the liberal arrangements made for holding this meeting and the manifestation of their interest in the welfare of the Society; also to the local committee and those citizens who have co-operated with them in perfecting the arrangements for this meeting; also that the thanks of the Society be extended to the Knox & Lincoln and Maine Central Railroads for reduction of fares; also to the several persons who have presented papers and reports, and to those who have entertained us with music.

D. H. KNOWLTON, *Secretary*.

PAPERS, DISCUSSIONS, REPORTS, ETC.,

PRESENTED AT THE

UNION WINTER MEETING

OF THE

Maine State Pomological Society and State Board of Agriculture,

HELD IN

Lincoln Hall, Damariscotta, February 12, 13 and 14, 1889.

The Union Winter Meeting.

Introductory.

The arrangements made with the Secretary of the Board of Agriculture, by which both organizations united in the winter meeting in 1888, proved so generally satisfactory, that the officers were unanimously in favor of making similar arrangements for the winter meeting of 1889. Secretary Gilbert met with the Executive Committee for the purpose, and a second union meeting was agreed upon, which proved even more satisfactory than the first one. There seems to be no good reason why the two bodies should not work together in this way in the future, especially when such effort seems to make both organizations more efficient.

The Lincoln County Agricultural Society and citizens of Damariscotta and Newcastle extended a very cordial invitation to the Society to hold the winter meeting in Damariscotta. Arrangements were accordingly made, and the meeting was held in Lincoln Hall, Damariscotta, February 12, 13 and 14, 1889. The programme offered was an exceptionally good one, and was faithfully carried out. The local interest in the meeting was good and the attendance was large, representing fruit growers from eight or more counties in the State. The papers and discussions presented were of a high order, and will rank favorably with those delivered before other societies, more liberally endowed than ours.

The citizens of Damariscotta and Newcastle were cordial in their attentions, and appreciative of the papers and discussions, and it is confidently believed that a fresh impetus was given to fruit culture in the locality. The numerous visitors are especially indebted to Mr. E. W. Dunbar of Damariscotta, and Maj. E. W. Stetson of Newcastle, for their constant and courteous attentions during the meeting. Those interested in perfecting the arrangements for the meeting are also indebted to these gentlemen for efficient services rendered by them in working up the local details for the meeting.

The exhibition of fruit was large and arranged with excellent taste by the committee. The fruit shown was of good size and well colored, but in quality was inferior to our best apples grown in ordinary seasons. It was gratifying to the society to note the rapid advance of fruit raising in Lincoln and Knox counties. The quality of the fruit shown was a sufficient guaranty that conditions there, when understood, will prove very favorable to profitable fruit culture in the future.

The society assumes no responsibility for the ideas advanced in the several papers and discussions found in this volume. They represent individual opinions of fruit growers and are presented as such.

OPENING EXERCISES.

In behalf of the Board of Agriculture, Maj. E. W. Stetson of Newcastle called the opening public session to order, stating the objects for which the meeting had been arranged and the local interest that had been generally shown by citizens. He also made brief allusion to the condition of fruit culture in Lincoln county and the rapid progress of recent years among the farmers. He was gratified to have the State Pomological Society meet with them, and in behalf of the citizens introduced the Rev. J. H. Parshley of Damariscotta, who extended a most cordial address of welcome to the representatives of Maine agriculture and fruit growing.

In behalf of the Pomological Society and the State Board of Agriculture, Secretary Gilbert responded to the address of welcome. He was grateful for the cordial words of the speaker and thanked him and the citizens for the welcome so gracefully extended.

Mr. Charles S. Pope, President of the Pomological Society, was then introduced and delivered his annual address.

ANNUAL ADDRESS

By CHARLES S. POPE, President.

Ladies and Gentlemen: As it has always been the practice to open our meetings with an address by the President, it may not be advisable to altogether ignore the custom at this time, but I shall be brief and will not detain you long from the feast of good things which has been prepared for your entertainment.

Firstly reviewing the work of the Society for the past year. By invitation of the trustees of the Maine State Agricultural Society the Executive Committee of this Society perfected arrangements for holding the Society's sixteenth annual exhibition in connection with the exhibition of their Society. The arrangements made were well understood and there was perfect harmony of action between the two Societies, and we are glad to state the most friendly relations have continued to the present. The Executive Committee gave the revision of the Society's premium list most careful attention and made several changes, the most radical of which was to offer increased premiums for our three leading varieties of winter apples for market, viz.: Baldwins, R. I. Greenings and Roxbury Russets. The premiums offered for each variety were $5 for the first, $3 for the second and $2 for the third. At first there were some doubts about the wisdom of this plan but as the season advanced it seemed to be approved by fruit growers, and when the tables at the exhibition were put in order there was spread out before the public a display of winter fruit never surpassed in Maine.

There were county exhibitions of fruit from all the counties except Hancock, Piscataquis, Washington and York. It was a pleasure to have so large a part of the State represented, but we ought not to be content till our tables are laden with fruit from every county. Hon. Parker P. Burleigh, from Linneus, made an excellent display of fruit, and from the fine specimens of apples in his collection we are convinced that Aroostook will soon produce an abundance of apples.

The executive officers took special care to have every part of the exhibition well cared for, and to show every attention possible to the exhibitors and the thousands of visitors.

The Fruit Growers' Convention, held during the evening of Sept. 12, was a grand success. The attendance was large, and the papers contributed for the occasion were practical, and the subjects were ably presented by the writers. The value of these evening meetings during the fair was fully recognized by all, and there can be no doubt that in future fairs they will form an essential part of the exercises.

The officers of the society have sent specimens of fruit during the year, to Prof. Harvey of the State College, for the purpose of investigating the extent of the ravages of *Trypeta pomonella* in the State. During the fair they collected infected specimens from several parts of the State, and forwarded the same to him. This troublesome insect is now found in several counties, and is doing much damage to fruit. The insect seems to work mostly in fruit grown in sheltered places around buildings, or in places otherwise protected from the cold winds. So far as our own observation extends, they are not working very much in the orchards of the State, except as noted above.

The Executive Committee received a cordial invitation to join the Aroostook party and attend the annual fair at Presque Isle. It was a cause of regret among them that circumstances prevented their joining the party. By permission of the exhibitors a selection of choice specimens of fruit was carefully packed and sent by express with the best wishes of our society.

Your Secretary received a circular and letter from the Division of Pomology of the United States Department of Agriculture, under date of October 19, 1888, soliciting from our society specimens for the fruit display for the Paris Exposition of 1889, "representative specimens of our finer American fruits of all kinds, not in great quantities. but a sufficient number of each variety so that when received here at the department, fine and perfect specimens may be selected for the exhibit. All specimens should be perfect in every way and representative of the variety and with stem and calyx intact if possible. Owing to the extreme difficulty of preserving even a small proportion of the specimens in a fresh state, it will be necessary to place them in a preserving fluid in glass jars, which will be done here. All specimens should be correctly named if possible, with name of grower and locality from which they come. We desire to make as creditable a display as it is possible to do in this manner and at this late day. Will you kindly communicate with this office, stating what you can do toward the furtherance of this scheme?"

On consultation it was decided to send specimens of as many of our best varieties as could be found suitable for that purpose. From various parts of the State the executive committee gathered specimens of fruit which were forwarded to the President, re-packed and expressed to Washington. About thirty varieties were forwarded at this time.

The reception of the fruit by the Department was acknowledged in the following communication:

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF POMOLOGY,
WASHINGTON, D. C., Dec. 4th, 1888.

MR. D. H. KNOWLTON, Secretary, Farmington, Me ,

Dear Sir:—In the continued absence of Prof. Van Deman, I take pleasure in acknowledging receipt of your favor of recent date and shortly thereafter of the barrel of specimens of apples from your society. The fruit is all in excellent condition, and is certainly very fine and a credit to your State.

Very truly yours,

C. L. HOPKINS, *Ass't Pomologist.*

You will see from the report of the Treasurer, that while we are owing a considerable amount to the "permanent fund," we have been very careful not to increase our indebtedness for the past few years. The society is very much in need of more funds, that it may extend its work in many directions. We are now receiving from the State $500 a year, but I think it could be easily proved that twice that amount could be expended to advantage, not only in helping to spread the knowledge acquired by practical fruit growers, but to teach others to avoid those errors which have cost many beginners, not only much vexation of spirit, but considerable money. It may not be advisable at this time to ask for a larger appropriation, but we hope the time will soon come when the society will be treated with the same liberality as are kindred societies in other States. Meanwhile let those who have an interest in the welfare of the fruit grower and the fruit consumer, (which should include the whole community) be willing to come forward and assist us pecuniarily by becoming members of the society, and thus assist us in sustaining our meetings and exhibitions. It may require considerable effort to attend these meetings, but we shall return from a meeting of energetic, practical fruit growers with a better knowledge of methods than can be obtained from the printed page, and with an enthusiasm which we hope will last at least until our tables are abundantly supplied with fresh fruits in their season.

The labor of disseminating a practical knowledge of horticulture must be largely a gratuitous one. The men who have done the most to awaken a greater interest in horticultural matters have been prompted by beneficent motives and without hope of pecuniary reward. I think you will find, as a rule, that those who take the most interest in such matters are generous, whole-souled men, ready to impart any knowledge they may have gained, and who have no desire to protect their new discoveries by a patent right.

We are not here to proclaim that every one can make a fortune in a few years by setting a few fruit trees or starting a garden of small fruits. We do claim that a man who has a love for the work and faith in the calling, who will not be discouraged at every failure, and ready to change his occupation whenever low prices prevail, will be well compensated for his time and the money invested. There is another point we wish to press, that is the raising of more fruit for the table. Some may call it a luxury that they cannot afford, but if it was known how easily blackberries, raspberries and currants can be raised, they need make no objections on that account. Blackberries will bear bountifully although badly neglected, and all of us know that the currant was in nearly every farmer's garden before the advent of the currant worm. This enemy is now so easily overcome, that old favorite should be universally planted again.

But to return, is it a luxury? We claim that while it may be a luxury it is certainly a judicious economy. It is generally admitted that during the summer months, no diet is so refreshing and wholesome as one in which fresh fruits and vegetables play an important part. Our farming population has the reputation of living on the least varied diet of any class of people, and this too, when with a little trouble and expense their tables could be supplied with the freshest and best of garden products.

We think there will be a larger area set with small fruits the coming spring than ever before, and we would warn beginners against spending much money for new varieties and novelties, which frequently are no better than the standard sorts and often worthless. The Russian mulberry, under the name of "tree blackberry" and the "gooseberry tree" are specimens of these, and are not wanted in Maine.

How to better distribute and open more markets for our fruit in years of great plenty, is one of the questions we are called upon to solve. Thousands of bushels of apples lie rotting in our cellars while tens of thousands of people here on this continent are unable to obtain an apple at a fair price. New markets must be opened and arrangements made with transportation companies to carry our fruit at lower rates. When we can get as low rates as our western fruit growers do to England, we can place our apples in distant markets and realize better prices.

The plan of evaporating our surplus fruit has been advocated by some, and I think no doubt that to a certain extent it is advisable, particularly to dispose of the poorer grades of apples when the farmer can do it with little or no extra help.

In those sections where fruit growing is made a specialty and prices are low, there are already enough evaporators in operation to supply the present demand at prices so low that we cannot afford to compete with them.

In closing I wish to say a word to those who are so discouraged by the experience of the past season in apple raising, that they have lost all faith in the business, and will turn their attention to other crops, neglecting the orchard until prices advance.

Perhaps the farmer is no more vacillating than other men, but it is proverbial that when the price of any farm product is high, everything else is neglected to grow this crop, which can be harvested only in season to reach an overstocked market. Nearly all business has its ebb and flow, and fruit growing is no exception.

In some other states apples may yield more abundantly, but our rocky hillsides, almost worthless for anything else, are particularly adapted to orcharding and will give us a good crop with a small investment of capital. Then our apples are not only noted for good keeping qualities, but those varieties that will fully mature in this latitude are much superior in every respect to the same fruit raised in a warmer climate. Maine Kings and Gravensteins are acknowledged by Boston dealers to be superior to all others, even those from the far famed Annapolis valley.

If you have land suitable and have a love for the business, there is no cause for discouragement. Fruit raising pays as well, if not better than any farm crop, if the requisite conditions are complied with. Feed well, cultivate well, sort well. In times like these the market reports read, "Only the best sell at all now."

The President's annual address was referred to a committee consisting of D. H. Knowlton, E. W. Dunbar and A. S. Ricker, who reported as follows before the close of the winter meeting, and the report was accepted.

Report of Committee on President's Address.

That so far as possible the permanent fund of the society should be maintained intact in accordance with our by-laws; and we would recommend that the indebtedness of the society to that fund be paid at the earliest day possible.

In the absence of further aid from the State, as urged by the President, it is hoped that the officers of the society and its members will earnestly endeavor to secure new members, that our funds may be increased and the work of the society extended.

We see no more reason for our apple growers being discouraged or neglecting their orchards in consequence of the present low prices, than that our western grain growers should stop planting the cereals in consequence of abundant crops and unprofitable prices for a single year.

ANNUALS FOR LAWN DECORATION.

By Miss L. M. Pope.

The present low prices of seeds make floriculture a possibility with even the impecunious. Every one must have observed the increase in flower gardens through the country in the past few years, due, no doubt, in part to the reduced price of seeds, but there must be a growing taste for flowers, as well. One now seldom finds a cottage too humble for its bed of annuals or vine-clad window.

That flowers are capable of giving delight to both cultivator and beholder, however humble and simple in character and arrangement, we must admit; but when the same outlay of trouble and expense may be made to produce pleasing effects, it seems a pity to huddle them in incongruous masses of coloring, and style of growth. Frequently this flower planting is performed by persons with little time for such recreations, and in their haste to make the most with the least outlay, they outrage every law of beauty. To be sure, they cannot spoil the color or form of the individual specimens, but the too close proximity to each other of individuals with discordant coloring and style of growth, spoils the beauty of all.

There is no question but with a little thought in planting, these beds of simple annuals can be made as much objects of beauty and means of decoration in the humblest yard as the experienced gardener makes of his beds on a grander scale on the extensive grounds of his wealthy employer. And since there is no doubt of the educating, elevating influence of beauty in the simplest things, beauty being allowed to be any revelation of nature's great law of harmonies, it becomes an object to study the best effects. Many of the green-house plants are more desirable for bedding than annuals owing to their habit of constant bloom. Not infrequently they are in full bloom when set and continue so through the entire season, but necessarily they are expensive and only accessible to the few, but by early planting many of the annuals are close rivals even in this respect. By planting some of the varieties in boxes, or better still in hot beds long before the frost is out, they will frequently have attained a size that will enable them to commence blooming as soon as their roots are fixed after transplanting, and many of these seedlings are quite as brilliant and effective when they once come into flower as their tropical rivals.

Having been for some years an enthusiastic cultivator of flowers I have given considerable time and thought to effective planting and will try and give some of the results of these experiments, to induce others to try like experiments, with no doubt better results, for the present multiplicity of varieties admit of infinite combinations.

One finds there is a limited number of specimens that combine well in the arrangement of any one bed or border; better effects are assured usually by employing a variety of colors in the same class of plants, only introducing another class when a dividing line is desired, or for a border to the bed when wanted.

The little beds often planted under the window and each side the door-step may be a thing of beauty, instead of a conglomerate mass of color, the coarse growing ones possibly crowding the delicate ones out of sight. Plant the taller ones at the back of the bed, and so graduate the height as to bring the lowest and often the prettiest ones at the front, being careful to choose only colors that harmonize. The border from the street to the front door, if properly treated, may certainly be very effective by using some small, flowering, low-growing plant on the inside line, like the bush lobelia, either blue or white. If the blue be used care should be taken in choice of color of the next line of plants. I will propose Drummond phlox in a variety of colors, but always leave out the blue and purple shades or use the calendulas in variety. And still another plant fits the place, the dwarf varieties of tropeolum, not omitting one single shade, as they all are beautiful and harmonize. One thing is necessary to insure constant blooming on all annuals, and that is cutting all the old flowers before they go to seed.

Then this border may be finished on the back by planting the dark foliage seedling, perilla nankinensis, in effect equal to some of the dark colors; or the border may be made without either the outside border lines, and any of the above named seedlings make beautiful beds in the grass if massed by themselves. The Drummond phlox needs to be planted very near together, as they grow slight and tall and can thus support each other. A few stakes placed around the outside of bed or border, with a wire stretched from one to the other just above the ground, will keep the plants in line.

Every one knows how much finer pansies are when planted in a bed by themselves. They are a cool-weather plant, and are better when planted in the early fall and transplanted to beds for spring bloom. They had better be slightly protected during the winter. They will not give large flowers or good colors during the summer months, but if they have been blooming all the spring, one can afford to pull them up by the last of June to give place to some summer blooming plant. Balsams, if planted in boxes, can be put in this bed; or snap-dragons in variety make a beautiful show.

Asters also should always occupy a bed by themselves. The most satisfactory way is to buy the seeds in separate packages of color using the darkest colors for the center of the bed and shading out to the outside of white or green of the lightest shades, or making ribbon beds using lines of contrasting colors.

The finest tropical looking beds used on the lawn are grown from seeds using ricinus for a centre, cannas for the next row, perilla nankinensis for the third row, and then centaurias, lastly the blue lobelia or white candytuft. A bed of the new single chrysanthemums makes a very fine show when planted in masses.

If the grounds are large, a bed or screen of double hollyhocks will make a stately appearance. Some of them are as fine in color as the camelias which they very much resemble. The seed should be planted in the early summer to bloom the next summer. If protected slightly during the winter they will live for several years. Beautiful beds are made of any regular growing plants of one color only, with a border line of some low growing flowering plant with contrasting color. I once saw a bed of pink zinnias with a border of white sweet alyssum that was strikingly fine. Any color of asters used in this way would be in good taste. Nothing can surpass the scarlet salvia when planted in masses on the lawn. They should be planted very early in the season to get the most bloom possible.

Rustic baskets and lawn vases can be filled with annuals entirely, and quite outshow some of the green-house products, using several of the pendant-growing seedlings to droop over the edges, among which are the thunbergia, lobelia clegans, ipomœa, quamoclit, maurandyas, or the tropœolums, if the basket is quite large. Then there are centauræs, dwarf cannas, perillas, pyrethrums, white candytufts, ageratums, bush tropœolums, vincas, uphorbias, emphorbias, agrostemma, and the amaranthus, the tri-color in particular for the center of such baskets.

Annuals furnish some of the finest vines for trellises or screens found among the florist's treasures; among them the cobœ, tropœolum, lophospernum and the iporm œa. These are some of the combinations I have used with happy results, and any one looking at the various catalogues issued by the florists will see there are still plenty of possible combinations to tax their ingenuity and give delight to any who may like to try inexpensive lawn decoration, and prove to the public that taste and not expense makes the beautiful attractive home.

ERRATA.

On page 32, 8th line from bottom. "centaurias" should be "centaureas." On page 33, 2d paragraph, 4th line, "lobelia clegans" should be "lobelia elegans." In same line there should be no comma after "ipomœa." In same paragraph, two lines below, "centauræs" should be "centaureas." In same paragraph, line following above, "uphorbias" should be "euphorbias," and the word following should be omitted, i. e., "emphorbias." In last paragraph, 2d line, "cobœe" should be "cobæa." In line following, "iporm œa" should be "ipomœa."

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POMOLOGICAL THOUGHTS AND FANCIES.

BY MISS DELIA M. TAYLOR.

To this society of wide repute,
A friend requests me to present some fruit.
I see the well-filled *table* where *three States*
Offer a fine collection of *choice plates*.
These fruits are standard and their merits known,
I've no rare specimens with labor grown:
There's only one encouragement I claim—
To send varieties without a name.

The Sibyl, nature, on fresh leaflets writes
Her precious lore, and our research invites,
No human voice the outward ear may reach,
Yet all around be eloquent in speech.
Each tree, perchance, by leafy pantomime,
May truth portray or breathe a murmured rhyme.
One day I listened, by these fancies led,
And carefully observed what each one said.

I noticed, first, a WILLOW drooping low,
In helpless anguish swaying to and fro;
And, as a light gale brought the whispered word,
This mournful message I distinctly heard:—
    "Life is for all, a round of loss and pain,
    What men call joy they never can obtain,
    Strive on, but failure only will remain."

"'Tis true that grief and fruitless toil oppress
The strongest soul." I cried in bitterness.
But soon, impulsively, I turned away,
"Has Nature, then, no cheering word to say?"
A ready answer came upon the breeze,
Borne from a group of merry POPLAR trees:—
    "Life is life, only as pleasure we have,
    Fearlessly sorrow and failure we'll brave,
    Gayly our silvery banners we'll wave."

"Alas," I said, "that I must hear again
The wild despair and idle mirth of men!
These sounds combine in bitter mockery
Instead of soul-inspiring harmony."
A LOMBARD POPLAR rustled at my side,
And sternly pointing upward, thus replied:—
    "Life is in renunciation,
    Pain and joy alike disdain,
    Outstretched hands must meet temptation,
    Earthly things are never gain."

"How true! No—false!" I thought, "but comment spare,
That distant sound may some new counsel bear."
The rushing wind this quiet wood alarms,
As men of old the herald's call to arms.
On dress parade the brilliant MAPLES stand;
Their winged messengers fly o'er the land:—
"Life is in conquest, in warfare victorious,
Proudly our standards shall gleam in the field;
When many fall is our triumph most glorious,
Only to all-conquering time will we yield."

I wondered more as each new voice I heard,
A gentle breeze the upper branches stirred,
Symmetrical in form and towering high
Above the throng so soon to fall and die,
A lofty PINE with dignity serene
Waved its majestic top of evergreen:—
"Life is rising above all these passions that blind;
What is nobler indeed than the conquest of mind?
To the truth and to *justice* your energies give,
For 'tis wisdom alone that is destined to live."

A stately ELM, betraying mild surprise,
Like one who hears, but tacitly denies,
With queenly gesture and becoming grace,
Declared what seemed most worthy of embrace.
"Life is art. Towards the ideal
Should all effort tend.
Aim beyond the low and real;
Beauty is the end."

Feeling responded quickly: "This is best.
Why further wait, or listen to the rest?"
Just then a noble OAK, with royal mien,
Spread out in generous strength its sheltering green.
"'Life is kindly service,' greatest hearts will say;
Goodness holds the strongest, most extensive sway.
That one is the wisest, fairest is his fame,
Whose success the people gratefully proclaim."

Conflicting murmurs then began to cease,
And all the wood around was hushed in peace.
Perplexing doubt within my soul was stilled,
But—why the thought of something unfulfilled?
The *orchard* trees my question seemed to meet,
And, silent, dropped their offerings at my feet.
"In leaves," I mused, "the wild wood trees abound,
But on their thrifty boughs no fruit is found.
No precious product of their own they give,

And only for themselves they grow and live.
What if the secret of true living be
In quiet, self-denying ministry?
Nature can have no grander truth to teach,"
I said aloud. And as, within my reach
An apple tree its luscious wealth displayed,
I picked the fruit, a transverse section made.
Counted again the ten green dots which seemed
The ten commands my childish fancy dreamed.
I *traced the outline* which these points made clear;
Amazed, I saw a *perfect flower* appear.
The spring-time *promise*, by slow growth concealed,
In full fruition was to *sight* revealed.
You smile, my friends. Yet why? Perhaps you see
The wondrous lesson of the apple tree.

FIELD WORK.

By D. H. Knowlton.

Some men whom I meet from time to time claim that the subject of fruit growing is an old story, and that people are tired of hearing so much about it. Well, there are old stories to be sure, besides that of fruit-culture. The story of salvation is one of the oldest, and yet men and women never tire of relating it, and singing together "The Old, Old Story." The A, B, C's are as old as our language, and yet there are and always will be boys and girls who do not know them. It will be remembered, moreover, that the wise man said, "The thing that hath been, it is that which shall be; and that which is done is that which shall be done; and there is no new thing under the sun."

So we may say in our pleasant tasks, that the principles of horticulture and pomology are as old as the hills, but there are and always will be men who do not know them. What more delightful duty can we have than teaching these principles so far as we may be fortunate enough to know them ourselves? None of us, however, are so fortunate as to have gained a knowledge of all or even a considerable part of all there is even in those branches of fruit growing in which we may be the most proficient. While the laws of nature may be unchangeable man has never gained a knowledge of them except as the reward for his study and diligence. As yet I am confident Nature has revealed to none of us a knowledge of all her ways, and there lies just before us in every department of our work, fuller revelations than have yet been made. We are not content to plant and grow crops as our fathers did for, we believe in utilizing all that has been learned, and at the same time we believe it to be our duty to search for more knowledge.

For years past horticultural societies have devoted their efforts mainly to the introduction of the best fruits and their cultivation. This was the work most needed in the past, and its importance is as imperative as ever, but it occurs to me the time has now come when more attention should be given to the dissemination of a knowledge of the invaluable qualities of fruit. This is of special importance to our own society, for here in Maine the apple crop is becoming one of our most valuable agricultural products. As the orchards have increased in size and number more apples have been used in the State, but we are confident that with a more complete kn wledge of the various ways in which fruit may be economically used in our domestic life, a much larger quantity would be used by the growers, while thousands of others would be ready to avail themselves of the information our combined wisdom may be able to offer.

Our country is large and embraces all the variations of climate between the Arctic and Torrid Zones. Almost every variety of fruit known is produced in some part of the country. The succulent fruits of the citrus family are successfully grown in the Southern States and California. Grapes and other fruits are also grown in their greatest perfection. The rapid transportation of these fruits to all parts of the country brings them into direct competition with Maine apples. I have frequently noticed our fruit stores and stands; where there is one basket of choice apples there are numerous baskets and crates of oranges, lemons and other fruits. Bananas, grapes, peaches, pineapples, in fact not only the fruits grown in the United States are in open competition with our apples, but those also grown in other parts of the world. Let us teach the world that in economic value the apple leads them all.

As a rule people know when they obtain a superior article of fruit. There is an autumn apple grown in my own county, called the Russell. I know of no apple of equal quality in its season, either for dessert or cooking. At the same time last fall there was an abundance of autumn apples in our markets, but they were sold from forty to sixty cents per bushel, while the Russell sold readily for $1.00. The quality made the difference.

Our President told me that he sent his Gravensteins to Boston with a few King Tompkins early in the winter. The former sold for $5.00 per barrel and the latter for $4.00. This was at a time when ordinary fruit was selling from $1.50 to $2.50 per barrel. The fruit sold on its merits.

This may not be in exact accord with the commercial idea of orcharding now prevailing, but at the same time we are quite sure that the demands of the future will be for the best, and not always for what our orchards may produce the most of. Remember, if you please, that we are competing not with different varieties of apples, but with the oranges, bananas and other fruits grown in warmer climates. When I can get a Russell or a Gravenstien I would not exchange for any fruit grown. They are *good enough* for me, and when their superior qualities are known, the sight of them will tickle the palate of the daintiest epicure.

In our cities and many of our larger villages all festive occasions are made redolent with the sweet odors of flowers. By some it is feared the people are becoming extravagant in the profusion of floral displays. It might be better if more flowers were used in our homes day by day and less on public occasions. But along with the flowers wherever good taste would admit, I would make use of fruits. Especially would we use them about our dining-rooms, and so far as flowers or ferns would add to their beauty we would combine them. Adorn the table and sideboards with the choicest fruits; and for one I like their presence before me at every meal. Fruit-pieces are ornamental sometimes in other rooms, and frequently add a charm to the guest little dreamed of by the housekeeper. For one I should be in favor of offering premiums for fruit pieces, though it might be well to limit the fruit to that grown in the State. So far as I have attended exhibitions of the society there has been an effort to make the displays of fruit and flowers attractive, but I fear we may not be doing quite enough, for the influence of our society in this direction is important, as illustrative of what may be done to make fruits beautiful to the eye.

Too often the fruits on exhibition are jumbled together in a confused mass, and in consequence are likely to be passed by unobserved. Let us remember that few people care to partake of fruit that is unattractive. It is usually safe to follow Nature in matters of art, and she adorns our trees with the fruits which never fail to win the admiration of the beholder; and never a man or woman can go among our fruit trees in harvest but an irresistible desire arises to test the fruit, and our word for it, the man does not always wait to receive it from the hand of the woman.

There is a lack of public taste in these matters. How rarely does one find the best apples placed before him at the hotels. In many cases it would seem as if the proprietors bought only No. 2 apples, and that the *best* of these were eaten by the servants. The fruit dishes are too frequently filled with inferior fruit, and that, too,, without any effort to make it attractive. Often one is disposed to refuse such fruit when offered. It is terribly provoking for a fruit grower to think of, for he knows there is no necessity for using inferior fruit any more than there is of using inferior potatoes. Let the hotels use the best dessert apples in the market, polish up their crimson cheeks and arrange them tastily before their guests, and they will find few who will care for other fruits.

In a standard work it is stated, that "For the kitchen the apple is certainly, of all fruits, the most useful; and perhaps it is here that its utility to man is most conspicuous, because it proves, when cooked, a nutritious and wholesome food." There are few indeed who realize the full extent to which fruits may be advantageously used. The testimony of physicians is uniformly that cooked fruit is one of the most healthful articles of food in diet, and scattered through the books on materia medica are frequent recommendations to use fruit both in health and sickness. When our people know how to make the fullest use of apples we shall have less occasion for eating so many meats, and the doctor's calls will be less frequent.

Future pomologists have many surprises in store. Here and there we have their shadows in view at times, though in our thoughtless methods we do not recognize them. The surprises are in the direction of plant or flower study. It has been the habit of our society to give liberal premiums for flowers, and the flowers form one of the most beautiful and instructive features of our exhibitions, but until the last fair I think the society has never offered a premium to directly encourage the study of our beautiful Maine flora. Heretofore the society has offered premiums for basket of wild flowers, bouquets, etc. But the last season as an experiment, for so it seemed to some of the committee, a premium was offered for best collection of correctly named wild flowers. There were two fine collections, but in one case the exhibitor omitted the essential condition, failing to give the botanical names.

We need more enthusiastic men and women to follow up these studies, and the more we can encourage our people to investigate the various conditions of plant life, the more useful we may become in our chosen field of labor. Let us offer more premiums for wild flowers, but let us insist as a first condition that the specimens, whether green or dried, shall be correctly named according to some standard authority. There may not be many who would take part in such a competition, but I am confident the children would enjoy the study, and it was never of greater importance than in the present condition of fruit and flower culture.

The Massachusetts Horticultural Society is one of the most active organizations of its class in this country. This society has a Window Gardening Committee that is doing good work in teaching children to care for simple plants that will thrive in windows, holding exhibitions and offering prizes. As a further stimulus, the committee will distribute free a pamphlet on the cultivation of house plants, giving directions for their growing and also lists of wild flowers in the vicinity of Boston.

It would be a pleasure if our society could do the same kind of work in Maine. Our people attend the fairs by the thousand and are enraptured by the display of flowers. They examine them with the closest scrutiny, to find out that they are all of foreign origin, hardly one among the entire collection that grows in its native soil. To obtain them in perfection is often difficult, and in our enthusiasm to cultivate rare plants we forget that Maine has floral beauties of rare merit.

It is an interesting diversion to look over the beautiful catalogues issued annually by the florists in our country. Even the French rose growers do not approach them in elaborate illustrations. They are so finely printed and gotten up it is really strange more people do not want them. But aside from this the most remarkable attraction to me is the evidence all the way through the pages of the immense results accomplished by the skill of the horticulturist. Every page shows new varieties of vegetables or flowers. Some of them may be inferior to the parent plants from which they originated, but many of them are vastly superior. The rose, the most beautiful of flowers, is one of the most extensive in varieties. The florists, by crossing different varieties, have produced marvels of beauty. The asters afford another illustration of new varieties, many of the later ones being so much superior to the originals that a botanist's scientific knowledge is almost necessary to recognize the relation of the new to the old. The tulips, the hyacinths, the gladioli and other bulbous plants, show similar results. Recent Dutch growers have announced in their catalogues nearly 2,000 named varieties of tulips. And so we might go on through the catalogue, and note the results of crossing, hybridizing and culture. The fact, however, is apparent, that the newer varieties are more attractive than the older ones, in short, an improvement over the old in most instances.

At our recent State fair there was shown a plate of pear-shaped apples, as perfect in form as any pears ever grown. One of our botanists examined them with great interest and samples were sent to others. One said the organs of reproduction in the pear were so formed they could not receive the pollen from the apple. But no explanation of the "sport" was offered by any one. Shortly after my attention at our local fair was called to a similar "sport." but in this case the limbs of the apple tree interlaced a pear tree near by. I offer no explanation, but I am reminded here of the fact that in the production of new varieties of fruit there has not been given the same study as the florist has devoted to his favorites. So far as I can learn the most of our improved apples are chance seedlings. In giving the origin of various apples, Mr. Downing says they originated "in some town," or "on somebody's farm," or "with some one." The origin of the Wealthy seems to be an exception, for he says, Peter M. Gideon originated it from seed, but then goes on to say that he obtained the seed from Maine. There has been great skill shown in the propagation of the apple tree, and the culture given the trees by many fruit growers is a great improvement over the past. Many new varieties have been given us which are incomparably superior to the old, but as yet Maine fruit growers are not satisfied with the varieties they are raising.

In my own county there are two distinct varieties of the Fameuse, one our fruit growers call the "Winter Fameuse," as it keeps later by at least two months than the ordinary Fameuse. The stock came from the nurseries as the Fameuse, other than this no one has been able to give the history of this apple. It is more oblong, and more highly colored with a deeper crimson. It is in flavor fully equal to the earlier Fameuse. One of our fruit growers sent samples to Dr. Hoskins and inquired for information. In reply Dr. Hoskins offered the probable explanation, which is, that in some parts of the Provinces where the Fameuse originated, that variety is about the only variety grown in many orchards, and various seedlings have been propagated from them as the Fameuse. This he suggests is probably one of these seedlings, which is really a cross of the Fameuse and some other variety growing near by.

A few weeks ago a gentleman living in my town brought to my place of business two apples which he wished me to test. They were the most perfect russets I ever saw, and they were also the handsomest. In quality they are fine, and though they may not keep quite as long as the Roxbury Russet, they seem to be of equal flavor. These apples originated on the gentleman's farm, a chance seedling growing by the roadside. The quality of the apple was accidentally noticed, and since then he has cut more or less scions from the tree.

These illustrations and others I might give, suggest that the "coming apple" for Maine has not yet been found. A large part of our fruit growers pronounce the Baldwin the most profitable apple for us to grow. Some people prefer different varieties, according to the markets in which their fruits are to be sold, but it is quite generally agreed that they all have their faults. The Baldwin, which most of our fruit growers now prefer, has been led in the English markets by several other varieties which have sold higher. The apple wanted in the markets must be attractive in its appearance, and to receive continued favor must be of superior quality. Then for profitable production the coming apple must be a good keeper, and stand up well in transportation. In other words, the apple we are in search of must have the combined qualities of several varieties, and even then there will probably be chance for improvement. A chance seedling will hardly be expected to be the apple we are in search of, for we know in other departments the best stock is not produced by chance fertilization. Good cultivation may improve the stock, but it cannot change its parentage or eradicate its inferior qualities. In recent years, the florist's skill has given us several strawberries that are superlative in their excellence, and so incomparably superior to the varieties grown thirty years ago, that those earlier varieties have nearly or quite disappeared from the fruit catalogues. There is good reason why they should. It is the survival of the fittest. Now we need the same skill in the culture, or rather propagation of the apple. It is more difficult, perhaps, to originate desirable apples—at any rate, it requires more time, and here is where organized horticulture ought to lend a hand. It is an easy matter to pick up chance seedlings here and there, and claim the origin thereof, though I would most certainly use even these when they are better than those found in the orchards. It is a matter of skill and patient toil to produce an apple by crossing two improved varieties, but when we see how much the florist has done in the production of new and superior flowers, we have abundant reason to hope for better fruit than we are now grrowing. Perhaps we may be able best to accomplish this great work through our agricultural colleges. At any rate, here is a good field in which they can join hands with fruit growers.

In conclusion then, our field of labor is a broad one, but there is no department of labor or research which offers the enthusiast more agreeable occupation or more generous returns. The dissemination of knowledge already gained is our first duty. This will teach the public of the best cultural methods and bring to the fruit grower the most desirable varieties. The invaluable qualities of the apple when more generally known will lead inevitably to a larger consumption of the fruit, and consequent profitable production. Then intelligently combine by cross fertilizing the best apples we raise, and in spite of the present depressed markets we may hope that the future will have in store for us more health and wealth in the production of fruits.

DISCUSSION.

Sec. Gilbert: I do not desire to consume much time in discussing this topic; but the paper which we have just listened to with so much pleasure is very suggestive in many directions. The only thought which I would call attention to just here is in connection with the originating of new varieties of fruit. The paper well asserts that we have not yet reached perfection, that there is yet an invitation to us to work for still better results. It is a fact everywhere found in nature that all of the good qualities have not yet been combined in a single individual. That is just as true with our fruits as with our animals and with our other products of the farm. There are, however, efforts being made, looking to the originating of new varieties which shall combine more of the higher qualities than the fruits we now possess. While we may think, just here, that we have fruits that are about good enough, yet we find that our fruits, most delicious in quality, many of them, have certain serious draw-backs ; in fact, it has come to be said that everything good has its out. Now, if by skill, if by attention to the matter, under careful, deliberate operations, guided by judgment, we can cancel the outs and retain the good qualities, or if we can displace some of the objectionable features with still other good qualities, we certainly can accomplish some good.

Horticulturists are quite enthusiastic over the improvement of small fruits, principally by cross-fertilization. This is especially true in regard to the strawberry, which has been multiplied almost indefinitely. We have a great many enthusiastic horticulturists who are at work on this problem of cross-fertilization, for themselves. In flowers great progress has been made ; the florists have multiplied results to a far greater extent than has been the case with small fruits. But these efforts have not been confined wholly to small fruits and flowers. There are efforts going on at the present time in the direction of the apple. The most marked example of this that we have are the efforts of that distinguished horticulturist, Mr. Peter M. Gideon, of Excelsior, Minnesota, who has been for several years at work upon this problem of the originating of new varieties of apples, with a view, particularly, that he may produce something which shall be better adapted to the northern belt of the fruit growing section of our country. His work certainly is a commendable one when we take into consideration that there is a belt across this continent, that is north of the natural fruit growing section of this temperate zone. This extensive belt has been, up to within a very recent period almost excluded from the privilege of growing palatable fruit for its own use, and has been obliged to purchase its supplies from abroad or go without this important luxury. Hence efforts are being directed toward the growing of fruits combining the desirable qualities for this belt. The first of all of course, is hardiness. It is a fact that our most delicious fruits are, as a rule, somewhat tender in their habits and cannot be grown far north. Now the effort is being made to combine hardiness with fine qualities, and this Mr. Gideon is engaged in that work. Such is his success in this line of work and so enthusiastic is he that still greater results will be accomplished, that he has been put on a salary by the State of Minnesota, and is now under employment by that State in propagating, through cross-fertilization, new varieties of apples, with a view to supply the wants of that section which has been heretofore excluded from the privilege. While he has not yet published the full results of his work in that direction, still he has accomplished a great deal. His attention was first called to this line of work by the apple which has been referred to here in the paper, the Wealthy, which was grown from seeds furnished him by Mr. Albert Emerson of Bangor. That seed is supposed to be a cross from the crab apple, which gives it its superior hardiness. And it is a very satisfactory fact that the Wealthy apple promises to be adapted to a wider extent of this northern country than any other fruit heretofore discovered of like high quality. Thus has occurred one of the greatest benefactions in this direction that has ever been handed down to us; and this was an accident; yet accidents have given the cue to what may be accomplished by design, and that is, the cross-fertilization of hardy varieties with other hardy varieties of higher quality. This is what is being done, and Mr. Gideon has now on hand some 25,000 seedling apple trees that are being grown for the purpose of showing the quality of fruit which has resulted from his cross-fertilization. These trees will all be fruited and the quality of the fruit tested, and from that number it is expected, and reasonably expected, that a large number of valuable varieties may result. He already has some twenty different varieties which he calls valuable acquisitions. They have not been disseminated to any considerable extent; except to test them in different localities; they are not given to the general public yet; still, unquestionably, there are valuable varieties there.

Now, when you take into consideration the results achieved with the limited efforts that have been carried on up to the present time, you see we may well believe that very much greater efforts will succeed, in the future, as we gain knowledge of how to go to work, what to cross with and how to bring about the desired results. The limit can hardly be conceived, and without any question the time is near at hand when we shall produce varieties of a high quality that may be adapted to our Northern climate. It is a curious fact, in this connection, that we have families of apples, like the Fameuse, for example—which is grown about Montreal, whole neighborhoods confining their orchards to that one variety—that reproduce themselves very closely. The Fameuse blossoms are crossed with Fameuse blossoms, and, as with our native Fameuse and the Canada Fameuse, they propagate themselves very closely indeed; and these Fameuse apples, varying only very slightly, have been multiplied almost indefinitely. The same occurs in Russia;

they have several varieties of apples there which propagate themselves; through a wide section of Russia the Alexander apple propagates itself as nearly as do our native Fameuse or the Canada Fameuse, varying but slightly, retaining almost the identical characteristics, from the fact that they are fertilized from their own kind. It is the opinion of Mr. Gideon that very much more may be expected from this method of originating varieties than from the introduction of the Russian varieties, which the Government and the Wisconsin State College and Mr. Gibbs of the Quebec Agricultural Society have been engaged in introducing. These Russian varieties, nearly all of them, are somewhat inferior in quality, and nearly all of them are summer fruits. Of course some summer fruits are desirable, yet there is a still greater desire for something of good quality that will keep late.

Certainly the State of Minnesota has set a good example in thus putting this enthusiastic worker on a salary which shall enable him to carry on these experiments for the benefit of the general public; for the country at large will have a share in the results of his work.

Mr. D. H. Knowlton. So far as you know, are there any others engaged in the same work in this country?

Sec. Gilbert. Not to any considerable extent. I think, however, that Prof. Budd, of the Iowa State College, is engaged to some extent in the propagation of varieties by this method; but his work has been largely connected with the introduction and testing of the Russian fruit. Mr. Gibbs is also engaged to a limited extent in the work, but he has been associated with Prof. Budd in testing the Russian varieties. These two gentlemen visited Russia for the purpose of examining these varieties in the home country and securing samples of them, scions from the trees, and forwarding them to this country, for the purpose of testing them here in our own climate.

There are efforts being made in the direction of originating new varieties of grapes that have been quite successful, and a considerable number of the valuable new varieties that have been introduced in our country have been the result of this method of work. The latest example of the New England grapes, I believe, is the one originated by J. B. Moore & Co., of Concord, Mass., which has been in the market only one year, called the Eastern grape, a very fine looking grape, and one that promises to be a valuable acquisition. There are many others of value, but more particularly adapted to the belt of country a little to the south of us, as we have very few varieties of grapes that can be grown successfully here.

Mr. Starrett. It seems to me that the paper we have just listened to is one of the most valuable that I have ever heard on the subject. There was an allusion to the poor apples which are served up at hotel tables. And we all know what an immense amount of mean, contemptible fruit is served up at the homes of farmers. I know many families who are eating poor fruit all the time, although they are raising good fruit; they will always have some variety of fruit which is a little past its season and which they think they must eat up before they commence on the next in order, and by the time they have got ready to commence on that, it in turn has over-matured, and the result is they are eating behind the season all the time. And there is so much poor mean fruit raised where choicer varieties might just as well be produced. It seems to me that it would be one of the grandest things that could be done if some one would go around and cut down all the mean, contemptible varieties of apple trees, so that people would be eating something worth eating.

Mr. D. P. True. I have been very much interested in the paper, which is certainly of great value. There was one point that particularly interested me, and that was in reference to the grapes. I think in this latitude we need an improvement in grapes. True, there has been a great advance. Cole, in his fruit book published a little more than twenty years ago, has not in his list one that is propagated at the present time. Even this year at our exhibition, although it was one of the most unfavorable of seasons, there were three varieties of grapes that were well colored and nearly ripe. It shows the advance that has been made in this direction, and I think there is a prospect that there will be still greater advance in this direction.

Mr. Pope. Speaking of new varieties, there was one placed upon our tables at the last State Fair, after a season so unfavorable that even the Concords grown in New Jersey were not well colored, yet these grapes that I speak of were so well ripened that the committee could not believe at first that they were grown in Maine; but they were, and were well ripened at the time of the fair, the first week in September, in that unfavorable season. It was the variety known as the Moore's Early, which I consider one of the greatest acquisitions in the grape line.

DISEASES ATTACKING OUR FRUITS.

By Prof. S. T. Maynard.

In the study of the plants about us we find two great classes; those having green leaves—which, taking up the elements, carbon from the air, and potash, lime, phosphoric acid and other mineral elements from the soil, transform them into their own organism—and those having no green parts with which to assimilate or organize the crude materials from the soil and air, but are parasitic, taking their food from the organized material of other plants.

Parasitic plants are all more or less alike in that they obtain their food from other plants, but differ as much from one another as do the higher plants From their minute structure they are very difficult to detect, except by their effect upon the host-plant, without the aid of the microscope, but are found in all departments of the farm and garden.

Perhaps we may say these diseases are the results of our advanced methods of cultivation, for in new countries they are less abundant and less destructive. With our efforts to produce abnormal growths and the removal of the natural protection of forests; with the unnatural conditions produced by pruning, by manuring and by cultivation, have come the conditions under which blights, rusts, mildews, etc., can develop rapidly.

It is claimed by the Entomological Department at Washington that the loss to our farmers from insects in a single year amounts to over $200,000,000, and with our experience from blights, rusts, smuts, rots and mildews, we feel certain that the loss must be far greater from fungus growths.

Parasitic plants, destructive to our fruits, may be divided into two classes, i. e., those growing within the host-plant wholly, as the blight of the pear, the yellows of the peach, etc.—and those which root in the tissues, but grow upon the outside of the host-plant as well, such as the mildews, rusts, etc.

BLIGHTS.

The first class consist of very minute unicellular plants often called bacteria, microbes, germs, etc., which feed and grow very rapidly under conditions of a certain stage of decomposition of the cell contents of the host-plant.

These germs are so very minute as to require the highest powers of the microscope to detect them. So small are some forms that it is claimed a globular mass that would pass through the eye of a cambric needle might contain 20,000,000 of these living, growing organism.

The lightest breath of air may disturb them and carry them long distances. They may be said to be everywhere. As many as 11,000 have been found floating in a cubic metre of air, and 80,000,000 have been found in a quart of ordinary water.

The blight of the pear and the twig blight of the apple and quince, are caused or accompanied by a very rapid development of very minute germs, (micrococcees amylovoms) which are oval in form, about $\frac{1}{25000}$ of an inch long by $\frac{1}{40000}$ in diameter, and closely related, in form and method of development, to those producing contagious diseases in animal tissues, as the small-pox, diphtheria, hog cholera, glanders, etc.

PEAR BLIGHT.

In some sections and some seasons it is more prevalent than in others. The first appearance of it may be seen by black spots on the bark of the shoots or by the leaves turning almost black, and so rapid is its work, that it requires but a short time to destroy large branches and often the whole tree.

It very seldom attacks all the trees in an orchard or all the varieties alike at one time, but we see a branch here or a tree there affected and perhaps one only of a large number of the same kind in a row, showing that it cannot be classed as a very contagious disease as is claimed by some

I shall take the ground that it is not contagious to healthy trees, but like so many of similar organisms which attack animal tissues, it only develops when the cells of the plant are in a proper stage or condition to furnish the necessary food. It is stated by Prof. W. S. Farlow, the noted mycologist, that the germs have been found in healthy tissues and did not cause the disease or blight, just as the germs of diphtheria and hydrophobia have been found in the throats of persons who were not attacked by either disease.

The germs may enter through crevices of the bark, through the delicate tissues of the blossoms or through the stoma of the leaves, but if the tissue is in a vigorous, healthy condition, it will resist their attack, or rather, the germs not finding the proper conditions of food will fail to grow. I have yet to find a single tree that has been attacked by blight that had not, in some way, been seriously weakened. The causes which may lead to the attack of this disease are want of plant food, or exhaustion of the soil, a wet soil, mutilation of the roots by the plow, or of the top by borers or improper pruning, and by overbearing.

To overcome, or rather prevent the disease, I would manure liberally in the fall or early spring with manures or fertilizers containing an abundance of potash and phosphoric acid, with enough nitrogenous matter to keep up a moderately vigorous growth; get rid of all surplus water by underdraining, and if the land is cultivated, not to use the plow or cultivator after August 1st. We cannot control the conditions of the seasons, which may sometimes affect the trees so as to bring on the blight, but in nine cases out of ten, I believe we can prevent injury by intelligent treatment.

TWIG BLIGHT.

The twig blight of the apple and quince is probably of the same nature as the above, and requires the same conditions to prevent attack. In all cases it is advisable to remove the injured branches at once and burn them, to prevent as far as possible the spread of the spores.

SUN SCALD OR CANKER.

In many apple orchards the ends of the branches die off in large numbers and we find that the injury begins at some distance from the end of the branch in a black cankered spot. Upon examination with the lens we find upon these spots, more or less hidden under the bark, numerous small mealy insects which feed upon the juices of the tissues. From this point decay spreads and the branch must be removed to keep the trees in good form and appearance. The decay of the branch is due to the increase of minute organism for which there may be no remedy after attacked, but by keeping the trees in a vigorous condition they may overcome the injury in some degree. All injured branches should be removed and burned as soon as the injury is noticed.

LEAF BLIGHTS, RUSTS, ETC.

Of an entirely different habit of growth are the leaf blights, rusts and mildews that are so abundant and so injurious to our farm and fruit crops. They are plants of a much larger growth, yet so small as to be visible to the naked eye only when seen in large masses, as the mealy or downy growth on the leaves of the grape vine, the yellow spots on the grass leaves and the brown spots on the leaves of the pear, apple and strawberry.

The germs or spores from which these plants originate are very minute and are easily carried about in the air but are generally hundredths of times larger than the germs of the true blights. These germs coming in contact with the leaf surface of the host-plant when there is rain or dew upon it, germinate and throw their roots down through the stoma feeding upon the juices. They grow only under conditions of moisture and heat, however, and in dry seasons very little injury is caused by them.

Like the blights for complete and rapid development, this class of plants are more or less dependent upon the condition of the host-plant. If the foliage is healthy and vigorous, the juices do not offer that condition of food under which the parasite can exist, and while the temperature and moisture of the season may be such as to cause an unhealthy condition of the tree, thus leading to an attack, much may be done by proper manuring, cultivation, etc., to overcome the injury.

Leaf Blights. The leaf blights are abundant on the pear, plum, cherry, and in some cases on the apple, and our strawberry crop is often seriously injured in the same way. The pear leaf blight comes on during hot, moist weather in July, often in severe cases, causing all the leaves to drop, and the tree remains bare until a new set is formed. Some varieties are more liable to injury than others, and it is especially injurious to young seedlings in the nursery before they are budded. In the nursery when the first spots appear on the leaves, we start the cultivator to loosen and lighten the soil, and if there is an indication of a want of plant food in the soil, some very soluble fertilizer is applied to give the seedlings a start into renewed growth. To prevent leaf blight on large trees in the orchard is a more difficult thing to do. If the land is well underdrained, if manures are applied only in the fall in sufficient quantities, and if the trees are not injured by over-bearing, by insects or by mutilation with the plow or saw, very little injury need be feared from leaf blight. Manures containing an excess of potash and phosphoric acid are especially valuable for a healthy growth of all fruit trees. Leaf blight upon the apple, cherry, plum and quince are of a similar nature to that of the pear, appearing under the same conditions and are remedied in the same way.

Leaf Blight of the Strawberry. Of the small fruits the strawberry is the only one that is seriously injured by a leaf blight. This disease is of a similar nature to that of the other leaf blights, attacking especially plants in beds more than one year old. Some varieties, and young beds under poor treatment, are sometimes attacked the first year's growth and seriously injured, but when properly supplied with an abundance of plant food and given thorough cultivation, little loss would occur in the annual system of growing this fruit. At Amherst we have discarded the two-crop system, and only take one crop of strawberries from the same bed.

Mildews and Rusts. Mildews and rusts, although of a similar nature and habit of growth, are given these names from the appearance of the mass of surface fruit which appears to the naked eye. Plants affected by mildews generally present a mealy or powdery appearance, whence the name (mealdew) mildew, while those affected by rusts have a rusty yellow or brown appearance.

The mildew of the grape causes the most loss and is familiar to almost every one who has attempted to grow the Delaware and some other thin-leaved varieties. It is very abundant in warm moist seasons, not only attacking the leaves, but doing serious injury to the fruit.

When planted a good distance apart, on high sandy or gravelly soil, and trained upon high trellises, it is less injurious than when the vines are trained low and grow on less elevated land. Good cultivation and proper plant food will, in a measure, assist in preventing the disease. I have often found when the mildew first appears, that stirring the soil twice a week will check it very materially.

Blackberry Rust. On old plantations of the blackberry and black-cap raspberry, a yellow or golden colored growth on the underside of the leaf sometimes appears, causing the leaf to curl and die. This is a parasitic growth similiar to the mildew of the grape, but the fruiting parts that come out upon the surface have this golden color while the fruit of the grape mildew is white. It has been my experience that it develops more upon old plantations, especially if neglected and that good cultivation and proper manuring will largely overcome the injury.

As plantations become old it is more and more difficult to keep up the proper supply of plant food to insure a healthy growth, and it may be more profitable when the plants begin to fail to renew them by planting on new land rather than to attempt to remedy the difficulty in any other way.

Rots. Many of our fruits when partially grown are attacked by fungous growth which we call rots. This is especially the case with the grape, plum, peach, tomatoes, etc.

The parasites which cause this destruction are similar in habit of growth to those causing mildew and rusts. They develop in warm, wet weather, and often spread so rapidly at the time when the fruit is approaching maturity as to destroy entire crops in a few days. Like all other growths of a similar nature they are dependent upon the conditions of the atmosphere and about the only thing we can do to prevent its ravages is to secure a healthy rather slow growth, and plant where there will be a full exposure of the foliage and fruit to sunlight and air, nature's two most powerful antiseptics.

FUNGICIDES.

In discussing the remedies for the destruction of the injurious parasites which are everywhere causing so much loss to our fruit growers I have said nothing about fungicides, or substances which may be applied for their destruction. I have not done this from the fact that so little is at present known upon the subject. During the past few years the agricultural department at Washington have conducted a series of experiments under the direction of Prof. F. L. Scribner and his assistants, in the use of sulphate of copper with various combinations for the destruction of mildew and black rot on the grape. The results so far as reported are very promising and if further experiments shall prove that this comparatively inexpensive and harmless substance will destroy two so destructive fungi, we may hope for equally good results in its use for other parasitic fungi of a similar nature.

The experiments above referred to are reported in the last annual of the department and in numerous special bulletins of the past season. The same department has also made numerous experiments with various insecticides for the destruction of injurious insects with very promising results. In both cases the applications are made in water and in many cases at about the same season of the year so that the two may probably be combined, thus reducing the labor and cost very materially. As an example of this, it has been found that the codling moth may be largely destroyed by spraying the trees with Paris green, and if it is proved that any solution of copper or other substances are destructive to the spores of the leaf blight, the apple scab or the twig blight the two substances may be used together at the same time with a large saving of expense.

So, also, in the destruction of the plum curculio, it has been found that the application of Paris green in water is effectual, and the introduction of the sulphate of copper mixture would possibly prevent the rotting of the fruit and perhaps the black wart.

The mixtures which are especially recommended by the department of agriculture are known as the "Bordeaux Mixture," Eau Celeste, a solution of sulphate of copper and ammonia, and simple solutions of sulphate of copper variously diluted.

Bordeaux Mixture. The Bordeaux mixture, a compound of sulphate of copper and lime, is made by disolving 16 lbs. of sulphate of copper in 22 gallons of water; in another vessel slake 30 lbs. of lime in 6 gallons of water. When the lime is cool pour the two together and stir thoroughly. This mixture is applied with a broom, brush or by a pump with a nozzle that will allow the particles of lime to pass through without clogging.

Solution of Sulphate of Copper. This solution is made by dissolving 1 lb. of pure sulphate of copper in 25 gallons of water and is ready for use at once with any hand pumps or spraying machine. It can only be used on the shoots and branches before the leaves appear as it is sure to injure the latter while young.

"*Eau Celeste*" In order to prevent the burning of the foliage by the acid of the copper sulphate ammonia is used to neutralize it, and the "Eau Celeste" or blue water is made by dissolving 1 lb. of sulphate of copper in two gallons of hot water and when cooled add $1\frac{1}{2}$ pints of commercial ammonia, when used dilute with 22 gallons of water.

The Bordeaux Mixture has proved the most successful in the experiments made at Washington and other places, and can be used with safety on the foliage. The solution of sulphate of copper alone can be used upon the shoots before the leaves start and will probably destroy a large number of the spores already in position for growth.

The above remedies have been successfully used in European vineyards and have been modified to suit our soil, methods and varieties.

It is claimed that none of these mixtures can affect the spores of the true pear blight, but a thorough trial should be given it.

INSECT PARASITES.

Quite as abundant and much more visible are the numerous insect parasites with which we have to contend, and great progress has been made in the knowledge of their habits and methods of destruction, thanks to the labors of such men as Riley, Comstock, Forbes, Fernald and a host of others.

Among the most injurious are the borers. The *flat-headed* borer is more abundant than the round headed one, but is much more easily destroyed from the fact that it feeds only near the bark.

The *round-headed* borer often works deep into the trunk and can only be destroyed while young. To detect their presence the rough bark must be scraped off two or three days before the examination is made, when the chips thrown out of the holes may be easily seen. A stout pointed knife is the best implement for destroying them. To insure the destruction of all, the trees must be examined in June and August.

The *peach borers* are often numerous and much of the decay called the yellows may be accounted for by their injury. They are more easily detected than the apple borer as gum always exudes where they make their puncture and fresh chips in the gum is a sure indication of their presence. The knife is the only sure remedy, examining the trees in June and August.

The *tent caterpillar* is a very abundant yet easily destroyed pest which does more harm than it ought. We have found the best way to get rid of it to destroy the eggs in the winter, (they may be distinguished in the winter on the twigs by standing under the trees and looking against the sky), and by drawing the web together around the cluster soon after they have hatched out, and taking them off and crushing with the foot. There is no excuse for an orchardist having his trees injured by this insect except that of negligence.

The *canker worm* in some sections is very abundant but by the use of the tar or ink band and Paris green or insect powder (pyrethrum) they may be easily destoyed with proper care. Syringing with Paris green mixed with water at the rate of 1lb. to 100 gallons, or pyrethrum powder in the same proportions, when the first insects that hatch are one-fourth of an inch long and again one week later is less trouble and not much more expensive than the ink band, which requires constant attention from December to April or May.

Perhaps no one insect in the entire country is doing more injury than the *codling moth* for it attacks the apple, pear, and quince alike, and our apple crop the past year has been rendered almost worthless from the injuries of this insect alone.

Within a few years the use of Paris green has been tried with promising results. It has been used at the rate of 1 lb. to 100 gallons of water at the time when the blossoms are just beginning to fall and 70 or 80 per cent. of the fruit saved from injury. Further experiments are required to determine its real value and we should not give up the other means of destruction, i. e., feeding to cattle and swine all fruit as soon as it falls from the tree, and combining orcharding and pig and poultry growing.

The *plum curculio* is the most injurious to our plum and cherry crop, but does more or less injury to other large fruits. By recent investigations it has been found that the beetle feeds upon the leaves and fruit of the plum and cherry and that by the use of Paris green they may be destroyed. Applications of the solution should be made just before the blossoms unfold, when they begin to fall and one or two weeks later.

The *apple maggot* is an insect which punctures and burrows in the tissues in such a way that its presence cannot be easily determined until it is opened. It attacks the sweet and mild flavored varieties in preference to the more acid. No remedy has thus far been discovered except by the destruction of the fruit as food for animals or their use in making vinegar.

DISCUSSION.

I have not spoken of the plum wart or black knot which with us is one of the most difficult things to prevent. The wart, while it is in character like the mildews and rust, produces quite a different effect. The spores falling upon the branches and bark in the spring, penetrate the tissues and by the combined effort of the plant itself and the tree this wart is formed, which produces numerous spores in the fall and winter, which are scattered and again transmitted the following season. To destroy it we combine linseed oil, turpentine and kerosene, a very simple remedy and one that is effectual. The kerosene must be used carefully, as if it is allowed to spread over the branch it will destroy it entirely.

Either alone will destroy it, and you may cut it off afterwards or let it remain. The application will destroy every spore and render it harmless. We have found the linseed oil effectual when applied two or three times, or turpentine and kerosene will kill it at once. Linseed oil has the preference. I would make two applications, or perhaps three. Kerosene will kill it at once, but if it is not carefully applied, if it runs over the outside of the wart it will do injury. It should be applied just the minute the bark is affected by the wart. You see first a little rising of the bark, a little excresence; then apply it, perhaps the first of June and then in July.

During the summer there is a developing of spores on the surface. Perhaps you have noticed that where the wart begins the color changes to a darker hue, and has a velvety appearance. Upon close examination you will find little spores growing upon stalks at the end, and that gives the velvety appearance. In the winter, if you examine it again, you will see it is covered over with little glistening black projections. As the season advances they open, and the spores escape from these little projections. So if they are not destroyed by the applications, they should be cut off and burned. The habit of the fungus is fully understood. There is no question about the development of the spores and that they are scattered and attack other trees.

Mr. Pope. Will you speak of the apple scab?

Prof. Maynard. The apple scab has appeared within a few years and, like the mildew grows upon the surface and also in the tissues. As we all know, it is particularly abundant in wet weather, the past season it having been particularly noticed. We know of no remedy, yet it is hoped that a sulphate of copper solution applied during the summer two or three times, may destroy it. No positive results have been obtained by its use, though it has been sometimes applied. It will not grow in cold weather, but in moist, warm weather it will grow very abundantly. In Massachusetts there was a great deal last year following the hot, wet weather of July.

In a dry season perhaps the condition of the tree would account for it. In a dry season, on high land, the tree might be weakened and in an unhealthy condition, and thus invite the fungoid development. I think it is unquestionably a fact that these fungous diseases will not show themselves in a perfectly healthy tree. That is a conclusion that a great many are arriving at, although there are a great many who still claim that they will attack healthy trees when the conditions of the atmosphere are favorable.

Mr. Blossom. Our pear trees here are affected by what we call the pear blight, which turns the leaves brown.

Prof. Maynard. The shoots turn brown and the leaves also. The leaf blight attacks the leaf first, I suppose, and keeps increasing until the leaves drop off, and pretty abundantly in hot, moist weather. It is a very difficult matter to determine what the cause of the disease may be in certain trees unless we know their history —the treatment which they have been receiving. If they have been highly cultivated and manured for a time, and then plant food has been withheld for a year, and the land seeded down, that might account for it. Or an excess of manure may have caused a hasty growth, which may have resulted in an injury to the tissues of the tree, leaving them in condition for these spores to develop in the following season.

Mr. Starrett. I had a Bartlett pear tree with the bottoms of the leaves all covered with a dirty, slimy looking substance, and the tree died, I don't know whether from that or some other cause. Some of the trees in the vicinity of that one were similarly affected, although none of them died. I strewed some wood ashes over the tree when the leaves were wet, thinking it would not do any harm. Have you any information to give us about that?

Prof. Maynard. There are two insects which injure the tree in that way, one a very minute scaly insect and the other a slug about a quarter of an inch to half an inch in length of a greenish slimy appearance. The former may be destroyed by a solution of one part of kerosene to two parts of soap which should be diluted with 25 parts of water and syringed over the tree. The latter may be destroyed by the use of pyrethrum powder dusted over them or by kerosene.

Mr. Blossom. You speak of flat-headed and round-headed borers. Do they both work at the base of the tree?

Prof. Maynard. Yes, generally within three feet of the ground. The flat headed borer, the perfect insect, is of a steel color and has a habit of snapping. You have seen the snapping beetles, when you take them in your fingers they will snap. This is one of those snapping beetles. They reproduce annually while the round headed borer produces only once in three years, that is, it takes three years for one round of development. It is impossible to get them by probing after they have been in the tree the first year, because they have then made a turn in the tree. When the round-headed borer enters the tree it leaves a hole the size of a small pencil. These holes should be stopped up. There is a chance for moisture and air to enter and the woody tissue around that point will decay very rapidly. It is a good plan to use grafting wax to fill up the hole and keep the air out, just as you would on any wound upon the tree. The latter part of June is the best time to dig out the round-headed borers. The flat-headed borers generally do not bore very much until the latter part of the summer.

Mr. Hale. My experience has been with peach trees. We have quite a large number of them and the borers have troubled us somewhat, and we have relied on washing. Originally we made a wash of strong soft soap, carbolic acid and lime, but of late years we have had more trees to wash and instead of using soap we have taken caustic, potash and made a strong lye and added lime and carbolic acid and put in a little white arsenic, which makes a handy filling, and sometimes a little clay to make it adhere to the tree. We wash early in May, moving a little of the top soil away from the trunk so we can wash a little below the natural surface of the ground. We apply it with a swab, striking into the branches and crotches of the tree one or two strokes. Where we have washed our trees in that way not one in a hundred of them is ever attacked by a borer. Occasionally we have left a row unwashed or a portion of a field unwashed and then not more than one tree in a hundred would escape from their attacks. Then we had to follow the professor's plan as to those trees and go around two or three times and dig them out. I think we save a good deal of money and labor, besides injury to the trees, by applying this wash. If the borer gets in and you go for him with your knife or a sharp stick or a wire it doesn't do much harm, but occasionally you don't find him; and after you have crawled around on your hands and knees all day digging out borers you are apt to get a little careless and skip some. We formerly had the idea which the professor has expressed, that the only way to get rid of them was to dig them out; but it costs ten times as much as the washing. And the washing leaves the bark smooth and clean and with no chance for insects to conceal themselves. I would not think of cultivating a peach orchard without an annual washing with something to keep out the borers and smooth the bark, and I should certainly try the wash on apple trees or any others that are troubled with borers. Two applications would be better. You want to make it strong and make it thick so it is almost a paste, and leave two or three swabs full in the crotches of the trees where the rain will wash it down.

Mr. DUNBAR. My experience with apple trees is precisely like Mr. Hale's with the peach trees. I have used a wash similar to what he speaks of, and have found it very effectual. I set an orchard, and the first two years the borers got into every tree and destroyed some of them entirely, and I learned about this wash and applied it, and after that I don't think I found more than one borer where I had found twenty-five before I commenced to wash the trees. There would always be a few that I would have to dig out, and I have not omitted that. My time was the first week in June and then again from the middle to the 20th of June a second application. I think if I had done it again in August I should have made almost a complete thing of it. I followed that for years, and have no trouble of any consequence now with the borers; still I look my orchard over once or twice a year.

Mr. POPE. Whenever a tree in this climate stands leaning to the north-east, the southwest side of the body of the tree is very apt to turn dark, the bark becomes hardened and drops off. This is said by our New Brunswick friends to be caused by the flat-headed borer.

Prof. MAYNARD. The flat-headed borer works almost invariably upon the south side of the tree, and the blight might result from the attacks of the borer and the sun striking on the south side, and the winter freezing and thawing might cause a drying of the bark, which would be destructive, and then of course the fungoid diseases which penetrate all decaying matter would develop there.

PROPAGATION AND IMPROVEMENT OF THE APPLE.

By FRANK BOWMAN.

As the apple is the most important fruit grown in Maine, my remarks will be mainly on the propagation of the tree, with some suggestions relative to the dissemination of new sorts. I will say right here that in all parts of this country the mode of propagation by nurserymen is almost exactly the same. As it would require a volume to write up all the details of nursery practice, only a synopsis of the leading and most important parts can be given. The first year in the seed bed the utmost pains are taken to grow the largest and healthiest seedlings. They are dug in the fall, sorted and stored in a cool cellar. During the winter they are prepared and worked for planting in the nursery rows, washed, side roots all removed. The tap root, which is from ten to twenty inches, is shortened to from three to five inches. If to be used as seedlings, the top is left of only sufficient length to handle conveniently. Of those that are grafted, three to five inches of root is all that is used.

On this shortening the tap-root, we hear much said, many expressing doubts as to the effects of such practice. I will say to all doubters, by shortening this tap-root we get several roots to take its place, which will go as deep, and three times as many small roots or feeders. These last would not have appeared to any extent until the growth of that original tap-root (if left its whole length) had been checked in the hard soil or pan. The roots of these small trees resemble the tops. They are full of buds and vigor. It is youthful vigor, so much so that three-fourths of an inch of root from one of them will furnish all the roots required for the largest tree. The question is sometimes asked if the trees are as good where three or four trees are made from one root, as they sometimes are in the large nurseries. My experience is, that with those sorts that do well root-grafted, it makes no perceptible difference. On some sorts the top has a marked effect on the roots. But this effect is the same whether the roots used are long or short. The best guaranty that purchasers of trees can have, is that every nurseryman endeavors to grow the largest, healthiest and best tree he can, and uses only the best roots and scions for that purpose. We come now to the planting of our root-grafts and seedlings. A line is laid on the ground previously prepared for them.

The setting is almost always done with a dibble. This is an important part, and none but trusty help should be employed. After the tree is inserted in the hole made by the dibble, the dirt should be pressed firmly around the root, its whole length and especially at the bottom, as on this success or failure depends. These instructions complied with we are sure of a supply of roots for the vigorous, healthy growth of the tree. Set the trees ten inches apart, space between the rows four feet, which gives about 12,000 to the acre. About ninety per cent. of the grafts grow. Ordinarily the growth is from one to two feet the first year.

The soil and cultivation must not be overlooked. For a nursery, a good elevation, and a fine rich soil underdrained, or with such natural drainage as would amount to the same thing are required. It is necessary to get the largest possible growth on the trees in the first part of the season. This is done by constant and clean cultivation from early spring until the first of August. To promote the ripening of the wood the weeds are allowed to grow the last part of the season. In a thrifty, well-ripened tree we have an excellent stock for transplanting. The sap is concentrated. A secretion of gum and starch takes place in the parts above ground. It can endure the winter. It has, as you might say, a stock-in-trade which it can draw on when transplanted next season. A tree will not go through the winter safely when there is a superabundance of sap in the body. The freezing in this state will cause an undue expansion which will destroy the texture of the wood. The consequence is, the sap becomes sour and stagnant; the heart wood turns dark; in short, a black-hearted tree is the result.

The pear, plum and cherry do not generally succeed when root-grafted. They are grown the first year in a bed, the same as the apple. The tap-root of the pear is long and very destitute of side roots and fibres. Unless this tap-root is shortened the first year, the trees are almost worthless for any future use. Sometimes we whip-graft the pear stock an inch above the collar before planting in the nursery rows, with about six inches of root, and they succeed fairly well. There is this difference in the planting of the grafts: with the apple, but one bud on the scion is left above ground, whereas on the pear an inch of the stock and whole scion are above. But the plum and cherry are mostly made by budding.

An important operation is the shaping and trimming of the trees which requires familiarity and experience with the different sorts. Those of a sprawling habit are cut close to the ground to ensure a straight and vigorous shoot. With others stockiness and well-ripened wood are taken into consideration and cut back accordingly. Cutting-back is always done when the tree is in a dormant state. On two and three-year-old trees the side limbs are cut close in August before the second growth commences. Trees for the last season in the nursery are trimmed to a whip and cut back to a proper height to set a top. This is done in the spring.

Not to weary you too much with the details of nursery practice I will tell you what I have learned from nearly twenty years of experience in the business; that we can grow as good a tree in Maine as they can in New York or anywhere else; that we can grow as many to the acre and as straight and healthy. I would say to those about to engage in the nursery business, do not use up your capital in experimenting, but go to some reliable nurseryman and make yourselves familiar with every part by seeing it done. I will dismiss this nursery talk here as I have a few suggestions to offer relative to the propagation and testing of new varieties.

We grow very fine fruit in Maine. But the standard of excellence in our fruit is susceptible of great improvements, and we should take pains to bring them about. We need to-day a more intimate knowledge of the many varieties that are adapted to our climate. We want better sorts of apples than we already have—for instance, a sort or sorts that will combine more of the good qualities in one tree. Fruit-growing in Maine is an industry representing a great deal of wealth, and is prosecuted by a very intelligent class of people. But the cause of this slow progress of improvement, is that orcharding differs from other industries. It requires a number of years to bring orchards to maturity, and they are planted only with old and well-known sorts. No seedling orchards are now permitted to grow up and come into bearing. Thus no advancement is to be looked for in this direction.

How shall these valuable and desirable improvements be brought about? They can only result from careful and pains-taking experiments together with an intimate knowledge of the subject. But the propagation and experimenting with new sorts is too costly for one man to do alone. I think that this matter deserves the immediate attention of our legislators. They should make a suitable appropriation for the establishment of a station for the propagation and testing of new sorts. It will meet with the approval of the whole people. They are interested in fruit and want to learn. Experiments and facts recorded by those in charge of such stations will be read with an eager interest. It will give a stimulus to the fruit industry. Fruit gardens will be multiplied. The coming apple and pear will make their appearance. Fruits, that grow in other countries, adapted to our climate, will be tested here, and valuable acquisitions will be the result. This is practicable, and can be immediately put in operation. Our nurseries could lend much aid at a small cost as they have hundreds of young bearing trees, they gladly would devote to the purpose, that could be top-grafted and immediatly brought into bearing so that every feature of tree and fruit could be studied.

In conclusion, whether the State lends its aid or not in this improvement I hope that every fruit grower in Maine will devote himself to the task of bringing out an apple as good as or better than the Baldwin, a later keeper, and a hardier tree. It can be done. It's value would be inestimable.

DISCUSSION.

Mr. Knowlton. There is one point in the paper of Mr. Bowman which seems to me of considerable importance, and I rise now to ascertain what is being done, rather than to comment on the paper. Mr. Bowman suggests the importance of laboring in the direction of obtaining better varieties of fruits, and urges that experimenting should be done. The only organized means of experimenting which we have in this State are centered in the Agricultural College and the Experiment Station at Orono, and I rise to ask of Sec. Gilbert what is being done in that direction in connection with the work of the State College at the present time, and, further, so far as he may know, what work is being contemplated by those who have charge of the institution, in that direction.

Sec. Gilbert. We have not, up to the present, done anything in horticultural matters. This has not been for the reason that we have not realized its importance, but we have been placed in the unfortunate condition of being without means to carry out the work in this direction. We have had to do educational work there in the lines that were first called for, and we have extended the work out in other directions from time to time, as the means at hand and the progress made has enabled us to do; but we have not yet taken hold of the matter of horticulture in any department whatever. The professor of agriculture at the institution for two or three years past, in his annual report at the annual meetings of the board of trustees, has pressed upon their attention the importance of doing something in connection with horticultural matters, and establishing a horticultural department in connection with the institution. Acting on that suggestion from him, and in conformity with the judgment of the trustees, we, at the last meeting, decided to ask of our legislature an appropriation for the purpose of starting in the work, and you will find scheduled at the State House, and now before the Legislature for consideration, a request for three thousand dollars in aid of this line of work. We thought that with that small sum we might start out in a way which will lead to something further as we go on. Further than that, we now have established a department of experimentation, a government experiment station, giving us $15,000 per year with which to carry on experimental work in connection with the institution. It is separate and distinct from the educational part of the institution, such as the bill contemplates, still it is a part and parcel of it.

Mr. Atherton. Will the gentleman allow me to ask why can not a portion of this $15,000, which is now appropriated, under the Hatch Experiment Station bill, to our State, be used in the direction of experimentation in the line of horticulture, instead of asking the State for an appropriation?

Sec. Gilbert. We have a very good reason for not using it in the way we would the appropriation we ask for, and that is that we are not allowed to do it; the government restrictions do not admit of it. We propose a horticultural department as an educational branch of the institution; the government aid in this direction is for experimental purposes and not educational work; the two are distinct and must be kept distinct entirely.

Mr. D. J. Briggs. I am very glad that Mr. Gilbert has given us the interpretation of the law which he has. I always supposed they could do any work and carry it on as they saw fit, not understanding the requirements of the law. I believe in an institution established in the State that should act partially in conjunction with the several associations of the State which are working in the same direction. It looks to me as though in a country like this we could with propriety take a step in that direction. I think if this society would take this matter in hand and carry it along, with the aid of the stipend which has been granted us, that we could accomplish something in the future in this direction. What is the society for? What is the station for? Why, it is to enlighten farmers in their business. I hope that something may be done at this meeting, in this early stage of the experiment station, in this direction, so that we may receive the benefits while we are living. Yankees are impatient and like to see matters going along as fast as possible; we are unlike the English, who can wait forty or fifty years for the results of experiments to be brought before the public.

Mr. J. H. Hale, of Glastonbury, Conn. The experiment station matter was correctly explained by your secretary. The law is broad enough to do any work in the State that the people in the State want; and while this society, or any society in the State, has no authority or power to say that the station shall do this or the other work, I am acquainted with the directors of some of the stations, and know the perplexities they are in to know what the citizens of the different States want done and what they can do to most benefit them. I know that any suggestion that you may make, or any organization or any farmer may make to the experiment station will be carefully considered at the station. That is what they are waiting for. I know, from talking with the station officers that I have met during the past year, that the real study with them now is to know what the people wish them to do. They are not supposed to know what the State wants. If there are any individuals here who have a special line of experimental work which they believe ought to be carried on in the State, if they will present the case fairly to the station officers, I believe they will take up the work and will be grateful for the hint. The hardy varieties of fruit, suitable to the northern part of your State, ought to be tested in that part of the State, and if the attention of the directors of the experiment station is called to this necessity, I think they will be glad to place the work in the hands of intelligent farmers in different sections of the State. In my own State of Connecticut we are doing that, not especially with fruits, but we have several what might be called sub-stations at farms in different sections where work is being done. Thus the experiment station is practically establishing sub-stations all over the State, to which the farmers in the neighborhood can go at any time, and see what is being done, and make suggestions as to lines of work which they would like to have carried on. I hope some action will be taken here to-day to urge your station to take hold and help the Pomological Society.

A committee consisting of D. H. Knowlton, D. J. Briggs and E. W. Dunbar, was appointed to offer resolutions bearing on the duty of the State Experiment Station in relation to horticulture and pomology. For report of committee see page 19.

HOW TO PLANT AND GROW AN ORCHARD.

By Henry W. Brown

I am well aware that the subject is an old one and also that there are many present who have had a great deal more experience in growing fruit than I have. but perhaps by telling of som · of the mistakes as well as the success that I have met with within the past thirteen years may help some beginner to avoid making the same mistakes.

I came to the farm that I am now on thirteen years ago, there was at that time an old orchard on the place set out some forty or fifty years ago, the larger part of the fruit being natural fruit, or cider apples, as we called them. Wishing to get good apples as soon as I could, I commenced in three different ways at the same time, by grafting the old trees, by planting the seed, and by setting New York tiees. Now, in as few words as possible, I will tell of the success that I have met with.

From the old trees which I grafted, I got apples at the same time as from the New York trees; but not so large and nice as from the young trees. Perhaps for two or three years I got more apples from the old trees, but at the present time the larger part of the old trees are dead and the rest of them do not amount to much. The young trees are fine, and doing as well as any one could ask.

The seed that I planted came up in due time and grew quite well, and the third year I set them in the orchard, and grafted them the fourth and they commenced to bear the sixth; that is the sixth year from the time I planted the seed, and at this time I was getting from one-half bushel to two bushels from each of the New York trees. The old trees at this time were doing quite well. The trees of my own growing now are very good trees. Not any better as far as I can judge than the New York trees, and if I was going to set an orchard now, should buy good nursery trees

When desired to plant an orchard the first thing to do is to choose a site. I would select a north, north-east, east or south-east slope if I had such, if not, such as I had, prefer a slope to flat land.

Do not set trees in some old field or pasture, that was never plowed or ever will be, expecting to grow fruit that will ever amount to much; if you do, you will be disappointed.

After selecting a site do not be in a hurry to plant, but thoroughly prepare the ground the fall before. Plow deep, and make it rich by the use of stable manure, ashes or any good fertilizer. Prepare as well as you would for corn, and the next spring plant the trees Look over your neighbors' orchards, and see what do the best on land similiar to what you have selected. When decided what kinds you want, order from some responsible, honest nurseryman who will send what you order. Two, or three-year old trees are large enough, and will thrive better than larger, or older ones. Do not set too many varieties.

When your trees are delivered, be sure and keep them out of the sun and wind, for the little fine roots will dry up very quick. Cover them up with straw or hay, keep wet until planted, and take but a few into the field at a time. Of course this will take more time, but time that you will get well paid for.

When ready to plant, take a man with you and measure the distance you wish to plant; thirty or thirty-five feet each way is none too far. It may look some distance for so small trees, but later on you will find it none too far.

Dig the holes a little deeper than the trees grew in the nursery and larger over than roots will extend. Do not leave the bottom of the hole hard, but pulverize somewhat deeper than you will set the trees. Set the tree in the hole, straighten out the roots, don't bend any of them,—cut them off sooner. Work the fine soil all around the roots with the hands. After nearly filled up, commence to trample down and fill, so that the tree will set a little deeper than when growing in the nursery. Do not hurry, but do this work thoroughly.

I know of a man who set an orchard, or hired it done. He engaged a man to do it for him, and he set out thirty trees the first day, and he was not satisfied with the amount of work done, and discharged him and engaged a man who could, and did, set one hundred; and was well pleased with this man; but that was his mistake. The thirty trees set by the first man all lived and grew finely, and over one-half of the trees set by the last man died.

Do not think that your work is done now that your trees are all set out. Thorough cultivation is very necessary. Beans or potatoes are a good crop to grow in the orchard, or most any crop that requires good cultivation.

This should be kept up for a few years, or until the trees get a good start and commence to bear quite well, after which I prefer grass, with top dressing every year or two. When top dressing, do not pile up close to the trees, but spread out as far as the limbs reach, or all over the ground is better. Watch close for caterpillars, canker worms, bark lice and borers.

All pruning is best done while the tender growth can be pinched or rubbed off with the hand, but keep a sharp knife with you, and when you see a limb that should come off, take it off. Avoid the saw as much as possible.

My paper is already too long, but I wish to say, don't be discouraged at the low prices that apples are selling for at the present time, for there is profit in apple-growing at the prices they are now bringing. Just compare with the other crops you grow, and see if there is not more profit in one acre of apple trees than on any other acre of your farm.

DISCUSSION.

J. H. Hale. I will say a word in regard to the paper which the gentleman presented on apple culture. There isn't any danger of overdoing the business if you will grow fine apples, and there is no question but you will grow fine apples if you follow the directions he has given Thorough preparation of the soil is an important point. Too many of us think that after we have set an apple tree it may be left to take care of itself and it will produce something. It is a wonder to me that they produce anything; but they do produce something, but that is not a good quality or marketable apples. But the thorough preparation of the soil as he has suggested, and a thorough cultivation of it after the trees are set will show themselves wonderfully in the quantity or quality of the crops. And I say amen to his idea about care in setting trees, and to his manner of pruning with the thumb and finger and the pruning knife; it is a good deal better than using the saw. The thorough cultivation of the trees after they are set and until they come into bearing is of great importance. I believe in reasonably large apple orchards; I would rather have a large one than a small one, as the proportion of profits is much greater. A man with twenty barrels of apples to sell may have trouble in finding a market for them at a profitable figure, but a man who has 500 or 5,000 barrels of apples can handle them at a much greater profit. I believe that fair sized orchards on most of the farms in New England will bring greater profit than almost anything that can be raised. I would ask your secretary if the Smith's Cider apple has been tested here in Maine. The name would indicate that it was a cider apple, but it is not; it is a Pennsylvania apple originated by a man who happened to be a celebrated cider maker, and hence its name. It is one of our most vigorous and hardy apples in Connecticut. It is a profuse and annual bearer, a bright red apple of fair quality, no better than the Baldwin—only an ordinary apple, but it is a magnificent growing tree, and is hardy and healthy and bears annually; nearly every year you can depend on a good crop of Smith's Cider, which will sell at high prices in any market on account of its fine appearance.

Mr. Knowlton. I will answer the question by saying that I obtained some very fine specimens of that apple grown in Franklin county. The gentleman from whom I obtained them had only one tree. I know of no others.

Mr. H. W. Brown. I have the same apple. I have half a dozen of them, and two of them bore a few apples this past fall for the first time. By the description that has given they seem to be true to name. It makes a very rugged, thrifty, hardy tree.

MONEY IN SMALL FRUITS.

By J. H. Hale, Glastonbury, Conn.

While we are all somewhat distantly related to Adam of long ago, we more clearly resemble and no doubt are not very distantly related to one Col. Sellers of a more recent date. Every new enterprise that comes to our notice has "millions in it," and many of us have rushed into the small fruit business in the hope o. there finding an easy road to wealth; yet the "millions in it" proved to be needs instead of dollars.

However, my subject here to-day, "Money in Small Fruits," has a very pleasing sound, for who of us tillers of the soil does not jump at the chance of any honest industry that there is money in? Not that the gathering or accumulating of money is or should be the chief end of life; yet we all know and appreciate its value in securing for us the comforts and necessities of life, and should neglect no opportunity to obtain enough of this world's goods, that our families may not be denied these things.

"Money in Small Fruits" would indicate the planting and cultivating of these choice gifts of nature was to be carried on for the sale of these products and to this part of the question we will now turn our attention. If any have come here to-day expecting that I am to unfold any great secrets of the business from my own personal experience, whereby large profits have been secured, I will state for their information that nothing startling is to be developed, simply a plain statement of a few of the main points that have been developed by a life of work in small fruit growing for profit, that has not brought a fortune yet has given what is better, a pleasant home and a good comfortable living. Of course you will understand that the term small fruits applies to strawberries, raspberries, blackberries, currants, gooseberries, &c., and not to small or second-class apples, pears, plums, &c. It may well be called one of our infant industries, for it is within the memory of most of the middle-aged men here, when the first berries were offered for sale in any of our markets, while the principal development of the business has all been within the past twenty years, and it is really only within the past ten years that all small towns and villages of the country have begun to have anything like a fair supply, while there are yet hundreds of towns and villages that are not one-half supplied; and those that appear to be well furnished now would use many more if better fruits were offered in a more attractive style. So there is a chance yet for new beginners, if they are willing to live up to the requirements and demands of the times. However, before attempting the business it is well to know that not all cultivators of berries have found money in small fruits; in fact, there have been some very serious failures.

The requisites for success are: *First*, a love of fruits for their own sakes—a pleasure in their culture. *Second*, a soil fairly well adapted to them. *Third*, good local markets, or convenient access to railway lines which centre in market towns. *Fourth*, extra laborers near enough at hand to be called on in case of emergency in cultivating and gathering the fruits promptly and economically when ripe. Having made sure of these things, if one is starting in the business, care should be taken not to plan for planting more than can be cared for in the most thorough manner or sold to good advantage.

STRAWBERRIES.

Of the various fruits, strawberries will receive first attention as it is from them that the quickest returns may be expected. Any good corn or wheat land will produce fine strawberries, but to secure the best results, it must be very rich in natural fertility or made so by the application of manure in some form. Well decomposed stable manure has always been recommended as the best of all for general garden purposes, and is not to be despised, and we should make, save and accumulate in every honorable way, all we can—use it in the vegetable garden or for the common field crops, but it is not to be recommended for strawberries, if the highest results are to be attained. My own experience has been that any soil rich in organic matter, or commercial fertilizers rich in nitrogenous matter, produce too much foliage growth for the most profitable returns in fruit, and my best crops have come from a sandy or loamy soil, where commercial fertilizers had been used, containing a large percentage of phosphoric acid and potash and lacking in nitrogen. Pure, fine-ground bone and wood ashes or muriate of potash, have proved to be the cheapest and best forms in which we could buy these manures, always applying them on the surface of the ground after ploughing, and working them in with a harrow before setting the plants, using from 1,500 to 2,500 pounds of the bone, and from 500 to 800 pounds of the potash per acre, or its equivalent in unleached wood ashes.

Land that has been in cultivation for a year or two previous is best. Plough this as deeply as possible early in the spring, then harrow it over and over again till a perfect seed bed is formed. An extra day or two spent by a man and team in a thorough preparation of the land will usually show itself in ease of cultivation later in the season. I make it a rule on my own farm, where I work in company with my brother, if it is so that neither he nor I can be present to attend to the work, to tell the men to harrow it over and over again, until they think they have done it thoroughly, and then tell them to expend just as much more time. I have never had it overdone; I never knew a farm crop to be ruined by over-cultivation of the soil beforehand. When the ground is thoroughly prepared, with a corn marker check off rows three feet apart, and set the plants from twelve to twenty inches apart in the row, according to the vigor of the variety.

Early spring is the best time in the whole year to plant; yet where one has valuable land that must produce two crops in one season, early vegetables can be grown and cleared from the ground by August first, and the ground planted with pot-grown plants that will get well established before winter, and produce a full crop of fruit the next June. These plants can be grown by plunging two-and-one-half-inch plant pots in the ground along the rows of spring-set plants; and so training the runners that the new plants will root in them. Ordinarily this will take about three weeks, so if we begin the first of July, we shall have a good stock of plants by August first. If pistillate or imperfect flowering varieties are used, plant every third row with some strong, perfect flowering variety, that blooms at the same time. Too many make the mistake of planting a greater number of rows of pistillates before adding the perfect bloomers to fertilize them, and also make the selection of varieties without regard to the time of blossoming. Cut off all blossoms or fruit stalks as soon as they appear, and as soon as growth is well started, begin the summer cultivation, which should be kept up once in two or three weeks all through the season till weed growth is stopped by freezing in the fall. On my own plantation the last hoeing is usually done in October.

Having been growing berries for market twenty-five years, and testing the various systems of hills, narrow rows and matted rows, as well as studying results obtained by these methods in all the Northern States, I am satisfied that the narrow row system is, on the whole, the most profitable. By this method, each of the spring-set plants is allowed to root a few of their first runners along near the line of the row, after which all the runners are cut off as fast as they appear. The advantages of this plan are that more of the work of cultivation can be done by horse power, as in hill culture, and yet there are always young plants enough to form one continuous row, even if a few do get destroyed in any way. There is abundant room for sunlight and air to reach all the berries when ripening, which assures larger, better colored and higher flavored berries than can be grown in matted rows; also firmer fruit, that stands transportation and sells for higher prices. There is another advantage in this plan,—it costs but little to clean out a bed of this sort after fruiting, and so renew it for another season's crop at little expense, while in matted row culture it is seldom profitable to continue a bed in fruiting more than one year. I will say to any of you who contemplate growing strawberries in matted rows, do not try to get but one crop. While you can get a second crop without much work, it will be small inferior fruit, and a poor crop. If you are bound to grow in matted rows set new beds every year and plow up the old ones right after fruiting. When the ground is frozen in the fall, cover the whole field lightly with a mulch of old hay, straw, corn stalks, or any coarse material that will protect the plants against the alternate freezing and thawing of late winter and early spring. This need not be removed but when growing time approaches pass along the rows and partially uncover the crowns of the plants that the new growth may push through it. Thus the mulch can remain to keep the ground moist and the fruit clean during the ripening season. This question of moisture at ripening time is a most important one. Many a field of strawberries that has received fairly good care through the whole year has failed to produce profitable results, simply for the want of sufficient moisture just at the fruiting season. Therefore, where it is possible without too great cost, irrigation should be provided if the highest results are to be obtained. There is no other plant that I know of that requires so much water to perfect the crop in the highest state and the greatest abundance as strawberries.

Where the markets are large enough to readily handle year after year the product of five or more acres from one farm, I am satisfied that an investment of from one to two thousand dollars for irrigation purposes would pay handsomely. However, as such an amount of capital cannot well be so invested by many planters, and cheaper means of obtaining an abundant supply of water are not to be had, except in rare cases, therefore I urge a thorough preparation of the soil for planting, and frequent cultivation, that the plants may root deeply and thus be able to withstand drouth, which comes so often just when we can least afford it.

In gathering and marketing the crop there should be one picker for each thirty or forty quarts of the daily product, and a superintendent to every fifteen or twenty pickers to assign them their rows and inspect their work from time to time to see that they keep to their rows and do not trample on the vines. Pick the fruit clean, and grade it according to the demands of the market to be supplied. Upon the thoroughness of this superintendent's work will depend a large measure of the success of the business. For keeping tally with the pickers, the best plan I know of is, to give each a picking stand or rack of a size suitable to hold four, six, or eight quart baskets. This should be plainly stenciled with the number of the picker, all of whom should be numbered. On commencement of each day's work the picker is given this rack with its full quota of baskets, no more, no less, and is required to return them, either full or empty to the packing shed when a daily account ticket is given. This ticket is of "tough check" paper, $3\frac{1}{2}$x$1\frac{1}{2}$ inches. Across the top is a space for name and number of picker, day and date of the week, then five upright columns of eight figures representing—1, 2, 3, 4 and 8 quarts or 144 quarts in all—as much as even good pickers are likely to pick in one day.

From this is punched with a conductor's punch, a number representing quarts of berries brought in, and given to the picker, who is then given a fresh lot of baskets, and returns to work and continues in this way till the day's work is done. Then the daily ticket is taken up and the number of quarts it represents as having been picked is then punched out of the weekly ticket, which is of the same tough check paper, size $5\frac{1}{2}$x$2\frac{1}{2}$ inches. This ticket has space for name and number of picker, amount paid per quart, and date of the week, on which it ends, and six columns of figures for a record of the berries picked each working day in the week, column for sum total and cash paid on Saturday, date of ending. These tickets are carried by the pickers through the week, a new daily ticket given each morning and taken up at night, then on Saturday, when we pay off we take up the weekly tickets and file them away, and thus in a simple form have a complete record of all berries picked, and in case of loss of a weekly ticket by a picker before the end of the week, we have the daily ones on hand from which to make a new one without loss to any one, thus there is no chance for a picker to lose pay, or for us to pay only just what is due.

Picking, except for local markets should not begin till the dew is off in the morning, and not continue through the heat of the day, if pickers enough can be had to gather the crop without it,—from four o'clock until dark is much the best time. The packing shed should be a cool airy place convenient to the field, and here all the fruit should be taken as fast as gathered. A general inspection of the fruit should be given by the person in charge, and packed according to its grade each variety by itself. Baskets or boxes should be new and clean, and made of the whitest wood that it is possible to obtain. All should be as rounding full as can be conveniently packed without injury to the fruit. There should be no inferior fruit put in, and that in the bottom and middle of the package should be just as good or better than that on top.

Having made sure of this, these should be packed in clean, bright crates or boxes, and of the size required by the markets where the fruit is to be sold. We in the east mostly use the square quart American baskets, well ventilated at sides and corners and pack them in thirty-two or forty-eight-quart crates that are also well ventilated at sides and ends and are returned when empty. In some sections of Pennsylvania, Ohio, Indiana, Illinois and Missouri, they use shallow boxes about 14x20 inches called a tray. Into these they turn loosely sixteen quarts of berries, and packing four of these, one above the other and a thin cover over the top one, cleats nailed on the sides to hold them together makes a "stand" containing sixty-four quarts. In the market the berries are scooped up and measured out by the quart, more or less mussed, with a shrinkage of about twelve per cent and yet this abomination appears satisfactory to those that have not learned of any better way. Surely no money can be made on small fruits handled so.

In the West and Southwest most of the fruit is sent to market in what is known as the "Hallock" a box five inches square, two and one-half inches deep, bottom elevated half an inch so as not to crush the berries below and no slit or hole for ventilation. These are packed three deep without any slots between them, in cheap twenty-four-quart gift-cases, and sell with the fruit. It is of great importance, if you expect to find money in the small fruits, to pay strict attention, to the careful gathering, packing and marketing of the fruit. Be sure that your crate is packed so that the berries at the bottom will prove as good or even better than those on top. If you are packing a 32-quart crate of berries and you have one quart that is not quite as good as the rest, put that on the top layer, so that the dealer may see it and understand that that is the poorest one there, that when he has seen the top of the crate he has seen the worst there is in it. That might not be good policy if you were only going to sell that one crate of berries, but if you are in the business for profit you must make a name and a reputation, and you cannot do any better than by absolutely honest packing.

In Chicago a year ago last June, just when red raspberries were coming in from Southern Illinois, I was there and visited the markets. They came in 24-quart cases, nailed up. The dealers were opening them and showing them as the truckmen would bring them in from the trains, and the grocers and fruit men were examining them and buying them at six and eight cents a quart. At one place where I was, about half a truck load came in, and the proprietor told the man to set them back in the back part of the store. Several buyers came in and asked what he was asking for them and were told ten cents; and they would take three or four or a dozen crates, and while I was there they were all sold and not one of them opened. I inquired of the proprietor why he didn't open those crates. He said, "You see that name on the top of the crate; that sells the berry; he is a man who has made a reputation in this market; we know that everything that comes from his place is carefully selected before it is packed; it is packed honestly; the boxes are new and clean and they are packed full; the berries are cooled before they are packed, and when they are nailed up we will not open them for any man in Chicago; if they will not buy them without their being opened they may go without them." I had the Yankee curiosity to travel three hundred miles south into Illinois to visit that man's farm. to see what he was doing and how he was doing it. He has won his reputation by careful, business-like, systematic work in every department of his fruit growing, and by thorough honesty in the packing. It is an old adage that honesty is the best policy. If you are mean and dishonest at heart and want to cheat every man you deal with don't do it, it won't pay; if you are after the dollars and cents, be honest. I am not preaching a sermon now; I am talking dollars and cents.

I am satisfied after several years of careful study of the markets, both East and West, that we are ventilating our baskets and crates too much, and by allowing so much air to reach our berries we are not keeping them in good condition as long as we might. Of course when berries are picked in the heat of the day and packed at once, they must go in ventilated baskets and crates, also, if wet from rain or dew they will dry off and keep longer when well ventilated, but I am clearly of the opinion that if we pick our berries in the cool of the day, or if picked when warm, we will at once send them to a cooling room and when thoroughly cooled pack them in tight boxes or baskets in crates where the air will not directly reach them, berries will keep twice as long and in better condition than they do now in what we call our best ventilated packages. I have stated that strawberries are usually over ventilated in packi g. In support of that, you will notice that when a market man has kept his strawberries about as long as possible, the last thing he will do will be to turn them over, bringing the fruit from the bottom of the box to the top. Why? because the air has been kept from the bottom berries and so they have kept better.

It is usually good policy to conform to the customs of the market whose trade we seek. However, where we find these that have not attained a high standard, it may be well to humor them to the extent of sending second-class fruit in the old style, and market our best in the most approved packages attainable. It will attract attention to our goods, and win favor and custom, especially if we guarantee every package to be as represented. We cannot afford to spend eleven months of careful cultivation of our fruits, and then accept inferior prices, simply for the want of a little care in the details of marketing.

RASPBERRIES.

Raspberries, red, black and yellow, following strawberries as they do, should next receive attention from one who is after money in small fruits. These require much the same soil as strawberries, except that they may be grown with profit on land that is far richer in nitrogenous matter. The red varieties may be planted either in spring or fall, but the cap varieties or any propagated by layering of the tips should always be planted in spring. Ground should be as thoroughly prepared as for strawberries. For years I have planted in rows, seven or eight feet apart, according to the vigor of the variety, placing the plants two and one-half to three feet in the row, but I am now satisfied that larger, firmer and better berries can be grown by planting in check rows, five or six feet apart, giving the plants more sunlight and air, and admits of more use of the horse and cultivator, thus securing better culture at less cost, while the yield of fruit is fully as large as from hedge rows.

After the ground is properly marked out it is best to take a light one-horse plow and open furrows three or four inches deep, and for late fall or early spring planting of dormant plants of all varieties that are propagated from the roots, the work can be done very rapidly by having a boy to hold the plant in place while the earth can be drawn over the roots with a hoe and trodden down with the feet. No harm will be done even if planted two or three inches deeper than they had naturally grown, except that they will not show signs of growth quite so rapidly. The canes should be cut off even with the surface of the ground, as the only growth of value is what comes directly from the roots. Often have I seen raspberries and blackberries planted with one to two feet of the cane left above ground, the awakening life starts the buds and leaves on these and as it requires all the strength of the newly transplanted roots to nourish this old cane there is little strength left to push the new growth, consequently it takes two years' growth to bring the plants into good bearing condition, while on the other hand if good strong rooted plants are put out and tops all cut away the first season's growth will be strong enough to produce a perfect crop of fruit the next season. The cap varieties and all those that are propagated by layering of the tips must not be planted as deeply, the roots should be carefully spread out and covered with fine earth, with the crown of the plants not more than one-half inch beneath the surface, as deep planting is sure death to this class of plants. If from any cause we cannot plant very early in the spring while the plants are dormant, it is not well to plant a little later when the new and tender shoots are just sprouting from the roots as many of them are likely to get broken off, but a few weeks later when the new growth is well established the young green plants may be transplanted as readily as tomatoes or cabbages, in fact the finest raspberries I have ever grown have been planted with these green plants, which however cannot of course be as well transported as the dormant plants. Whatever and however the plants are set cultivation should begin early in the season, and be frequent and thorough through the summer mouths, so as to stimulate a rapid growth early in the season, giving ample time for maturity of wood during the fall. The new growth should be pinched back when fifteen to eighteen inches high. This will cause a strong growth of lateral branches, which should be allowed to grow at will, leaving all further trimming till early the following spring.

Some of our best market varieties, such as Cuthbert and Marlboro among the red ; Caroline and Golden Queen, yellow ; and Carmen and Springfield, Earhart and Sowhegan black caps, are hardy enough when well grown to withstand the frosts of most of the northern sections of the United States with but little injury, except now and then a winter when they get badly nipped, but as we are after the money in small fruits, and the whole profit in the business comes from little things, it is not wise anywhere north of latitude forty-two, to attempt to let them go through the winter without some protection ; plenty of snow will answer if you could be sure of it. However, the present winter has taught us that it is not best to depend on that, and as the next best and cheapest material is earth, plans should be made to cover them late in the fall, just before the approach of winter. This can be done cheaply and rapidly by two men, one with heavy gloves to bring the canes as close together as possible, and carefully bend them down lengthwise of the row, and the other throwing a shovelful of earth at the base on the side towards which they are being bent will prevent them from breaking ; then a few shovelfuls of earth on the tips will hold them in place, and they can pass on to the next plant, and so on over the whole field, after which each can take a shovel and complete the covering the whole at a cost of from five to eight dollars per acre.

Where the rows are far enough apart to admit of it, after the plants have been bent over and the tips held down with earth put on with a shovel, the principal covering can be done with a team of fast walking horses and a plow that will throw the soil well, and so reduce the labor cost somewhat. This is a sure and safe method of insuring the crop as far as the extreme frosts of winter might affect it. As soon as frost is out and ground dry enough in the spring, uncover, straighten up the plants, thin out and shorten in the laterals from eight to fifteen inches as may be required to form a well balanced bush.

Thorough cultivation may be given up to blooming time, after which it is not well to stir the soil till after fruiting. The gathering and marketing of the fruit should be on the same general plan as for the strawberries, except that half pint and pint boxes or baskets should be used in place of quarts for the most delicate varieties.

BLACKBERRIES.

Blackberries should next receive attention and as they are generally inclined to make too much wood growth, it is well to select land of moderate fertility. The high bush varieties may be planted either in spring or fall, the latter being the best, planting the same as stronger growing raspberries, while the dewberries or trailing blackberries should always be planted in the spring in rows ten feet apart, plants three to four feet in the row, and allowed to form a matted row. Close pruning and winter protection are essential to the highest success in blackberry culture as with raspberries.

GOOSEBERRIES AND CURRANTS.

Gooseberries there is only a limited sale for, but for currants the demand is still far greater than the supply. Strong, rich, fairly moist soil is best for the latter. They may be planted at any time after their leaves drop in the fall, or very early in the spring, in check rows four and one-half to five feet apart. The growth is all made the first two months of summer. It is therefore essential that the cultivation be thorough and liberal early in the season, if we wish to stimulate the best wood growth. The first two years only enough pruning will be required to form a broad open headed bush, with bearing wood evenly distributed but in later years a pinching back of all the new growth when two or three inches long will tend to develop a wondrous formation of fruit-spurs and buds. This has not been the general practice, but is practically a new plan that is worth making a careful note of, even by those having only a few bushes.

GENERAL REMARKS.

In theory it is all very nice to aim to supply only varieties of superior quality and educate the popular taste, but as a matter of business it does not pay. Your efforts will not be appreciated, the average buyer of small fruits goes about the business as though they were never intended to be eaten, they use the eye only in buying, and fine large showy fruit, sells quickly at high prices regardless of quality, while high flavored fruit sells slowly and at low prices if it is not of showy appearance.

There are a few customers in every town and city who appreciate and will pay for quality, but they are so few in number that their trade is comparatively small, and will hardly attract our attention. We must therefore bow to the popular demand and grow such varieties as will yield the greatest number of quarts of large berries of as good form and color as it is possible to obtain. If with these we can combine fine flavor so much the better, but one who is after profit from the business must not sacrifice fine appearance for quality It is a shame to be obliged to say this here in New England where we are supposed to appreciate the best of everything, yet it is one of those hard facts that we have to face. possibly the time will come when horticulture will be taught in our public schools and our town and village people working in the local horticultural society for the sake of its ornamental feature will gradually learn that there is a vast difference in the quality of our fruits, and in time will buy them on their merits as to quality. Yet, under existing conditions, study the markets that you are to supply, then visit growers in your neighborhood, county and state, and learn from them what are the well tested and approved varieties, and make the largest share of your plantings of these.

On my own fruit farm of some eighty acres the old standard Crescent, Windsor and Downing strawberries, Cuthbert and Sowhegan raspberry ; Snyder blackberry, and Victoria currant have always been profitable. Jessie, Bubach, Pineapple and Miami strawberries, Carmen and Scarlet Gem raspberries, Lucretia dewberry and Fay currant among the newer varieties are wonderfully fine, and are likely to surpass many of the old ones, and there are many others that are fast coming to the front, but I am not here to advertise new fruits. The world is improving all the time, and so are our small fruits, yet do not rush headlong into highly praised new ones. Test them all in a small way and you will surely find some that are just suited to your soil and market, thus obtaining for yourself an advantage not possessed by others. The man who is always looking for something better is the one who makes the most out of the old varieties as he gives them the best culture. His neighbors may

6

think he fools away time and money on a little trial plot of new varieties, yet out of many failures comes one success that pays for all and places him way ahead of all competitors.

With culture such as I recommend, strawberries should yield four thousand quarts per acre, sell in your markets at about eight cents per quart or a net profit of one hundred and fifty dollars per acre. Raspberries about three thousand quarts per acre at ten cents per quart will net about the same profit as strawberries. Blackberries should give rather more quarts than the raspberries but selling for less price, the profit is not so great. A good product of currants is from fifteen hundred to two thousand quarts per acre, and the price I suppose here about six or eight cents; but as a field of currants may be kept in fruiting for an indefinite number of years, it is one of the most profitable of all small fruits, as the cost of culture is so much less than any of the others; strawberries having to be renewed every two or three years, raspberries and blackberries every five or six years for the best results, although there are many fields now eight or ten years old that are yearly giving profitable results.

So much for a hurried run over the field with an eye to producing small fruits for market, but to get at bottom facts as to money in small fruits the family garden is the place to begin and end if we are looking for great results. Every farmer should and will have, when he awakens to a full sense of the duty he owes to wife and loved ones, a small fruit garden of half an acre or more in proportion to the size of his family and his real interest in their welfare, for right here he has a home market that will take at high prices every day in the week, quarts upon quarts of the choicest products of his plants, and the owner of town or city lot can in no way get so complete and satisfactory returns for money and labor expended on it as from a choice selection of small fruits. Here, of course many of the methods recommended for field culture will have to be abandoned, limited space making it necessary to plant more closely and to cultivate with hand implements. Strawberries should be given the most sunny exposure, plants set about fifteen inches apart each way and confined closely to hills which with liberal culture will grow large enough to shade the whole ground and largely check weed growth.

After midsummer a heavy mulching of some material that is most readily obtainable may be put on, between the plants to keep down the weeds and save the trouble of hoeing. This may be added, too, for winter protection, then early the following spring uncover the crowns of the plant only and the new growth will push up through.

The heavy mulching over the ground will make a carpet to prevent weed growth and to keep the ground moist and the fruit clean. Remove this after fruiting and by hoeing often in July and August the plants may be put in condition for another year as before.

Raspberries and blackberries in the small city lot or village garden should each be planted in single rows with plants fifteen to eighteen inches apart and only one or two sprouts allowed to grow from each plant, all others being treated as weeds and hoed down as fast as they appear. The training of the canes so as to be as little in the way as possible is an important consideration in such a garden, the plan that keeps them the most closely within bounds and yet gives room for sun and air is to set at each end of the row heavy posts four feet high and eight to ten inches in diameter, on these stretch three strands of wire on either side of the posts, and training the canes to grow up between these wires they will always be confined within the space of eight or ten inches.

Keep the canes pinched off just above the top wire which should be near the top of the posts, lateral branches may be shortened in according to the room we can spare to them. The shady spots may be given to the raspberries as they will fruit well there if manure and moisture are supplied, although of course the fruit will not be as rich and sweet as that grown in the sun.

Gooseberries and currants may also be planted quite closely in single rows and by close pruning and a wire frame, be confined much the same as the raspberries and blackberries except that the width between the wires should be not less than fifteen inches, however, these little matters of details will largely regulate themselves according to the situation of each plot of ground or the taste and ingenuity of the owner.

There is no great mystery about fruits and their culture, plenty of manure and liberal culture, and almost any manner of pruning and training that will let in air and sunlight, will give abundant returns. That is what we are after, plenty of fine fruit as early and cheaply grown as possible. Its importance as an article of diet is at last beginning to be appreciated. Every dollar expended on the fruit garden will save at least two dollars in butchers' and doctors' bills, and the sooner we understand it the better. Three times a day the whole year, our tables could and should be supplied with these refreshing and health-giving fruits of our own growing. How much better for the boys and girls at school to have a dish of fresh berries, a cluster of grapes, or a cup of raspberry jam and good nutritious bread and butter than to have the mother slave herself to death from day to day in preparing some health destroying compound of grease and spices in the shape of loaf cake, doughnuts or mince pie to tempt the appetite and destroy the stomach as well as a lot of good flour, eggs and butter that might be used to give health and strength rather than destroy it.

I note with pleasure in my travels about that fruit growers and such farmers as have plenty of fruits very seldom have pastry of any kind upon their tables, its place being supplied with fruit, either fresh or canned, and since the improved method of canning that has been adopted in the past few years it is possible to have fruit at any season of the year, approaching in flavor that fresh from the vines, red raspberries retaining their flavor best of all.

The taste for fresh fruit is growing fast, and while many of our farmers know that they ought to supply it to their families they still fight shy of planting and say they can buy what berries they want cheaper than they can grow them, yet they will not buy one-hundredth part of what their families would use if it could be had for the picking. My own family is not a large one, yet we manage to dispose of from six to ten quarts of strawberries, raspberries, currants and blackberries per day through June, July and August, and the next three months we worry along on peaches, pears and the product of one hundred and sixteen grape vines.

A friend of mine having a half-acre city lot bought his fertilizers, hired the land plowed, planted thereon twenty-six dollars' worth of plants, kept an account of all money paid out for labor for five years, and charged the family at market rates for all fruit consumed, told me that this half acre paid him a profit of one hundred and sixty dollars annually, and such a half acre should be on every farm. Wife and loved ones will appreciate it. Tell the children that on the half-acre lot back of the barn, or not far away from the house, there are twenty bushels of strawberries, ten each of red and black raspberries, five bushels of currants, ten bushels of blackberries, five of Lucretia dewberry, a bushel of gooseberries, a ton of grapes, a wagon load of delicious canned fruits. How their little eyes would open, and with what shouts of joy and gladness would they rush out after such a rich treat; and all are there, even if the little ones do fail to find them on some farms.

Farmers, open your eyes! Why be blind to the fact that these delicious articles of food and home comforts may be found on many good half acres of your farms, and it only requires a light expenditure of money and some intelligent labor to unfold them. All are there and to be had for the asking. Will you accept them? If so, you will see that there are health and happiness as well as money in small fruits.

There is nobody in the world that can live so well as the farmer; no one that has so splendid an opportunity for good living as the New England farmer. But, after all, as a matter of fact, we do have less variety than our city cousins; our friends in the city have more vegetables than the average farmer and a greater variety of fruits. It is a shame that we who can live so well do not live any better than we do. You sometimes hear a man say that he will not raise small fruits because he can buy all he wants cheaper than he can raise it. Did any of you ever know a farmer to buy all the small fruits his family wanted? There is a man that nods his head. I am very glad to know that there is one farmer in Maine who buys for his family all the small fruits they want. I don't believe there is another one in the United States. Occasionally you will find a man who thinks he does, but when you come to inquire into it you will find that he buys, perhaps two or three quarts a day, while a good-sized family will eat six, eight or even ten quarts a day.

DISCUSSION.

Mr. Luce. I would like to ask how much any one can afford to pay for wood ashes to use in strawberry raising.

Mr. Hale. That depends upon where he is situated, and what other fertilizers he can get, what his fruits are worth, etc. As I am situated, I should be glad to pay thirty cents a bushel for all the unleached wood ashes I could find. We do not buy them, because we find it difficult to get them unleached; and therefore we buy muriate of potash; that is the cheapest form of potash we are able to find at the present time. It answers the purpose not quite so well as the sulphate, but it is so much cheaper that we use it instead. I think perhaps the sulphate of potash gives a higher color and perhaps a little sweeter taste.

Mr. Starrett. After the raspberry crop is gathered do you cut off the canes?

Mr. Hale. That is a good question. Writers on fruit culture say that we must cut away the old canes after the crop is taken; that is the theory advanced by all writers on the subject, and I suppose I ought to tell that in order to keep along with the procession. But really that is all nonsense. Just leave the old canes right where they are. It is an awful job to cut them out in the summer when the new growth is there. I am growing fruits for dollars and cents, although I love the business and I have no money except what I have dug out of the farm. In practice we leave those canes right where they are all summer long and all the fall. They help sustain the new growth. When the new growth is young it is very tender, and if a high wind comes up they are liable to be all broken down. Leave the canes there for a support to the new growth through the summer, and in the winter they make a grand protection; they help catch the snow and hold it there, and they help support the new growth against the wind. If you lay down your raspberries and blackberries in the fall you want to get the old canes out at the time you lay the new growth down, and they are so brittle then that you can almost break them out without cutting. But when we do not lay them down we do it in the spring; when I am trimming around the bushes and using my hands and eyes for that operation, I use my feet to break down these old canes and kick them out of the way. I have never carted any out of the field. There is no trouble about it. I have visited men who were new in the business and who had read in the books that the old canes must be cut out in the summer, and I have seen them working through a mass of briers in mid-summer, when they ought to be doing something else.

Mr. Knowlton. Do you treat blackberries in the same way?

Mr. Hale. Yes.

Question. What variety of strawberry would you plant for pollenizing purposes for the Crescent?

Mr. Hale. I plant a variety that is worth but very little for fruit—the old Ironclad. It is a shy bearer and not a very desirable fruit, but it is a strong growing plant, absolutely hardy; it blooms very early, and it has very strong stems. I had rather plant one row in three of the Ironclad with the Crescent and never pick a berry from the Ironclad; I will get enough fruit from the Crescent so that I can afford to go without any from the Ironclad. I can do better that way than to fertilize with the Charles Downing or any of the other varieties whose fruit is more valuable.

Mr. Pope. Do you protect your blackberries by laying down?

Mr. Hale. You must with all the tender varieties. You can grow the Snyder, I suppose, anywhere in Maine, almost, without any winter protection; there are but few other varieties that are valuable for market or table but that would be tender here. Possibly the New Erie will stand your climate, and I am not sure but that the Minnewaska will, but they have not been tested here, I presume. Any variety that you are not absolutely sure about I should protect.

Mr. Briggs. What are one or two of the best red raspberries?

Mr. Hale. The Cuthbert is as hardy, perhaps, as anything except the Turner. If I was to grow it in Maine I should give it protection, I presume; but we grow it without protection. It is the best red raspberry, all things considered that there is in the country. Of course there are higher flavored berries, but there are none that will prove more satisfactory in all respects. It is the Concord-Baldwin-Bartlett stock of the raspberry.

Question. In the cultivation of currants, I would like to inquire how you conquer the currant worm?

Mr. Hale. There is very little trouble about that; the currant worm need not affect currant culture hardly a particle. Watch closely for their first appearance and dust the vine with white hellebore. That is sure destruction. If you do not clean them all out with one application try another one in a week or so. By watching the field carefully it need not make an expense of fifty cents per acre to keep the currant worms under subjection. Paris green or London purple may be used; but we use the hellebore because it is less dangerous and will do the work. I have been recently informed by an expert gardener in Duchess county, New York, that where he had applied iron filings about his curraut bushes, in a field that had been over-run with currant worms for several years, he was entirely rid of them. He applied the iron filings and chips about the base of his bushes in September or August five years ago and there has not been a currant worm in the field since, while a neighboring field, where they were not applied, is still afflicted. I have never tested it myself, but that comes from very reliable authority. I shall most surely try it next year.

There is one thing that I desire to say emphatically to the farmers of Maine, and that is, do not go into the growing of small fruits for the market until you have a splendid farm garden. I would like to inquire how many men here are using five acres of land or more. Nearly all of you raise your hands. Now, how many of you have a good small fruit garden that is giving your families a good supply? Only two! How many are growing a full supply of strawberries and raspberries? Three! How many a full supply of strawberries? Four! How many dislike strawberries? Not one! How many like them? [Everybody raises his hand.]

It is a shame to us that we don't live half as well as we might. We don't get as many comforts out of life as the city people do, and to some extent it is our own fault. If we like these fruits we are at fault if we do not raise at least enough for home consumption. They are so easily grown; there is no great mystery about it. You can grow a bushel of strawberries almost as cheaply as a bushel of potatoes and just about as easily. Which had you rather have in your family, a bushel of strawberries or a bushel of potatoes? You would rather have 29 quarts of strawberries than 32 of potatoes. If you set out a little patch of strawberries in a shady corner of your garden and don't half cultivate your land and let the weeds choke them out you will think it doesn't pay, and it doesn't if you go about it in that way. But take it right out in the open field; plant them in long rows, just as your vegetable garden ought to be planted in rows 4, 6, 8, 10 or 12 rods long and do almost all the work with your horse cultivator, and there is no part of your farm that will begin to give you such returns at so little expense.

Mr. Starrett. What is the value of the yellow raspberries? what are they good for?

Mr. Hale. In the first place they are good to eat. If you refer to the yellow cap variety; they are very yellow, dry as a chip and hardly fit to eat, but take such a variety as the Brinkle's Orange and there is no raspberry than can compare with it for fine flavor. It is rather a slow grower, but the fruit is excellent. The Caroline is a hardy variety; it is a cross between the red raspberry and the cap variety of very good quality, hardy, a profuse bearer and ripens extremely early. It is only fit for home use, being too soft for the market. Then we have another one of a more recent introduction, a sport from the Cuthbert, the Golden Queen, a very large orange colored raspberry of delicious flavor, a profuse bearer and a hardy plant. But yellow raspberries and white currants and things of that kind never have sold well in the market. The Golden Queen has only been recommended throughout the country as an amateur berry, a family berry; but during the last few years it has been put upon the market to some extent and it has been a matter of surprise to all fruit growers how it has sold. It has sold very readily and at high prices on account of its beautiful appearance. It is firm and keeps up well and is a valuable market berry and should be in every fruit garden. It compares with the Cuthbert in its vigorous growth and general good qualities.

Mr. Atherton. It would please me very much to have a nice small fruit garden. I think I could easily devote half an acre to one, but the difficulty would be to get the time in the summer when my other work is so pressing, and the expense that would be incurred in setting out and caring for a half acre of the different varieties of small fruits. I do not know how much the expense would be, but nearly every farmer is pretty busy in the spring.

Mr. Hale. Busy in doing what?

Mr. Atherton. Attending to our field crops; we have to get the money out of them to pay our taxes.

Mr. Hale. A half acre of small fruits will bring in enough money to pay one hired man all summer and it will not take half his time to attend to the half acre. As to the expense of starting I would advise a man who hasn't any small fruit garden to invest two or three dollars this coming spring in a few plants and set them out in good rich soil and propagate his own stock for the next year. Plants sufficient to set a half acre would cost fifteen or twenty or twenty-five dollars according to the selection of varieties. But by investing three or four dollars in the desired varieties of plants this spring he could propagate his own stock and the following year set out his half acre and then when he needed to renew it he could do so without expense.

Mr. Atherton. I did not have reference simply to the expense of purchasing the plants; but time is money and this fruit garden would require time from the other farm work.

Mr. Hale. The actual profit by using the fruit in your own family in place of more expensive kinds of food, I think we may set at $100 for the half acre. Are you growing any crops on your farm that are netting you $200 per acre profit?

Mr. Atherton. No.

Mr. Hale. Then why talk about the cost of a fruit garden. It is the most profitable thing you can put on to your farm. After the ground is plowed and prepared I would agree to set out the plants for half an acre in a day and call it fun. And after they are set out in rows as they should be, the old horse and cultivator will do the most of the work.

Mr. ATHERTON. Another objection is that we cannot continue to grow the fruit on the same half acre but must change it from place to place; so we have got to devote more than the half acre to it.

Mr. HALE. You can shift from your fruit garden to your vegetable garden and in various ways you can get around that difficulty. You are Yankee enough to work that out.

THE CULTURE OF SMALL FRUITS.

By A. J. TOLMAN.

The subject I am about to treat is a well worn one, and one that has been handled in a masterly manner by good authorities on the subject, at the present and at previous meetings of this Society, so that I doubt my ability to give you any new information in regard to it, or present an article that will be of much general interest. The culture of the small fruits is an important branch of our horticulture, and in favorable locations has proved a very profitable business. I have been an enthusiast on this subject in the past, and still have great faith in the business, and advocate their general cultivation for the Maine farmer. It is a matter of surprise that so little attention, as a general rule, is given to the fruit garden. Many neglect it entirely, and but a few give it the prominence it deserves. The farmer is better situated to have upon his table everything in the way of small fruits than any one of every description. Though the most luscious strawberries can be raised in any garden at a small cost, and the free use of them during their season saves many doctors' bills, yet not one farmer in a hundred will devote his time to them. Even the few old currant bushes are neglected and grown up with grass and weeds, although the currant is one of the most desirable fruits we grow. But this is a busy world. Neither time nor money is plenty. There are many families who would be pleased to have upon their tables every day the delicious berries in their season, and if they knew how easily they could be grown, would certainly cultivate them; but having made some unsatisfactory experiments, with but partial success, they give up the attempt and think that the business requires too much expense, or special instruction. However, Nature is kind to all who have an appreciation of, and make a proper use of her gifts, and like other products of the soil, she places small fruits within the reach of all who own or occupy a few rods of land. The march of progress in the line of introduction of small fruits has been very marked and rapid. And now, with the numerous varieties we have to select from, adapted to every taste, for every purpose, for the table, for market, for canning, with different modes of cultivation, and a climate suitable for every variety, there is an opportunity for all classes to enter into the full enjoyment of the excellent fruits, which an indulgent Providence has been pleased to provide.

To enjoy the different kinds of small fruits in their greatest perfection requires a considerable amount of care in their growth and training, and this excuse is offered by the average farmer against their general cultivation. It is true that the farmer in the cultivation of general crops, the care of his stock and general management of the farm, must spend the larger portion of his time. Yet there are always some opportunities when a few moments might be expended in this work that would otherwise remain unimproved. A little time spent at the blacksmith shop or at the corner store, discussing the tariff or in some other equally unprofitable manner, would be sufficient to give all necessary care to a collection of small fruits that would furnish an agreeable succession during the average fruit season, and when the undertaking is once fully entered upon, the new beginner is frequently surprised at the small amount of time actually required in the production of that which furnished so large a share of gratification and comfort to the family. But there is a higher consideration than the gratification of appetite in this question, and that is the health of the family.

Physicians are agreed in according health producing and health giving qualities to well ripened fruit. Then, as a matter of economy alone, how much better it would be for the farmer even to spend a little extra time in the cultivation of fruits for the use of his family when diseases are prevalent or likely to occur rather than be obliged to make an expenditure of money to pay the family doctor for accomplishing the cure which perhaps his fruit would have rendered unnecessary. Sickness is caused no doubt during the summer season by an improper use of fruits, but it is generally brought about by using those in an over-ripe or decayed state, and frequently it is our own boy who has been sampling the cherries or green apples. There are many families within our State the head of which may be a mason, carpenter, blacksmith, mill-hand or day laborer, who have a little place of their own, or one that they occupy, on which can be found a small plot of land which might be devoted to the culture of small fruits. Many of these little garden spots are grown up to grass and weeds and allowed to run to waste. If the owner would devote a little spare time to the preparation of a fruit garden, set a few grape vines a foot or two from the fence on the sunny side, eight feet apart, plant a row of blackberries and raspberries on the one side, of currants and gooseberries on the other, with the strawberry bed in the center, or any other arrangement to suit the taste, in a year or two with the proper care of the same he would have fruits to adorn his table fit for a prince. They will last about three months in the year, or perhaps longer, as we pick the first strawberries in June and blackberries long after the first frost makes its appearance in September. The most delicate and luscious kinds can be grown. They are not found in the market because too soft for transportation, and may be picked fresh from the vines at any time the owner chooses to use them. It would cost a few dollars to make a start in this direction at first, and will be attended by some failures and discouragement, but with the experience of a season or two, with an observance of the habits and proper training of the plants, vines and bushes, success is assured. The work of an hour or two each day will soon become one of pleasure. As the growing vines flourish and develop, the children when home from school can lend a helping hand and feel that they have an interest in the little fruit garden. The surplus can be sold and add not a little to the family purse, and frequently will pay many times over for the trouble and care of the plants.

Sometimes immense yields are given on these gardens, that would be almost impossible to get at the same rate per acre from plants grown in the open field. Some of the best patrons of our agricultural exhibitions and readers of the agricultural papers are these amateur fruit growers, who are enthusiastic in their work and always interested in the claims, of new varieties for public favor. In regard to discussion on the different berries that we designate as small fruits. I do not claim to advance any new ideas or offer any special instructions. It is a subject upon which many of you could throw more light than myself. It has been discussed every year at our fruit growers' conventions, so that it is difficult to bring out any new points. I can only tell you in my practical way something of my experience with the different varieties, with now and then some figures as to the yields, and prices of the products, as I have found them in our own State. Strawberries can be grown on any soil that is rich enough to produce corn, or potatoes. There are some unprofitable modes of cultivation. One is to set aside old, well tried and reliable kinds, and invest in every new variety that is offered for sale at exhorbitant prices, nine cases out of ten such varieties prove worthless and unworthy of cultivation. Another bad plan is, to buy and set out cheap plants, that are sold for a less price than good pure first class plants can be produced, for either of these methods will result in failure. In order to make the cultivation of small fruits of *any kind* pleasant and profitable you must devote your time and attention to it. In setting out strawberry plants the ground should be prepared by plowing, or spading deeply. The proper soil, everything taken into consideration, is a sandy loam sufficiently loose and porous, so that it will have the excellent quality of drainage which is not only favorable during a wet summer, but also making a marked difference in the winter season. A porous soil, lessens the tendency to smother the plants from heavy snows and favors an early start in the spring and early cultivation.

Mr. Chas. Downing tells us, that no fruit was so affected by varying soils and climates as the strawberry. I have come to the conclusion that soil, locality and climate make such vast differences, that unless these variations are carefully studied and understood, books will mislead more people than they will help. My plants are mostly on a clayey loam and give good yields of fruit, but the ground heaves badly, and I think they are more liable to winter kill than they would on a lighter soil. There are many ways of cultivation ; I have always advocated the matted row system, for in field culture there must be plenty of room to work with a horse cultivator. In the garden there is not always room to do this and a better plan where you wish to economize space would be to set them in hills about twenty inches apart, or two feet each way. The fruit is much larger, the crop larger, and on most soils the work is much easier with less labor by hand picking the weeds. There are sorts that must be grown in hills to produce well, and there are none but what do better grown in this way.

I have used any and all kinds of fertilizers and find that my strawberry bed needs a heavy application to give the best results. Much depends upon the condition of the soil when the plants are set If a hoed crop has been grown on the piece the previous year, about ten cords of stable manure or 2000 pounds of phosphate per acre would not be too heavy. After the first year I prefer a commercial fertilizer for a top dressing as it contains no foul seeds, is much easier to apply, and just as good results are obtained as by using stable manure. The latter is preferable on a heavy clay soil, as by constantly mixing it with the soil and working with the hoe, it changes its nature and becomes more porous. A strawberry bed should be set where it is sheltered. If in the garden located so that the snow will fall upon it, and remain on the ground the larger portion of the winter, making a most excellent covering. Do not set plants where they will be shaded; the fruit will be later of inferior quality and not as productive. With most sorts the beds get exhausted and run out when two years old and should be spaded up and re-set. Though I have seen a bed of Wilson's on the same piece of ground seven years and still bear abundantly. This was done by spading up the old plants each year and taking them out after the runners were well rooted. Of course this is about as much work as it would be to set and cultivate a new bed. My practice has been to take two crops from a bed, sometimes three before ploughing them under.

All growers do not believe in this practice, and say that there is more money in producing *one good crop* and then turn them under. I should say that that would depend on the situation, the condition of the plants, *entirely*. If the plants *all grow* when they are set the first year, and a perfect matted row is formed, and they survive the winter all right, yield a large and full crop, then I should advise ploughing them under as soon as the fruit was taken off. But I have never been able to get a perfect set of plants the first year. Many of them die out. The cut worm destroys many more, and by the time that new plants are set in these vacant spaces and rooted well the season is too far advanced for them to send out runners enough to make a perfect row, consequently I do not consider it a perfect or full crop the first year under these conditions and believe that it will pay to run them the second year, when by that time the rows are wider, there are many new plants formed, and from these we look for the bulk of the crop the second year. It is much more work to keep them clear from weeds the second year than it would be to care for a new bed. Sometimes, however, the yield is the largest the second year. A large grower of small fruits of Palmyra, N. Y., has made the statement that he expected as large a crop the second year from his strawberry beds as he did the first year. But the fruit is much larger and finer the first season. This has been very nearly my experience growing them in Maine. During the season of 1884 we had an acre piece that yielded a little better than 100 bushels. The next year it produced at the rate of 84 bushels to the acre, with but little care. I should not think of cultivating a bed of Wilsons the second year if a large yield was given, say at the rate of 125 bushels to the acre. It certainly would not pay to do it. The Wilson fails after giving a full crop, and does not seem to have the vitality possessed by some other sorts, like the Crescent, for instance, which has been grown three years successfully.

My plants are set about one foot or fifteen inches apart in the row, and the rows three and one-half feet apart. They should be hoed every ten days if possible, the weeds kept down and not allowed to start. Brush, straw and meadow hay are used for covering the plants during the winter. Brush is preferable, as the limbs do not pack close around the plants when covered by heavy snows, and the ventilation is better. Straw contains many foul seeds, and should be avoided if you can get anything else to cover with. Now as regards varieties, there are none more profitable with me than the Wilson or Crescent. These are strictly market berries, and although they have been grown for many years, the former about thirty or more, it still holds the lead as a firm berry to ship. For family use, the Wilson is inferior in quality, and there are many others that are better. The Captain Jack is a very fair market berry, and one that remains in bearing a long time. Miner's Great Prolific is a large, fine berry, productive, and one of the best. The Windsor Chief is an excellent berry, of good size and quite productive. The Sharpless is one of the largest berries grown, and none will compare with it as regards size. The Big Bob is nearly as large and of better flavor. The Manchester is productive, but in our section mildews badly. The Mount Vernon promises well, and is considered by all who have tried it an excellent variety, large and productive.

Perhaps this list is long enough. The amateur hardly knows what to select. The best plan is to visit your neighbor's or nurseryman's grounds in the height of the season, when the different sorts can be seen in full bearing. A personal inspection will show which varieties are the most desirable, whether they are to be grown for your own table or for market. Next in importance to the strawberry, and as a paying small fruit for market, is the delicious, indispensable and very useful fruit, the raspberry. A few years ago the wild berry was very abundant. It was found in plenty on the timber choppings all over the State. They were brought to market by the bushel, we might say by the ton, as they were sold by weight, and our markets in the past have been glutted with them, the price being as low as four cents per pound some seasons. In some localities they are abundant at present, but nearly all of the favorite clearings have yielded their last crop. The bushes have been browsed down by the cattle or choked out by a growth of bushes and weeds, so that we must depend largely upon the cultivated plant in the future. It is not only an excellent fruit for the table, but one of the finest for canning and preserving. Raspberry jam is an important article of commerce, has a ready sale, and the right sorts, properly grown, will prove a paying crop near a good market.

It is most regular in bearing, does not require a large amount of labor, and nearly always brings good prices and compares very favorably with ordinary farm crops as a matter of profit, while soil must be good and well worked to produce good vegetables, it is not requisite with the raspberry. Many kinds of small fruits yield the heaviest and are much more hardy on poor soil than on highly cultivated lands, while a little compost or commercial fertilizer thrown close around the plant once a year will keep up productiveness, even if this is not done, thorough cultivation will do nearly as well. In fact in our northern States it is safer to plant on a rather poor or new soil than on one that has been richly fertilized for this reason. Nearly all varieties run less to plant or bush and more to fruit, they are more hardy, and stand our winters better. The weeds and suckers can be kept down on a poor soil by thorough cultivation, and hoeing without injury. While with the same practice on rich land, we force the plant into a rapid growth and make them very tender, so that they winter kill easily. There is another point, plants on a poor soil generally produce the earliest fruit. This does not seem consistent with Nature, but we always get the first strawberries on our old worn out beds, and find the wild raspberry in the market before we have picked a berry from our cultivated plants in the garden. This rule applies more particularly to raspberries and blackberries. I have rarely seen a soil too rich for strawberries.

It takes about two years to secure a full crop of raspberries to have the spaces filled up so that the rows are perfect. Mine have been grown in rows six feet apart (I think seven would be better) and the plants set as close as you wish, one or two feet apart, the thicker the plants the sooner will a perfect hedge be found. Some varieties sucker much more freely than others. The Turner will produce a fair crop the second year.

Some growers advocate hill culture, grown in stools about five feet apart, and run the horse cultivator both ways. I have not practised this method, as I believe the plants stand our winters better in the matted rows, and as the land contains more plants a larger crop is realized. As soon as the young wood is about eighteen or twenty inches long the end is pinched off, and within a few days the operation repeated, pruning them three times during the season is generally sufficient. This produces a strong, stocky plant that will stand up against heavy winds, and will bear double the crop of those allowed to grow up in the ordinary way. This pruning should not be neglected, especially the first year, so as to give the plant a strong growth of roots and a good start Too much wood and too much fruit the first bearing year is a great drawback, if you wish to produce long lived stocky plants. After the first crop has been taken off the old wood, *the canes that produced the fruit* should be cut out as soon as possible, so that the strength of the plant will be given to the growing canes for the future crop the following season. In regard to varieties, there are many fine ones. I do not like the black caps; they bear abundantly and are firm about marketing, but it is hard work to sell them. They bring a lower price than the red sorts, and are of inferior quality. The Gregg and Mammoth Cluster are probably the best black caps. The Highland Hardy, or Kirtland, is an excellent red sort, and about the earliest with me. The Clark is a fine berry, large, of good flavor, but rather soft. The Herstine is an excellent and very large berry, but I have not found it as productive as some others. The finest of all to my taste is the Brinkle's Orange, a handsome white berry, large but very tender. The above I consider all tender sorts, except the Kirtland, that need protection during the winter. The Turner and Brandywine are hardy sorts that need no covering, and are recognized as standard market berries. The Cuthbert is at present the most popular red sort, large, productive, of excellent flavor, and bids fair to exceed them all. The culture of the blackberry does not differ materially from that of the raspberry. They are set about the same distance apart and the same course of setting, pruning and cultivating will apply equally to both. Most sorts are quite tender. I have found but one or two kinds that can be grown in this State without winter protection. They are a fine fruit, coming at a time when they are most needed and staying with us until the early frosts take them. The wild berries are abundant in some localities. We are not growing enough of them to supply our home markets, and hundreds of bushels are brought here, so that we have an abundance of them. I have had some very good crops, having at one time a half acre in cultivation, half of them the Wilson early, the balance Kittatinny and Lawton. These are all tender varieties requiring protection. They were a paying crop at first, the first berries selling at 25 cents per quart, while the wild ones were sold at 8 and 10 cents. I have had good crops some seasons; at others they were killed in spite of all precautions, until I became discouraged and ploughed them all under and planted the ground to cabbages. Since then I have tried sorts that have proved more successful. The Snyder stands our winters pretty well, also the Agawam and Western Triumph. The Snyder is my favorite and will succeed two-thirds of the time without covering. Blackberry bushes are not pleasant to work about, the sharp thorns scratching the hands and face, tearing the clothing, which is not pleasant. One of the best of all of our summer fruits is the currant. They are both useful and ornamental; they take up but little room, bear abundantly and unquestionably add to the attractiveness of the garden.

There is no plant that will bear so much neglect, and yet produce a crop of berries year after year, like the old currant bush. Nearly every garden in the land contains a few plants sometimes a little compost is thrown around them, but the weeds and grass are allowed to grow, and it struggles on for an existence when other plants would have given up long before. It seems to be a fact fully established in the minds of most people, that the currant is a hardy plant, after being once transplanted, and will do well enough if left to take care of itself. They are not pruned unless it is done by the browsing of domestic animals, instead of a proper use of the knife at the right season. Grown in this way it is small and insipid. How much better it would be if the plants had better care, and how much larger the crop. The currant is propagated by cuttings. As a general rule they should be taken off late in autumn and buried in deep mellow soil hilled up on the surface, so as to throw off the rain. They should be set early in the spring in good rich soil with the earth pressed closely around them. They should be six or eight inches long, cut off close to the old wood and planted two thirds or three quarters of their length in the soil, with one bud above the surface. They soon take root, and form young plants by autumn. If well managed they will grow when cuttings are taken off very early in the spring, but will not strike roots as soon, or make as strong plants as those cut late in the fall. As a general thing they are rather uncertain, and probably not more than fifty per cent will grow. One of my neighbors who cultivates them quite extensively, thinks, that not more than two cuttings out of five will form plants, of either currants or gooseberries. The old Red Dutch is the variety grown for market all over the land, and there is none better for a paying crop, so far as I can learn. The White Grape and White Dutch are both excellent of finer flavor, but not as productive, and do not sell as well as the red sorts. Fay's Prolific is one of the newer red varieties and said to be one of the very best. I am unacquainted with it and have never seen it in bearing. Many are deterred from growing this fruit on account of the ravages of the currant worm. I know of no remedy to prevent their work, lime dust shaken on the plant every morning while the dew is on is sometimes effective. Gooseberries are growing more popular every year, there is not the same profit realized from the cultivation of these, as there has been in years past yet they will now return a fair profit, when carefully attended to, and well supplied with fertilizers. They will produce heavy crops for many years under these conditions. The gooseberry is always sold in the green state and when they are of fair size should be marketed. The vines or bushes do not get exhausted as much as other plants, which have to ripen up their fruit before it is gathered.

A young orchard is an excellent place for them, as they delight in a partial shade. If the piece selected be a moist one (not wet) so much the better for large fruit. It is folly to plant them in very dry land or where they will be exposed to the hottest sun during the summer. We cannot grow the fine varieties that they do in England, as they are affected by the mildew. The Houghton Seedling gives general satisfaction and is the berry we find in our markets. It is very productive and under good culture gives abundant crops. With grapes I have had some experience and have at present about seventy nice vines, all the way from three to seven years old; nearly one-half of them are the Concord, and for the past two years the early frosts have taken them before they were ripe. It is called the grape for the million, and is a fine sort when well ripened. I have some varieties that I think are much better suited to our climate. The Champion is one of them; it will ripen every year, sometimes in August. It is not of the finest quality, but a very fair grape, a strong, healthy grower, and as productive as the Concord. Its chief point is earliness, and since I have grown them have never failed to ripen. They are very hardy, the vines being tied up to the trellis all winter and the wood as a general thing green and uninjured, sound to the end of the branches. There are some others that will ripen with us every year; the Janesville is one of them. I name the Champion first as I consider it of better quality. These two ripen at about the same time, from the last of August until the middle of September. The Brighton is not as early as its patrons have claimed; it is not hardy, but an excellent grape. The Lady is a fine white sort that ripens every year, quite productive, and one of the very best. The Delaware is excellent, of fine flavor, productive, and ripens before the Concord. The Salem is very good, while the Hartford is a week earlier; this sort drops from the vines when ripened, which is a bad fault. Moore's Early is a promising variety of large size, early, of fair quality and quite productive. The cultivation of the grape would pay in many localities no doubt, but they are sold very low in the height of the season; good fruit, much better than we can produce of all of the choicest table varieties, when natives would have no sale at all on account of their inferior quality. If our season was two weeks longer it would make a vast difference; as it is, fine fruit can be brought to our very door long before ours commences to change color.

And now, ladies and gentlemen, I will draw my article to a close. I hardly dare to advise the general cultivation of small fruits on a large scale for all localities as a money making business, for in many places it has been overdone. The decline in, and the low prices received for the past three or four years has driven many out of it. At one time the product of thirty acres of land set with strawberries were being sent to market from Knox county alone, one of the smallest in the State. At present I doubt if there are ten acres in good condition. The past season the crop was nearly a failure and high prices were the result. The culture of strawberries for the future has a more promising look, and thousands of plants will be set during the coming spring if they can be obtained. I have given more attention to the strawberry in this article, not that I understand their culture any better than many of the others, but I have grown them more largely, and consider them the most important small fruit we grow, the one most certain to succeed in our climate. Commission men and freight handlers on nearly all of the transportation lines tells us that in the amount shipped, strawberries head the list, with grapes second. And, now, if any one desires to make a start in this direction my advice is to select those varieties best suited for your purpose: As a general rule those sorts best suited for market or for profit are not usually of the finest quality. Bear in mind there is always some leader in its class, some variety that gives general satisfaction, the Wilson among strawberries, the Concord among grapes, the Red Dutch currant, etc. Many varieties that succeed well in other sections of the country, are worthless here in our own. Small fruits require as much pruning and trimming and as much care as do our apple and pear trees. In closing I quote the following extract from the work of the late Rev. E. P. Roe, the eminent author who was largely interested in their culture: "Small fruits pay many people well, unless location, soil and climate are hopelessly against one. The degree of profit will depend chiefly on his skill, judgment and industry. The raising of small fruits are like other callings in which some are getting rich, more earning a fair livelihood, and not a few failing. It is business in which there is a sharp, keen competition, and ignorance, poor judgment and shiftless, idle ways will be as fatal as in the workshop, store or other industries."

PICKING, STORING AND PACKING APPLES.

By JOHN W. TRUE.

The subject before us is one that may well engage the attention of all orchardists as competition grows sharper and sharper, and the question of profit or loss becomes more and more a vital one, so that every point must be studied and looked at in all its bearings to find out the best methods and the cheapest way of executing them. An orchardist may raise a very fine crop of apples and that, too, at a decided profit, and then by improper handling and marketing, the balance after all may be on the wrong side of the account. In the first place, we must begin at the foundation in order that we may start aright, for if we begin wrong it makes it more difficult for us to work out the per cent. of profit in our business. In setting our orchards see to it that all the trees of a variety are in one locality or nearly so, for it makes it very inconvenient. It takes time, and "time is money," especially at the harvest season, to have a dozen or twenty trees in one locality and have them of as many different varieties. I have in my mind an orchard of five or six acres in extent, that the varieties are mixed, thoroughly mixed, so that a man going into that orchard to gather the apples has got to go all over the ground for each variety; therefore I say, have each variety by itself as far as possible, then you can go yourself or send your help and every step will count. After the trees are properly set then they are to be taken care of, see that they make a good growth every year, and in order for a tree to do that it must be fed in some way either by top dressing and mulching or by cultivation. The experience that I have had teaches that where it is practicable the better way is to cultivate them, having some other crop on the ground while the trees are growing, and in order to do that you will be obliged to remember that you must put on dressing enough for the crop and the trees, and an orchard treated in that way from the time it is set out until it is in full bearing condition, will produce fruit that is worth harvesting even at our present low prices, not forgetting all this time to prune and shape the tree for the purpose for which it has been grown.

Now, that we have got the trees properly grown, it will be seen that they are in a first-class condition for the operation of picking the fruit. At the first thought it would seem as though very little could be said in regard to picking an apple. You may go out to employ a man to help you; you ask him if he knows how to pick apples; he will invariably answer, "Oh, yes; I can pick apples." I don't think you could find a man that would acknowledge that he did not know how. I have seen these men start for a tree, set their ladder up and let it come down on to the limbs loaded with fruit, at an angle of about 45 degrees, bringing down more or less apples at the first charge; then they will go up the ladder or *onto* it, hang up their basket and go at it with both hands, seizing the apple with the points of all their fingers and thumb, pressing with all their strength so as to be sure of their hold, then give a *yank*, and either the limb, fruit spur or the stem of the apple has got to come; and a barrel of apples, especially if they are of a light skinned variety, will look as though they had been *kicked* rather than picked off. It is unnecessary for me to say that *that* isn't the way at all. That man doesn't know how to pick apples.

In the first place, you should be properly equipped with ladders and baskets. The best ladder that I have ever used for a light person like myself for small trees was made in about fifteen minutes, and I have used it for the past ten years; it was made of two spruce poles not more than two inches through at the butt and about 14 feet long, straight and holding their size well; they were slightly spotted on one side. I then nailed on short pieces for rounds, longer at the bottom than at the top, with two clinch nails in each end, making a very light and strong ladder. I have other kinds but this is the favorite with both myself and my men. The basket should hold about half a bushel with a handle that will tip down with a hook firmly attached to the center. Place your ladder carefully against the limbs as nearly perpendicular as possible and allow of a man ascending it; go up carefully, hang your basket securely on the ladder or a limb and begin by picking those apples under and nearest to the ladder, taking the apple full in the palm of the hand, with the fore finger or thumb placed against the stem then with a sharp *cant*, it is severed from the limb or fruit spur at the joint. After they are well picked, different varieties require different treatment. All light colored fall apples should be picked directly from the basket into the barrel so as to save all the handling possible. All colored fall fruit may well be put into piles upon the ground to be sorted up and put into barrels, by an experienced hand, as you want that part of the business done in as even a manner as possible. Varieties like the Northern Spy require very careful treatment; it should never be poured from the basket for in doing so the stem of one apple will break the skin of another and that apple is bound to decay in a very short time. Our practice with *Baldwins* is to have a cart set near the trees into which the apples are carefully turned from the baskets, and then before storing are carefully sorted.

There is a question and a serious one in regard to the advisability of storing apples at all, but it seems to me that the most of us here in Maine should hold our winter fruit into the winter months. A few can sell, perhaps, in the fall directly from the orchard and get as much, counting the extra cost of handling and the shrinkage, as others to store them, but the question would be different if every fruit grower should force his stock upon the market at the same time; therefore it would appear to be necessary for a large majority of our fruit growers to provide a proper place for storing their fruit, giving a man a much longer time in which to find a market, and not being obliged to take the first offer that is made. Where a person has large quantities of fruit it is probably best to build a regular fruit cellar, in that way relieving the house cellar of one of its many duties. In the first place, apples can be kept to advantage at a lower temperature than potatoes, and having ventilation enough to keep the cellar at thirty degrees above zero would keep the rooms above uncomfortably cold, and as a rule a special fruit cellar can by a little planning be made much more convenient to get the fruit both in and out than is usual with the house cellar, and as time goes on and the march of improvement reaches one after another each house will be furnished with its furnace, thus heating the common cellar to such a degree as to be unfit for the storage of apples, but for the present the majority of farmers have no other place than the house cellar, and it would seem best that the apple bin should be put in that corner that can best be kept the coolest and darkest, taking care that it does not get below thirty degrees above zero. The best cellar for the purpose is a very moist one, and in such a cellar my opinion is that there is little danger of putting too many in one bin. And the Baldwin may be kept in this way until April and even into May, and usually at an advantage, as by that time the bulk of the apple crop has been consumed or has gone to decay, leaving the market short of good, bright fruit. Not that I think it advisable for every orchardist to hold his fruit until spring, but that it is best for him to put himself into such a situation that he can hold them if he thinks it best, and the farmer above all others should keep himself informed in regard to the market so that he may know when he gets a fair price offered for his produce, and it is usually wise to accept such an offer rather than to hold for extreme prices.

In packing the fruit the first thing in order is to see that we have good, clean barrels to put them in, and in my experience, if good new barrels can be procured at from five to ten cents more per barrel than the ordinary flour barrel it is policy to do so, for unless a great deal of care is taken in cleaning the flour barrels, the fruit will be dusty and will have a very dull and dingy appearance when opened for inspection or sale, and usually there are more or less of the hoops out of repair or missing and it takes more time to cooper them, and finally the fruit will sell for enough more to pay the difference in the cost of the barrels, but in using either old or new barrels great care must be taken to see that they are perfectly clean and free from dust. In putting in the apples I shall simply give you my usual way, and my reasons for so doing, although I shall probably differ from many of those present. I think it is the most practical and the best method for me. I begin by putting in two layers of apples, stem downward, said apples to be bright, fair specimens, not the largest, so that the barrel may have a presentable appearance that it may attract the attention of the person looking for a barrel of apples. You may say that those apples that are sent to Europe are sold only on their merits, a sample being turned out in sight of the purchaser, so that it makes no difference whether they are faced or not, but we must remember that they are not sold to the consumer in that way. The buyer in Liverpool will pay more for a lot of fruit that is slightly inferior, take them as a whole but put up in an attractive form, than he will for a better lot put up in a slovenly manner, that is, putting the apples in all alike and pressing in the head. Now, when that head is taken out the apples will present a bruised and homely face to the purchaser, you may tell him that it is really better than it looks, they are better as he goes down, but he takes the *other barrel* just the same then after facing, the barrel is filled with good, sound apples, not all strictly No. 1 fruit, for when you warrant a barrel of apples to be all strictly No. 1 you have got a barrel of *very fancy* fruit, and it should bring at least twice as much as the ordinary quotations. Therefore, I say fill with good, sound fruit, and I have very few No. 2 apples for sale. That question hasn't troubled me as yet.

Different varieties must be sorted differently in packing. Such varieties as the Hubbardston Nonsuch you should not put up any specimens that you would avoid if they were set on the table at the hotel as they are a purely dessert apple, while the Baldwin and other varieties like it are more of a cooking apple, and many specimens that would hardly be suitable on account of being off color or perhaps a little under size to be set upon the table are very nearly as good for culinary purposes.

To illustrate, about eight years ago, I had 75 barrels of Baldwins for sale. A man from Portland buying apples in the vicinity called and looked them over and offered $3.00 per barrel for the No. 1's and a much less price for the No. 2's, he to help put them up. I got his estimate as to the number of barrels of No 2's, and he thought about 10 barrels. I told him *no*, those apples should not be divided in that way at that price. In a day or two one of the present members of a large firm in Boston called and looked at them and wanted to buy. I told him my price was $3.00, taking all the sound apples. He says, all right, I don't see any No. 2's there and I will take them. He came with his man and put them up and did not leave a peck of sound apples.

While filling the barrels they should be well shaken down, then fill nearly an inch above the top; the head is placed on and pressed down and well nailed. That is to be the bottom of the barrel when it gets to market as it is marked on the other end. I have for a number of years sent my apples to Boston to be sold on commission, and I have never failed to get full quotations and usually a little more.

Mr. Pope. I will just make this remark, that I think it makes considerable difference what variety you are putting up and where you are going to send it; whether it will pay to take extra pains in packing. If you have some fancy fruit that you are going to send to the Boston market it will pay, and pay well to sort very carefully. If you are going to ship apples abroad, the size makes but little difference as compared with what it does in the fall apples sent to the local or Boston markets. A small sized hard apple is acceptable in England. When we are packing our Kings and Gravensteins and Fameuse for the Boston market the better they are sorted the better the price.

Mr. Briggs. There are many kinds of machines for picking apples. There is a long pole with an adjustment on the end for detaching the apple and a bag to receive it. The object of it is to prevent climbing out on the limbs and knocking and shaking the apples off. That may be a good instrument to have; but I have never seen anything that I thought it would pay me to adopt for this work.

Mr. Blossom. In the first place in picking, all the wind-falls should be removed from the ground before any are taken from the tree, because if you leave them until the apples are picked from the tree you will have a bad mixture on the ground. All the machine that I have ever seen that is fit to go into an apple tree to pick apples is the human hand attached to an honest careful man.

H W. Brown. I have a hundred crates made out of laths, on purpose to use in picking apples. I carry them into my orchard and distribute them around. I have my apples, No. 1's, sorted in the orchard and then put into these crates. The crates will hold a bushel. When the crates are filled I take them in my spring wagon to the house and carry them into the cellar. I lay down an old quilt or comforter in the bin and turn the first crate-full on to that; then raise it carefully and place it on top and turn the next crate-full on to it, and so work until the bin is full. When I visited my Baldwin bins last I did not find any rotten apples.

Mr. Pope. This Talman Sweet, taken from the exhibition table, which I hold in my hand, was not handled roughly, simply dropped into the basket, and yet you can see the difference between it and this other, which was carefully handled. A barrel of them handled as this latter one was, will bring at least a dollar more in the market than a barrel of those which are dropped into the basket when they are picked. I came home one night, and the boys had packed some Kings to send to Boston. I looked at them and was not satisfied with the sorting. The next morning I helped them re-sort the Kings, and put up two barrels of No. 1's and one barrel of No. 2's from the three barrels which they had packed for No. 1's. I sent them on, and they sold for $4 a barrel. My neighbor heard of it and sent his Kings to Boston to the same party. They arrived a few days later, and sold for $2 a barrel.

NEW FRUITS.

By L. H. Blossom.

Read at State Fair Meeting.

Those who have looked over the long tables of fruit that are on exhibition at this time on the upper floor of this building, have noticed many new varieties that have come in from year to year, and the question may be asked what of all this countless number of varieties shall I select for my own orchard? I will call your attention to the selection I have made for this occasion, specimens of which are now before you.

While these varieties may not be the best apples for all of you to raise, still I believe they have succeeded over a larger area of our State than any other varieties that have been brought to our notice of late years, quality and hardiness to be considered.

Beginning with the season, the first that I wish to call your attention to is the Yellow Transparent. This is of Russian origin; it was imported from that country in 1870 by the department of Agriculture, and is recommended very highly for its hardiness. It is the earliest apple we have, ripening its fruit some two weeks ahead of the Tetofsky, and of much better quality. The fruit is, as you all see, of good, fair size and of most beautiful appearance, and bids fair to become one of our best early fruits.

The next apple that I wish to call your attention to is the Russell, originated in Franklin Co., this State. It is of large size and beautiful appearance, and to those who have not tested this apple I wish to say that they have missed a treat, for certainly I think it is the best apple when in its prime that I have ever had the pleasure of eating. Season, early autumn.

The next apple I wish to call your attention to is the Wagener; while it is not strictly speaking one of the newer varieties, yet I think it is well to call your attention to it as an apple that has been boomed in this State, too much for its own good. It is an apple when well grown and ripened that has few if any superior as an eating apple, but it has too many outs to be a profitable market apple for us to raise. Tree of slow growth and apt to be black hearted, an enormous bearer of small irregular fruit if not kept thinned out while growing, which in an orchard of any size would be too much work for profit, and, as we are all the time having new varieties brought to our attention, I would say try something else.

For another new variety of great promise, I wish to call your attention to the McIntosh Red, an apple of Canadian origin, said to be a seedling of the Fameuse to which it bears quite a resemblance. Tree is hardy and a vigorous grower, bears young and has this peculiarity about it, it bears its fruit close to the larger limbs instead of on the little twigs which gives them some protection from the winds; fruit of good size, fair and handsome. In some localities it is a little inclined to spot the same as the Fameuse, but not as bad. It is in its prime as an eating apple from December to February. I consider this a first-class variety and it deserves a place in every orchard.

The next one on the list that I will mention (and it is a good one, too) is that famous apple of the Hon. Peter M. Gideon, the Wealthy. This apple originated in Minnesota from seed sent from Bangor, Maine. I know of no apple that has as many good qualities with so few poor ones as this apple has, in fact all the fault I can find with it is that it drops from the tree quite badly, and to remedy this pick early. As you all can see it is a handsome, rich red apple, of good flavor; season January to February; tree perfectly hardy and, I think, succeeds over a larger part of our State than any other one variety with which I am acquainted.

Now, as I have called your attention to a few of the varieties that are worthy of a place in every man's orchard, I wish for a moment to call your attention to two varieties that have no place whatever in the orchard, and these are the Walbridge and Winesop, both of which are inferior in every respect, and I have called your attention to them at this time so when the tree agent comes around and wants to sell you a few of this kind at a dollar apiece that you may be prepared not to bite.

NEW PEARS. PLUMS AND GRAPES.

By D. P. True.

Many of the fruits new in some sections are old in others; others are new only in name. In pears we have Keiffer's Hybrid, Indian Queen and Eastern Belle. The two latter are natives of our own State. The Eastern Belle has proved quite an acquisition, the other two are very hardy and fruit well, but like the Ben Davis apple lack fine quality. The improvement in new pears has not been so marked in the past few years as in some other fruits.

In plums we have the Kingston, Niagara, Weaver, Shropshire Damson and Moore's Arctic; the last in the list originated in this State and is a plum of medium size and hardiness; fruits well, but lacks somewhat in quality. The Kingston and Weaver are very large but have not been fully proved.

The Shropshire Damson is somewhat larger than the common Damson; quality best, and does not rot on the tree (a very important quality in the plum.) It brings the highest price in the market.

For new grapes we have Brighton, Jefferson, Lady Washington, and Moore's Early. The important point in a grape for Maine is early ripening qualities, one that sweetens its fruit before our early frosts. Moore's Early develops that quality the best of the list, but in a season like the present (1888) even that grape in most locations is little better than a failure. I think here is a profitable field for our intelligent propagators. Much has been done in this direction in the past twenty years with a prospect of a great advance in the next.

Cole in his fruit book published within the memory of many of the pomologists in the State does not mention any grapes that are on our lists at the present time—will the same length of time produce the same wonderful change?

REPORT OF COMMITTEE ON NEW FRUITS.

Made at Winter Meeting.

Your committee recommend that in consequence of the large number of new varieties being sent into the State from time to time that the fruit growers report to the society the value they place upon these fruits. In this way we may be able to compare them with our standard fruits, and so far as their qualities are known the results may be placed before the public.

The attention of your committee has been called during this meeting to the fine specimens of Dudley Winter, of which Mr. J. W. Dudley of Castle Hill, Aroostook county, says:

It is far ahead of the Duchess, I think; it is not as tart an apple; it is a mild apple, juicy and quite crisp; it is what I call a nice tasting apple; it probably would taste nicer to me than to the rest of you.

I have kept them until nearly the last of March. I have not tried to see how late I can keep them. I have sent half a bushel of them to Chase Bros. The tree does not require very rich cultivation to get a nice apple. It is a more sturdy tree than the Duchess of Oldenburg, which you all know is liable to split down. I have never seen any of that in mine. The apple is quite well colored; half of some of the apples is quite red. Many people have taken the apple for an Alexander at first glance. They are considerably larger than the Duchess.

I will say in regard to my apple that it is a seedling from the Duchess of Oldenburg. The way I happened to get it was this. A neighbor of mine and I were in my garden, where I had two Duchess of Oldenburg trees and a Hyslop Crab—I suppose you all know that it has been but a few years since we have raised any apples in Northern Aroostook, and our orchards are now very small compared with those in this part of the State. I had a few apples on my Duchess of Oldenburg trees and I was quite proud of them because they were the first apples I had ever raised. My friend and I ate an apple, and I said to him, "I guess I will plant the seeds from this apple"; so we each planted the seeds to see what we would raise. The seed came up and I got a tree that commenced bearing in five years from that time. The first year it bore I got five nice apples. The tree from the commencement had a very vigorous, strong growth; the leaves were dark, and I used to say to my brothers, "That looks like a Duchess of Oldenburg." I transplanted the tree, and it has continued to bear every year since. I have had six crops of apples from it, and it has been loaded. This year it bore over a bushel, although it is a small tree yet, of course.

Another variety on the exhibition table has attracted the attention of your committee in consequence of its remarkable beauty. It is a chance seedling, originating on the farm of Mr. Ephraim R. Lord, of Farmington. Mr. Lord says of this apple:

"This russet apple originated on my farm. The tree seems perfectly hardy. It is an upright grower, very thrifty and a great bearer. It has been in bearing about ten years, and bears very heavy every year so that I have had to prop the limbs every fall. They keep well with me until May. They are very thin skinned and require careful handling, but do not drop from the tree as badly as the Baldwins. The specimens exhibited are an average in size, being a trifle larger than the American Golden Russet. It is of excellent quality." Your committee recommend that it be named 'Lord Russet.'

Report of Committee on Revision of Fruit Catalogue.

At the first winter meeting of our society held in Augusta in 1874 a committee on Catalogue of Fruits, consisting of Z. A. Gilbert, S. L. Goodale and H. McLaughlin was appointed. This committee prepared and issued a circular of inquiry to Maine fruit growers, and from the returns received made up the list of varieties as presented in their report. This catalogue of apples contains the principal standard varieties the grown in the State to any considerable extent, the object further being to recommend only such as were deemed worthy of propagation. The State was divided into three sections in order that the recommendations might so far as possible cover the entire State. The plan of the catalogue was that adopted by the American Pomological Society. The report as presented was discussed during the winter meeting, and the catalogue as revised was published in the "transactions" for the year 1874. This list contained as published 87 varieties of apples, 20 of pears, 18 of plums, 12 of cherries, 20 of grapes, 3 of blackberries, 5 of currants, 3 of gooseberries, 8 of raspberries and 4 of strawberries. There accompanied the catalogue an excellent description of the apples named and many of the other fruits.

The following winter meeting the catalogue was again taken up and revised after discussion, and the number of varieties of apples was lessened by two, pears increased to 26, two varieties of quinces were added, cherries increased by the addition of Governor Wood, Early Purple Guigne and Belle Magnifique; one more variety of grapes was added, one currant, one variety of raspberry was struck out, and two of strawberries were added. Portions of this catalogue were carefully discussed and the information proved of great value to the fruit growers of the State. This catalogue was published in "Transactions" for 1875.

The same catalogue was again published in the "Transactions" for 1876, there being few if any revisions.

No further effort was made to revise the list for ten years, when with a few revisions made by individuals it was published in the "Transactions" for 1885.

During the annual winter meeting of the society held in New Gloucester in 1888 on recommendation of President Pope, a committee to revise the society's fruit list was chosen, consisting of D. H. Knowlton, Farmington; D. J. Briggs, South Turner; D. P. True Leeds Centre; Henry McLaughlin, Bangor; E. W. Dunbar, Damariscotta. At the recent meeting of the society in Damariscotta, the committee reported progress and were granted further time to complete their labors.

Believing the experience of our own fruit growers should be made the basis on which to form a fruit list, the committee prepared the following questions, and sent them to fruit growers in all parts of the State:

General Questions—Where do your people obtain their nursery stock? Are the trees purchased from canvassing agents proving true to name, and are the dealings of the agents generally satisfactory so far as you know? To what extent is fruit growing carried on with you? How does the fruit crop compare with other crops raised for the market? Is fruit growing in your county profitable? Are the small fruits raised in your locality? What market is there for the small fruits? How many farmers do not raise fruit enough for their own use?

Apples—What varieties of apples are the most profitable in your town and county? Do local buyers prefer the same apples as foreign buyers? What apples are successfully grown in your locality? Please draw a line under those you would recommend for planting. What objections, if any, are there to the Baldwin? If you were going to set 1000 trees, what varieties would you set? Please give the number of each kind as well as name. Are many trees being set in your county? Is the codling moth injuring your fruit, and to what extent? Is Paris green or London purple used to destroy the codling moth? Has the apple maggot (*Trypeta pomonella*) troubled your fruit any? If so, to what extent? Please give us any information you can in regard to this troublesome insect. Do you think the outlook for apple growing in Maine is good? What do you do with your No. 2 and No. 3 apples?

Pears—Are many pear trees growing in your county? Is pear culture profitable? If so, what kinds pay the best? Are your pear trees healthy?

Did the past winter injure many trees? Which kind of stock does the better, home-grown or foreign? Have any pears grown in your locality been sent out of the State to market? What varieties would you recommend for home use? For market?

PLUMS—Are plums grown in your locality for market? If so, is plum culture found profitable? What varieties do you recommend? Is the black-knot injuring the trees to any extent? To what extent is the fruit injured by the curculio? Do you use any remedies to destroy curculio?

CHERRIES—Are cherries successfully grown by you and your neighbors? What difficulty, if any, do you have in raising them? What varieties do you recommend?

STRAWBERRIES—To what extent is the strawberry grown by the farmers for home use? When do you find the best time to set out the plants? Name varieties you know to be good for Maine. Do you mulch the vines?

RASPBERRIES—Which do you prefer, the Red or the Cap varieties? Name the Red varieties you consider best for Maine. Do you protect bushes in winter? If so, how? Name Cap varieties you would recommend.

BLACKBERRIES—Name the varieties you prefer for Maine. Do you have any special difficulty in raising them? Do you protect bushes in winter? If so, how?

GRAPES—Are your people raising them for market? Are the vines troubled any by insects? What varieties do you recommend for Maine? Do you protect vines in winter? If so, how?

CURRANTS—Is the fruit (not foliage) injured by insects to any extent? Are currants a profitable crop to raise? What varieties do you recommend?

GOOSEBERRIES—Is the gooseberry grown for market with you? What varieties do you recommend?

THE GENERAL QUESTIONS.

Returns were received from about 100 fruit growers, representing all the counties in the State as follows: Androscoggin 6; Aroostook 6; Cumberland 4; Franklin 17; Hancock 4; Kennebec 6; Knox 11; Lincoln 11; Oxford 6; Penobscot 1; Piscataquis 3; Sagadahoc 4; Somerset 8; Waldo 3; Washington 1; York 1. They are from representative fruit growers, and the information they gave has proved of great service to the committee in reaching their conclusions. A brief summary of the information received follows:

So far as the returns indicate the source from which the nursery stock is obtained, 75 per cent comes from New York, and 25 per cent. from Maine and other sources. Canada, Vermont, New Brunswick and Connecticut are mentioned as furnishing some. In several counties trees do not prove true to name, and some complaint is made of tree agents. It is gratifying to note that little or no fault is found with the stock grown in the State.

Fruit growing is successfully carried on in the larger part of the State now settled. In Androscoggin, Cumberland, Franklin, Kennebec, Knox, Lincoln, Oxford, Penobscot, Sagadahoc, Somerset, Waldo and York counties, the fruit crop is one of the most important products from the farm. In Androscoggin, Cumberland, Franklin, Kennebec, Oxford, Somerset, York and Penobscot there are numerous individual farmers who are each producing more than 100 barrels of apples for the market, and in several cases the past year the quantity has exceeded 1,000 barrels each; and with only one or two exceptions fruit growing is reported as profitable, in many instances paying better than any other farm crop.

It is a surprise to your committee to learn that there are still many farmers who do not raise their own apples. So long as this state of affairs continues no one will question that our society has work to do. In some localities there seem to be very good reasons why apples are not raised, but when we know how easily the small fruits are grown in all parts of the State, it is a matter of surprise to learn that less than 10 per cent. of the farmers in Maine raise enough for their own family use. Near the cities and villages the culture of small fruits for the market is found to be profitable, but it does not appear that the small fruits are sold to any extent away from the local markets.

APPLES.

The varieties of apples most profitable in the State are really few, though they are not the same in all the counties. There are several reasons for this; the most important of which are that the same varieties do not flourish equally well in all parts of the State and the markets for fruit are different. In the larger fruit growing sections the apple crop is either sent to the large cities or shipped to Europe, while as yet the local markets in other parts of the State call for all produced in their vicinity. Those found the most profitable are Baldwin, R. I. Greening, Roxbury Russet, Hubbardston Nonsuch, King Tompkins, Yellow Bellflower, Nodhead, Northern Spy, Talman's Sweet, Wealthy, Ben Davis, Fameuse, Deane, Duchess of Oldenburge, Early Harvest, Gravenstein, King Sweet, Orange Sweet, Red Astrachan, Somerset, Williams Favorite, Alexander, Porter, Harvey Greening, Twenty Ounce, Pound Sweet, Spitzenburg, Golden Russet, Granite Beauty, Hunt Russet, Rolfe Starkey, Stark, Milding, President.

In the fruit growing sections of the State nearly all varieties of apples are successfully raised, though some varieties do not thrive as well as others. It is also true that in no part of the country are better Gravensteins, King Tompkins and Harvey Greenings produced. The same may be said of several of the earlier varieties, particularly the Williams Favorite.

The Baldwin has been the most profitable apple when it can be raised successfully. The objections to it made by fruit growers are: The tree is not hardy enough to endure our severest winters; the codling moth attacks the fruit badly; in recent years the apple scab has injured the fruit. Since receiving the reports from fruit growers the committee have learned of neighborhoods where thousands of barrels of the last (1888) year's crop were ruined by the apple scab.

For general culture for market the majority of the reports favored the Baldwin as the best variety to set, though many other kinds were recommended. Many trees were set the past season (1888) and fruit growers generally advocated setting more trees, while a few, seeming to realize fully the situation at the present time, recommended raising *better* apples.

During 1888 insects were not very troublesome, and though recommended by fruit growers in other States, as yet few have made use of Paris green or London purple for the destruction of the codling moth.

It is much to be regretted that the apple maggot (*Trypeta pomonella*, is injuring much of our earlier fruit, and to some extent the winter varieties. Its ravages, however, though extending over a large part of the State, seem to be confined mainly to sheltered areas, and have not yet generally injured the fruit grown in the larger orchards. As yet little is really known of the habits of this troublesome pest. Entomologists in various parts of the country are studying the insect. Prof. Harvey of the State College has learned many of the habits of the insect during the past year, and it is hoped remedies may soon be found that will enable the fruit grower to protect his fruit from its ravages.

Many have sold the No. 2 apples to buyers, who have not been over scrupulous about what they were buying, but in most cases little has been realized from the No. 3 apples. Some have evaporated them, others have made them into cider, and others have fed them to the stock.

PEARS.

Although there are few pear orchards in Maine, there are many pear trees, most of which have been set during the past twenty years, though here and there are trees thriving that have borne their annual burden of fruit during the past half century. The testimony of fruit growers indicates that many varieties of this delicious fruit flourish in the State. Our recent exhibitions have also borne witness to the possibilities of pear culture. Pear culture cannot, as yet, be said to be profitable to any great extent, though some who know how to handle the fruit find its sale a source of revenue on the farm. When good strong stock has been set the trees have generally been found healthy; at any rate it may be truthfully said there are no diseases prevalent.

PLUMS.

Plums do not receive much attention at the hands of the majority of farmers, though it may be said a great many have more or less trees. The black-knot in the past has been so destructive, that the trees now growing are unhealthy and unsightly to the beholder. In this connection we call special attention to Prof. Maynard's excellent lecture on "Diseases and Insects Injurious to Fruits," which is published as a part of the society's annual transactions. The plum-curculio has proved another annoyance in raising plums, and this same lecture refers to several methods of holding them in check.

CHERRIES.

Cherries are generally raised though they are subject to the attacks of black-knot, and the rapacity of the birds. Inasmuch as few are giving special attention to the culture of cherries, the loss does not seem so great. In favored localities raising cherries for the market has proved profitable.

THE SMALL FRUITS.

The small fruits may be successfully grown in all parts of the State, and it is a cause of regret to learn that by far the larger part of our farmers do not raise the small fruits at all, while very few raise enough for their own families.

The directions for their culture are set forth in the excellent papers presented at our winter meeting and to which reference is made. It is gratifying to note that the influence of our society is being felt in this direction, and that there has been a steady increase in the quantity generally produced in the State. Grapes alone have come the nearest to being a failure, but in the southern portion of the State the earlier varieties have been raised quite successfully.

THE FRUIT LIST.

The important duty assigned to the committee is the preparation of a list of fruits that may be recommended for culture in Maine. The committee have made careful inquiries, and though the list they propose is not a large one, it is believed to be a good one for Maine. There are local conditions affecting different varieties which we are unable to incorporate into our report.

As previously stated nearly all varieties of apples are found to flourish in those portions of the State where fruit growing is developed. No pretense is made that the list is complete, or that under varying conditions from year to year it may not be necessary to add to or take from the list according to circumstances. It is believed the list will cover a large part of the State except perhaps Aroostook county and the northernmost sections.

Several varieties are recommended "for trial" in the hope that we may be able to find an apple or apples that may have more desirable qualities than those now generally raised. By "trial" we do not mean setting an orchard with any untried variety, but one or two trees till it is fully determined whether such variety is deserving of culture in Maine. In this direction any information the fruit growers of the State may be able to give the society will be of great value to the interests it represents.

The names of apples, pears, plums and cherries in *italics* are regarded as the *best* in quality, while the *most profitable* are marked with a star (*). The names of the varieties are arranged in alphabetical order and not with reference to the preference of any grower.

APPLES.

SUMMER—Duchess of Oldenburg, *Early Harvest*, Golden Sweet, *King Sweet*,* Large Yellow Bough, (sweet), *Red Astrachan*.* *Russell*, *Tetofsky*, *Williams Favorite*.*

AUTUMN—Alexander, *Deane*, *Fameuse*,* *Garden Royal*, *Gravenstein*,* *Munson Sweet*, *Porter*, *Pound Sweet*,* Wealthy.

For trial, Montreal Peach, Somerset, Gloria Mundi.

WINTER—Baldwin,* Granite Beauty, Harvey Greening, *Hubbardston Nonsuch*, *Jewett's Fine Red*, *King Tompkins*, *Milding*, *Rhode Island Greening*,* Rolfe, Stark, Talman's Sweet,* *Yellow Bellflower*.

For trial, McIntosh Red, Minister, Sweet.

LATE WINTER—American Golden Russet, *Northern Spy*,* Roxbury Russet.*

AROOSTOOK COUNTY—From reports received there are several apples that thrive here, among which are Red Astrachan, Duchess of Oldenburg, Fameuse, Alexander, Wealthy, Yellow Transparent. The Dudley, a variety originating in Castle Hill, is also recommended by those who have tested it. Several others of New Brunswick and local origin are also mentioned.

DESCRIPTION OF FRUITS.

Many of the older varieties have already been described in previous volumes of the society's transactions. In connection with the fruit list some of the newer varieties are described. There may be found also under the "Reports on New Fruits," more or less regarding recent fruits of various kinds. The descriptions are taken from various authorities, and so far as possible made to apply to the fruit as grown in Maine.

ROLFE—We are indebted to Mrs C. J. Herring of Foxcroft, for the following sketch of this Maine variety, which is certainly gaining in popularity among fruit growers:

The ROLFE APPLE is a seedling from the variety known as Blue Pearmain. A lady in the town of Abbot sowed the seeds in a nursery on her farm Some time afterwards a man known throughout the vicinity as "Uncle Rolfe" purchased the place. When the trees from those seeds were large enough for transplanting "Uncle Rolfe" gave Rev. Thomas Macomber—the first minister in the town of Guilford—twelve of them. The Elder set eleven on the place he occupied at the time, giving the twelfth to his son, who lived on an adjoining farm. Changes in the family brought the son's farm into the Elder's possession, where he resided until his death. When this twelfth tree came into bearing the superiority of its product over any variety at that time was very marked, and Grandmother Macomber found that to secure the fruit from the uncontrollable appetites of the young masculines of the neighborhood required eternal vigilance. The tree is hardy and finely developed, having a round spreading top; is a good bearer, producing heavily on alternate years. The fruit is large and smooth, round in shape (corresponding to the shape of the tree), is beautifully colored, being mostly a lively red, fine grained, sub-acid, skin glossy and firm but thin, core very small, season fall and early winter, excellent for eating, cooking and selling. There is an eager demand for it in the local markets at a figure considerably in advance of other varieties. It sold readily the present season (1888-9) for 95c. to $1 a bushel. The original tree is dead, being one of the pioneer trees of the town of Guilford, but—thanks to the hogs—a broken root sent up a sprout that has developed in tree and fruit the fac-simile of the parent, proving beyond question that the old tree was a seedling. This child of the mother-tree still continues to bud and blossom and bear fruit on its native soil. The eleven trees, with one exception, bear quite large, fair, pleasant flavored apples. Mr. G. D. B Herring of Guilford was the one to propagate the Rolfe by grafting, and has also furnished scions to parties in Maine and several other states. Mr. H L. Leland of East Sangerville has introduced the Rolfe quite largely into his orchard and has been instrumental in bringing it into favorable notice in different sections of the State. At the Farmers' Institute held at East Sangerville, November, 1888, Secretary Gilbert pronounced the Rolfe an acquisition to the State. A basket of specimens presented at the State Grange at Bangor, December, 1888, met with a very *tasty* reception, and the verdict rendered was "good enough."

An excellent illustration of the Rolfe appears in this volume of the transactions.

Yellow Transparent—A Russian variety, imported by the Department of Agriculture, Washington, D. C. It promises to be valuable as an early fruit of good quality, ripening before Tetofsky, with more tender and delicate flesh, but does not continue long in use. The tree is said to be hardy, moderately vigorous, upright, an early and good annual bearer. Fruit medium, roundish oblate, slightly conical, slightly angular; skin clear white at first, becoming pale yellow when fully mature, moderately sprinkled with light and greenish dots, somewhat obscure; stalk short to medium, rather slender; cavity rather large, sometimes a little greenish; calyx closed; basin medium, slightly corrugated, sometimes small protuberances; flesh white, half fine, tender, juicy, slightly subacid; quality good to very good; core medium. Season early in August, and a week or two before Tetofsky.

McIntosh Red—Originated in Ontario over seventy years ago The tree is hardy, long-lived, vigorous, with a spreading head; a good annual bearer of fair, handsome fruit of excellent quality, valuable for home use and market. Fruit medium or above, roundish, oblate, regular; skin whiteish yellow, very nearly covered with dark rich red or crimson, almost purplish in the sun, moderately sprinkled with light dots; stalk short, rather small; cavity medium; calyx closed; basin rather small, slightly plaited; flesh white, fine, very tender, juicy, mild, subacid, refreshing, peculiar slight quince-like flavoring, core medium. October to February.

Wealthy—A variety raised from Maine seeds by Peter M. Gideon of Minnesota. Tree hardy, healthy, vigorous, spreading, very productive; a beautiful and excellent fruit. Fruit medium, oblate or roundish oblate; skin smooth, whitish yellow, shaded with deep rich red in the sun, obscure, broken stripes, splashes and mottlings in the shade, sometimes entirely covered with crimson and many light dots; stalk short to medium, slender; cavity large, green russet; calyx partially closed; basin deep, abrupt, uneven; flesh white, fine, sometimes stained with red, tender, juicy vinous, lively subacid; very good; core small; October to February. The chief objection to it is that it drops badly.

MUNSON SWEET—Origin uncertain, probably Massachusetts. Tree vigorous, spreading, an annual and abundant bearer. Fruit medium, oblate, pale yellow, sometimes with a blush. Stem short, cavity large, calyx closed. Basin small. Flesh yellowish, juicy, sweet. Good. September to February. One of the most desirable for family use.

BEN DAVIS—The committee do not deem it advisable to place this variety in the Society's Fruit list at this time, for while the apple sold well in 1886, 1887, and 1888 in the foreign markets,—better than the Baldwin in fact,—it is of inferior quality. It is said by our pomologists that those grown in the southwest are superior to those grown in Maine. The tree is hardy, blossoms late, a regular bearer, and to give a succession of fruits through the year for family use one or two trees are desirable, but for commercial purposes it is thought by many that its quality will not warrant growing them in Maine. For the information of the public we give the following description of the tree and fruit abridged from Downing:

"The origin of this apple is unknown. The tree is very hardy, a free grower, with very dark reddish brown, slightly grayish young wood, forming an erect round head, bearing early and abundantly. In quality it is not first-rate, but from its early productiveness, habit of blooming late in spring after the late frosts, good size, fair even fruit, keeping and carrying well, it is very popular in all the Southwest and West. Fruit medium to large. Form roundish, truncated conical, often sides unequal. Color yellowish, almost entirely overspread, splashed and striped with two shades of red, and dotted sparsely with areole dots. Stalk medium, rather slender. Cavity narrow, deep, russeted. Calyx partially open. Basin wide, abrupt, slightly corrugated. Flesh white, tender, moderately juicy, pleasant, subacid. Core medium to large. Good to very good. December to March."

Maine grown Ben Davis are not as good as those described above; in fact it is inferior to many of our best apples in quality. Its season in Maine is from February to August.

MILDEN OR MILDING—Origin, Alton, N. H. Tree hardy; a strong, vigorous, upright grower, forming a large, round head; very productive alternate years of large, fair fruit, which is highly esteemed where known for market and family use. Fruit large, oblate, slightly conic, slightly angular; skin smooth, whitish yellow, shaded, striped, splashed and mottled with light and dark bright rich red nearly over the whole surface and a few light dots; stalk rather short, slender; cavity broad, deep, sometimes thinly russeted; calyx closed, or nearly so; basin broad, moderately deep, furrowed; flesh whitish yellow, rather coarse, brittle, tender, juicy, sprightly, subacid, slightly aromatic; core medium. December, January.

PEARS.

SUMMER—*Bartlett*, Brandywine, *Clapp's Favorite*, Osband's Summer.

AUTUMN—Belle Lucrative, Beurre Superfin, Eastern Belle, Goodale, Louis Bonne de Jersey, Nickerson, *Seckel*, *Sheldon*.

WINTER—*Beurre d' Anjou*, Lawrence.

LAWRENCE—Originated in Flushing, Long Island. Tree hardy, a moderate grower, an early and abundant bearer; young shoots dull yellow brown; a valuable sort for orcharding, and unsurpassed in its many good qualities among our early winter pears; ruit medium size, obovate, obtuse, pyriform nearly regular, color lemon yellow, with traces and occasional patches of russet, and thickly dotted with minute brown dots; stalk of medium length and rather stout, set in an irregular russeted cavity; calyx open; segments shut, persistent; basin broad, shallow, uneven, or slightly corrugated and thinly russeted; flesh whitish, juicy, melting, sweet, and aromatic, very good or best. December.

OSBAND'S SUMMER—Origin, New York State; tree moderately vigorous, upright, an early and prolific bearer. Young wood rich yellow brown. Fruit small, roundish ovate, obovate pyriform, clear yellow, thickly dotted with small greenish and brown dots, with a warm check on the side of the sun, and some traces of russet, particularly around stalk and calyx. Stalk of medium length, rather strong, inserted in an abrupt cavity; calyx open, set in a broad, shallow basin; flesh white, juicy, melting, with a rich, sugary flavor, and pleasant, musky perfume. Very good. Ripens early in August.

EASTERN BELLE—Originated with Henry McLaughlin, Bangor, who says: "It is a moderate grower and perfectly hardy. The fruit is of good size, peculiarly rich and spicy, color yellowish, occasionally tinged with red, good shape, with long stems, very evenly distributed over the tree, and never rots at the core. The tree is an upright grower. Downing says it is one of the best."

PLUMS.

Bradshaw, Greeley, *Green Gage*, Jefferson, Kingston, *Lombard*,* *McLaughlin*, Moore's Arctic, Niagara, Pond's Seedling, Prince's Imperial Gage, Purple Gage, Rivers' Blue Prolific, Shropshire Damson,* *Washington*, Yellow Egg.

MOORE'S ARCTIC—Originated in Aroostook County on the grounds of A. T. Moore, Ashland, for whom it was named. It is perfectly hardy; tree healthy, an early and abundant bearer; branches smooth, olive brown, grayish. Fruit below medium size, roundish, slightly inclining to oval; suture nearly obscure, apex a dot; skin purplish black, thin blue bloom; stalk medium, rather slender; cavity small; flesh greenish yellow, a little coarse, juicy, sweet, pleasant flavor, but not rich, adheres a little to the stone; season first half of September.

CHERRIES.

Black Heart, Black Tartarian, *Common Native*, *Early Richmond*, Governor Wood, Mayduke, Ox Heart, Rockport.

THE SMALL FRUITS.

STRAWBERRIES — *Crescent*,* Downing, Kentucky, Manchester,* *Sharpless*, Wilson. The following are recommended for trial,— Bubach,* Pineapple, Ohio,* Jessie, Belmont.

Those in *italics* are early, and those marked with a star (*) are pistillate and require some of th· perfect-flowered varieties set near them to pollenize the flowers.

CRESCENT*—Medium to large, conical, slightly depressed at the apex; color bright scarlet; flesh soft, quite acid; plant very vigorous and hardy, and for productiveness has scarcely an equal; very profitable for home market; season early to late.

DOWNING—Fruit large, conical, pretty regular; scarlet; firm, juicy, sweet, rich; plant vigorous and productive; a very valuable sort for family use and for market; like the Wilson, adapted to a great variety of soils; season medium.

KENTUCKY—A tall, rank grower, somewhat inclined to rust; is, however, a valuable late variety for light soils, moderately productive of large, conical berries; pale scarlet color; soft and delicate in texture, and of rich, sub-acid flavor

MANCHESTER*—Medium to large; oblate conical, quite uniform, scarlet; flesh pink, melting. firm with a pleasant, sub-acid flavor; quality good; plant vigorous and very productive; stalk short. A valuable variety. Season medium to late.

SHARPLESS—This variety originated in Pennsylvania, and was introduced eleven years ago. Has been fruited extensively ever since, and is still regarded as one of the very largest and best strawberries in cultivation. Plant very hardy, enduring both heat and cold without injury. To secure the best results "Hill Culture" is advised.

WILSON—Medium to large; dark red; very hardy, vigorous and productive. The most widely known and universally successful strawberry grown. Holds its own wonderfully.

BUBACH*—Fruit large and handsome, roundish conical, bright scarlet, rather soft of fair quality. Plant a strong grower, with large, healthy foliage, and very productive; succeeds on light or heavy soil. One of the most promising of the later introductions. Season early to medium.

PINEAPPLE—The plant is a remarkable grower, strong and healthy, making runners quite freely; very broad dark green foliage that grows very tall and rank. Fruit averages large and is said to be a good shipper; dark crimson color; flavor is said to be the most delicious of any berry in cultivation. It is a new variety received in 1887-8 from Maryland.

OHIO—Somewhat similar to Kentucky in growth, is even more productive; fruit medium-sized, nearly round, and of good quality, *ripens late*, and is of special value on that account.

JESSIE—Large, handsome, roundish, conical, dark red. firm and of good quality; plant vigorous, healthy and productive; season early to medium.

BELMONT—Originated near Boston The plant is more vigorous than Sharpless. On heavy, rich land, it is very prolific, of large, rich scarlet berries, conical in shape and of good quality, firm and good for canning.

RASPBERRIES—*Red*—Cuthbert, Turner; *Yellow*—Golden Queen; *Black*—Gregg. Ada and Carmen are recommended for trial.

CUTHBERT—A chance seedling in the garden of the late Thomas Cuthbert, Riverdale, N. Y. Nearly all the nurserymen pronounce it hardy, but it is not an "iron clad" in Maine, and, unless protected, is likely to be more or less injured during the cold months, especially when the canes are not thoroughly ripened. On account of its size and beauty, it is a valuable variety for market and family use. It is very productive; canes strong, vigorous, upright, sometimes branching; spines short, stout, purplish, rather numerous; it suckers freely, though much less than the Turner. Fruit medium to large, scarlet, crimson, roundish, obtuse-conical; grains rather small, compact, separates freely from the stalk; flesh quite firm, juicy, sweet, sprightly, having a slight flavor of the common red, which is probably one of its parents.

TURNER—A hardy variety. It succeeds in more localities than any of the red varieties and is less subject to changes of heat and cold. The canes, foliage and fruit possess many characteristics of the native red berry, and it suckers quite as freely; canes vigorous, light reddish on the sunny side; upright, seldom with branches; very few short purplish spines; foliage quite large and abundant; very productive. Fruit medium or above, roundish, conical, bright scarlet; grains of medium size, compact; flesh rather soft, sweet, pleasant, but not rich; a good berry for home use and thoroughly hardy.

GOLDEN QUEEN—A seedling or a "sport" from the Cuthbert, found growing in a field of that variety in 1882; equal to that noble berry in every respect of plant growth, vigor, hardiness, and productiveness; *berries of largest size*, of rich creamy yellow color, firm and solid, and of *rich sweet flavor* It is also a *superb market berry*, its fine appearance commanding for it a ready sale at high prices.

GREGG—*Largest and latest* of all. Valuable for family use and for such markets as can profitably handle late fruits; not quite hardy at the north.

ADA—A strong, stocky growing plant that has thus far proved *absolutely hardy* as far north as Connecticut, productive of *very large* berries, with slight bloom, firm and solid: ripens late; equal to the Gregg in all respects, and being much more hardy, is far more valuable as a late market variety, or to supply the family table after all others are gone.

BLACKBERRIES.—Agawam, Snyder. For trial, Bangor.

AGAWAM—A hardy and popular variety among Maine growers. Not as vigorous in growth as the Snyder.

SNYDER—The Messrs. Hale in their annual catalogue say of it: "It is *the one great blackberry* for market in the far north." It is vigorous, hardy, productive and reliable; has never been known to winter kill even in the northwest; fruit of medium size and good quality; ripens medium to late.

BANGOR—This variety is of Maine origin and, as we are informed, was propagated from canes growing on the farm of Henry W. Brown, in Newburg. It is said to be hardy and a desirable variety.

LUCRETIA DEWBERRY or Creeping Blackberry, though not yet tested in Maine, is offered by nearly all the nurserymen. The plant is said to be hardy, and the fruit large and of excellent quality. As most of the descriptions mention "winter protection" we mistrust it may not be entirely hardy. It deserves, however, a fair tria in Maine.

Currants—*Red*—Fay's Prolific, Red Dutch, Victoria; *White*,—White Grape; *Black*—Lee's Prolific.

Fay's Prolific—All are familiar with the other varieties, and we offer only the description of this one:—Has been carefully cultivated for the past nine years alongside of all the popular varieties, and proved by far the most prolific of all. Color, rich red. "As compared with the Cherry Currant, Fay's Prolific is equal in size, better flavor, with much less acid, and five times as prolific; also, from its peculiar stem, less expensive to pick." It is one of the few good things that will sustain all the claims made for it. It is one of the strongest and most vigorous in growth, and is deserving a place in our fruit gardens.

Gooseberries — Downing, Houghton Seedling. Smith's Improved is recommended for trial.

Smith's Improved—Plant a more slender grower than Downing, and much less thorny. Very productive of large, yellowish-green berries, of most excellent quality. A delicious berry for eating out of hand, and fine for cooking purposes.

Industry—Produces fruit of the very highest quality, in flavor equal to a fine plum The fruit is red, of great size and produced in enormous profusion. It is a recent variety, and some complaint is made of its mildewing.

Grapes — Brighton, Champion, Delaware, Hartford Prolific, Lady, Moore's Early. True's Early, a Maine Seedling, is recommended for trial.

Moore's Early (Black)—Bunch medium to large; berry large, round, black, with heavy blue bloom; good quality; vine hardy and vigorous; fairly productive; ripens early. Valuable for the table or market.

Brighton (Red)—One of the best varieties of recent introduction; as large and beautiful as Catawba, which it resembles in color, form of bunch and berry, and is fully equal to the Delaware in flavor; vine vigorous, hardy and productive, making it one of the most valuable. The best red grape in America.

Lady—Extra early white grape; seedling of Concord; vine vigorous, hardy and productive; flesh rich, sweet and sprightly; very valuable for family vineyard.

True's Early—Mr. D. P. True of Leeds Centre, with whom this variety originated, sends the following description: "True's Early grape, a native of Maine; bunches medium, berries round; size medium, color black; its flesh tender, flavor vinous and sprightly. It ripens extremely early—two weeks before the Hartford Prolific. Valuable for its hardiness and early maturity."

THE SECRETARY'S PORTFOLIO,

CONTAINING

Original and Selected Scraps, Composed by Fruit Growers and Others, and Gathered from Various Sources.

"O painter of the fruits and flowers!
  We thank thee for thy wise design,
Whereby these human hands of ours
  In Nature's garden work with thine.

"And thanks that from our daily need
  The joy of simple faith is born,
That he who smites the summer weed
  May trust thee for the autumn corn.

"Give fools their gold, and knaves their power;
  Let fortune's bubbles rise and fall;
Who sows a field, or trains a flower,
  Or plants a tree, is more than all."

THE SECRETARY'S PORTFOLIO.

PETER M. GIDEON'S SEEDLINGS.

In one of the papers read at the Winter Meeting, and the discussion following, reference was made to the new varieties of apples propagated by Mr. Gideon from the experimental fruit farm in Excelsior, Minnesota. As giving some idea of this work we take the following from Mr. Gideon's report to the Minnesota Horticultural Society:

"Twenty-three years ago I planted a few cherry crab seeds obtained of Albert Emerson, Bangor, Maine, and from those seeds I grew the Wealthy apple; in seven years it fruited, and that fruit convinced me that the true road to success was in crossing the Siberian crab with the common apple, and on that line I have operated ever since, with results surpassing my most sanguine anticipations. I did not suppose that in the short space of sixteen years, the time since the Wealthy first fruited, that I should have more than twenty first-class apples, as good as the world can produce, in succession from the first of August to March, and in hardiness of trees surpassing all known varieties of the common large apple. But it is done, and in the doing the problem is solved as to what to do and how to do it, with the material at hand with which to attain yet greater results. At the outset it was test and try; but now that the problem is solved, it is onward, with great results certain.

"When I say we have twenty first-class apples, that does not include all that are worthy of cultivation by any means. And now, with such results, and only a few thousand trees fruited at the end of sixteen years, what may we not expect at the end of the next sixteen years, with 20,000 or 30,000 choice, selected trees from the very best of seed, which are not yet fruited, and the seed of over one hundred bushels of choice apples planted this fall, all to fruit in a few years?

"To get the desired cross we plant the selected varieties in close proximity, so that the natural fall of pollen will the more surely do the desired fertilizing, and the seed thus produced being planted, the most promising of the seedlings selected and set in orchards for fruiting, and, after fruiting, the best in tree and fruit being selected from which to grow seeds to try again, and so on, at each repetition I find there is a gain. The young trees that fruited this year for the first time gave a larger percentage of first-class apples than any lot ever fruited before."

A CARGO A DAY OF BANANAS.

The necessity for improving the quality of our fruits was never more potent than at the present time, for to compete with tropical fruits ours must be the best possible. An item from the newspapers emphasizes this when it says a New York firm has secured an island near Cuba, where they have succeeded in developing the finest bananas ever seen in the United States. Some of the bunches are nearly as large as flour barrels. Beginning with September 1st, the firm proposes to land a cargo in New York every day.

SUSPICIOUS PLUMS.

The Secretary has received several inquiries regarding the Niagara and Greeley plums. They were both introduced as distinct varieties but their similarity to the Bradshaw has led many to question whether they may not be the same. The Secretary of the American Nurserymen's Association reports that "few can see any difference between the Niagara plum and the well known Bradshaw."

A writer in the *Maine Farmer* of recent date says:

"Bradshaw is one of our best plums. but to sell it by a false name at double its regular price is a fraud, and the trees have undoubtedly cost the farmers of this country many thousands of dollars more than they would had they been sold by their true name. Brother farmers, let us profit by our past experience, and ever beware of the new-fangled fruit trees. In my opinion, the Greeley plum, which is introduced by the same treeman that humbugged the farmers by the Russian mulberry tree, will turn out, like the Niagara, to be some old standard variety."

The similarity between the Niagara and Bradshaw has been noted by some of our fruit growers, but there are others raising both who claim they are distinct varieties.

A NEW DEPARTURE IN CURRANT CULTURE.

A writer in *The Country Gentleman* recently described his method of currant culture. Whether good or not, it is peculiar and may deserve more than a passing notice. He writes; "I allow each year from four to six new shoots to grow from the ground surface on each bush, keeping the soil well fertilized and cultivated clean, destroying the currant worm when it appears by a careful dusting especially of the under surfaces of the leaves with powder of white hellebore applied while the dew is on When the currants are sufficiently ripened (and for perfection in making jelly they should hardly all be red or ripe) the pickers cut off with a corn-knife or grass-hook every branch which is in bearing, lay the branches carefully in the garden barrow, wheel them off and dump in the shade, where they afterward sit and strip the branches at leisure. As all the currants under this treatment grow on new wood the fruit is finer and more abundant, and the dread of picking while 'squat like a toad' in the boiling heat of July has vanished. After six years of this apparently severe treatment my old bushes are more vigorous than when I commenced, and in better condition than the new planting which I then made in the expectation of killing out the old ones and relying on the new."

THE FORESTRY QUESTION.

I do not think that it is yet proven that forests increase the rainfall, or equalize the flow of our streams. Neither do I think it proven that there is the least danger of a scarcity of wood and timber in this country for the next century. But I do consider statements upon forest subjects made in the census reports and by high officials at Washington, exceedingly erroneous. If the statements made at the American Forestry Congress at Boston in 1885, by the then highest official authority, are correct there will be no forests in the United States in the year 1894. And if the last United States census estimates of the spruce timber in New Hampshire are correct more than one-tenth of the whole amount standing was being cut each year. So you see, that by this time our last spruce is being cut, yet one party authorizes me to sell cheap one accessible lot from which experts say forty million feet may be cut yearly for the next fifty years, even if timber grows none during the time. Yet I believe there is both profit and pleasure in growing timber, and that the subject of forestry is one of vast importance to your State and mine as well as to the country at large.—*John D. Lyman, in Lewiston Journal.*

A NATIONAL FLOWER.

Professor Thomas Meehan, the botanist, and also poets, scientists and others, support the idea of adopting a national flower for the United States—just as Ireland has the shamrock, Scotland the thistle, England the rose, and France the fleur de lis. Suggestions of choice include the sunflower, the golden rod, and *The Philadelphia Ledger* favors "the noble plume and tassel of Indian corn—the fruitful, widespread Zea mays. Possibly that may be matched, but it cannot be superseded."

L. Prang & Co., art publishers, Boston, have issued recently a floral design in the form of a folio inclosed within ornamental covers. There is a full page chromo of arbutus and another of the golden-rod. Each purchaser is allowed to send in to the publishers on a postal card furnished for the purpose his preference for the national flower. The golden rod would be a good one.

THE CULTURE OF WILD FLOWERS.

At a recent exhibition of the Massachusetts Horticultural Society one exhibitor showed thirty-eight varieties of native asters. They were given good culture and bore a fine display, both in hue and form. Beautiful specimens of gentian were also exhibited. A lady enthusiast also made a display of native plants and flowers. There are more than sixty different golden rods and many more of the asters. We have frequently seen scattering plants of these, growing along the edges of cultivated fields, and they seem to take kindly to cultivation, and, in fact, are improved wonderfully by it.

NURSERY FRAUDS IN THE WEST.

It matters not where a tree is grown, whether east, south or north, that tree is best that comes to the planter in the best condition, if true to name, but with the great mass of tree planters the smooth-tongued agent with his rubbish and frauds is the one thing needful. Though fleeced a score of times they patronize him the twenty-first time as freely as ever, and the bigger the price of the fraud the more greedily they swallow the bait. The fact is notorious that tree agents have sold one hundred trees of the Gideon apple at one dollar per tree, where I, the originator, have been able to sell one at twenty-five cents. They have been swindled so often, and paid so dear for it, that they have come to love to have it so. They are wedded to the agent; it is love's union, and dead trees, plants and grape vines cannot separate them.—*Peter M. Gideon.*

TREES ENHANCE AND BEAUTIFY.

Trees, the most beautiful objects in nature, should not be overlooked. The average farmer has so much to do with trees as lumber, or as objects to be removed to fit the land for cultivation, that he regards them as too trivial, commonplace or weed-like to be esteemed as objects of superlative beauty, to be planted and carefully tended for their looks. But nothing adds more to the pleasantness of a home than trees judiciously planted about it. A few near the house may break the fury of the winter blizzard or the summer heat, in addition to their æsthetic uses. Trees are particularly appropriate by the roadside. How charming they are, rising from the smooth green! Why should not the roadside trees, enchanting mankind and wooing the birds with the charm of their rich foliage and symmetrical shape, be the rule instead of the exception? Many a farmer who calls himself enterprising, and who does raise good crops, forgets that with a few hours' work he could plant a dozen trees that would greatly enhance the value of his estate, and continue to yield blessings of beauty long after he has passed away. Here, too, common varieties possess as many elements of real beauty as those more rare. There are no more beautiful trees than the common maple, elm, spruce or cedar. There is a row of hemlocks in front of my residence in the country, and my personal attachment for that kind is very great. Some writers, combining æsthetics with the material, advocate the hickory and chestnut for roadside planting. It may seem a little thing to bring a sapling from the woods some cloudy day, and plant it near the house, but it will prove a pleasing and profitable investment.

Humboldt says: "Trees have about them something beautiful and attractive, even, to the fancy. Since they cannot change their places they are witnesses of all the changes that go on around them; and, as some reach great age, they become, as it were, historical monuments, though, like ourselves, they have a life, growing and passing away; not being inanimate and unvarying like the fields and rivers.—*Geo. M. Whittaker, before Mass. Hort. Society.*

PLANT A TREE.

He who plants a tree,
Plants a hope.
Rootlets up through fibers blindly grope;
Leaves unfold into horizons free.
So man's life must climb
From the clods of time
Unto heavens sublime.
Canst thou prophesy, thou little tree,
What the glory of thy boughs shall be?

He who plants a tree,
Plants a joy;
Plants a comfort that will never cloy;
Every day a fresh reality.
Beautiful and strong,
To whose shelter throng
Creatures blithe with song.
If thou couldst but know, thou happy tree,
Of the bliss that shall inhabit thee!

He who plants a tree,
He plants peace.
Under its green curtain jargons cease.
Leaf and zephyr murmur soothingly;
Shadows soft with sleep
Down tired eyelids creep,
Balm of slumber deep.
Never hast thou dreamed, thou blessed tree,
Of the benediction thou shalt be.

He who plants a tree,
He plants youth;
Vigor won for centuries, in sooth;
Life of time, that hints eternity;
Boughs their strength uprear,
New shoots, every year,
On old growths appear.
Thou shalt teach the ages, sturdy tree,
Youth of soul is immortality.

He who plants a tree,
He plants love;
Tents of coolness spreading out above
Wayfarers he may not live to see.
Gifts that grow are best;
Hands that bless are blest;
Plant! Life does the rest!
Heaven and earth help him who plants a tree,
And his work its own reward shall be.
—*Lucy Larcom.*

DUTCH METHODS.

In Holland, when it is desired to produce blooms of the greatest excellence for exhibition, great care is given to the preparation of the beds. The natural earth is removed to the depth of eighteen inches; six inches in depth of manure is first put in and the bed is then filled with a mixture of old manure, loam, and sand, which has been turned frequently in sunny weather to kill the worms. Sifted sharp sand surrounds the bulbs, which are planted in October four inches deep. Before being set the skin is slightly raised from the base of the bulbs to permit the roots to escape more freely. As the season of flowering approaches, a raised covering is put over the beds so that the flowers are protected from injury by rain and direct sunlight In this way they are made to last in bloom as long as carnations, and their size and color are enhanced and intensified. The history of the tulip is an interesting one; and, though the time is long ago past when fortunes were spent in the purchase of a few coveted bulbs, their real beauty and worth have never been more generally acknowledged than at the present time.—*Robert Farquhar, before Mass. Hort. Society.*

SWEET PEAS.

A row of sweet peas planted where one would hardly think of planting anything, next an alley, in a soil mostly sand, ashes and rubbish, produced such magnificence of glory and sweetness, from early summer until November frosts, as to repay a thousand times the few cents' worth of seed and slight attention bestowed upon them. A prodigality of blossoms, from delicate pink to deepest purple. loaded the vines all the season through, their beauty and fragrance rejoicing the hearts of those who plucked them, and delighting also the passers by. A nook or border thus planted brings a rich return.—*Chicago Advance.*

FLOWERS AND POLITICS.

Another way of purifying and ennobling the national life is through its political life. Flowers and politics—what incongruous elements! How can flowers be made to benefit politics? In the political strife of England known as the "War of the Roses," we find the angry Duke of York wearing the white rose as his emblem, while his opponent, the haughty Duke of Somerset, plucked from the bush a red rose to be worn as his badge. Later on, we read that the primrose has been favored by some of England's lords; and from certain associations connected with it, might almost be called a political flower. The Primrose League, which numbers more than four thousand members, is an order of conservatives founded in honor of the late Lord Beaconsfield and takes the primrose as its badge. So we see that flowers have figured conspicuously in English politics. It has been urged that if women were allowed suffrage, the voting places would be purer and that her presence would have a tendency to refine her brothers. We need not wait for that day to come, but may commence now to make the atmosphere healthier and purer in these voting halls. Decorate them with flowers as you do your churches until the perfume of these gifts of nature is more pervading than the odor of tobacco, and even the coarsest natures will feel their influence. Teach them that as the flower is pure so the ballot must be kept pure, and that it is a sacred trust to elect officers for city, State or nation. Do you say this is a sort of millenial doctrine—a condition that can never be obtained? I believe that there is something within the heart of nearly every man or woman, even though he or she be a hardened criminal, that would in time respond to the influence of flowers, as surely as it would respond to the kind act of some near friend.

In all receptions given to prominent personages, flowers are used profusely. Whether it be an ovation to our President, or to the representative of royalty, we welcome him with flowers, adorn his carriage, and strew his pathway with the choicest blossoms, and let the flowers utter our adieux. Thus the people cause the flowers to express most beautifully, though silently, the respect, the love even of the nation. There may have been, in some instances, political ambitions to be promoted by their outlays for flowers, but we wil hope that these cases have been rare.

Use, then, the flowers for inspiration in your mass-meetings, in your elections, and, other things being equal vote for the men whose characters have become ennobled in part, at least, by a love of flowers.—*Mrs. Fannie A. Deane, before Mass. Hort. Soc'y.*

HOW TO BUY NURSERY STOCK.

A speaker before the Michigan Horticultural Society recently gave the following caution:

"Do not buy of an agent who has some extraordinary new fruit, curculio proof, iron clad, and of wonderful size and extra quality, for which, on account of these superior qualities, he is obliged to charge five or six prices."

He also advised against buying of a nurseryman for the reason that he offers a little under the price of most others, but of whose standing you are ignorant. Of small fruits he advised to buy as near home as practicable.

SPRAYING FOR THE PLUM CURCULIO.

Experiments conducted at the Ohio Agricultural Experiment Station for the purpose of determining the effect of spraying the trees with London purple seem to indicate that it may prove an efficient remedy for the curculio. A half acre of bearing cherry trees was set aside for the purpose, and a part of it was treated while the rest was left as a check. The London purple was applied just after the fruit forms in a water spray, mixed in the pr. portion of one-half pound to fifty gallons of water. An examination of the fruit showed that three applications saved 75.8 per cent. of the fruit liable to injury from the curculio; that four applications saved a very much larger per cent. of the fruit. Two quarts of the ripe cherries from each lot were chemically examined and no trace of the poison could be found upon any of them.

A SENSIBLE LAW.

The following law appears in the statute books of the State of Michigan: "Every overseer shall cause the noxious weeds within the limits of the highways within his district to be cut down and destroyed twice each year, once before the first day of July, and again before the first day of September, and the requisite labor shall be considered highway work; and once in every month, from the first day of April to the first day of December, shall cause all the loose stones lying in the beaten track of every road within his district to be removed. Any overseer who shall refuse or neglect to perform the duties required by this section shall be liable to a penalty of twenty-five dollars."

WHAT APPLES TO PROPAGATE.

Maine is a large State in territory, and contains so many kinds of soil, and has so great a variation in temperature, it would be folly to lay down any definite rules in relation to the best varieties of apples to propagate throughout the State. The only way I know to settle the question of what varieties will pay best, is to experiment with the leading varieties, and propagate those that succeed best. I will briefly consider the merits and demerits, of a few of the leading varieties of late keeping apples that are now raised with more or less success in a large portion of Maine, for it is the late keeping varieties and those only that can be profitably grown in a large portion of our State.

Orchardists may differ from me as to the most profitable varieties to raise, and the kinds of soil best adapted to the different varieties. No doubt many will, but I have arrived at my conclusions from practical experience and close observation in this particular section of the State.

The Wealthy is said to be gaining favor in the markets, but it is a variety I am not acquainted with, and can say nothing in favor of, or against its propagation. The Fameuse is a good bearer, though a little under size. It sells well in the late fall and early winter, frequently higher than the Baldwin, but after the middle of January is taken with much caution by apple dealers on account of its habit of rotting by specking under the skin while it still looks all right on the surface. The Bellflower is a beautiful bearer in many parts of the State, sells well but requires extreme care in handling. The Spy is an excellent apple, but requires a long time to come to profitable bearing, a good variety for us to plant for the benefit of the next generation. The King sells high in the English market, but as far as my information extends is a shy bearer and not profitable to raise. The Roxbury Russet, although not a good cooking apple, and only a fairly good eating apple, fills a space in the year when most other kinds are gone, and for a short time sells high and is a profitable apple to raise on the right kind of soil in a limited amount, but if as many were put on the markets as there are Baldwins large quantities of them would perish. The R. I Greening is a hardy tree, an abundant bearer, and usually sells at the same price of the Baldwin and is gaining favor in the English markets notwithstanding its objectionable color. It has the habit of falling from the tree before maturity, and should be planted where not exposed to the wind. It thrives wonderfully planted at the base of a hill where its roots extend in one direction into stony land and the other into moist or swale land.—*S. R. Leland, before State Fair Fruit Growers' Convention.*

DISPOSAL OF NOS. 2 AND 3 APPLES.

When I commenced raising quite large quantities of apples I was sorely puzzled to know how to manage to get any money out of them at certain times. Nice No. 1's were no trouble to me at any time. Once in a while a gale just at harvest time would strip the trees of a nice crop and ruin them, for No. 1's and No. 2's were not worth barreling and sending to market, neither was fall fruit. I would sometimes sell them for a few cents per bushel. I next tried making cider; that did not pay much, and besides it was too mean a business especially the selling of it. Making pure cider vinegar does not pay when competing with acid vinegar. I tried feeding to stock, but was not satisfied with that. When evaporators first came into my vicinity, I sold to them and that paid me some better. Then I got one of my own and that does better still. Consumers demand that everything we have to sell shall be placed on the market in the best possible shape and as nearly ready for use as it can be, and also in condition that it can be kept so for a length of time without becoming damaged. The most successful producers of any article are those who are alive to the necessity of keeping up with the demand of the times and looking well to the business end of their affairs which is the disposal of their products. It takes a very smart person not to make some mistakes. After many years of experience in the business I have come to the conclusion that orcharding, to be profitable in a business point of view, like all other farm operations, must be conducted in an intelligent business-like manner, and that means constant care and good management both in getting up an orchard and the disposal of the fruit. For any one to say that apple raising cannot be made a profitable business in Maine shows ignorance of the capabilities of the State in that line. Untold wealth lies concealed in thousands of our granite hill farms and no surer, easier or better way to extract it can be found than by means of the roots of fruit trees intelligently managed. In raising large quantities of fruit we must necessarily have much that in many years will not pay a profit to market in a green state. In the older fruit growing sections, New York especially, evaporating all such has become a very large business, each of several counties producing much more than the whole State of Maine ever did, and in many instances, single factories evaporate more. There is no year but that unmarketable fruit is worth something for evaporating and some years it will pay extra well, and what little of the Maine product has found its way into market is preferred to the western article, and at a better price and will continue to do so if we will only put up a nice honest thing. The market for it is extending and more and more is steadily disposed of in the market and it is the only way that apples can be dried to obtain a fair price for the labor required.

I make it a rule to evaporate all the apples I raise that will not sell for $1.25 delivered at the depot and quite often it is better to evaporate them at a higher price. Some years some varieties will grow to be scabby. It is useless to try to keep such ones any great length of time for market, and I find the best thing to do with them is to evaporate them together with all of my fall fruit. When the market is glutted, I make three qualities of my winter fruit, No. 1's extra. The No. 2's are those that are wormy only in the blossom end and those a little under size for No. 1's, and all others go for No. 3's if not too small to evaporate. These last I always dry, and watch the markets to determine whether to evaporate the No. 2's or not after having got through with all others. My No. 1's will generally bring $1.00 per barrel extra and such No. 2's as I make sell pretty well up to the ordinary price of No. 1's. I find this to be the best way I can manage to dispose of my apple crop at a profit. Without an evaporator I should think I was losing a considerable of the benefit of my orchard, and in hard years for selling green fruit it is quite a relief to have such a resource for disposing of surplus and unmarketable fruit and putting it in good shape to keep for a better sale.—*Phineas Whittier, before State Fair Fruit Growers' Convention.*

EXHIBITING PLANTS.

This matter of exhibiting plants is a very important one, and it is our intention to try and explain how window plants should be prepared for exhibition. In the first place, the pot in which the plant is growing must be clean. Not only the sides but the inside of the top rim and the bottom. This applies to the saucer as well. The earth in the pot should be entirely free from weeds, and all stones and other matter should be carefully removed. The pot should be filled to within one-half to three-quarters of an inch of the brim, according to the size of the pot, as it looks badly to have the pot heaping full, or on the other hand, not over half filled with earth. The plant itself should be erect and symmetrical, with all the broken branches and dead leaves carefully removed. If the plant be a climber, it should be trained either on a plant stake or trellis.

To make a plant symmetrical it is necessary to turn the pots often as they grow in the window, as, if the pot is left for any length of time in one position and not moved, the plant will become one-sided, that is, it will grow toward the light. Of course, where plants like ivies are trained especially for a window, to be seen from the outside, the case is different, but this is one of the exceptions.

It was only the other day that the writer saw a window of plants which on all accounts was probably as fine a collection as one often sees, with the exception that the pots were covered with a thick green mould which destroyed what would otherwise have been the perfection of window gardening. It is these little points which make up the perfect window, and whether one intends to exhibit or simply to grow flowers for home decoration, these little essentials should be attended to. Have the pots clean, turn the plants often, take off all dead leaves, and by observing all the other little matters mentioned, although they may seem insignificant details, the desired effect will be obtained, namely, a beautiful window of plants.

Perhaps in this connection it may be well to say a few words regarding the exhibition of wild flowers. If one is gathering them regularly it is well to have a case made for this purpose, either of wood or tin, as desired, as the flowers must receive as little handling as possible. Wild flowers are exhibited in glass bottles, and it is desirable that the common and botanical names should be written on some permanent label, either cardboard or thin wood, and attached to each specimen.—*Window Gardening.*

DOUBLE ICELAND POPPIES.

The *Gardening World* describes specimens of a double form of the Iceland poppy recently sent to its editor who says, "It first appeared amongst a batch of the orange or saffron-colored variety about two years ago, and has maintained its character since. The flower is perfectly double, and consists of the outer or true petals, which are undulated and crumpled in the usual way, and form a guard to the numerous linear or lance-shaped segments occupying the center of the bloom. There is no question as to the origin of these small petals, for although they are of a deep orange almost to the base, most of them are surmounted by the yellow anther lobes. Mr. Caudwell makes no statement as to whether it can be raised from seeds; but seeing that the ovary is perfect, and that many of the petaloid stamens bear pollen in the anther cells, there seems no reason why this variety should not produce fertile seeds like other double poppies. When once a double variety has been obtained, we may soon expect to get double white and yellow, as well as orange, and there can be little doubt that the public will appreciate them. Double Iceland Poppies would have a more refined appearance, because smaller than the doubles of *Papaver Rhœas* and *P. somniferum*."

ITEMS PICKED UP.

The Orchard Committee of the Illinois Horticultural Society disfavor use of apple seed from the cider-mills, if thrifty trees are wanted, and advise touching the Russian varieties "lightly."

Over 5000 plants in pots were given to children by the churches of Massachusetts on Easter Sunday.

Increased attention is being given to the study of botany in our public schools. We learn of several high schools that have done excellent work the present (1889) season.

A garden containing an acre, and even less space, will amply supply ten persons with the luxuries of the season. * * * * Each family can easily plan the size of the garden suited to its needs by taking this estimate for ten persons as a basis, and planting more or less as they may require.—*M. B. Faxon, before Mass. Hort. Society.*

The centennial of the chrysanthemum in Europe will be celebrated by a brilliant exposition at the Casino, at Ghent, from November 24 to December 1. Not only will it include other Chinese and Japanese flowers besides chrysanthemums, but also an exhibition of pictures and representations of the chrysanthemum on silk, china, etc.

Following the example originated by the Royal Society of Agriculture and Botany of Ghent, the Royal Societies of Flora and of Linnæus unite at Brussels, on November 17, 1889, in an international exhibition of chrysanthemums.

INDEX TO AGRICULTURAL REPORT.

INDEX TO STATION REPORT.

INDEX TO POMOLOGICAL REPORT.