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STATE OF NEW JERSEY.

Twenty-Seventh Annual Report

OF THE

State Board of Agriculture

1899

Printed by Order of the Legislature.

To the Hon. Foster M. Voorhees, Governor of New Jersey :

SIR—In accordance with the act creating the State Board of Agriculture, adopted April 22d, 1884, and with the provisions of the law approved June 15th, 1895, I have the honor to present the report of said Board for the year 1899.

FRANKLIN DYE,

Secretary.

Dated TRENTON, November 29th, 1899.

State Board of Agriculture.

OFFICERS FOR 1900.

PRESIDENT.

HON. D. D. DENISE.....Freehold.

VICE-PRESIDENT.

E. B. VOORHEES.....New Brunswick.

TREASURER.

WILLIAM R. LIPPINCOTT.....Fellowship.

SECRETARY.

FRANKLIN DYE.....Trenton.

EXECUTIVE COMMITTEE.

H. F. BODINE.....Locktown.

JOS. B. WARD.....Lyons Farms.

WALTER HERITAGE.....Mickleton.

WITH ALSO,

THE PRESIDENT, VICE-PRESIDENT, SECRETARY AND TREASURER.

STATE CHEMIST.

E. B. VOORHEES, A.M.....New Brunswick.

STATE ENTOMOLOGIST.

JOHN B. SMITH, Sc.D.....New Brunswick.

MISS JESSIE V. RUE, STENOGRAPHER OF THE BOARD.

TWENTY-SEVENTH ANNUAL MEETING

OF THE

New Jersey State Board of Agriculture

HELD IN THE

State House, Trenton, N. J.

Wednesday, Thursday and Friday, January 17th, 18th and 19th

1900.

BOARD OF DIRECTORS

New Jersey State Board of Agriculture.

1900.

Term of office for all except two-year County Board Directors, from January 1st, 1900, to December 31st, 1900.

Class A.

EMMOR ROBERTS.....	Geological Survey.
ELWOOD EVANS.....	} Board of Visitors, Agricultural College.
ELIAS N. MILLEN.....	
E. B. VOORHEES.....	
	{ Director of Experiment Station,
	{ Professor of Agriculture.

Class B.

EDMUND BRADDOCK.....	Master of State Grange, P. of H.
M. D. DICKINSON.....	Secretary State Grange, P. of H.

Class C.

JACOB V. CONOVER.....	State Horticultural Society, two years.
GEORGE E. DE CAMP.....	State Horticultural Society, one year.
JOSEPH H. MATLACK.....	Burlington County Pomona Grange.
W. W. DE CAMP.....	Central District Pomona Grange.
AARON B. SOMERS.....	Gloucester County Pomona Grange.
E. M. HEATH.....	Hunterdon County Pomona Grange.
DANIEL McD. HITCHNER.....	Salem County Pomona Grange.
IRWIN MILLER.....	Warren County Pomona Grange.

BOARD OF DIRECTORS.

Board of Directors.

NAME.	ADDRESS.	TERM.	COUNTY.
L. H. PARKHURST.....	Hammonton.....	2 years.....	} Atlantic.
V. P. HOFMANN.....	Egg Harbor City.....	1 year.....	
JOHN H. ACKERMAN.....	Englewood.....	2 years.....	} Bergen.
SAMUEL R. DEMAREST, JR.....	Hackensack.....	1 year.....	
EZRA BUDD MARTER, JR.....	Burlington.....	2 years.....	} Burlington.
JOHN E. DARNELL.....	Mount Laurel.....	1 year.....	
CHARLES C. STEVENSON.....	Blackwood.....	2 years.....	} Camden.
J. M. GARWOOD.....	Blackwood.....	1 year.....	
JOSEPH W. PINCUS.....	Woodbine.....	2 years.....	} Cape May.
H. L. SABSOVICH.....	Woodbine.....	1 year.....	
WINFIELD S. BONHAM.....	Shiloh.....	2 years.....	} Cumberland.
A. W. ONTHANK.....	Vineland.....	1 year.....	
WM. VANZEE.....	Livingston.....	2 years.....	} Essex.
F. C. GOBLE.....	Verona.....	1 year.....	
JOSEPH M. SITHENS.....	Swedesboro.....	2 years.....	} Gloucester.
JOSEPH T. CARTER.....	Mickleton.....	1 year.....	
JOHN T. COX.....	Readington.....	2 years.....	} Hunterdon.
H. F. BODINE.....	Locktown.....	1 year.....	
SAMUEL B. KETCHAM.....	Pennington.....	2 years.....	} Mercer.
JOHN M. DALRYMPLE.....	Hopewell.....	1 year.....	
WM. FITZ RANDOLPH.....	New Market.....	2 years.....	} Middlesex.
RUNYON FIELD.....	Bound Brook.....	1 year.....	
WILLIAM MORRELL.....	Hazlet.....	2 years.....	} Monmouth.
FRANK DENISE.....	Freehold.....	1 year.....	
OSCAR LINDSLEY.....	Green Village.....	2 years.....	} Morris.
S. E. YOUNG.....	Afton.....	1 year.....	
CHAS. M. RORER.....	Cassville.....	2 years.....	} Ocean.
H. R. WILLS.....	Toms River.....	1 year.....	
CHARLES R. LOVELAND.....	Cohansey.....	2 years.....	} Salem.
S. JACKSON MORGAN.....	Woodstown.....	1 year.....	
ERNEST C. TAGGART.....	Griggstown.....	2 years.....	} Somerset.
WILLIAM N. ROGERS.....	Plainfield.....	1 year.....	
WILLIAM H. LEPORT.....	Deckertown.....	2 years.....	} Sussex.
NEWMAN HALL.....	Unionville, N. Y.....	1 year.....	
JOHN O. MAGIE.....	Elizabeth.....	2 years.....	} Union.
F. E. WOODRUFF.....	Cranford.....	1 year.....	
WM. EUGENE OBERLY.....	Broadway.....	2 years.....	} Warren.
WM. C. ADDIS.....	Broadway.....	1 year.....	
H. W. HOAGLAND.....	Princeton.	Princeton Agricultural Society.	
I. S. CRANE.....	Chatham.	State Dairy Union.	
ISAAC LIPPINCOTT.....	Moorestown.	State Dairy Union.	

We, your Committee on Credentials, would beg leave to report all organizations entitled to representation are represented, and only two absentees, all of which is respectfully submitted.

M. D. DICKINSON,
 GEORGE E. DECAMP,
 JOSEPH T. CARTER,
Committee.

Minutes of the Twenty-seventh Annual Meeting.

FIRST DAY.

Morning Session.

JANUARY 17th, 1900.

The Twenty-seventh Annual Meeting of the New Jersey State Board of Agriculture was called to order at 10:30 A.M. by the President, Hon. D. D. Denise.

Rev. Dr. Studdiford offered prayer.

The President announced that the first thing was the adoption of the order of business which had been prepared.

The order of business was amended so as to dispense with the special Legislative Committee, and the Executive Committee to be the Legislative Committee, and was then adopted as amended.

The minutes of the last session were approved as printed.

The Chair then announced the following committees :

Credentials—M. D. Dickinson, Salem; George E. DeCamp, Essex; Joseph P. Carter, Gloucester.

Committee on Resolutions—John T. Cox, Hunterdon; John E. Darnell, Burlington; John M. Dalrymple, Mercer.

The President—We have usually had a Committee on Officers' Reports, but that committee generally made their report just about the close of the session and there was never much done with it. The Executive Committee feel that it might be better, after the reading of of each one of these reports, if there is any matter therein which you want to discuss or bring before the meeting you may have opportunity to do so after the reading of the report. We thought that would be an advantage and we will try it.

A Delegate—We understand that under that head, if it is necessary to offer any resolutions to carry out the suggestions that those reports make, that will be the time to make them.

The President—Yes; any matters connected with the reports, as far as we have time.

The report of the Executive Committee was then read.

REPORT OF EXECUTIVE COMMITTEE.

Your Executive Committee has given such attention to the work committed to its care by the Board under the law as its demands seemed to require. Six meetings, during the year, have been held.

The work of the State Entomologist, Prof. John B. Smith, who is charged with the execution of the law for the suppression of the San José scale and the inspection of nursery stock for this pest, demands and receives the attention of the committee, as they are required to appoint commissioners in the several counties and decide what pay they shall receive; and, also, assistant inspectors to the Entomologist when the work demands it, and generally to audit bills and keep account of the work. A statement of what has been done in the way of inspections will be made at this meeting by the Entomologist.

Nurserymen, fruit growers and farmers should be persistently on the alert for this pest and co-operate with the State Entomologist in the effort to stamp out this serious menace to fruit production.

At the meeting of committee, June 12th, appropriations were made according to law to such County Boards of Agriculture as seem to be fulfilling the requirements of the law.

The committee have had under consideration the advisability of holding a special meeting of the Directors of the Board for the purpose of advising together as to the future yearly work possible to be done and to secure their co-operation in advancing the interests of the County Boards and Farmers' Institutes.

In some such way the committee believe the directors might be brought into a closer touch with the work of the State Board and be made responsible for its efficiency in the counties. Should this suggestion meet your approval, such a meeting may be called early next Fall and be made, in part, a popular meeting for all farmers of the State.

At their meeting, September 27th, the committee considered the growing adulteration of the various feeds put upon the market for the use of dairy cows and other domestic animals, whether in county or city. It was their unanimous judgment that a law having similar

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provisions to that of the State of New York should be in force in New Jersey, and Prof. Voorhees was requested to prepare such a bill. It has been examined by and has the approval of the Executive Committee.

Considerable correspondence has been had between Mr. L. G. Powers, Chief Statistician, in charge of agriculture for the next census, in relation to the taking of said census in this State and the best means of advising farmers, prior to the visit of the enumerators, concerning the details of such inquiry.

The chief suggested the publication of such information in our forthcoming annual report. The Executive Committee, however, doubted the wisdom of this for the reason that the report would not reach the farmers much sooner than the enumerators. The information is very compact, however, and would not cover more than four pages of the report. It would be valuable if received in time, and as a matter of reference for the future.

The committee suggested the preparation of a circular to farmers on this subject to be mailed as soon as possible. This has been done by the Census Department and a package sent to our Secretary, who has in turn sent them to the various organizations of farmers throughout the State.

Your committee earnestly desire that the farmers of New Jersey study this question and prepare to give a correct and full return of the varied products of our farms in order that the State may make its full and just showing. It seems to be the desire and purpose of Mr. Powers to have a full and honest census of the farming interests taken.

The committee have held two meetings in the farming sections of Mercer, Gloucester and Salem counties. Our Treasurer, William R. Lippincott, writes in relation to those trips :

"On the thirteenth of June the Executive Committee drove through Mercer county to note the condition of crops. Going from Trenton to Pennington and then proceeding to Hopewell, we passed through an excellent farming country during the entire drive.

"The fields showed the effects of the very dry weather then prevailing all over the State, but, even under unfavorable conditions, we saw very fair crops of grass in some places and a new variety of wheat called 'Golden Coin' attracted our attention upon the farm of Dr. J. Stockton Hough.

"Corn had come up well, but, at this time, was not very far advanced in growth. Few potatoes are raised in this section and very little trucking of any kind is done. Farming is conducted on a more economical system than in the lower counties of the State, but the farms in Mercer indicate as much prosperity as in any section the committee have lately visited, and the clear gain of farmers here may be as great as where immense crops of truck are raised and sold at prices that benefit only the consumer.

"The apple and pear orchards on the road hardly promised, at that time, the immense crops of fruit that matured later, but all cherry trees were doing their best and showed their red crowned heads in every nook and fence-corner. When the cherry bears well the later fruits are apt to follow with full yields.

"One must drive into farmers' lanes to see how they live. A very correct idea of their prosperity cannot be gained by a glance from the roadside. When one farmer visits another new ideas are given and received. So with the visits made by your committee.

"We visited a farm not far from Hopewell, owned by Mr. Hill, and found much to interest us in the economical way he managed his milk by utilizing an elegant spring of clear water that gushed from the hillside filling a large, deep pool in a spring-house walled in with blocks of stone. Into this pool of cold and constantly running spring water the milk, in tightly closed cans, was entirely submerged by a system of shelves that worked on pulleys and made the labor of handling the cans very light, entirely dispensing with ice and, although the milk was shipped more than thirty miles to Philadelphia, it kept remarkably well after being thus cooled.

"A meadow, watered by the stream flowing through the spring-house, was green with pasture, even at this dry time, and a herd of fine Jersey cattle, cropping the luxuriant grass, made a picture to please an artist or adorn a farm and pay the farmer. The farm-house had been built upon the side of a hill and its heavy stone walls had long resisted decay, being 197 years old, and, like many ancient places in our State, it was rich in reminiscences

"Of the chiefs of ancient fame,
Who to share its shelter came."

"The upper part of the State is so rich in revolutionary history one cannot fail to be impressed with the sentiment that prevails among the people who own the farms of their ancestors who took part in the

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revolution. It is a sentiment that has given birth to some of the noblest elements of the human character, it has produced the finest feelings of patriotism and led to the highest aspirations of manhood.

"On our way to Hopewell we were shown a turnpike road that had been repaired by using broken stone to fill the worn-out places instead of the old method of filling the holes with gravel, and we were assured the new way had given great satisfaction.

"Passing through Marshall's Corners we were reminded that the village had once been the home of James W. Marshall; and an old resident of the township, with some show of pride, said, 'Hopewell sent the man that discovered gold in California, and the man who led the first expedition across the Rocky mountains; and here, too, Jersey raised her first company of soldiers for the American Revolution.'"

The Executive Committee held a meeting at Woodstown, Salem county, August 7th, took a drive through a section of the State where a different system of farming prevails and perishable products are raised in the greatest abundance and perfection. We visited the great shipping station at Swedesboro, Gloucester county, which was piled with tomatoes, cantaloupes, eggplants, melons and fruits destined for various points. One car was loaded for Buffalo, another for Boston, and the committee noted that the farmers had attained great proficiency, not only in the yield and quality of their crops, but in their distribution; the only drawback seemed to be that the price received for the products was not, at that time at least, a fair remuneration for the growers' labor and skill.

The Farmers' Institutes have been carried on, as heretofore, under the general direction of our Secretary. A number were held during November, 1899, and another series is in progress during the present month. If attendance and interest is an indication of the value of such meetings, the committee have this assurance. At one meeting only has there been a decline, and that only in the attendance, and even this might have been due to unknown but reasonable causes.

To make these meetings successful in the highest degree farmers should plan their business so as to attend them and take part in the subjects discussed. By so doing they will also encourage those who plan, conduct and address them. The Secretary, in his report, refers to the extension of free rural delivery. This matter has our unqualified endorsement.

It is a great satisfaction to your committee to be able, at this time, to report that the State Printing Board has granted our request to publish a work on "The Entomology of New Jersey." This work will comprise several hundred pages and will be fully illustrated with cuts, which will greatly assist in determining the shape and character of the insect described. It will be issued as a supplement to the report of the State Board of Agriculture.

The State Entomologist, Prof. John B. Smith, has given much of his time for several years past to the preparation of material for this work. The publication of this report is both a recognition of his careful work and of his ability as an entomologist. In publishing this book, at this time, New Jersey leads the way. No other State, so far as we know, has issued a similar work.

The present edition of this publication is not large and it will not, therefore, be sent indiscriminately throughout the State, as it is the desire of the Executive Committee to place the work in the hands of those who are especially interested. Those who desire a copy, therefore, should send a written request to the Secretary for it, giving post-office address and county. These names will be placed on file and the report be sent in the order of application.

A copy will be sent to any teacher of our public schools who requests the same for reference and use in the school. Our regular exchanges in other States will receive a copy.

The program of subjects for the Twenty-seventh Annual Meeting of Board has been prepared with special reference to the questions in which the farmers of the State have, at this time, the greatest practical interest. The speakers who are to address on the subjects named are all practical men. Their long and intimate experience with the questions they are invited here to treat will make these addresses and discussions of exceptional worth to our farmers for future use.

Having already entered upon the closing year of this eventful nineteenth century, it is the earnest desire of your Executive Committee that it may be to our farmers, in every respect, one of the most prosperous in their experience. And it is our further hope that, by the blessing of God, we may meet here again to greet each other at the opening dawn of the twentieth century blest materially, not only, but with clear vision to discern the things that are right and with high and noble purpose to secure them, we may go on to still greater prosperity as farmers, as a State and nation.

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The report of the Executive Committee was then adopted and ordered placed in the minutes.

Mr. Rogers—I want to especially emphasize the matter of the census report, and in order that you may understand the importance of this report, the last census shows only one-tenth of what we were entitled to as a State because the farmers and growers did not give the whole matter to the census-taker. The census is taken as a basis of making up the crop reports for other years. The reports given to the census-taker are not used for the purpose of taxation. Make your list out before the enumerators call, and give it so that we can show what New Jersey is doing that no other State does.

The Secretary—New Jersey not being essentially a grain-growing State, our great industries, which amount to large sums in money value, do not appear in the yearly crop reports. If we get ready and give full and correct statistics of our farm products—fruit, dairy, poultry and all those industries, as well as the report of the grain—New Jersey will make a better showing in the next census.

Prof. Voorhees—I wish to call attention particularly to the work, “The Entomology of New Jersey,” which has been prepared and will be printed. I think we do not all appreciate the value of this as we should; neither do we realize the valuable offices of our Secretary in securing the consent of the Printing Board to print that as part of our report. I think he should receive some special recognition for that particular work, and that the State Board should also recognize the value of the work itself and Prof. Smith’s services in its preparation, and at this time particularly, when there is so much interest taken in what is known as nature-study. The distribution of a work of this sort to the public schools will be of incalculable value, aside from the value it will be to individual members of our Society in their own work.

Upon motion, a vote of thanks was extended to the gentlemen named for their services in this regard.

Upon motion it was

Resolved, That the Executive Committee be and they are hereby directed to present to our Legislature the bill referred to in the Executive Committee’s report concerning the selling of feeding stuffs, and that they use every means in their power to bring said bill to immediate passage.

Upon motion the Secretary was requested to forward to the publisher of every newspaper of the State a copy of the paper entitled, "Interesting facts about the census," requesting them to publish the same in their various papers.

The report of Legislative Committee was then read, received and ordered placed in the minutes.

REPORT OF LEGISLATIVE COMMITTEE.

Mr. President and Members of the State Board of Agriculture :

Your Legislative Committee in thus presenting their annual report, realize that a strong and healthy public sentiment, with a definite aim in view, is important in securing legislation, as well as in enforcing its provisions after enactment. It has been but a few years since the State recognized the Department of Agriculture in a manner to grant substantial aid, even in a moderate sum; and the advancement made along this line up to the present date should be cause of encouragement. And while your committee may not have succeeded as fully as you regularly directed by resolutions at the last annual meeting, yet there are some redeeming features: *One of those resolutions* by Hon. J. A. McBride requested that the Legislature appropriate \$15,000 for the use of the Dairy Commissioner—an addition of \$5,000 above the present appropriation.

The Legislature increased the appropriation to the Tuberculosis Commission to the amount named in the law—\$10,000 for the year. *Another resolution* on the subject of "Foul Brood" affecting the apiaries and fruit growers of the State, received attention; members and others from different sections were consulted. The subject evidently is not generally well understood, and the hesitancy to draw upon the State treasury for means to make the act effective, led your committee to defer the subject for the time.

Mr. Crane's resolution on pure milk is in shape for action in the near future.

The State's part in our country's foreign relations and national dependencies received appropriate recognition at the hands of the Legislature.

The appropriation for permanent improvement of roads was increased from \$100,000 to \$150,000.

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For the purpose of making the act of 1898 on "Traveling Libraries" operative the Legislature of 1899 appropriated the sum of \$1,500, and on December 15th last State Librarian Buchanan sent out the first lot of the traveling libraries. A case of fifty books was sent to Shiloh, Cumberland county; one to Pensauken, Camden county; one to Freehold, Monmouth county; one to Blairstown, Warren county; one to Port Oram, Morris county, and one to Branchville, Sussex county; and since that date twenty-two other like cases of fifty books each have been placed in different sections of the State upon application from the people according to the rules established by the commission having the libraries in charge.

Chapter 78 of the laws of 1899 provided for the sum of \$700 to be paid to the New Jersey State Horticultural Society to aid it in its work; \$400 was appropriated.

There was a strong desire to render further aid to the public schools of the State and thus reduce the rate of assessment for school purposes. This will be likely to claim further attention, with other important matters connected with our public school system. This revision of the school law should interest every citizen.

The establishing of a State Board of Children's Guardians is in the right direction.

The increase of the appropriation for the destruction of injurious insects, as provided for by the law of 1898, from \$500 to the \$1,000 named, would be desirable.

Work under the law to exclude tuberculous cattle from this State is reported in the report of the Tuberculosis Commission.

Chapter 197 requires that the slaughtered carcass of the horse shall be labeled "*Horse Flesh*" when offered for sale as food.

The act requiring bi-weekly payments of wages to employes exempts agriculturists and watermen.

The killing of muskrats at all seasons of the year is now allowed.

One matter that would seem to need immediate attention is that of securing an amendment to the law allowing townships to pay for poultry killed by dogs from the dog tax. The sheep industry has been largely abandoned, and that of poultry raising extensively introduced instead, and it would be but just that the poultry owners should be indemnified from loss by dogs in like manner as the former growers of wool were.

Another important subject is claiming and arousing the attention of the American people, and that is the matter of pure food, and that every article shall be marked and sold for what it is.

With reference to tax burdens, the lack of united action in enforcing the provisions of present laws is largely responsible therefor.

The *disregard* of *law* that is begotten by continued unchecked violations thereof is subversive of the public welfare and endangers liberty. And out of this fact arises the thought that in a country like this, where the will of the people is supreme, *right* must prevail if well directed.

JOE S. HAINES,
J. A. McBRIDE.

January 17th, 1900.

The report of the Worthy Master of the State Grange, Mr. Edmund Braddock, was then read, received, and ordered printed in the minutes.

The report of the Secretary was then read. (See Report.)

On motion, the report of the Secretary was received and ordered placed in the minutes.

Upon motion, the following communication was ordered sent to each Congressman :

“ JANUARY 17th, 1900.

“ *To Hon. — — —, House of Representatives, Washington, D. C. :*

“ DEAR SIR—The New Jersey State Board of Agriculture, now in session, takes a peculiar interest in the maintenance and extension of ‘ Rural Mail Delivery.’ Please do what you can for the cause.”

The Secretary—Another matter. The older members of the board know that the New Jersey State Board of Agriculture has heretofore put itself on record as absolutely opposed to the irrigation of the arid lands of the Western States and Territories at government expense, because this would be taxing us to bring into cultivation more land in competition with ourselves. The report of the Secretary of the Interior calls attention to the matter with favorable recommendations. The time will come when that land can be redeemed, but let it be done by the States wherein such lands are found if they want it done. I think we ought to have a resolution on that subject.

Mr. Rogers, of the Committee on Transportation, reported that pears and quinces are now classified the same as apples.

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Afternoon Session.

The meeting was called to order by the President at 2:30.

The Committee on Credentials reported progress.

The Treasurer, in reading his report, stated that he had not charged himself with the full amount of the appropriation from the fact that the Secretary's salary and that of the stenographer, with bills for printing, stationery and blanks, are paid direct by the State Comptroller.

WILLIAM R. LIPPINCOTT *in Account with* THE NEW JERSEY STATE BOARD OF AGRICULTURE *for the Year Ending October 31st, 1899:*

Dr.

Total appropriation	\$6,000 00
Total amount received from State Treasurer.....	4,387 09

Cr.

Annual Meeting, January 11th-13th, 1899—	
Delegates' expenses.....	\$319 66
Speakers and traveling expenses.....	405 40
Stenographer	125 00
Lantern service, hall rent, janitor, board speakers and Executive Committee.....	114 25
	<hr/>
	\$964 31
Delegates' expense Pure Food Congress.....	41 01
Franklin Dye, traveling and other expenses.....	48 96
Appropriations to County Boards—	
Atlantic.....	\$25 00
Bergen.....	25 00
Burlington.....	50 00
Camden.....	25 00
Cumberland.....	20 00
Essex	25 00
Gloucester.....	50 00
Hunterdon	50 00
Mercer.....	50 00
Middlesex.....	25 00
Monmouth	50 00
Salem.....	50 00
Somerset.....	50 00
Sussex.....	25 00
Union	25 00
Warren.....	30 00
	<hr/>
	575 00
Appropriation to State Horticultural Society.....	300 00
Packing and expressage on reports.....	134 69
Legislative Committee expenses	39 50
Executive Committee expenses.....	150 35

STATE BOARD OF AGRICULTURE.

Franklin Dye, traveling and other expenses.....	\$21 90	
Repairing typewriter.....	2 50	
		\$24 40
Treasurer's salary.....		100 00
Expended on Institute work.....		1,991 90
Two lectures and expenses Jamesburg Farmers' Conven- tion.		16 97
		\$4,387 09

On motion the report was received and referred to the Auditing Committee.

The President—I have previously appointed Prof. E. B. Voorhees and Walter Heritage as Auditing Committee. They reported that they had audited the account and found the same correct.

Upon a call of the counties, the following were nominated to serve on a Nominating Committee :

Atlantic, L. H. Parkhurst.
 Bergen, John H. Ackerman.
 Burlington, Edmund Braddock.
 Camden,
 Cape May, A. B. Walters.
 Cumberland, A. W. Onthank.
 Essex, W. W. DeCamp.
 Gloucester, Joseph F. Carter.
 Hunterdon, John T. Cox.
 Mercer, S. B. Ketchan.
 Middlesex, Runyon Field.
 Monmouth, Frank Denise.
 Morris, Oscar Lindsley.
 Ocean, C. M. Rorer.
 Salem, Charles R. Loveland.
 Somerset, W. H. Rogers.
 Sussex, Wm. A. Leport.
 Union, John O. Magie.
 Warren, W. E. Oberly.

The State Entomologist, Prof. John B. Smith, then read his report.

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REPORT OF THE STATE ENTOMOLOGIST, JOHN B. SMITH, SC. D.

Of the plans made for the work during the season of 1899, only a small portion could be carried out, because of the fact that the Legislature again appropriated but \$500 for the use of the office during the year. With this sum no comprehensive plan covering the State could be carried out. It was not even possible to exercise any close supervision over stock coming into the State, because that would have involved the active employment of the Insect Commissioners and their reasonable payment for services rendered. The State Entomologist gets no pay for his services in the matter, and as the time employed in attending to the office is necessarily taken from his duties to the College and Experiment Station, which do pay him, it became necessary to have some assistance for a portion of the season in order to keep up with the work.

In a general way the efforts of the office were again directed to locating the various colonies of the pernicious scale in New Jersey, and in the endeavor to prevent the further distribution of the species by means of nursery stock from other States or from our own nurseries. Nursery inspection has been called for by some twenty-five or thirty nurseries, and of these the following have received regular certificates, though some of them are limited to specified kinds of stock.

No. 1, 1899, August 15th, C. Ribsam & Son, Trenton.

No. 2, 1899, August 17th, John N. May, Summit. (Florists' stock only.)

No. 2a, 1899, September 11th, Henry A. Dreer, Riverton. (Ornamentals.)

No. 3, 1899, September 20th, Geo. A. Shultz, Jamesburg. (Peaches only.)

No. 4, 1899, September 25th, Hiram T. Jones, Elizabeth.

No. 5, 1899, September 27th, Elizabeth Nursery Co., Elizabeth. (Small fruits, shade and ornamentals.)

No. 6, 1899, September 27th, S. T. Pullen & Son, Millstone, Monmouth county.

No. 7, 1899, September 27th, Jos. H. Black, Son & Co., Hightstown.

No. 8, 1899, September 27th, Chas. Black, Hightstown.

No. 9, 1899, September 27th, C. A. Bennett, Newtown.

No. 10, 1899, October 3d, Stanton B. Cole, Bridgeton,

No. 11, 1899, October 3d, R. D. Cole, Bridgeton.

No. 12, 1899, October 3d, Joseph Burt, Bridgeton. (Peaches only.)

No. 13, 1899, October 6th, Flemer & Felmly, Springfield,

No. 14, 1899, October 11th, Belleview Avenue Nursery Co., Plainfield.

No. 15, 1899, October 12th, David Baird & Son, Manalapan.

No. 16, 1899, October 21st, Theodore A. Ball, Westfield.

No. 17, 1899, October 31st, Sam'l C. DeCou, Moorestown. (Shade trees only.)

No. 18, 1899, November 14th, Bay View Nurseries, James McColgan, Atlantic Highlands.

No. 19, 1899, December 8th, Edwin Allen & Son, New Brunswick. (Peaches only.)

A number of certificates for individual shipments were given, and two for purchased stock only. Except in two instances where special circumstances required it, all the examinations were made after September 10th, and this is as early as examinations of this kind should be made at any time.

In the effort to protect the purchasers of trees and plants, nurserymen have been urged to take every possible precaution in handling stock received from other points and, where any large amount of it was received to erect fumigating houses. Three good fumigating houses have been built, and there are two if not three fumigating boxes. Others of our larger nurseries have in contemplation the erection of similar structures, and while fumigation is by no means an absolute cure for all ills, it will nevertheless serve to prevent the spread of certain kinds of insects to a considerable extent.

Quite a number of new points have been discovered during the past year in which scale had been introduced rather recently, and in almost every instance foreign nurseries were in fault and stock had been sent in under certificate. I have on previous occasions called attention to the fact that a certificate did not always cover all the stock in the box to which it is attached. Almost all nurserymen are dealers to a greater or less extent, and while their own nursery may really be free from injurious insects of certain definite descriptions, nevertheless some of the stock they send out may be infested. That this has actually been done is proved by the fact that on no less than four nurseries I found this year rows of left-over stock containing scaly trees. In every case the nurserymen were very prompt in destroying all these remnants, and I have strongly urged that no

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stock whatever be held over. Stock that is purchased under certificate may be re-shipped; but it is a risk for a nurseryman to hold such material over for a second year.

Another difficulty in the matter of certificates is the date at which inspections are made in certain cases. Quite a number of certificates sent in to me bear date in July, and the certificate is supposed to be good until the following June. If the stock examined included peach, the certificate is not worth the paper that it is written on as actual evidence of freedom of the stock. It is not until nearly the middle of June that the scale begins to breed, and assuming that an infested bud was put into a seedling the preceding August, the insects would be so few in number in July, that discovery in the mass of foliage at that period of the year would be next to an impossibility. This applies almost equally to other stock. In my own case I have this past year closely examined a peach nursery in the middle of July without finding a trace of scale, but late in September had no difficulty in finding the insects scattered throughout the block. We will, therefore, have to face the probability that the insect will continue to come into our boundaries even under certificate, and must be dealt with by our growers.

Fortunately it is now possible to at least control, if not to exterminate, the insect. In fact I may say on this point that extermination is, under present circumstances, an impossibility. Too many square miles are covered and there is scarcely a city or large town in certain portions of the State where there is not some scale in gardens and back yards. Hedge plants have become infested, half a mile of osage orange being covered with scale in one locality in Burlington county. In other Burlington county towns and villages hedges of Japanese quince, purple beech, *Citrus trifoliata* and other plants are attacked. In Plainfield, Montclair, Passaic, Hackensack and other towns of that sort, gardens everywhere have scaly trees and shrubs.

Under the circumstances all that we can do is to assist the farmers to discover the pest in as early a stage as possible, and suggest to them the remedial measures to be used. It had been intended, had the desired appropriation been made, to secure for the use of the State Entomologist a number of pumps, which could have been located in charge of a commissioner at some central infested points and which could have been used by those who were willing to make applications in accordance with directions and in the nature of experiments; but

this plan had to be abandoned for lack of funds. Nevertheless, much has been accomplished in the effort to control this and other insects, and at all events there is no longer that dread as to the future of fruit-growing which was so marked two or three years ago. Even in the localities where the scale is worst additional orchards are being set out, and farmers have become confident in their ability to raise fruit in spite of this or any other insect. A large part of the money has been spent for traveling expenses to points where I had reason to suspect infestation or where I was watching it, and almost every portion of the State has been visited in the course of the year. It is to be observed that the present organization is such that, with a sufficient amount of money at hand, it would be possible to get track of every bundle of trees that came into the State. Traveling is expensive, since the railroads make no concessions to the office, and I have not attempted for that reason to get into personal touch with all the Commissioners as I should do under other circumstances.

It would be possible, I think, to induce all our nurserymen to put up fumigating houses by giving them a little assistance in the way of fixing up the proper amounts of cyanide of potassium, as is done in the State of Maryland, where all fumigation is controlled by the State entomologist. I do not believe in carrying matters to this extent, but I do believe that a little assistance judiciously given would make nurserymen more inclined to co-operate and would afford added protection to the farmer and fruit grower.

In my report for 1898 I mentioned the fact that in Atlantic county a systematic survey of one section had been attempted. This survey has been continued and practically completed. The information gathered by the commissioner to whom the work was intrusted has shown that if the same system could be carried throughout the State there would be no practical difficulty in checking any serious injury by this or any other insect.

Beyond the points mentioned very little has been attempted, except in providing for the spread of information in response to questions. We have now a series of twenty-three entomological circulars, and these are used as replies to inquiries concerning the special insects of which they treat. Each circular is confined to one subject.

It is somewhat discouraging to be charged with the duties of an office which it is impossible to administer as it should be. Five hundred dollars is just about enough to keep the organization alive

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and to enable me to keep track of what is going on in the State. It is not enough to enable me to do anything effective or to present any results worthy of your attention. It is bad enough to be expected to work without pay, but if, in addition to that, bricks are expected without straw, the matter becomes unpleasant indeed.

Now, I would like to say to you, gentlemen, that there are two or three things that I would like to do as State Entomologist. Some of you may know of the fact that the European countries of late years sent over experts into this country to investigate the subject of this scale insect. Those men were specialists who were trained to do their work. They came to New Jersey, and from here went to California to investigate the general subject. I showed these people everything that was to be seen in the State of New Jersey so far as infestation by this scale was concerned, and told them all we had done and what we expected to do, and I think the reports that some of these gentlemen made to their governments show that what we have done here made an impression upon them, and what we have done has been regarded as of sufficient importance to influence their recommendations to their various governments. Those men have learned a lot in going over this country and in studying the condition of affairs here. It is pretty nearly time that somebody found out what they are doing over there in the line of controlling insects in their own countries. They have some species that are just as troublesome and dangerous to fruit stock as any we have over here. Dr. Bos, the entomologist sent over by Holland, said he had seen in Germany orchids and orchid trees that were infested by a scale insect that were just as bad as any we had in this State affected by the San Jose scale. It is a matter of interest that that particular scale has been introduced into this country of recent years, and we have, or will have, another scale to deal with which in Germany and Holland is doing just as much injury as the pernicious scale is doing in the Eastern and Atlantic States. We want to know what keeps that insect in check in the European countries, and it is just as much to our advantage to learn what the European nations and scientists are doing at the present time as it is for them to know what we are doing over here. New Jersey has always taken a foremost stand in matters of that kind; it is the only Eastern State that has appropriated money enough to send a man to California to find out what the condition of affairs was, and we have done more to kill out the scale

infection than any other State in the eastern United States, and I think New Jersey ought to keep in the front rank of the fruit growing States, and ought to go to ascertain the condition of affairs not only here in the United States, but in other countries. I think New Jersey can do it, and, if it would only do what the law calls for, if it would give the appropriation which the Legislature did give, just what the original appropriation bill calls for, we could do more than twice as much as has been done. All of you know the difference between \$500 and \$1,000. It is more than the actual difference that is shown. It means more than twice as much. \$500 means just enough to keep the machine going; \$1,000 means \$500 to be spent for the purposes of getting original information, and so I do hope that some persistent effort will be made, if the office is to be continued at all, to get sufficient appropriation to carry on the office as I think it ought to be carried on.

In answer to a question, Prof. Smith said: "If the purchaser carries over infested stock there is only one point infested. If the nurseryman carries it over he stands a chance of infesting all the stock he sends out and spreading it further. The point is, if possible, to keep the nurseries clear, so that they will not distribute it generally, and I have given more attention to the nurseries, for that reason, than to any other point, because if I can keep the distributing points clear the chances are that the consumers in the State who buy from our own nurserymen will be practically free."

Further, he said: "I tried to learn what treatment was resorted to in foreign countries, but the difficulty was that those people were out for information, and they were not giving much. I will say this, however, that, take it as a whole, in our own State and in the United States generally we are far in advance of the people on the other side in their method of treating the injurious insects, although they have special methods of treating things of that character that we do not know anything at all about."

The report was received and ordered printed in the proceedings of the Board.

Mr. Denise then delivered his annual address, which was received and referred to the Executive Committee for publication in the Annual Report.

Governor Voorhees being present then addressed the Board, and was followed by ex-Governor Hoard, who spoke as follows:

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Ex-Governor Hoard—You have a very clear headed Executive. I have been watching the mental make-up of your Governor during his talk here to you, and I have been exceedingly interested in the fact that he did not claim any more than he could pre-empt. Now it is no reproach for any man to be an Executive of the State of New Jersey or any other State and not be a farmer, but it is a reproach to any man to occupy the position of an Executive of any State and not have a broad, clear, comprehensive sympathy with all kinds of industrial thought and action ; and therefore, when I hear a man talk to a body of farmers as Governor Voorhees has talked to you, my respect for him rises. If he had said he was born on a farm, and had undertaken to turn warm water down your back here for a little while to make you feel good, you would have been more chilly after the thing had cooled, but he simply gave you words of good thought, of good cheer, and good weal.

It is a splendid thing, while crossing this vast land from one ocean to the other, to have one band of workers say unto the other, "Come over and camp with us for a night and we will give thee cheer." And the farmer, and the artisan, and the merchant, and all the manufacturers, and all the men that make up New Jersey's civilization, and everybody that makes up the civilization of our beloved country, they are all of them fulfilling the destiny of citizenship so long as they keep an honest eye on the binnacle lamp and on the compass and are steering along the lines of intelligent thought with patriotic effort.

We have a great many things to complain of in this country. We have a great deal of selfishness—unpatriotic selfishness—and I often think, when I know of the corruptness that exists in politics and in government, and everywhere—when I think of this constant concomitant of dishonesty and corruption I think of just one solution for it—one true one—and that is, patriotism. [Applause.]

Patriotism. The man that is a patriot is invariably an honest man, invariably accords to his neighbor that which is his due ; and patriotism will cure all the evils we have to-day in public life. What is patriotism? Self-sacrifice for the good of the whole. That is what it is. It applies to the farmer on his farm, when he pays his taxes, and if he "nigs" out of it and swears that he has not got that which he has, to that extent he is a traitor to the public weal. A man who does not pay his taxes fair and square is tampering with treason. It

is treason. Sacrificing the public weal for one's selfish end. Take these two definitions with you, my good friends, and may I take them with me, and in all our work, wherever we are, when we contemplate effort or duty, let us have recourse to that one inspiration—is this patriotic, is it my duty as a citizen?—and every man that squares himself by that, whether he be delving on the farm or whether he be behind a counter, or whether he be a manufacturer or a lawyer, that man is serving the well-being of the State. Patriotism is the grand central proposition, everywhere, by which we inspire public duty.

I know something of the demands upon an Executive. I know something of the things he confronts, I know something of the care; I know something of the work; but I say to you this, that there are a thousand men that are square and right and true, in Legislature and in Congress, to where there is one who goes wrong, providing this, that the constituent behind the official will do his duty, and do it square. It is the very fact that the legislator doesn't know what his people want that puts him in confusion and makes him the prey of dishonest interests. Never in my life have I seen a man refuse to do his duty when his constituents came up and said thus and thus is the way for you to walk. I presume if I should ask of the farmers of the State of New Jersey how many of you in the last year have written a postal-card to your Congressman or to your member of the Legislature stating what you wanted, I shouldn't find that there was one in fifty that had done it. If we fail to do our duty on these great questions of public moment, if we fail to impress ourselves upon the men who represent us, how then shall we blame them if they go astray; how then shall we hope for good representation in the great oleomargarine question. In Illinois, on the passage of their law we spent three thousand dollars only and the oleo men spent one hundred thousand, and all that we spent it for was simply postal-cards; we sent double postal-cards to the constituents, and asked them to tear off one and sign their name to it, and let them descend like a rain from heaven upon the just and the enemy, and they did, and one oleomargarine lobbyist said "Damn it, you have got men to vote for your bill here with postal-cards when those men had a thousand dollars of our money in their pockets." I believe in making the raft of men to serve the Lord, and I say to you that all these great questions that affect the well-being of agriculture affect the well-being of every interest. On all these great questions the thing to do is to arouse the

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farmer himself to an understanding of his position, the dignity, the character, the power and the grandeur of it, and all things else shall be added.

Mr. Vermeule then read a paper on "Forests and Forest Reservations and their Relation to the Water-supply." (See paper.)

The address of Mr. Vermeule was followed by remarks on the same subject by Prof. John C. Smock, State Geologist, after which Board took recess to 7.15.

Evening Session, 19th.

Board called to order by President Denise, who introduced Prof. John B. Smith, State Entomologist, who gave an illustrated lecture on "Another Year of Entomological Work," a summary of which is here given.

ANOTHER YEAR OF ENTOMOLOGICAL WORK.

Abstract.

The lecture consisted of two parts, both illustrated by lantern slides. One portion related to the life history of a digging-bee, *Augochlora humeralis*; the other gave some of the results of a series of experiments with crude petroleum, a history of spraying in the State, showing machines now in use, and some reference to a few of the principal injurious insects of the year.

The little green and blue digging-bee, *Augochlora humeralis*, inhabits the sandy pine district of a part of Ocean county, and has a very interesting life history. It digs perpendicular burrows five feet and more down below the surface, and at a distance of from nine to fifteen inches builds breeding-cells in which it raises from three to fifteen young. These cells are very peculiarly constructed, stored with pollen and surrounded with air chambers to prevent the outer influence from affecting the young in their cradles. The young change to adults in July and in a very few days afterward the females begin digging what proves to be their winter quarters. They make the same perpendicular burrows that their mothers did in early spring, but do not make breeding-cells. Instead of that they dig all sorts of queer processes and go into winter quarters five feet and

more below the surface, at the very bottom of their burrows. They leave these burrows about the middle of May, abandon them completely, and start all over again to dig for breeding purpose. The method of studying these insects by means of plaster of paris poured into their burrows was explained.

The white man's burden, according to the lecturer, was the spraying machine, made in the form of a knapsack; and now-a-days a chemical laboratory for the making of insecticides and fungicides is a regular portion of the farm outfit. Spraying machines have improved wonderfully within the last decade, and instead of the simple pumps then in use, complicated machines are now manufactured. The Gould Kerowater and the Deming emulsion sprayer were illustrated as used in actual field work. Both have been employed in New Jersey on a large scale, with the results decidedly in favor of the Gould pump. The tendency has been of late years to the use of geared and power pumps. Geared machines for spraying potatoes are in profitable use in many places, and a number of farmers use geared machines in the orchard, where they are less desirable, because of the tendency to do superficial work. This is especially true where scale insects are to be reached, and it is necessary to direct the spray to the wood rather than to the foliage. Power pumps are in use on at least two farms where fruit is largely grown, and pictures of the machines in active service were shown. The objection to the machines now in use is their weight, and the consequent tendency to keep them moving constantly, which leads to imperfect work. A lighter engine, which could be mounted so as to be more easily drawn—if possible, by a single horse—would be more advantageous.

A long series of experiments was made with crude petroleum. Many were on the experiment orchard, by the Entomologist himself; others under his direction, or at his suggestion, by fruit-growers on a commercial scale. Pictures were shown of the experiment trees during the progress and at the end of the series of applications, showing definitely that winter applications of undiluted crude petroleum do no harm to peach, pear, plum or apple. These results are borne out by the orchard experiments. The effect of summer applications upon peach and pear were also exhibited, and it was shown that while the oil would cause a falling of the foliage, nevertheless a peach-tree that had been completely defoliated by a liberal use of the oil in May, showed in October as thrifty an appearance as any of the others that were untreated.

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A series of experiments with kerosene and crude petroleum in a mechanical mixture with water was also tried on a commercial orchard, with the view of controlling the San José scale, and this proved very satisfactory. In this connection it was stated that on the experiment orchard were several trees of different varieties that were infested when set out, and on which, despite of the fact that no treatment of any kind had been made, the scale had made no progress, being no worse at this time than two years ago, when the trees were first set out. The suggestion was that we might be able to find varieties that were actually resistant in all kinds of fruits.

Experiments were also made at Vineland on tulip trees, and pictures were shown of trees treated with crude petroleum and undiluted kerosene.

The effect of the scale agitation on the nursery business has been more marked than in any other direction, and most of the advanced nurserymen are now fumigating their stock before sending it out. Illustrations of the fumigating houses thus far erected in New Jersey were shown. The effort will be to secure the erection of similar houses in all nurseries in the State.

Among the unusual insect occurrences the injury done by a thrips upon peach nursery stock was especially marked, and illustrations of the insect and of the work that it did in a nursery were shown. This creature is especially injurious in dry weather, and its progress is usually stayed by a cold rain.

In all, sixty-six lantern slides were used to illustrate the lecture.

Dr. Byron D. Halsted, of the State Agricultural College, of New Brunswick, N. J., then delivered a lecture on "The Movement of Saps in Plants." (See address.)

The meeting then adjourned until 9.30 A. M., January 18th, 1900.

SECOND DAY.

Morning Session.

THURSDAY, January 18th.

The session was called to order by the President at 9:30 A. M., and was opened by prayer by the Rev. W. Strother Jones, of Trenton, rector of St Michael's P. E. Church.

The roll of delegates was then called, showing a very full attendance.

The Committee on Nomination of Officers reported that they had agreed upon the following nominations :

For President—Hon. D. D. Denise, Monmouth.

For Vice-President—Prof. E. B. Voorhees, Middlesex.

For Treasurer—William R. Lippincot, Burlington.

For Executive Committee—H. F. Bodine, Hunterdon ; Joseph B. Ward, Essex ; Walter Heritage, Gloucester.

No nomination for Secretary was made, the committee believing that no vacancy existed.

On motion, the report of the committee was accepted and concurred in.

The report of the committee being unanimously concurred in, the officers named were declared re-elected, and each, in a brief speech, accepted the same.

The report of the Tuberculosis Commission was then read, received, and referred to the Executive Committee. (See Report.) The Treasurer of the Commission presented his report, which was received and referred to the Executive Committee. (See Report.)

Mr. Lindsay, after some remarks, offered the following preamble and resolution :

WHEREAS, All wealth is the product of labor applied to the soil ;
therefore, be it

Resolved by the New Jersey State Board of Agriculture assembled,
That our members of the Senate and the House of Representatives,
now assembled at Washington, D. C., are requested to use all their
effort to relieve agricultural labor from the burdens now imposed
upon it.

The resolution was referred to the Committee on Resolutions.

Mr. Pancoast offered a resolution relative to the ballot law of the State, which was referred to the Committee on Resolutions.

The President—It is a great pleasure, gentlemen, to have with us ex-Governor Hoard, of Wisconsin, who has frequently addressed this Board, and he will talk to us this morning on "True Economy of Dairy Practice." (See address.)

At the close of Mr. Hoard's address the Board took a recess to
2.30 P. M.

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SECOND DAY.

Afternoon Session.

The meeting was called to order by President Denise at 2.30 P. M.

The Committee on Credentials then reported all organizations entitled to representation, represented, and only one absentee.

Mr. Cox, chairman of the Committee on Resolutions, stated that the committee reported adversely the resolution offered by Mr. Lindsley. The report was concurred in.

Mr. Cox—Your committee recommend the following resolution as a substitute for the resolution by Mr. Pancoast :

“Your Committee on Resolutions recommend that the Executive Committee of the State Board of Agriculture give close scrutiny to any bill or bills that may be presented to the Legislature looking to a change in the present election laws, approving only such as in their judgment will increase the secrecy of the ballot and tend to prevent bribery.”

The substitute was adopted.

The President—We have present with us Mr. John Gould, of Ohio, who will talk to us on “Cow Care and Dairy Sanitation for a Critical Market.” (See address.)

Mr. Dickinson then requested that the names and post-office addresses of the Masters and Secretaries of the various Granges in the State be sent him at once for publication in the Proceedings of the State Grange and the State Board Report.

Mr. Henry Comfort then made a few remarks relating to the work of associations of dairymen in his State.

The President—I will now call on Mr. Hoard, who is on the programme to talk to the Union on the oleomargarine question. (See remarks following address on “Dairy Economics.”)

A recess was then taken until 8 o'clock P. M., when the Board was invited to meet in the auditorium of the State Normal School.

SECOND DAY.

Evening Session.

The board met at the auditorium of the State Normal School, Trenton, N. J., and, owing to the ill health of President Denise, was called to order by Secretary Dye, who called on Prof. Green.

Dr. Green—Ladies and gentlemen, we have come to look at the gatherings of the New Jersey State Board of Agriculture as a sort of anniversary in our school life. The Secretary has asked me to say something to you. I can say little more than I have said on previous occasions, that the New Jersey State Normal and Model Schools are in thorough sympathy with all progressive educational movements. The tradition has been that the agricultural movement was one of those which was not necessarily educational, but we are very glad indeed that that attitude of the public mind has changed, and that it is coming to be recognized that agriculture, probably more than any other branch of industry, is dependent upon intelligence. Someone has said that the farmer at the present time has the greatest struggle in the competition with other lines of business. Certainly, wherever there is the greatest struggle there is the greatest need for intelligence, for intelligence is victorious in every battle that is waged.

We are sure, however, that agriculture appeals to more branches of science and more branches of learning than almost any other line. It certainly calls in the study of physics, botany and biology; it calls in all of the leading sciences, and, just in proportion as those sciences are received, and throw their light on the work of agriculture, just in that proportion does it flourish.

Our teaching force that is being prepared here is brought in sympathy with that great line of work. The aim is in our department of science to make that as practical as possible, and thus not only to dignify the industry but apply the science.

We want you to feel to-night that you are certainly most cordially welcome in this, your own institution, for this is an institution peculiarly of our State, dedicated to its schools and to its learning. We will always welcome you and hope you will enjoy yourselves here. I now have the pleasure of presenting Mr. Dye, the Secretary, who will have further charge of the meeting.

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Secretary Dye responded, and then introduced Dr. C. Hart Merriam, of Washington, D. C., Chief of the Biological Survey of the United States, who spoke on the mountains, glaciers, &c., of Alaska.

Dr. Merriam—I am not going to give you any formal or set lecture, and I am not going to talk to you about agriculture in Alaska, either present or prospective, and perhaps you will judge why for yourselves before we finish looking at the slides I shall show you. And I am not going to tell you about the Klondike or Cape Nome, or the great gold fields of Alaska; nor even about the fisheries, the great salmon fisheries and other fishing industries that are carried on there, and that will be carried on there for a great many years to come. They constitute one of the great sources of wealth of Alaska, but I shall tell you something about the coast region of Alaska as it is, as one sees it who has the good fortune to traverse it by steamship, and tell you something of its glaciers, of its volcanoes, of its mountains, of its fiords. In order that you may get a clear conception of Alaska I will first present a map of Alaska. All of you know that Alaska is our far-western possession, stretching so far into the Pacific that the westernmost limit, the island of Alto, is further west from San Francisco than San Francisco is from Boston.

The lights were then turned down and the lecture continued with the use of the stereopticon, Dr. Merriam meanwhile explaining the various views as they were thrown upon the screen, to the great enjoyment and instruction of the large assemblage which had convened to hear him.

THIRD DAY.

Morning Session.

FRIDAY, January 19th.

The session was called to order by the President at 9:30 A. M.

The Committee on Resolutions reported the following, and recommended their adoption :

WHEREAS, The power and influence of the State Board of Agriculture would be effectively increased if, upon occasion, they could receive the assistance of each County Board;

Resolved, That the State Board recommend each County Board to appoint a Legislative Committee, to co operate with the Legislative Committee of the State Board when that committee so desires.

WHEREAS, It has come to our notice that an effort will be made to pass a bill making it unlawful to dehorn cattle in our State; therefore,

Resolved, That Moorestown Grange, No. 8, respectfully solicits the State Board of Agriculture to use every effort to prevent the passage of such a bill.

The report was concurred in.

The committee also reported adversely upon the following resolution :

Resolved, That all resolutions presented to the Board shall appear in its printed proceedings, with its action thereon, unless the Board shall otherwise direct.

The reason given for such recommendation was that the supervision of the State Printing Board made its adoption needless.

Mr. Dickinson offered the following preamble and resolution :

WHEREAS, There seems to be a growing demand in some of the Western States and Territories for the irrigation of arid lands in such States at government expense ;

AND WHEREAS, If this is done, it will be virtually taxing the farmers of the non-arid land States to bring into competition against themselves such irrigated lands ; therefore,

Resolved, That the New Jersey State Board of Agriculture now in session is emphatically opposed to the irrigation of such lands at government expense ; believing that if such lands are to be irrigated it should be done either by private enterprise or by the States possessing such lands.

The same was adopted.

Mr. Ketcham moved that a committee of two farmers be appointed to represent this Board at the Pure Food Congress, in Washington, D. C. The motion was duly seconded and carried.

Mr. Evans, of the committee, reported upon exhibits as follows :

John Repp—A fine specimen of Gloria Mundi apples, very large.

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Horace Roberts—A specimen of "Turn of Lane" apples, well preserved.

One exhibit of yellow corn, also one of sugar corn.

John Oberly—Specimen of fine wheat, originated from White Mediterranean.

Ellis DeCou—Mammoth Asparagus, very large and fine, in glass can.

A. W. Onthank, of Vineland, Secretary Farmers' Protective Association—A specimen of sweet potato grown there.

L. W. Carman, Yardville—A sweet potato in bloom; a fully-developed flower; several of them clustered within one and one-half inches of the potato. A fine specimen and very unusual.

Henry E. Hale, Princeton—A diseased branch of plum tree.

Wm. Gill—Wheat-bran, adulterated with a lot of hulls and a variety of rubbish, such as stock-feeders have to contend with and pay for with the feed.

The President then introduced Mr. Warren W. Rawson, of Arlington, Mass., who delivered an address on "Greenhouse Production of Market Garden Crops." (See address.)

At the conclusion of the discussion following Mr. Rawson's address the President introduced Prof. Edward B. Voorhees, who spoke on "Origin and Development of Experiment Stations." (See address.)

The paper was, on motion, received and referred to Executive Committee, to be printed in the Annual Report.

Upon motion of Mr. Ketcham the paper of Mr. Dye on "Agricultural Progress and Profit" was referred, with the other papers, for publication in the Annual Report.

The President then appointed as delegates to the Pure Food Congress at Washington, March 7th to 9th, John T. Cox, of Hunterdon, and Hon. Charles Wright, of Burlington county.

Governor Hoard, upon request, then made the following address :

Mr. President, Gentlemen of the Convention—It seems to me it would have been more proper for me to have said yesterday that this was positively my last appearance on this stage. But I shall not meet with you again for some time, and some time or other we have got to lay down our bundle and take our rest, and we are all cheerful about it; and the main proposition everywhere—whether we live in Wisconsin or live in New Jersey, is to live as useful a life and as helpful

a life, and one as promotive of the objects of the civilization that surrounds us, as we possibly can.

In my remarks to you I may have at times appeared to you to be somewhat radical, but my effort has been to challenge thought; not that I would instruct you, but that, if once your thought is awakened, you will be led in the direction of truth. I do not propose to assume that I am a repository of the truth, but this much I do know—that where men engage in constant thought along certain lines there may be opened to them a vision, as was given to the prophets of old. They saw the truth as it should be in Israel, and so for us in agriculture, and so everywhere.

I read from the enunciations of Christ this wonderful utterance to men, "Except you become as little children, you shall in nowise enter the kingdom of heaven." And I see in it a broader philosophy than that in which the theologian would clothe it. I ask myself the question, did He mean, except as ye become as ignorant as a little child? No. Did He mean except ye become as innocent as a little child? No, not that. What did He mean? Except ye become as teachable as a little child ye shall in no wise enter the kingdom of heaven, and He might with equal propriety have said, Ye shall in no wise enter the kingdom of agriculture, nor the kingdom of mathematics, nor the kingdom of any human acquisition of knowledge; and so to me comes with constant force the idea that the longer I live the more teachable I ought to be.

I have been requested to tell you a story. I don't know whether I ever told you a little incident connected with my old German friend Karl Muller or not. No matter whether I did or not, I cannot afford to tell a new story always.

During my army service I had for a comrade one of the sweetest-hearted old Germans that I ever knew—a man as guileless as a child and as unthinking of evil; as brave as a lion, and as sweet-hearted a man as ever you knit to your heart—and the comradeships and friendships that are forged on the field are almost indissoluble.

About three weeks after my inauguration as Governor of Wisconsin I looked up one day from my chair, and there stood in the door-way before me Karl Muller, this old German, standing erect, at attention. I was delighted to see him, and said: "Helloa, Karl! Come in," and he walked in with a very grave air and walked up to my table and said to me: "You know me? You know who I was?" Well,

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it hurt me to be asked such a question by him, and I said: "Why, God bless your brave old heart, what do you mean? Why do you ask me that question?" And he brought his fist down on my table with a tremendous thump that made every penholder dance around there, and he said: "My God! I tell them you know me; I tell them you know me." And I saw instantly the meaning of it. Some of the gallots around there had told him that I would not know him, and he came forty miles to see whether politics had changed the heart of his old comrade.

Well, when his status was assured, he saw that everything was straight as it had been, then his humor, which was a very gentle and delightful humor, was aroused, and he put his finger up to his nose in the old German sententious way, "You know" he said, "we sleep with the same blanket." "Yes, Karl I remember that, and sometimes I got your share." "Sure, sure," he said, "I wake up that way, but then," he said, "may be better you say nothing about that blanket business." Well, I watched him; thinks I the old man is still busy with the apparent disparity, and I said, "Why Karl, do you think I am ashamed of it." "No, no, not that; but don't you see if that gets out and everybody hear from that blanket business that everybody will want to sleep with me." (Laughter and applause.)

Well, I said, "Karl you must go home with me." "What, go by the big house, oh no." I said, "There is no house, Karl, too big for you and me; my wife never saw you and she has heard me tell of you many times." "All right, I will go." So I invited him and Senator Viles and Judge Cassidy, and a whole lot of the men who live there on the hill, and they voted they never had such a delightful time in their lives as they had that day in the presence of that splendid old man who was entirely guileless of the sin of self-consciousness. He never bethought himself whether he was before the President or before any man, he was Karl Muller, standing right out always, giving things in his own way and shape, and so he went on and described his varying fortune. He had been a soldier fifteen years in the German army, and all that. In the night there came a snow-storm, and in the morning he came down to breakfast and looked out of the window, and shook his head deprecatingly, "Oh, that is a bad thing." "What is a bad thing, Karl?" "That snow; don't you see that snow?" "Yes, but what is so bad about that?" A beautiful thing with him was the

rare affection which existed between him and his old Frau Lucetta, and they both were as tender of each other as though they had been boy and girl. "Well," he said, "all my life long my good Frau Lucetta she care for me just like I be a baby, and when she see that snow, then right away quick come pain to her heart, and she say, 'Where is my Karl, old fellow he be, pretty much old fellow, maybe he be in a snow-drift, he be lost; I see that, and feel that I must go right away, and that feeling from her heart take out—I will do something.' 'What will you do?' 'I will go by the telephone, and when I get the telephone I will say, 'Give me Lucetta by telephone,' and when I get Lucetta I will say, 'Hello, Lucetta, don't you be scared of me, I sleep with the Governor.'"

It is some of these little fresh and delightful exhibitions of human nature uncorrupted, among all these contentions of life, that, like the violets that bloom by the wayside as you climb the mountains, in their own chosen little nooks, surrounded by Alpine scenery, yet bloom there by themselves, that reward us abundantly if we have eyes to see them and hearts to hear them.

I am glad once more to have met you, my good friends; I want to commend you and congratulate you upon the growth of sentiment, and the growth of progress, and the growth of feeling, and the growth of conviction and encouragement which is manifested to me from the time I first met you until this time. There is an increase in New Jersey, I can see plainly, in the spirit and pride of the avocation, the grandest and best avocation on earth—that of the farmer. (Applause.)

Mr. Ketcham—I desire to say just a word. It has been the general expression of all members that this has been one of the most profitable as well as one of the most pleasant meetings that the board has ever had. I know gentlemen, perhaps more than most of you, the work of the Executive Committee, and the work of the Secretary and President in making arrangements for this meeting, and I feel that it is due to them that we give them a special vote of thanks for the efforts that they have put forth for our welfare and the success of this meeting. I move that a vote of thanks be extended to the Executive Committee, Secretary and President for the efficient manner in which they have provided for the success of the Board of Agriculture.

The motion was seconded and carried.

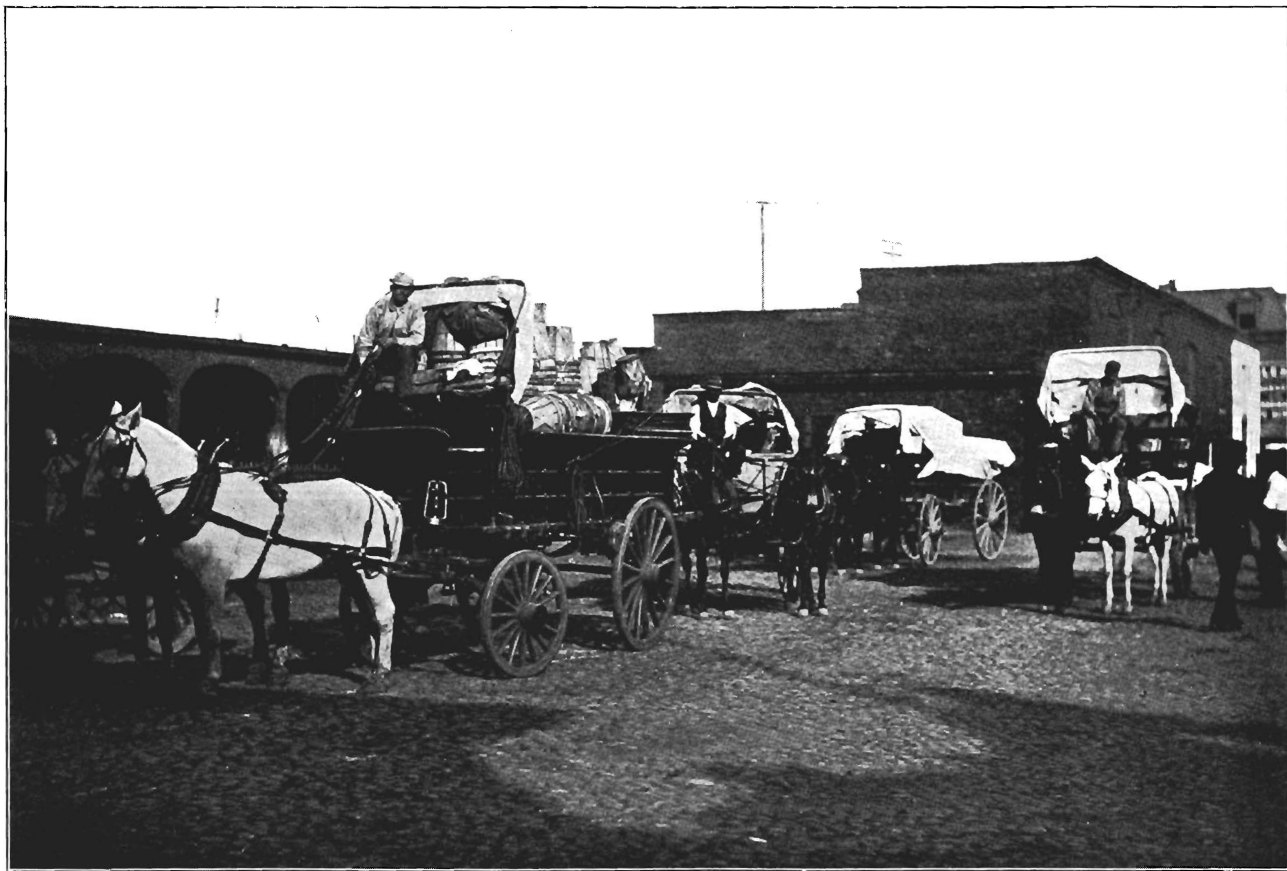
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Mr. Ketcham—Gentlemen you have the thanks of the Board for the efficient manner in which you have performed your duties.

Mr. President—We thank you gentlemen. Our meeting here has been so pleasant and instructive that I almost feel like not declaring it adjourned, but the time is up and I now declare the twenty-seventh annual meeting of the New Jersey State Board of Agriculture adjourned.

FRANKLIN DYE,
Secretary.



CARTING FARM PRODUCE TO THE PHILADELPHIA MARKET.

During Summer and Autumn 1,500 Teams, loaded with New Jersey Fruit and Produce, cross the Camden and Gloucester Ferries, daily, into Philadelphia.

Report of the Secretary.

The farmer's chief business is the cultivation and improvement of the soil for the production of such crops as may to him seem best for his purpose. Of the total acreage in New Jersey reported in 1850, which was 2,752,946 acres in farms, there has been a steady encroachment during the five decades to date by cities, towns, parks, railroads, &c, amounting to 90,937 acres, making the total at this date about 2,662,009 acres.

There was, in 1850, a total of unimproved land in the State of 984,955 acres. By underdraining, clearing, and, in general, improved methods of agricultural work, the farmers have reclaimed 322,063 acres of this; so that there is now, of what may be called unimproved land, which is mostly wooded, but 662,892 acres included in farm areas.

The uses to which these 1,999,117 acres of improved land are devoted are perhaps more varied in New Jersey than in any other eastern State; that is, there is a greater variety of crops grown for market purposes. Crops that are grown in other States only for the farmer's family are in New Jersey produced as a money crop. This is due to the favoring climate, peculiar to this State, and the millions of consumers engaged in other callings so near to and within our borders.

Estimated annual product of the farms of New Jersey, by census of 1890, is \$28,997,349.* This sum, divided by the total number of farms, gives a return per farm of \$940 annually, and a yield per acre for each farm of \$10.93. This calculation includes all the land comprised in the farm. If the wood, natural meadow and waste lands are deducted the average yield per acre for the improved land would be somewhat greater.

On the basis of the census of 1880, the product per acre in New Jersey was \$10.26, being \$2.81, at that time, higher than in any other State, and the present calculation shows that New Jersey farmers are

* See tables at close of this report.

maintaining their position as leaders in progressive agricultural work. And I may say, from careful observations throughout the State, that, as a class, the farmers of New Jersey are improving in knowledge of the requirements of their diversified business, and, under intelligent management, the important industry of agriculture is advancing to greater productiveness.

The State Experiment Station work, as carried on under its efficient corps of professors, has contributed, in a very positive way, to the farmers of the State essential fundamental knowledge necessary to intelligent farm practice and profitable returns.

Another helpful agency in this particular is the Farmers' Institutes, arranged and conducted under the State Board of Agriculture law. While they are largely the farmers' winter school of methods, they also give opportunity for our professors of the Experiment Station to present the more scientific questions of agriculture, with which they are experimenting each year, to the farmers in person. Thus, by personal contact, questions are asked and answers given of great *immediate* value, which, without this agency, might be a long time in reaching so many farmers and so effectually.

For the present fall and coming winter thirty such meetings have been arranged for in eighteen of the twenty-one counties. An increase in the appropriation of one thousand dollars would enable the Board to hold fifty such meetings--three in each of the larger counties and two in the others. Such appropriation would pay the State. Agriculture is a productive industry, and by such means our farms would increase in productiveness and taxable value and the exports of our products be much greater.

The annual meeting of the State Board, held at the State House in January, has grown in popularity and usefulness each year. Three days are now required for the transaction of its business, and the papers and addresses are from the most advanced practical students of agriculture, stock management and dairying available. These papers, printed in the Annual Report, have a permanent value, and go to the farmers of the State for reference and study. We have on file numerous strong testimonials as to the value of these reports.

A majority of the County Boards of Agriculture hold regular meetings three or four times a year, and consider local questions of interest connected with their work. The State Horticultural Society, which annually draws three hundred dollars from the appropriation of the

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State Board, holds one meeting each year, which is chiefly devoted to matters connected with horticulture.

Formerly the Executive Committee of the State Board of Agriculture was required to pass upon its report, which was bound in and circulated with that of the State Board, but of late years the society has issued its own report. The society is doing good work for the industry it represents.

It would be a highly valuable contribution to our knowledge of the resources, yield and annual earnings of our farms, market gardens, greenhouse crops, orchards, dairy cows, poultry, etc., could we give, from correct, itemized returns, such a statement. I earnestly hope the Legislature will give the State Board of Agriculture authority to collect, through the assessors, possibly, such information annually, such returns to be tabulated by this office and presented to the Governor and Legislature at the close of the agricultural year. The cost would be small; the facts obtained highly valuable. Why not know the returns of our agricultural interests as well as those of our mines and manufactures? The United States Department of Agriculture does not collect this information. Their investigations are confined more especially to the heavier crops. New Jersey is each year becoming more and more a horticultural, market-garden and dairy State, and to place ourselves, as a State, in our rightful place as in comparison with other producing States, the annual yield and value of the products of our farms should be published. As intimated in a previous report, "such knowledge would be of great value in attracting to our State worthy settlers seeking farm homes."

We have conclusive evidence that farming lands hundreds of miles west of New Jersey, and not nearly so well located as to market facilities, are held at and command a higher price than do the highly improved, near-the-markets farms of New Jersey. Buyers do not know the advantages this State has to offer them in the cheap and highly-improved farms, best markets on every side, transportation facilities, school opportunities and social privileges.

Railroad facilities are unexcelled. No spot in the State, it is believed, is more than seven miles distant from a railroad. The advent and extension of stone roads is another advantage of exceptional value to all producers; and to those who grow quickly-perishable products, particularly so. A large load can be easily and quickly transported to the place of sale without delay or injury.

For trading and for social, school and lecture advantages our increasing trolley or electric roads add another to the many inducements enumerated. All which should have great weight in determining a man's choice in the selection of a home, whether he intends to cultivate the soil for a living or seeks only a place of residence. Great emphasis is attached to the prodigious crops of wheat and corn produced by some of our Western States, and justly so. These crops come within the annual tabulation of the United States Department of Agriculture. Ours, of another character, but equally great, considering the size of the State, are not.

CROPS AND PRICES IN 1899.

Climatic conditions that are favorable to some crops may not be to others, so that it is rarely possible to report equal prosperity to all in any single year. The year 1899 has not given our farmers that degree of increased profits from their work that seems to be favoring other industries. And for the reason, chiefly, that farm products have not advanced in price in a proportionate ratio to the advance in others.

Milk has not advanced in proportion to the increase in price of milch cows, beef, and the necessary cattle feeds. Poultry has not increased in price in proportion to the price of meats, and wheat is slow in leaving the low prices received prior to 1897. Dollar wheat means an addition to the wheat growers' income in New Jersey—over present prices—to the amount of \$1,000,000 annually.

Early fruits were so low in price as to scarcely pay for gathering and marketing. The winter varieties yielded a profit, and there were some Keiffer pear orchards that gave their owners a phenomenal profit. The severe and widespread drought of early summer reduced the hay crop to forty per cent. of a good yield, and potatoes to about fifty per cent. The loss to the farmers of New Jersey on these two crops alone will exceed \$2,000,000. Pastures and market-garden crops and berries were also affected by the drought; and yet there were some crops, in locations with near-market facilities, that gave good returns, and such farmers are pleased with their year's work.

There have been years when the farmers in general have fared much better than during 1899, and yet few are they this year who have not received a living profit for themselves and families. To the

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question sent from this office—"Has the past year been more or less prosperous than 1898 for the farmers of your section?"—the answers are about equally divided. A part say "more prosperous"; the others, "less prosperous." Should the general prosperity in other industries continue, it is my belief that farmers will soon receive increasing profits from theirs.

The keeping of sheep and the production of lambs and wool for market is a branch of the farming industry sadly neglected by the farmers of New Jersey, and one that, in my judgment, offers exceptional opportunities for increasing the revenues of the farm in sections of the State adapted to this business.

Complaints are made in localities devoted almost exclusively to grain and grass (hay) production, and to milk production at creamery prices, that these products do not pay. A further complaint is that corn and oats are so low it does not pay to grow and sell these crops and buy fertilizers to maintain soil fertility. For such the sheep, if properly handled, offers a solution to the question with profitable returns and in several particulars.

First—The direct profit to be made from the lambs and the wool; second—the manufacture on the farm of the cereals, hay and other fodder crops into mutton, lambs and wool, and thus solving, to a large extent, the fertility problem by retaining the plant-food contained in said crops on the farm, instead of selling it off in the crop; third—if properly handled, sheep will soon overcome the increasing nuisance of weeds of every sort that are crowding out the valuable grasses, robbing cultivated crops of plant-food and moisture, disfiguring fields, orchards and roadsides, and generally reflecting adversely on the reputation of the farming community where they are allowed to grow and propagate themselves without restriction.

VARIETY OF CROPS FOR THE GENERAL FARMER.

My own theory (and practice of agriculture for forty years) is to lay the farm under tribute to produce in variety all it is capable of doing each year, having always due regard to the demand for such crops and my ability to care for them with the means at my command. Thus attention was given to the raising of horses, cows, swine, while caring for all provender crops carefully. Young stock can be brought to maturity at little expense, and the time always comes when a good

horse, cow or other animal will command a paying price. With horses and cows the experience of the past two years justifies this practice. And for one's own needs it is usually more satisfactory to have ready, when needed, stock to take the place of that that must be disposed of.

THE FOOD, DRINK AND DRUG QUESTION.

The question of food adulteration should be followed up and the mixers compelled to honest dealing or be driven out of the business. The abomination is everywhere. It affects nearly everything usable by man and beast.

The time is ripe for concurrent State and national legislation. Public sentiment is directed to it and in favor of it as never before. Two insitments are prominent in the contention by those who seek common justice :

First, that all human foods, drinks, drugs and condiments, and all domestic stock feeds, shall be unmistakably labeled and branded according to the constituents in their composition and by whom made. Second, that absolute poisons shall be excluded from all foods, drinks and condiments ; guilty parties to be punished by heavy fines and imprisonments.

We must have law to deal with fraud. Law that is plain, that means something, that goes straight to the mark, and then law enforced. The question of State and inter-state and of national jurisdiction should be made as clear as the light. No legal quibbling should be allowed to hinder the suppression of this abomination. It is a crime against the producer of straight goods and the consumer who spends his money (and with millions of laboring men it is hard-earned money) for what purports to be pure but is too often a cheap counterfeit, which, in many cases, is injurious to health also.

Under existing conditions it is a race with the adulterators who can make the cheapest compound. The meetings of the National Pure Food and Drug Congress held in Washington, D. C., during the last two years are bearing fruit. The National Congress is giving this question serious attention. The Senate appointed, at its last session, a special committee to investigate the character and extent of adulterations. Most important and valuable facts are being collected and will be reported to the Senate. The sentiment of those who

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desire legislation on this question seems to be crystalizing in favor of the Pure Food Congress bill, known as the Brosius bill.

The Pure Food Congress will be convened in Washington for the third time on March 7th, 1900. In my judgment, a committee from this Board should be appointed to attend that meeting. But we should do more. This same committee, or another, should be appointed with power to investigate this question, as it relates to the farming and dairy interests of the State of New Jersey and the consumers of farm and dairy products, and to secure, if possible, such legislation as will cope with and control all fraudulent transactions affecting the interests named.

To call off the list of adulterated articles would be a tedious undertaking. Those affecting dairy products will naturally first claim your consideration.

FORESTS, WATER-SUPPLY AND SEWAGE.

From time to time reference has been made in this report to the forest question. I would not refer to it again in a general way did I not feel that farmers have a deep interest in it. Small streams by the thousand throughout the State have been denuded to their banks of all wood and small growth. Soon, after light rains, these become dry.

If trees exhale moisture, then by that much is the atmosphere dryer in the growing season where groves of trees are gone than it otherwise would be. Allowing these smaller and larger slopes to remain wooded, the outflow of such streams would usually be steady and continuous, and the volume and discharge of the larger streams and rivers would be similarly affected.

Furthermore, such little groves here and there—and every farm should have its share—afford a nesting-place and protection for insectivorous birds. Birds like a home-place to which they can migrate year after year to rear their families. Without this, we need not expect them to assist in the great work of controlling the hordes of injurious insects now so destructive to garden and fruit crops.

The wood and timber question seems to be considered of little value by farmers at present; and yet it is evident that many acres now cleared had better be replanted with locust, chestnut and other desirable trees. Where the former variety will grow it will yield, when ready to harvest, a nice profit for each year it has occupied the soil.

Cities are so greatly interested in the question of an abundant water-supply they might well take the initiative in securing legislation to encourage forest growth and protection. It has been suggested that well-kept forest lands should be exempted from taxation.

With plenty of water, the next need is *pure* water. The way our streams are being polluted by the discharge of factories and city sewage is a reproach to our intelligence—streams, too, on which millions of people are depending for their daily meed of water. The Schuylkill river as a water-supply is a reproach to the wealthy city that uses it, and all the more as, each year, hundreds of lives are sacrificed owing to its unhealthful condition.

Our own Passaic has become a by-word. The righteous demands of the people adversely affected by its condition should be heeded.

Says "Good Housekeeping": "Forty cities and large towns, more or less, empty their filth into the Connecticut river, yet some of them are now facing the inevitable bringing of this water into their homes and public buildings for general use." Rivers and streams of less volume have been made general sewers for the communities through whose borders they flow. Is this right?

I have referred to the Passaic. But numerous other streams throughout our State, otherwise beautiful, are made the receptacle of every polluting substance. This all finds its way, and sometimes with death-dealing power, to the larger streams from which so many thousands must take their water-supply.

Every public-spirited citizen should take an active interest in some phase of this general question. Science has done much in showing people how to live healthily. Can science solve the very important problem of reducing to a dry concrete form city waste and sewage, and in such condition and cost that it may be returned to the soil where it belongs?

Even now the dumping-ground of the garbage of New York city, in the vicinity of the harbor, has produced such a condition that it is regarded as impossible for any war ship to get within three miles of the metropolis without running aground, so great is the deposit. A singular military defense, indeed.

And New Jersey is affected by this pollution. Our seaside resorts as far south as Ocean Grove are, at times, unfit for bathing purposes because of floating debris. The amount of money annually expended at our seaside resorts and the excellent market afforded our farmers

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incident thereto, are of so much value to our people we cannot afford to have these resorts become unpopular.

The main question of forest area and water supply will be set forth by Mr. Vermeule at this meeting, to which attention is invited.

THE TREND CITYWARD.

There has been much said and written in recent years concerning the tendency of rural populations to migrate to the cities. The fact, by some, has been deplored. It is not certain, however, that our agricultural population is absolutely decreasing; but it is true that it is not increasing in proportion to the increase in the general population.

In 1840 about 75 per cent. of the population of the United States was agricultural. In 1880, 50 per cent. of the male population, engaged in gainful occupations, was employed in agricultural work; in 1890 this population had declined to 44.28 per cent. Possibly the next census may show a still further decrease.

This tendency to urban rather than to rural life is not confined to the United States. The population of the German Empire showed an increase, from 1882 to 1895, of 14.48 per cent. During those thirteen years the gain in the larger cities was above 30 per cent. The total increase, not only in the population, was absorbed in such business as centered in the towns, but the country population contributed to this increase also.

It is apparent that this tendency to seek occupation in the cities decreases the number who are engaged in producing the world's food-supply. The inference would naturally be that, with the increasing population of consumers of food who are not producers, the price of food-products would rapidly advance. But conditions as they have and do now exist do not sustain such inference. Superabundance in production is quite as great in agriculture as it has been in other industries, if not more so.

It must be, therefore, that the lesser number of agricultural workers, as compared with the population in other callings, are, by improved machinery and implements, by better understanding of the requirements of soil and stock and by more intelligent methods, producing in increasing ratio above old-time methods, and in excess of

the actual demands of the non-productive hosts of consumers, at such prices as farmers consider profitable.

It is clear that a much smaller proportion of the population employed on the land—the basis of all industry—is sustaining a very much larger proportion of the industrial population engaged in other pursuits. How long this condition and tendency of population to the cities will continue none can tell. But, so far, it has not been detrimental to farmers as a class.

What the effect on the individual and family life to those who leave the country for the city will be does not seem to be considered now more than in Lot's time. It is highly probable that this movement will not be checked until prices of farm produce advance to such an extent as to promise greater pecuniary profits to capitalists and manual laborers than do other callings.

RURAL FREE MAIL-DELIVERY.

This board is to be congratulated on its early and persistent advocacy of free rural mail-delivery. In 1892 a resolution was presented by Mr. Ebert favoring the system and asking Congress to aid the same. The resolution was adopted, and a special report was also presented thereon.

In 1893 the subject was again presented by Mr. Thos. J. Beans, who offered a resolution in its favor, also adopted. At the meeting January, 1894, special attention was given. President Burrough, in his annual address, spoke heartily in its favor and referred to personal efforts he had put forth in that direction.

The Executive Committee of the Board also mention the same in their report, and Mr. Thomas J. Beans presented a valuable paper at the session, in which he brought out the advantages to be derived from rural mail service.

In 1895 Mr. Brown, in an address, claimed that the country should have free mail-delivery as well as the cities, and W. M. John T. Cox, in making report from the State Grange that year, advocated its early adoption. At the session of 1897 our esteemed friend, whom we may call the apostle of free mail-delivery, Mr. Beans, again addressed the Board, advancing strong arguments in its favor; and we sincerely trust that he may live to see the mail daily left at every farm throughout the State.

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Last year Worthy Master Braddock reported the farmers were still in favor, and that experiments already made in that line warranted their extension.

In the report of First Assistant Postmaster General Heath, November, 1899, in speaking of the great advantages of the new system, summarizes as follows:

“There has been nothing in the history of the postal service of the United States so remarkable as the growth of the rural free delivery system. Within the past two years, largely by the aid of the people themselves, who, in appreciation of the helping hand which the Government extended to them, have met these advances half way, it has implanted itself so firmly upon postal administration that it can no longer be considered in the light of an experiment, but has to be dealt with as an established agency of progress, awaiting only the action of the Congress to determine how rapidly it shall be developed.

Advantages of the Service.

“The facts hereinafter set forth, with some elaboration of detail, which the importance of the subject seems to me to warrant, will, I think, demonstrate ‘that the free delivery of mails in rural communities can be widely extended with great benefit to the people and with little cost to the revenue.’

“That whenever the system has been judiciously inaugurated with a sincere purpose to make it a success, it has been followed by these beneficial results: First, increased postal receipts; more letters are written and received; more newspapers and magazines are subscribed for. So marked is this advancement that quite a number of rural routes already pay for themselves by the additional business they bring.

“Second. Enhancement of the value of farm lands reached by rural free delivery. This increase of value has been estimated at as high as \$5 per acre in some States. A moderate estimate is from \$2 to \$3 per acre.

“Third. A general improvement of the condition of the roads traversed by the rural carrier. In the Western States, especially, the construction of good roads has been a prerequisite for the establishment of rural free delivery service. In one county in Indiana a special agent reports that the farmers incurred an expense of over

\$2,600 to grade and gravel a road in order to obtain rural free delivery.

"Fourth. Better prices obtained for farm products. The producers being brought into daily touch with the state of the markets, and thus being able to take advantage of information heretofore unobtainable.

"Fifth. To these material advantages may be added the educational benefits conferred by relieving the monotony of farm life through ready access to wholesome literature; and the keeping of all rural residents, the young people as well as their elders, fully informed as to the stirring events of the day. The moral value of these civilizing influences cannot be too highly rated."

Mr. J. M. C., under date of November 22d, writes in the Ledger:

"The Post-office Department is most thoroughly enlisted in a campaign for the extension of rural free delivery, a subject which was first brought into prominence by Postmaster-General Wanamaker during his intelligent and efficient administration of the Post-office Department. First Assistant Postmaster General Perry S. Heath believes that the system will in the end not only prove thoroughly satisfactory to patrons of the Department, but will be found to be economical because by its extension a large number of fourth-class post-offices can be abolished. In a carefully prepared statement for the press, Assistant Postmaster General Heath declares that out of the fifty experimental rural mail service districts to which inquiry has been sent requesting information as to the results, from every one has come back the answer 'favorably.'

"You can take up any district, almost at random, says Mr. Heath. There is Lancaster county, Pa., for instance, where there are nearly 150 fourth-class post-offices, every one of which could be abolished if rural free delivery were put into effect throughout the entire county, and the indications are, judging from the results obtained in the two experimental routes established in that county, that in a year or two the increase of postal business would pay for the increased facilities."

Advantage of Rural Free Delivery.

The Assistant Postmaster General, after discussing the saving in salaries of postmasters and of star routes which would result from extension of rural free delivery, says that such estimate does not take

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into account the inevitable growth of postal receipts, which has followed increased postal facilities wherever they have been provided.

"This is not confined," he says, "to the rural free delivery service. We put letter-boxes on all the street cars of Des Moines, Iowa, and the amount of mail handled by the office nearly doubled. We started an experimental postal marine service on the Detroit river for the benefit of passengers and sailors on the lake steamboats, with the result that nearly 200,000 pieces of mail matter were handled in this way during last season at a cost of less than \$800 a month.

"Postmaster-General Wanamaker gave free delivery a test in some forty or fifty villages, and demonstrated that the increased business not only paid the extra cost, but yielded a small profit."

In no other State do better road conditions exist for free rural delivery than are found in New Jersey. Farmers not only, but all rural residents, should unite and bring their influence to bear for the extension and perpetuity of this function of the Government. It is our Government; the demand is just—it will pay both the service and the people. No good reason can be adduced for its discontinuance.

Farmers take an active interest in State affairs. They regard with disfavor any legislation that encroaches on what they believe to be their rights. Our code of game and fish laws they consider of this class. Many of them are not reconciled to the innovation so lately made into our time-honored district school system, believing the old method was nearer the people and more effective in essential results to the child. They are suspicious of legislation that increases taxation without good cause shown, and hail with gratification any project that promises relief from present requirements. Thus the appropriation from the State's income of \$100,000 to reduce the school tax is welcomed.

In national matters they are wide awake. Schemes for the irrigations of our arid public lands at Government expense they are opposed to, and, if they were called on to vote on the question whether the Government should not cease practically giving away our remaining public lands, as is now being done, they would vote No. Some portion of it should be reserved for years to come, that the descendants of veterans in our wars may have a chance at Uncle Sam's land.

They are in favor of free rural mail delivery, believing that farmers have equal rights with other taxpayers to Government favors. I believe they would favor (my personal view) the building of the

Nicaragua Canal, approve favoring legislation to an increase of the American Merchant Marine and a submarine cable through our Pacific possessions to Asia. Believing these enterprises would enlarge Asiatic markets for American agricultural products and greatly increase American prestige in that part of the world.

The Farmers' National Congress, held at Boston, October 3d-10th, was well attended. New Jersey had the second largest delegation—thirty delegates. The State was honored by a request for an address by Prof. E. B. Voorhees, and also the Secretary of this board. The Congress discussed many questions relating to the agricultural interest of our country. What effect these discussions and the resolutions passed may have on State or National legislation is problematical.

Table showing acreage, production and value of corn, wheat, rye, oats, buckwheat, hay and white potatoes produced in New Jersey in 1899, with also number and value of farm animals. Furnished by request by United States Department of Agriculture, division of statistics, Hon. John Hyde, Statistician, with the exception of the estimate of milk production.

Crops.	Acreage.	Average yield per acre.	Production. Bushels.	Average farm price per bu. Dec. 1st.	Farm value Dec. 1st.
Corn	254,816	39	9,937,824	\$0 40	\$3,975,130
Wheat	123,370	14.5	1,788,865	75	1,341,649
Rye	66,719	15	1,000,785	55	550,432
Oats	95,193	24	2,284,632	33	753,929
Buckwheat.....	10,422	21	218,862	56	122,563
Hay.....	392,191	.83 tons	325,519 tons	15 35 ton	4,996,717
White potatoes.....	47,955	83	3,930,265	51	2,029,935
Total value.....					\$13,770,355

Stock.	Numbers Jan. 1, 1900.	Average price per head.	Values.
Horses	79,972	\$72 88	\$5,828,258
Mules	7,196	94 48	679,883
Milch cows.....	223,261	39 10	8,729,505
Other cattle.....	39,896	30 70	1,224,982
Sheep	42,722	4 34	185,584
			16,648,212

Total value..... \$30,418,567

Assuming that the annual product per cow is 1,600 quarts, and making the average price two cents per quart, would give us

357,717,600 quarts, value..... \$7,144,352

Total value of the above crops for the State..... \$37,562,919

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As it will be seen, the above list does not include poultry, fruit, market-garden and greenhouse productions.

CRANBERRY PRODUCTION.

The cranberry industry of the State of New Jersey is large. By permission of the Secretary of the American Cranberry Growers' Association, Prof. A. J. Rider, I present a portion of his report for 1899, made January 1st, 1900:

It seems to me that there has never been a time when the necessity for closer organization and co-operation among growers was so apparent as at the present.

We have just sold a short crop of berries, not only without profit, but with actual loss to the producer, which I am prepared to prove.

Whether it was necessity or ignorance that brought about this result would be a good subject for debate. When a man sells for \$1.25 what he thinks has cost him \$1, he is well satisfied with himself. When he learns after that the actual cost was \$1.50 and that he is consequently out 25c. on each article sold, and discovers that he might as well have received cost and a fair profit, he is not so well pleased.

This fairly represents the average cranberry grower at this beginning of the end of the 19th century.

He has heard and said so many times that a bushel of cranberries can be grown and delivered in market for \$1, and that a 10-acre bog is equal in productive capacity to a 100-acre farm, that he has come to accept both as truths, and believes them, while as a matter of fact both are wide of the truth.

It is not at all improbable that cranberries have been produced under favorable conditions for \$1 per bushel and even less, or that a 10-acre bog may, under favorable conditions, have produced as much or more than a 100-acre farm. But it must be remembered on the other hand that there are other circumstances wherein the cost of growing a bushel of cranberries is \$2 per bushel, or more, and where a 10-acre farm will out-produce a 100-acre cranberry bog. By taking neither of these extremes do we acquire any real knowledge of existing conditions. By taking all the conditions and all the results and striking an average, we have what may be termed a reliable basis for calculation.

It will pay us to look into this matter more carefully than we have heretofore done. As the larger portion of the cost of placing a bushel of cranberries in market is made up of actual cash outlay, it should not be difficult to arrive at this portion of the cost with near approach to accuracy. For the sake of clearness and the better opportunity for criticism, I shall divide the subject into three parts or heads.

- 1st. Harvesting expenses.
- 2d. Market expenses.
- 3d. Productive expenses.

You will observe that I have reversed the natural order, but this is for convenience, as you will see, and that the separate items are not extremes either way, but averages made up from figures by others and confirmed by my own experience on three plantations.

1. *Harvesting expenses—*

Picking, per bushel.....	.40
Supervision.....	.05
Carting to store-house.....	.01

Between the picker's bushel and the market bushel there is a shrinkage of from 5 to 15 per cent., varying according to time of marketing and condition or keeping quality of the fruit. I place the average at 10 per cent.; therefore the expenses named above represent $\frac{9}{100}$ of a market bushel; hence we must add for shrinkage $\frac{1}{100}$ or .05, making total harvesting outlay for one market bushel..... .51

2. *Market expenses—*

Box or barrel.....	.10
Assorting and packing.....	.07
Cartage to station.....	.03
Freight.....	.07
City cartage (New York, .03, Philadelphia, .02).....	.02½
Commission 7½ per cent.....	.10½

Total market expenses41

Making a total cash outlay per bushel..... .92

Now we come to the third item or *Productive expense—*

While it is not possible to arrive at this item with as great accuracy, we have the data from which we can arrive at an average with a fair degree of accuracy.

First—There are estimated to be in New Jersey 5,000 acres of bearing cranberry vines, representing an investment or cost of \$1,000,000, or an average cost of \$200 per acre. (French, in his report of 1876, placed the acreage in New Jersey at 5,000 and the value at \$1,750,000) Since that time, I believe as many acres have been abandoned as added, and valuations have shrunk in proportion as cost has been reduced. This cost may be verified by the experience and observation of any successful cultivator of this fruit.

For instance, if all conditions are favorable—for example, cheap land, ready cleared, easily drained, inexpensive dams and flood-gates and cheap vines—the cost may be kept down to a minimum of \$100. As we depart from these naturally favorable conditions the cost is increased from one to \$500 per acre; hence we conclude that \$200 is rather below than above the average cost of an acre of producing cranberry vines.

Second, these 5,000 acres, according to the best information we have, produced last season 250,000 bushels, or an average of 50 bushels per acre.

From these we have a basis for computation of interest on capital invested and as to average product.

To arrive at the other items it will be necessary to take as an example an average plantation of, say 50 acres, representing a cost of \$10,000.

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First, there must be employed a foreman or superintendent at a minimum cost of	\$400 00
Additional labor in cleaning bog, ditches and repairing dams, also a minimum estimate.....	400 00
Incidental expenses, taxes, insurance, &c.....	200 00
Total.....	\$1,000 00
Or per acre.....	20 00
Add interest on capital, 6 per cent.....	12 00
Gives total per acre.....	32 00
Or per bushel.....	64

Some may claim that they can reduce this cost by economizing these labor items, but I conclude after 25 years of experience that any effort at economy in this direction is piling up trouble and discounting future profits.

It is also claimed by some that this acreage is too small and that the per acre average would be more nearly 30 bushels. Admitting this and that the aggregate crop is practically correct, the showing would be far more disastrous than I have made it.

To sum up the cost we have the following :

1. Harvesting expenses.....	51
2. Marketing expenses.....	40
3. Growing expenses.....	64
Total cost of producing a market bushel of cranberries.....	\$1 55
Deduct estimated average selling price, 1899.....	1 45
Leaves a net loss per bushel.....	10

Though not so familiar with conditions in New England, I know sufficient to show practically the same result, with slight alteration of the figures.

For instance, we know that 10,000 acres produced 600,000 bushels, or an average of 60 bushels per acre, against 50 in New Jersey. This advance of 10 bushels per acre is more than offset by increased cost per acre, amounting, say, to \$300 (or a total of \$3,000,000 investment), and increased expenditure for care-taking or cultivation. With a larger proportion of selected late varieties, the average selling-price may reach \$1.55 instead of \$1.45, as in New Jersey. But the result in the aggregate will not vary materially from that shown for New Jersey.

It is safe to assume that the average grower in the West, with his trials and tribulations, cannot produce a bushel of cranberries more cheaply than the Eastern grower.

With these figures staring them in the face, the condition of the average cranberry grower is not a happy one. He is not living, he is only existing on the hope that he may be favored another year with a better crop or more remunerative prices, or perchance take a fortunate hand in speculation on a late market.

While the conditions named are those of the average cranberry grower, it is no doubt true that there is a class who, even under these unfavorable conditions, have been able to show a margin of profit. I refer to that class who

count their acres by the hundred, with proportionately reduced cost of supervision.

Fortunately I am in both classes, and I know by experience what it is to raise cranberries at a loss and what it is to raise them at a profit the same year. Then, too, under these circumstances, I can say something concerning the responsibility of these larger growers without giving offence.

I do not believe the large grower would knowingly, wilfully or even willingly force his less-favored neighbor to the wall or drive him out of the business, and yet that is the inevitable result of a continuance of the conditions and experience of the last year. It will be well, too, to remember that the way out for a cranberry grower is not so easy as that of the grower of other small fruits who is forced to the wall. The lands of the latter can be turned to other purposes, while those of the former are useless for any other purpose.

He has no alternative but to increase his acreage on borrowed capital or die a lingering death.

To my mind it is clearly within the power, it is the privilege, nay, more, a duty, of the large growers to say that not a bushel of cranberries shall be sold for less than average cost of production.

The question of the hour is, then, Will they perform this duty? which will not only save their neighbor from destruction, but add to their own profits, besides securing peace of mind and a clear conscience.

For one I pledge my voice and my practice to this policy. If I have sinned in this respect (and I am not sure I have), it has been unwittingly, and I am sorry for it. Hereafter, before my fruit will be sold for less than cost of production, it will rot in the store-house and go to the dump.

That the larger portion of the crop of '99 was sold for less than its value goes without saying. There was no financial condition of the country to warrant such a sacrifice. I can only account for it on the ground of ignorance of its actual cost and undue haste to dispose of the larger crops.

Experience ought to teach us that large crops do not necessarily mean low prices. The largest crop grown previous to this season closed out at good, round prices, and, unless all signs fail, the present large crop will do the same.* But growers, except they are also dealers, will have no share in the advance. In New Jersey, where the usual holdings at this season are from eight to fifty thousand bushels, a few hundred will now cover it.

The following table will be valuable for future reference, if not for present use:

*At this date—March 14th—cranberries are selling from \$4 to \$6 per bushel, demonstrating the correctness of Secretary Rider's theories and conclusions.—F. D.

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Table Showing the Crops of the Country, Amount Remaining in Hands of New Jersey Growers January 1st Following, With Opening, January and Closing Prices, 1879 to 1899.

Year.	Actual Crop.	On Hand Jan. 1.	MARKET PRICES.					
			October.		January.		May.	
1879	233,000	30,000	\$1 75	@ \$2 00	\$1 75	@ \$2 00	\$5 00	@ \$6 00
1880	492,630	56,500	1 50	" 2 00	1 50	" 2 00	50	" 1 00
1881	461,325	21,975	1 50	" 2 00	3 50	" 4 00	2 00	" 3 00
1882	322,171	11,475	2 75	" 3 00	4 00	" 4 50	2 00	" 3 50
1883	395,995	13,925	2 75	" 3 00	3 00	" 3 75	5 25	" 5 50
1884	280,014	12,500	2 75	" 3 00	4 50	" 4 75	2 50	" 2 75
1885	743,436	45,125	1 50	" 1 70	1 20	" 1 40	50	" 75
1886	540,449	24,150	1 25	" 1 50	2 50	" 2 75	3 75	" 4 00
1887	612,023	12,925	1 75	" 2 00	2 75	" 3 00	2 75	" 3 00
1888	585,000	28,940	1 35	" 2 00	2 00	" 2 25	75	" 1 00
1889	620,000	7,725	1 50	" 2 00	2 50	" 3 00	4 00	" 5 00
1890	800,000	20,523	2 00	" 2 25	2 50	" 3 00	3 00	" 3 50
1891	760,000	31,487	1 50	" 2 00	1 25	" 2 25	1 25	" 1 00
1892	600,000	12,489	1 25	" 1 50	1 75	" 2 25	2 00	" 3 00
1893	1,000,000	12,520	1 25	" 1 50	2 00	" 2 50	2 00	" 3 00
1894	410,000	11,450	2 00	" 2 50	2 50	" 3 00	50	" 1 00
1895	630,000	23,300	2 00	" 2 50	1 50	" 2 00	2 00	" 2 50
1896	830,000	Est. 30,000	1 50	" 1 75	1 00	" 1 25	75	" 1 00
1897	700,000	10,000	1 50	" 2 00	1 50	" 2 50	2 75	" 3 00
1898	800,000	Est. 20,000	1 50	" 1 75	1 50	" 2 00	1 50	" 2 50
1899	985,000	3,600	1 25	" 1 50	1 75	" 2 25	.....	.....

The aggregate crop of 1899 I now divide as follows:

New England and New York.....	625,000
New Jersey.....	250,000
The West.....	110,000
Total.....	985,000

Annual Address.

D. D. DENISE, PRESIDENT.

Gentlemen of the State Board of Agriculture :

We have assembled at our twenty-seventh annual convention as representatives of the most important branch of industry in our land. Agriculture, the oldest of occupations, should, from its nature and usefulness, be one of the most honorable and desirable as well as one of the most advanced of the arts practiced by man. Necessary to his existence and indispensable to his highest welfare, it has been, in all ages, the predecessor of all other arts and the pioneer in the advance of civilization.

From the time when the soil was first stirred by the rudest implements known to man until those implements represented the best efforts of man's thought and skill, there seems to have been a steady advance made in the science and art of agriculture. Yet there is no use disguising the fact that agriculture to-day is a much-abused industry. Abuse is being heaped upon the industry by the very people who should defend it.

Are not the conditions more favorable than ever before, in some respects? There never was a time when improved lands could be bought so cheaply as now, and when one man, with the aid of improved machinery, could do so much work as he can to-day. Unless the farmer stands up for his calling, no one else will. It may be true that the agricultural industry is less remunerative at present than any other branch of industry. It cannot remain in that condition long, when viewing the magnificent prosperity which to-day abounds all over our land.

We are at present on the very crest of a wave of prosperity, one of the most pronounced that this country has ever realized. It extends to every part of the world. Labor is everywhere employed at increased wages; factories and furnaces are running to their full capacity, day

and night; new ones are being built everywhere. There is a tremendous boom in mining—of coal, iron, lead, copper and all precious metals, to supply a constantly increasing demand. Witness the exports of the products of American factories. Witness every locomotive and every car taxed to its limit, and every vessel laden to its utmost capacity to carry products to market—a prosperity never before known in the history of our country. The very elements seem to echo prosperity.

But how about the farmer? Is he realizing his just share of this prosperity? I have carefully looked into the matter, and am compelled, reluctantly however, to admit that he is not. The price of what he has to sell has not advanced in proportion to the prices of what he has to buy. The result is, it takes more of the products of the farm to buy the necessities.

What can the farmer do to relieve the situation? Well, improved methods of production will help him some. Strict economy in the use of all by-products of the farm will help him more. The farmer who makes money to-day is he who observes, intelligently and scientifically, the economies of production.

The margin of profit is reduced so low that there is no room for the waste of former days, and no chance of profit except to the skilled, intelligent, systematic management of agricultural affairs. Where wastes are excluded, loss of labor minimized, processes economized, products well marketed—then the farmer is on the royal road to prosperity.

AGRICULTURE IN OUR PUBLIC SCHOOLS.

Has the time not come when the welfare of the country demands that the science of fruit and plant life should be taught in our public schools? It may be said there are already too many branches taught in our schools, and this is in a measure true; but what is the prime object of an education? I answer, to be a useful member of society, and be happy.

A closer knowledge with nature, by which we are surrounded all our lives, will be the means to make us more useful and more contented. Can any one thing contribute more to the pleasures of rural life than a knowledge of the things about us, and how to turn them to the best use? The introduction of this study in the public schools would require a class of teachers who are in love with nature, and who

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are capable to impart such instruction as will prove of lasting benefit to the boys and girls, who are to be the gardeners, the fruit-growers and farmers of the future.

The district school-house is headquarters, and here the successful farmer, gardener and fruit-grower of the future must receive practical instruction.

What a wonderful field is open for teaching the principles of horticulture and agriculture in our public schools, and the opportunity which offers to turn our school rooms into a place of personal delight to thousands of children!

I believe the farmers ought to see that these things are taught to their children—the boys and girls in the country districts. And it teaching and studying is carried on along these lines, we shall enter into a period of greater prosperity in this country in agricultural development. We shall lift the whole subject to the position where our young people will seek, rather than evade, it.

The child who is taught the wondrous workings of nature enjoys the unfolding of its mysteries and thoroughly appreciates its beauties, spread around with so lavish a hand, and, as years roll away, will learn to love the work for which he is so richly rewarded; and as his eyes wander over the farm, his soul drinks in the beauty of the waving grain, sweet scented clover, rustling corn and golden fruit, his intelligent mind realizes the fact that at the base of each shining thread a rich reward awaits him.

The study of agriculture broadens our views, engenders purity of thought, a thorough appreciation of all that is beautiful in nature, love and reverence for Him who created that we might enjoy. Surely this is one step gained towards good citizenship, which is and ought to be the aim of all instruction. Good farmers make good citizens. Good morals, good government, and all combined, a prosperous people.

FRUIT INTERESTS.

Soon after the pioneer farmer had established himself in New Jersey with the intention of making a permanent abode, he at once commenced planting fruit trees. Perhaps in nearly every part of our State there is abundant evidence that his thoughts were directed towards the cultivation of fruit.

No place could be more suitable, especially for the orchard, than where the forest had just been removed, and the virgin soil so perfectly

adapted to its vigorous growth and development. Those days when the fruit tree grew almost spontaneously, with but little attention, have passed and gone. We are now succeeding in the culture of fruit only by diligent study and persistent efforts.

The conditions on which the fruit-grower may anticipate success are various and diversified. The location, the condition and fertility of the soil, the drainage and tillage, the variety, its training and pruning, the destruction of insect enemies, all these and vastly more are the contingencies the successful fruit-grower must encounter before he can hope for a bountiful production.

In the growing of fruit profitably several things are essential. One must be in love with the business and study it in all its bearings. I should not advise any one to embark in the business who is fond of ease, for reward will not come to the slothful and indolent. It is a work of care and waging of constant warfare against insects and diseases, and a contention with unfavorable seasons.

Don't take anything and everything you read in the books and papers for granted that it applies to your case. Make experiments and watch the results for yourself. I would not, by any means, discountenance the reading of books and papers, but boil down what you do read with a good stock of common sense. We are learning something on the question of varieties, but there is so much, it seems to me, involved in this question of varieties and their adaptability to soil, that we have to go out and study the question, each and every man for himself, for no one can tell his neighbor just what varieties will do best on his soil.

I do not believe that we can grow every variety of apples upon our soils. I believe that there must be a study of varieties with reference to location, and it is a pretty broad study. The more I think of it, I sometimes think, the less I know, but judging by the experience of men who have followed the business of orcharding for years, this is one of the great problems to be wrought out. Each and every man must be a law unto himself.

There are opportunities, fellow-farmers, in the line of fruit culture here in New Jersey that we have not begun to appreciate. I believe that commercial fruit culture in New Jersey has been sadly neglected. I believe that instead of complaining so much about farming being unprofitable, we should try to develop all these lines of agriculture to their highest state of perfection.

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Some are trying to do it and others are contemplating an effort in the same direction. Any one who has a considerable crop of fruit can sell it to much better advantage than he who has a small crop. I have learned, by my own experience, the man who develops the best fruit and handles it the most intelligently is the man who makes the most money out of the business; and there is no reason why New Jersey, with its location between the great markets, should not be one of the greatest fruit-growing States.

FARMERS' INSTITUTES.

Their object, in the first place, is to stimulate a proper self-respect for the occupation, dispensing with the idea that the agriculturist has no field for thought or mental culture. They improve the social condition of our farmers, which oftentimes is grossly neglected, for the farmer who makes a perpetual drudge of himself blunts and stupefies his intellect, dwarfs his mental yearnings and leaves him a slave to ignorance and incredulity. Social contact with others will teach him the things that it is to his advantage to believe more successfully than it is possible from books or papers.

It is a place where our farmers have an opportunity of meeting men who are in advance in the science of agriculture. The teaching of the Farmers' Institute is essentially a missionary work; the heralding of the gospel of a new dispensation of better things to come to agriculture. It is the challenge of the sentinel on duty to his sleeping comrades to awake, bestir themselves and prepare for the march and the conflict. It is a call to the sluggard to mend his ways. You all know the sluggard; you have often passed by his place and have seen where and how he lives.

In traveling over our State, I am sorry to say that I see too many places that do not look as they might be made to look with just a little energy. Why not make the surroundings of your home cheerful and pleasant and everyone happy? These institute meetings afford the farmers, generally, a convenient and inexpensive opportunity to personally meet noted men in their line of business, of whom they have read and known.

They are or have been practical farmers, diligent students of the fundamental principles of agricultural science, a correct apprehension of which is essential to economical agricultural production. It is

sometimes a difficult problem so to state and explain and illustrate some of the principles as to be understood by the plain farmers that they may get some manner of conception of them which will awaken an interest, lead to further inquiry and prompt to a more judicious practice.

Many a shrewd, practical farmer has been able to take a long step forward in his business because some embarrassing difficulty has been cleared up or some, to him, knotty problem has been solved through correct, scientific information obtained in answer to questions asked at the Farmers' Institute.

A class of speakers who do most excellent and acceptable work at our Farmers' Institute meetings consists of plain, practical farmers of the vicinity; of stock breeders, dairymen, poultrymen, fruit growers, market-gardeners, etc., in active business life.

The class of local speakers to whom I have reference, except perhaps some of the amateur gentlemen, are not, generally, learned men. They know, practically, what succeeds best; but some of them would trip and stumble badly if they should attempt to give the philosophical reason why.

They have, however, in their several and varied experiences, encountered practical difficulties and problems, common to many or to all who are working on parallel lines, and in their own ways and for their own localities have perhaps often overcome them and solved them. Their words are entitled to weight and respectful consideration. They contain suggestions of great practical value.

Most farmers are imitators. It is so much easier to observe what our neighbor, in like circumstances with us, has done and then to imitate him in what has succeeded, than pursue for ourselves lines of original experimentation. We grasp an idea all the more readily when it is set before our eyes in the form of an object-lesson. It is good for any locality to have an energetic and progressive farmer that he may be an object-lesson to the less progressive.

I must not overlook the valuable contributions to the Institute work of our lady friends, many of them farmers' wives and daughters. The advancement and adorning the home, that only a woman's hand could fashion, the keeping of the house from cellar to garret, the methods of cooking, etc. Social life in the country, the training and education of the children upon the farms. All these and many more are appropriate themes for treatment by our lady friends.

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These gatherings of the tillers of the soil are not so well attended as they should be, when we consider their infrequency and that it is the only high-school where the principles of farm economy and progressive farming are taught, which the everyday, practical farmer has an opportunity to attend. The advantages to be gained by interchange of thought with the brightest minds in our own calling, not only in our own State, but, as it usually happens, from our sister States.

Let us cherish our Farmers' Institutes and all other agricultural gatherings for the sake of the good work they are doing, and seek, by every means at our command, to advance still further the measure of their usefulness. The farmers are the food-producers of the country; the conservation of their interests and welfare is a matter of common concern and solicitude.

The fostering care of the State in contributing to the development of a higher type and larger scale of agricultural production is not an act of charity, but of patriotism and statesmanship. I venture the assertion that no money appropriated by the State for any educational purpose or otherwise is producing so large a return in substantial value, dollar for dollar, than the money appropriated for agricultural meetings. To increase the appropriation would mean to enhance the value of our State, for what advances agriculture increases prosperity. There is no more promising field for the exercise of a liberal, but judicious fostering care on the part of the State.

Let us consider carefully what step should be taken. It should be the duty of every member of this board to take part in the exercises of this session, not only with reference to one particular subject, but with all that may come before the board, and so advance our industry to the position that it deserves among the industries of the land.

Finally, let me urge upon the members to lend their assistance to build up our board by united work, and so keep our State in the front rank of the great agricultural procession and abreast of the times in the progressive age in which we live.

Forests and Forest Reservations

C. C. VERMEULE.

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Forests and Forest Reservations, and their Relation to Water-Supply and Agriculture.

BY C. C. VERMEULE, TOPOGRAPHER GEOLOGICAL SURVEY, N. J.

MR. PRESIDENT—I approach this important subject, not from the standpoint of a scientific forester, but with some familiarity with actual forest conditions in New Jersey, derived from about twenty years of intimate acquaintance with all parts of the State, and from a rather full study of the water-supply problem. When I began these studies it was with a full acceptance of the generally expressed and reiterated belief that our forests were being willfully wasted and rapidly destroyed, and that in consequence, we were threatened with aridity—like that of Arabia, Palestine, or the deserts of Sahara, a view which I have been forced to modify considerably, for, to my great surprise, I found that if our streams had become more unreliable during the last half century, it was in the face of a steady improvement in our forests, which are unquestionably as extended in area and more luxuriant than they were at the middle of the century.

It is true that to-day our State has not, and is not likely to have in the near future, an important logging or sawed lumber industry, for most of our heavy forests were cut off before 1860. The census figures for 1890—while perhaps incomplete—afford a means of comparison at least. At that date the saw-mills reported merchantable lumber cut from only 8,355 acres—whereas in New York the acreage was 120 times, and in Pennsylvania, 175 times as much. The yield of merchantable lumber per acre was 4,986 feet, board measure, in New Jersey, 5,631 feet in New York, 10,104 feet in Pennsylvania, and from 5,413 to 8,714 feet in the South Atlantic States, so that we were low in the scale. But in the value on the stump, per thousand feet of lumber, we were far in the lead; the figures for New Jersey being \$5.60, for New York, \$1.90, for Pennsylvania, \$2.25, and for the South Atlantic States, from \$0.86 to \$2.86.

The demand for fuel, telegraph, telephone and trolley-poles, piling and railroad ties, is sufficient to absorb the entire product of our forests. For such uses chestnut may be most profitably cut at from 35 to 45 years old. Oak at from 40 to 50 years. Excepting the fuel, or cord-wood, in which there is now very little profit, these uses afford as profitable an outlet as merchantable lumber, and the forest can be more frequently cut. Some years ago there was much more cutting of cord-wood, hoop-poles and coaling than at present, consequently the wood was cut off younger, at about 20 to 25 years, instead of 35 to 50 years.

Such are the economic conditions which determine the present forest age and tendencies. Let me explain that I use the word forest to include all land devoted to timber-raising, consequently stump-land, brush-land and all stages of growth, up to merchantable timber, are classed as forest.

The total area of forest in New Jersey measures 2,069,819 acres. The cleared farm land is almost exactly equal in area, viz., 1,999,117 acres; in round numbers 2,000,000 acres of each. Of this, 800,000 acres is practically all deciduous timber, mainly chestnut, the several varieties of oak, maple, with many other kinds interspersed; 1,200,000 acres is coniferous forest, mainly pitch pine on the upland and white cedar in the swamps. This coniferous forest is the well-known pine belt of Southern New Jersey.

The distribution of the forest is shown on a map recently prepared by the Geological Survey, to be issued with the forthcoming report on forestry.

There are two great forest regions. The largest is the coniferous forest, 1,200,000 acres in extent, in Southern New Jersey. Next comes the forest of the Northeastern Highlands, 211,000 acres, covering the northern portions of Morris and Passaic counties, the southeastern border of Sussex and a small part of Bergen. Next in size is the forest region of Kittatinny mountain, in Sussex and Warren counties, comprising 58,000 acres.

A smaller area, but a notable one, is the Palisades mountain forest, in Bergen county. We have here 11,000 acres of fine forest, with many trees 20 to 30 inches in diameter and 60 to 80 feet in height, surrounded by the dense urban and suburban population of that section near New York city. This forest seems quite as worthy of preservation as the Palisades themselves. Indeed it is a remarkable fact

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that Bergen county, as a whole, has 40 acres of forest to 60 acres of cleared land, and much really valuable timber, although so near the large cities.

The trap ridges, First, Second and Sourland mountains, are quite well wooded, and so is the southern part of Middlesex county, especially the watershed of South river.

The most completely deforested sections are the Raritan valley, including Piscataway township, in Middlesex, and nearly all of Somerset and Hutterdon counties, Mercer county, and the belt of fertile land extending back about 12 miles from the Delaware river from Trenton down to Bridgeton. Similarly bare of forest are the valleys of Warren county and a small area about the Shrewsbury river in Monmouth county. All of these districts have less than 10 acres of forest to 100 acres of upland. The beautiful Kittatiny valley, in Sussex and northern Warren, has 19 acres of forest to 100 acres of upland.

When we consider the excellence of the timber, however, we find that, as a general rule, those portions of the State having the smallest acreage of forest have the most valuable timber. This is partly because this timber is owned and cared for in connection with farms, and partly because the soil is better. The farmers of New Jersey have quite generally appreciated the value of ten acres or so of timber connected with their farms, and, notably on the red sandstone, this timber on the farms has not only supplied the farmer with fuel, fencing and an occasional stick of timber, but has gone on increasing in size until the offer of the lumberman becomes a tempting one, and the steam saw-mill does its work. There is still much heavy timber scattered over the red sandstone and clay and marl regions. The occurrence of trees from 24 to 36 inches in diameter here is much more common than diameters of 12 to 24 inches in the Highlands.

That good timber denotes good soil is proverbial, but our best soils were all cleared up for cultivation before 1860, and it follows necessarily that the half left in forest is not such soil, as a rule, as will produce the finest timber. I cannot believe that good timber ever grew upon some portions of the pine barrens or upon the thinly-soiled hills of the Highlands. While there is much fair timber, therefore, in these regions, there is not a good prospect of making forest culture very profitable over any extended area. At the present average rate of growth of our deciduous forest it does not increase in value faster than \$3 per acre yearly of marketable product, and even with the best

management it is not likely to give an annual return exceeding \$4 per acre of marketable product, whereas the improved farm land gave a product of \$14 per acre in 1889.

Nevertheless, the land now occupied by forest probably returns an aggregate product worth \$4,000,000 annually, and affords employment to many persons. If the forest growth should be destroyed it would yield nothing at all, and it is important to preserve it for this and other reasons. Some of the agricultural sections are too bare of forest. Every farm has waste-land which should be in forest. The ravines and hillsides of the red-shale country are of no use for cultivation, and many side-hills here and in the State wash badly if ploughed. All these should be kept in woods, thus affording wind-breaks, shade for cattle, and the necessary fuel, fencing, etc., for the farmer. If forest can be profitably managed by any one it can be by the farmer in connection with his farm. The necessary pruning can be done when he cuts his fuel, and the product can be gathered at seasons when there is little other work. If the forest is already there, care for it; if not, plant a few trees—a few chestnuts, oaks, hickories, maples and walnuts; keep the cattle out of the young growth, thin it when necessary, and nature will do the rest. The waste places will become beautiful, your farm more valuable, and you will soon derive an annual profit from it.

When I started out, as I have said, I took it for granted that the forests of the State were being rapidly destroyed, and in consequence streams were drying up and untold misfortune overshadowed us. Actual investigation, however, showed that there was an error somewhere, and that, if the evils complained of really existed they could not come from cutting off the forests. Statistics show conclusively that there is no more land under cultivation in the State to-day than there was in 1860, and since we know from observation that when timber is cut off if the land is not cultivated it grows up again in forest, it follows that there has been no decrease of forest area. It is true that some forest has been brought under cultivation about Hamonton, Vineland and elsewhere in the extreme south, but land formerly cleared has been allowed to grow up again elsewhere, so as to offset this. Likewise it appears that the timber of the forest is better to-day than it was from 1850 to 1860. On this point we have the testimony of many reliable men familiar with the forests of their own localities, and other evidence. In the Highlands there is little timber

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over 50 years old and much about 40, thus showing that much of the growth dates from 1850 to 1860. Eye-witnesses tell us that about that time great areas were absolutely bare of timber. The cause is to be found in the large consumption of charcoal in the forges and furnaces then in operation, in the general use of charcoal for other purposes, the use of wood instead of coal for domestic, manufacturing and railroad purposes, and to the fact that much sawed lumber was then being manufactured, as the heavy original timber had not yet been all cut off. I estimate that the iron industry alone cut off 6,500 acres, or over ten square miles, annually, of timber 40 years old, or a larger area if cut younger. Even in the Pines there were 25 forges and furnaces in operation in 1850 and scores of saw-mills, of which only a trace is now visible. A canvass of the water-powers of the State in 1892 furnished 75 abandoned saw-mill sites, and no doubt there were many more of which no visible traces now remain. These are silent but convincing witnesses of the former activity in lumbering operations.

So long as there was an active market for charcoal and hoop-poles and a profit in selling cord-wood, the timber was often cut at 20 to 25 years old, but it is now found that it is much more profitable to allow chestnut to reach 35 or 40 years and oak 40 to 50 years, or even older. Consequently, the timber of the northern part of the State is visibly improving in size and quality. There have been errors in management which should be rectified. Chestnut continually growing from the stump, or coppice, will deteriorate, and some areas should be replanted when cut off. The seedling trees will be much more valuable. Another evil has been the browsing of cattle in the young growth, to its great injury; but there is no serious disposition to waste or neglect the deciduous forest. The owners, as a rule, want to get the best possible returns from their woodland, and the more progressive ones are learning how to do it.

In the Pines forest fires work great injury, and many owners do not consider their forest holdings worth protecting. This is a serious problem, and if the land is to remain in the hands of private owners the suggestion which Mr. Gifford will make in the forthcoming Report on Forestry, of the Geological Survey, seems practical and reasonable. Having given much intelligent study to this pine forest, he recommends that the highways should be opened up to a width of three or four rods, and the timber and brush cleared off for the entire

width. He points out that the good-roads movement and this measure go hand-in-hand, and one will aid and supplement the other. Perhaps the same principle of moderate State aid might apply to each with success. In addition, the railroads should be induced to clear the brush and timber from the entire width of their right of way. Such fire lanes would enable the owners or an organized fire-fighting force to back-fire and otherwise successfully restrict a fire in the woods.

Mr. Gifford Pinchot has made suggestions which also involve the use of fire lanes. When I was at work surveying the pine region, in 1885, and had several opportunities to see forest fires at work, and existing methods of fighting them, I independently reached the same conclusion, and suggested a system of fire lanes in the Annual Report of the State Geologist for 1885. But those who are especially interested in this subject will do well to consult Mr. Gifford's paper, to which I have referred above, as it is replete with suggestions.

In their relation to the water-supply of the State it will be found an almost invariable rule that the best streams for public water-supply are those which contain the largest proportion of forest upon their catchments. Thus in the Northeastern Highlands we have the Ramapo, Wanaque, Pequannock and Rockaway rivers—all beautiful streams so far as natural conditions affect them—and having from 72 to 83 per cent. of forest area. The Pequannock has been taken to supply Newark, and the Rockaway for Jersey City. All will soon be needed for our cities. In the pine belt of South Jersey the streams are also good, potable water; remarkably free from sediment or contamination. The exact influence of forests upon the flow of streams is a mooted question. I have given the subject most careful study, for it concerns not only those who make it an argument for forest preservation, but still more the water-supply on the two-thirds of our population now dependent upon public water-works. It has long been believed that forests exercise a beneficial influence upon streams, and most writers attribute this to a decreased evaporation in the forest.

During my studies of the water-supply of the State, and since, I have consulted many measurements of stream-yield and rainfall, and find no substantial evidence that a given rainfall will produce a larger total yield on a forested than upon a cultivated stream-basin.

I do not see why a forest growth should not take up as much water as any farm crop. It is well known that the roots of a tree take up

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great quantities of water which is thrown off into the atmosphere by the leaves after feeding the tree. We have all observed how a leafy tree will absorb all of a light shower of rain. But I have found that in the woods there are more springy places—that more of the rain is absorbed when it falls, and that it does not run off so quickly. The stream measurements seem to show that a forested stream holds up better in dry weather, and is not so frequently in flood as a deforested one. In other words, while the same quantity of water may run off in a year, the forested stream is less fluctuating than a deforested one. In this respect cultivation is far better than a barren condition. The last is the worst of all conditions for the water supply. Streams in barren country are extremely flashy and unreliable.

Forested streams also carry less sediment—an important matter in potable waters. Probably such forest conditions as we have in our Highlands are the best of all for healthfulness of the water-supply. That is, it is better to have 20 to 25 per cent. of the watershed along the valley-lines cleared of timber and in grass. This allows the sun and air to reach the streams, and the water does not contain as much organic matter as when the forest comes down to the stream banks.

It is therefore desirable for the preservation of our potable waters in their best condition—both the streams already taken and those which will be needed in the near future—that the forest shall be preserved both in the Highlands and the Pines. It is desirable also for climatic reasons, for while I can find no proof that rainfall is affected by deforestation in our country, I am convinced that our pines would have a much less desirable winter climate should the forest largely disappear. Indeed, I can say from personal observation that the difference of climate between the cleared country and the pine woods in winter is most marked. Without its pine forest much of Southern New Jersey would become an uninhabitable desert of shifting sand. With this forest preserved and improved, I believe it will eventually have a value for winter residence, not merely for the conventional winter resort, but for private country places, far beyond any value it may have as woodland alone.

As for the Highlands, the picturesque beauty of this region is just coming to be appreciated. If we can conceive of this country becoming again deforested, as it was from 1850 to 1860, it will be a

calamity to that part of the State, as well as to the cities dependent upon its streams for water.

I cannot say that the danger of this seems to me imminent, and yet it may come about from the very fact that much of this forest is of the same age, and that it is steadily improving. Some day we may awake to find it all merchantable timber, ready to be cut off at once. If cut moderately, as at present, there is no danger. A reasonable amount of cutting is good for it. Coppice chestnut, if not cut at about 40 to 45 years old, often rots at the heart. Now, of the 2,000,000 acres of forest in the State, 40,000 acres may be cut each year—16,000 acres of oak and chestnut and 24,000 acres of pine and cedar—without causing any diminution in the present visible timber-supply, for it will at this rate take fifty years to cut it all, and we may then begin again. At present there is not so much as this cut.

But if protection is necessary, no way is open but the creation of State reservations or parks or timber preserves. New York has adopted this policy in the Adirondacks, but if this be done we must remember two things. If there is to be merely a reservation, with no careful forest management, thinning, pruning and cutting, the forest may deteriorate faster than it does in the hands of its present owners. The coppice chestnut will surely go to ruin. On the other hand, if scientific forestry is adopted it cannot be expected to yield a profit over any extended area, and it must be undertaken for its educational value, or else the whole reservation must be regarded as a State park or pleasure-ground, which may possibly be made self-supporting, but scarcely profitable.

So in the Pines, State ownership will not lessen the danger from forest fires, which is the great evil to be guarded against. There must be fire lanes and a fire police. Scientific forestry here, excepting for its educational value, will be a hopeless proposition. It appears to me that unless the proposition for a State reservation conveys the idea of a State park or pleasure-ground, rather than a means of improving forest conditions, it should be approached with caution and only adopted, if at all, after more time has been given to the study of actual forest conditions and of the evils which it is intended to guard against or correct.

Our forests are well worthy of serious attention, therefore, because of their beneficial effect upon the water-supply, their importance in preserving the favorable climatic conditions, their attractiveness, and

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the value of their product, but first of all let us be fully informed as to their actual condition, their tendencies and needs. Those interested in our forests will find some information of this character presented by the Geological Survey in its forthcoming report; for the first work, the physical examination and survey of the State forests is already well advanced, some remedies for evils discovered are also suggested, but I think the immediate need is to push this work farther. The forest-owner should have the benefit of the same kind of assistance and suggestion that has been extended by the State to the farmer, the miner, and other industries.

A fuller examination into the errors of past management, and practical suggestions for improvement, are more needed than any more radical step at present. Just as the farmer has had the aid of the Experiment Station, so the forest owner should have at his command the aid of a practical scientific forester, and a bureau of forest information.

State reservations may be the ultimate outcome, but the idea may well be held in abeyance until we have fully digested the facts as to our forest. The expense of such a step will be very considerable, and we must be sure that it will really improve forest conditions before undertaking it.

But in any event nearly half a million acres of our most valuable forest is scattered through our agricultural sections in small wood-lots. This can not be reached by reservation, but it may derive very great benefit from the course which I recommend. In this part of the forest this society is most directly interested, for it is owned by the farmers of the State.

Prof. Smock referred to the fact of having given a paper before the Board and which had been published in one of the early reports (Vol. I of Reports), which gave in some detail the results of planting locust trees on the waste land on a farm in Monmouth county. Referring to Mr. Vermeule's paper he said that the question of forest management is one of importance to every farmer who has a wood-lot or waste land which is not suited to pasturage or tillage. These waste lands ought to be in forest and be cared for, because it is as easy and as economical to raise valuable timber trees as to raise poor trees.

He gave the result of observation of a tract of woodland on the same farm which had not received any attention and which was coppice wood largely, with many poor trees and open areas with worthless

brush-wood and shrubs. Half of the ground appeared to be unoccupied. A little care at the proper time would have produced a dense growth of fencing-timber of value. The waste lands of the ravines and banks, planted by father and grandfather of the speaker, were successful locust plantations ; the wood-lot, left to itself, was not successful forest management and was unprofitable land.

In regard to the question of forestry he mentioned the work of the Geological Survey, which had been making an investigation of the forest conditions of the State, in accordance with a law passed in 1894. Mr. Vermeule had given much care and study to the survey of the forested lands, and experts in forestry also had assisted in these surveys—notably Prof. Gifford, of the N. Y. College of Forestry at Cornell University, who has prepared a report on forest management in Europe. He commended highly this report to the attention of the farmers of the State. The relation of water-supply to forests also was referred to as consistent with the farmer's interests. The importance of keeping the hillsides tree-covered or in wooded condition was stated and stress was put on it because of the washes and gulleys made in the tilled fields and even in pasture-lands by heavy rainfalls. These are scars on our mountain-slopes and they should be prevented by keeping the hillsides in wood.

The timbered hillsides prevent the washes and also improve the quality of the water by keeping the soil from being carried off by the brooks and streamlets making the water roily. The larger part of the population of New Jersey which uses city water or water from a public water-supply, makes this question one of great importance in the State, and the interests of the city and of the country are both with the forests and favor their protection.

In answer to a question of ex-Governor Hoard, Prof. Smock said that the depredations of the locust-borer were less now than they were about 25 years ago, when the plantations were cut. The succeeding growth had appeared to be vigorous and to survive the borer's attacks, or were perhaps more able to resist them. Possibly the borer has its periods of more active attacks upon the tree, and it may disappear.

The Movements of Saps in Plants

BYRON D. HALSTED.

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The Movements of Saps in Plants.

BY BYRON D. HALSTED, STATE BOTANIST.

One year ago, while at the twenty-sixth annual meeting of this Society, it was suggested to me that a paper would be appropriate upon the movements of the sap in plants. I then promised myself that if the Executive Committee desired me to address you, and I was granted the privilege of choosing my subject, it would be the one that stands as the head-line of this page.

Fearing that I might misjudge the popular mind in its conception of the subject before us, four questions were addressed to a considerable number, representing all classes and conditions of our people. Pardon me while they are read here, with the conditions under which they were answered :

“ Kindly give me your off-hand replies to the following questions :

1. Is there more than one kind of sap in plants ?
2. Does the sap circulate, and if so, what determines the direction and rate of the movement ?
3. What becomes of the sap of ordinary trees and shrubs during winter ?
4. How does sap get into and out of plants ? .

My whole point is lost if you first look up the subject ; therefore please comply with my request for off-hand replies at the outset.”

There were many persons who took the line of least resistance and simply said, “ I do not know.” This frank admission of complete ignorance, while pitiable in some instances, was neither misleading nor equivocal.

To the first question, “ Is there more than one kind of sap in plants ? ” many replied that there was, but the number, except in rare instances, was not stated. One lady claimed complete ignorance, but being deeply engaged in school-work had a keen appreciation of questions, and stated that she answered “ yes ” because the question seemed to call for more than one kind. One person of middle age, who is a graduate of our

State Normal School and a long-time teacher, replied that "Different plants have sap according to their several needs, differing slightly in each variety." A lad of twelve years stated nearly the same fact in the following words: "There are as many kinds of sap as there are kinds of plants." One person thought "there must be two kinds of sap, the same as there is the arterial and venous blood."

All, without exception, believed that the sap circulates; but the cause of the movement was stated variously, and often in the vaguest terms. One person believed that the shape of the plant determined the direction; another thought that heat and cold were the leading factors in sap circulation. It was stated by one that "it must circulate and there was a heart somewhere." Another believed that "the heart was packed away somewhere in the bottom of the trunk." This last individual must have recently returned from a journey and had enjoyed the experience of living with baggage. The person who passes as the "philosopher" of his neighborhood quickly disposed of the subject of sap-movements by referring it to "a final cause," and owing perhaps to my obtuseness, the clarifying effect of his explanation has totally escaped me.

The third question proved to be the easiest of all and was replied to with promptness and a feeling of some complacency upon the part of many. "What becomes of the sap of ordinary trees and shrubs during winter?" Nine out of ten answered this at once and in practically the same words, namely: "It goes into the roots." Some gave reasons for the departure, as, to escape the cold. Some thought it did not all go into the roots or the plant would die, while others took the opposite view that if it was not all drawn into the roots the plant would perish. There was a belief in something taking place somewhat akin to that of hibernating animals, that hide themselves in holes in the ground during the winter season.

Question four—"How does sap get into and out of plants?"—was comparatively easy for the first part, for nearly all thought the sap entered through the roots from the moist soil. The exit of the fluid was understood but imperfectly, except by a few, who believed it went out by the leaves. Several gave no reply or confessed their ignorance, while the philosopher, more otherwise than wise, replied that "it was just like Topsy," which to those who are not philosophers is a virtual admission of ignorance.

As a preliminary to a consideration of the flow of sap in plants it is necessary to look for a few moments into the structure

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of roots, stems and leaves. The simplest of all plants consist of single cells, that is, they are sacs, usually microscopic and are made up of a wall of solid substance and the liquids that are contained within. A step higher in the scale of plant-life are the strings of cells with the units placed end to end as in many of the low forms of water plants, as pond scums, and the like, and the fungi. Should we rise to higher plants the plane is soon reached where the individuals have broad surfaces, and a little later we come to those with roots, stems and leaves. In these last the cell is still the unit of structure; but it is modified greatly, and as a result a tree or shrub exhibits a complication of forms of the cell each adapted to its particular use in the economy of the whole plant.

Beginning at the root there is a woody central cord of tough fibres surrounded by a loose substance, and near the tips of the young roots where the substance is all still delicate the surface is covered with a multitude of long outgrowths from the surface known as the root hairs.

The central cord of woody substance in the root connects with a similar firm tissue in the stem, and outside of it is the layer of delicate cells where growth takes place, the cambium, and having for protection a tough layer upon its outside known as the bark. Upon this stem directly, or the branches it may produce, are borne the leaves at certain points, while the twigs themselves terminate in buds. These buds are undeveloped stems, and from them unfold the various parts of the plant, as leaves and flowers in the growing season.

Flowers are for the production of seed, and, therefore, as such and for the fruits they produce, are cared for by the other portions of the plant. We need not discuss their structure in this connection.

The leaves consist of a framework of fibres and vessels which holds up a pulpy substance usually colored green, and all kept in place by a tough skin that is over all, but through which are vast numbers of minute holes, the stomates, or so-called "breathing-pores."

The chief uses of the roots are to anchor the plant in the soil and to absorb the soil-water with the various salts it may contain in solution.

Ordinary foliage has for its leading function the exposing of its green cells to the air and sunlight, by which the water taken in from the soil by the roots is evaporated and some of it united with carbon dioxide of the atmosphere in the production of such substances as starch and sugars.

when the heart-wood and the bark are almost entirely uninjured. It seems queer, therefore, that the upward stream of crude sap is through the younger or sap-wood.

This young wood consists of long cells or fibres with thick walls and many larger and much longer ducts or vessels, and it is through these cavities that the sap passes on its way to the leaves. After reaching the leaves it then finds the same type of conductive tissue in the stalk and numerous strands of fibres and vessels that are in the much ramifying frame-work of the leaf.

It has, therefore, been shown that there is a continuous line of travel for the soil water from the time it enters by membrane diffusion the surface cells of the roots up through the central fibro-vascular cord to the sap-wood of the stem, and the branching system of conductive tissue, until it is brought by a continuous and complicated set of pipes to the green-bearing cells in the soft pulp of the leaves.

Having determined the path of the stream we are ready to consider the forces at work in the ascent of the sap. The leaves, consisting of loose tissue exposed to the air give off large quantities of water in a state of vapor. It is only in this way that the requisite amount of the soil constituents can be brought to the foliage. While the stem is variously protected upon the surface to reduce the escape of water, the leaves are especially designed for transpiration by being flat, thin, spongy and provided with vast numbers of the openings through the epidermis into the spaces between the cells in the middle of the leaf. Some leaves have many millions each of these openings reaching into their spongy interiors, so that ample provision is here made for the escape of their liquid contents by vaporization. Hales found that a medium-sized sunflower transpired thirty ounces in twelve hours on a warm, bright day. A cabbage-plant exhaled twenty-six ounces in the same time. At night it is very much less. The amount of water transpired by an acre of corn upon a hot, dry August day is several tons. When plants are growing under a bell-jar the transpired vapor is condensed upon the glass. The rapid wilting of crop plants, as clover and grasses in hay-making, is a wholesale instance of the escape of water from plants. Uncut twigs may wilt whenever the transpiration is in excess of the absorption of liquid by the roots, as upon a hot, dry day. It has been demonstrated that the leaf-pores (stomates) are open in the sunshine, but closed at night and during dark rainy days. Turgor opens the pores; wilting will close them.

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When the plant is unfavorably conditioned the turgidity of the guard-cells may cease and the stomates are closed, checking the transpiration. It is seen that there is a very delicately-arranged mechanism, excellently designed to control to a large degree the rate of the transpiration. There are many special contrivances for regulating the water-supply, as rolling up of leaves or a felt of hairs upon their surface, as usually found in plants of arid regions where the foliage is reduced to a minimum.

The rate with which the sap ascends can be measured by the use of some harmless substance in the soil-water that is easily detected in the plant tissue. For example a very small percentage of nitrate of lithium passes with rate undiminished in the sap and is quickly detected by burning a small portion of the tissue and noting the flame by means of a spectroscope. For the experiment young plants of tobacco or sunflower may be taken and the soil watered with the lithium solution. After any desired period the stem is cut into sections and a fragment of each tested for the substance used in the experiment.

In this way it has been found that the sap rises per hour in

Willow.....	85 cm.	34 inches.
Corn.....	36 cm.	14 "
Tobacco.....	118 cm.	47 "
Pumpkin.....	63 cm.	25 "

Some of the exceedingly strong aniline dyes are employed to show to the eye the rate and path of the sap. Thus succulent transparent shoots, as those of garden balsam and the white floral leaves of lilies, etc., are employed. With such stems or leaves, placed in the colored liquid, the vascular tissue will show as a pink or other tinted strand in the stem or a fine network in leaf or petal. The forces that are at work to cause the flow of sap are not as yet thoroughly understood.

The transpiration of the leaves makes a place for the inflowing water, but one does not find in it the force necessary to account for the rise of sap for the great distances that obtain, for example, in tall trees. There is a root-pressure that needs a moment's consideration. This is illustrated by cutting off a potted plant of begonia, sunflower, pumpkin, &c., and placing a rubber tube closely over the stump connected tightly with a glass tube. By filling the tube partly with water it will be found that this liquid will soon rise in the tube due to an upward flow not caused by transpiration, but, instead, to a force being exerted at the root, and is spoken of as "root-pressure."

The flow of sap from a wound made, for example, in the sugar-maple trees by tapping, begins early in the spring, while the soil is frozen and the roots inactive. The flow is rapid in the day and slow at night, showing that temperature of the surrounding air has much to do with the rate. The tree is full of sap during the winter, and the warmth of the atmosphere expands the air in the stems and a pressure is produced that finds relief in a flow from the wound.

But leaf transpiration, root-pressure and the tension caused by unequal temperatures within and without the plant are not sufficient to account for all the flow of sap. At one time capillarity alone was thought enough for the upward movement of sap, just as it is said to be the cause of the ascent of the oil in the lamp-wick. The ducts and fibres are properly constructed for this action, but, by calculation, they are not of a size or character to account for the flow upward of sap through more than a small portion of the stems of large trees.

The full explanation of the rise of the crude sap from the roots to the topmost leaves of the furthestmost branches is still to seek ; but for our purpose it may be considered as due in large part to the demands of the transpiring leaves, supplemented by the imbibing power of the surface-cells of the roots, combined with capillarity of the pores of the wood, atmospheric pressure within and without the plant, and possibly several vital processes not yet understood.

After the crude sap has been modified, and, in short, out of it and the atmospheric gasses food-substances have been constructed for the upbuilding of the plant, we come to the second form of sap, with the flow of which it is our purpose to briefly deal. It goes without saying that the flow begins at the pulp-cells of the leaves and other green portions of the plant, and is from there to the stems and roots, in fact to any and all parts where growth is taking place or the food-materials are stored as such. The general movement of food-substances is downward from the leaves. As with the crude sap, so here all materials ready for or undergoing transportation are in solution. It is a liquid that contains carbo-hydrates and nitrogenous compounds and an un-organized ferment to bring about the solution of these substances.

If we start with the stem it will be recalled that the root-sap flows upward through the young or sap-wood. It would not be satisfactory to have the same substance conveying two kinds of sap and in opposite directions. The food current is in the bark, and chiefly in that portion called the soft bast, or inner bark. The familiar illustration of

THE MOVEMENTS OF SAPS IN PLANTS. 95

girdling a tree is sufficient proof that the food for the root system is cut off where only a small zone of bark is removed from a tree. In a young twig the stem will thicken just above the girdle showing that it is arrested there in its downward course in the bark.

But all circulation of sap is not in wood-stems, so that we need to consider the path of the food-current in succulent twigs, as of herbs and in the leaves themselves. A stem that has not attained to a ring of wood is made up of soft cellular substance, and a number, few or many, of tough strands of fibres and vessels. These fibro-vascular bundles, as they are termed, are the conductive tissue for the transfer of the crude sap through the woody portion, while the food-current passes along the bast fibres, and the albuminous portion in particular through those cells that are provided with sieve-plates, that is, ends or side areas where the wall is perforated with numerous small passages for the protoplasmic substances.

The rate of the flow of the assimilated sap is slow, especially when compared with that of the crude sap. There is no root-pressure or transpiration imbibition to be considered, and the causes, therefore, become greatly simplified. The law of supply and demand is dominant, acting through membrane diffusion. In other words, the flow is towards the point where the substances the sap contains are being used, and therefore removed from circulation, just as when a crystal is forming in a solution there is a tendency for the substance building the crystal to flow toward it. This flow in the plant may be against gravity and directly upward, in the same manner as the rise of oil in the wick of a burning candle. The liquefied tallow is used up in the flame, and other particles rise to meet the demand. Capillarity may combine with diffusion in all these movements of the food-currents in plants.

As an illustration of this portion of our subject, it may be assumed that, by the combination of water from the soil and carbonic dioxide from the air in the loose green cells of the leaf, starch is the final product. This is, as such, insoluble; but is readily changed into sugar, and is then ready to migrate. Sugar is being used up in making new tissue in the stem, some distance away, and this reduces the amount of this substance close at hand, and there is a flow toward the growing bud of the sugar made in the cells of the leaf. The food substance passes from cell to cell along the soft tissue of the fibro-vascular bundle close to, but not interfering with, the much more

rapid current of crude sap that mounts through the woody substance and meets at last the demands of leaf evaporation and food construction. The case is essentially the same if the sugar goes as far as the root and then is changed into starch to become a reserve for future growth.

We have seen that a plant in active growth is a complex organism with many activities not the least of which are the movements that take place in its liquid contents. These are incomprehensible until a knowledge of the cell structure and the intimate relation that is maintained throughout all the living parts by the protoplasmic threads that bind all together as a unit is understood.

The plant is a factory, supplying itself with all its crude materials and often laying down large storehouses of material. It is more than a factory, because it is vitalized, and that which is usually seen are but the rooms in which the work is done. The workers are the green-bearing cells that catch and store up the energy of the sun. All other parts are subservient to this whether they be for the service of the plant itself in transfer of fluids, etc., or the continuance of the species.

THE ASPARAGUS RUST; ITS TREATMENT, &c.

BYRON D. HALSTED.

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The Asparagus Rust; Its Treatment and Natural Enemies.

BY BYRON D. HALSTED, STATE BOTANIST.

Asparagus-growing is one of the leading industries in several towns in the State; Hazlet, Keyport and Red Bank, in Monmouth county, contain a large number of asparagus farms, from which the product is shipped to the New York market, while Philadelphia is supplied by large growers in Camden, Gloucester and Burlington counties.

Until 1896, the Experiment Station had received but very few complaints of asparagus troubles that were of fungus origin. In August of that year, however, samples of diseased asparagus were brought to the Station, with the statement that the beds were ripening prematurely and the conditions alarming.

It was quickly determined that the source of anxiety was a genuine rust, and in a few days a circular of information was issued, giving some account of the fungus and suggesting measures that might tend to check the development of the trouble the coming year.

Many visits were made to the asparagus regions during the season of 1897; a watch was kept upon the rust as to the time of its development and the forms it assumed, and the injury to the crop recorded. A field of asparagus upon the Station grounds was sprayed at frequent intervals with fungicides, and the results obtained are given in bulletin 129 (June 10, 1898) of the Experiment Station, from which the two plates and some of the matter for this article are taken.

THE ASPARAGUS RUST.

The rust of the asparagus is caused by a fungus that was described by De Candolle as *Puccinia asparagi* in the year 1805. From this it is seen that the rust upon the asparagus has been known to science for nearly a hundred years. No search of the early writing upon garden-

ing has been made for a mention of the trouble, but it is reasonable to suppose that more or less of this fungus has existed beyond the history of man.

Saccardo gives England, France, Germany, Austria, Switzerland, Hungary and Italy. Souauer, Frank, Ludwig, Prillieux and Tubeuf and Smith all make mention of the asparagus rust in such a way as to strengthen the opinion that the parasite is not uncommon in Europe. Zimmermann presents eight figures of the asparagus rust, five of which are from microphotographs, and Plowright gives a description of the three forms of spores. No account of it is met with for Asia or Africa.

The only mention of its being found in the United States previous to 1896 is by Dr. Harkness, and correspondents in California inform us that the rust is not found there at the present time.

It is impossible to account for the unusual outbreak of the rust in the Eastern States in 1896, which, after a full correspondence with botanists, horticulturists and asparagus-growers, seemed to be limited in that year to New England, Long Island, New Jersey and Delaware.

The predictions have proved true, and, as a rule, all fields that were badly infested in 1896, in New Jersey at least, were even worse in 1897. A letter of inquiry has been sent to at least one person in each State and Territory, usually a station botanist or horticulturist, and from these reports, kindly furnished, it is gathered that the rust is in the South Atlantic States, including South Carolina, and the large asparagus fields around Charleston in particular. In short, the disease has spread considerably during its second year in this country; but the vast interior and the western part of the United States seem as yet free from the rust.

RECOGNITION OF THE RUST.

When an asparagus field is badly infested with the rust the general appearance is that of an unusually early maturing of the plants. Instead of the healthy green color there is a brown hue, as if insects had sapped the plants or frost destroyed their vitality. Rusted plants, when viewed closely, are found to have the skin of the stems lifted, as if blistered, and within the ruptures of the epidermis the color is brown, as shown in Plate I, Figures *a* and *c*.

This brown color is due to multitudes of spores borne upon the tips of fine threads of the fungus, which aggregate at certain points and

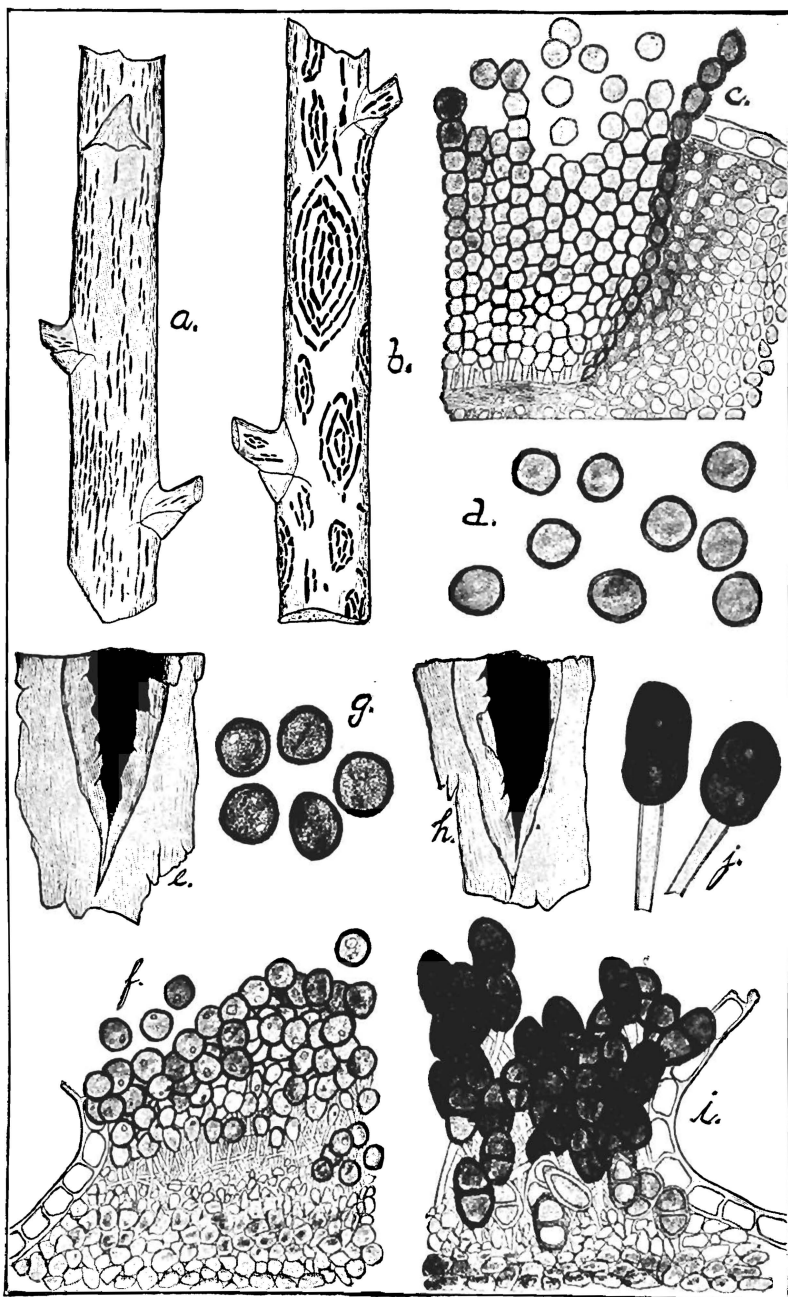


PLATE I.

Description of Plate.

PLATE I.

- Fig. a.** An asparagus stem showing Uredo form of the rust ; natural size.
- Fig. b.** An asparagus stem showing teleutospore form of the rust ; natural size.
- Fig. c.** A portion of a section of an *Æcidium* cup showing the rows of spores and the Mycelium of the fungus and cells of the asparagus stem ; magnified 175 times.
- Fig. d.** *Æcidial* spores ; magnified 175 times.
- Fig. e.** Portion of Uredo sorus ; magnified 25 times.
- Fig. f.** Portion of a section of a Uredo sorus ; magnified 175 times.
- Fig. g.** Uredo spores ; magnified 300 times.
- Fig. h.** Portion of teleutospore sorus ; magnified 25 times.
- Fig. i.** Portion of a section of teleutospore sorus ; magnified 175 times.
- Fig. j.** Two teleutospores ; magnified 300 times.

cause the spots. A view of a section through one of the spore-bearing spots is shown in Plate I, Figure *f*. The threads from which the spores are produced are exceedingly small and grow through the substance of the asparagus stem, taking up nourishment and causing an enfeebled condition of the victim, which results in loss of the green color and the final rustiness of the plant, due to the multitudes of spores formed upon the surface, shown by Figures *f* and *g*. These spores are carried by the wind to other plants, where new diseased spots are produced, but as the autumn advances a final form of spore appears in the ruptures, Plate I, Figure *j*, that is quite different in shape and color from the first ones produced through the summer. In Plate I, Figure *i*, is shown a section of a rust rift, with the spores of late autumn, which, from their dark color, give an almost black appearance to the spots as seen in Figures *b* and *h*.

There is another form which the rust fungus assumes, not usually seen in the asparagus field, but may be found in early spring upon plants that are not subjected to cutting. This is the cluster-cup stage, so named because the fungus produces minute cups from the asparagus stem and in small groups of a dozen to fifty, making usually an oval spot easily seen with the naked eye. In Plate I, Figure *c*, is shown a portion of one of these cups, with the spores, *d*, that are formed in them. This stage of the fungus comes first in the order of time in the series, and is met with upon volunteer plants that may grow along the roadside or fence-row, or in a field where all the old asparagus plants have not been destroyed. Last spring this form of the rust was quite common upon plants in vineyards and orchards set upon old asparagus fields and the plants near the trees or trellises, out of reach of the cultivator, were left to grow.

NATURAL ENEMIES OF THE ASPARAGUS RUST.

It is a pleasure to record that during the past season a parasite has been frequently seen upon the Urdeo form of the asparagus rust. This is a fungus bearing the name of *Darluca filum* Cast., that is well understood as preying upon the rusts generally. To the naked eye, the fungus, as seen in the field, gives the rusted plant a mouldy appearance. This light-gray color is due to multitudes of fine, curved threads that ooze out of the more deeply-seated portion of the fungus. When these minute spirals, made up of spores that with the accompanying jelly are pushed out of the spore cavities, are washed away

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by rains, the asparagus stems appear covered with minute dark pimples, which are the spore cavities of the fungus. The intimate association of the *Darluca* with the rust fungus is shown in Plate II, where, at *a*, is given an enlarged view of a spore rift of the *Puccinia*, within which there is a large number of the dark spore cavities of the *Darluca*. The fine threads of the latter fungus fasten themselves upon those of the rust and there finally result the structures for spore production, as shown at *b* in a sectional view of a rift.

The two fungi, namely, the rust that feeds upon the sap of the asparagus and the *Darluca* that gets its nourishment from the filaments of the rust, are quite unlike in many things. The spores of the *Darluca*, shown much enlarged at *c*, are colorless and boat-shaped, with a cross-wall dividing each into two nearly equal parts, and therefore very different from the large, oval, thick-walled, orange-brown spores of the rust. Again, the method of their production is within a pear-shaped cavity, while the rust-spores are formed upon the free tips of the threads. Both are fungi; both are found in the same diseased spots of the asparagus; but under the microscope, the differences are as great as between asparagus and onions, for the latter both belong to the same family of flowering plants (*Liliacæ*), while the *Darluca* and the rust are members of widely-separated families of fungi.

In some localities this parasite upon the asparagus rust has been so abundant as to make it difficult to find a fully-developed rust-spot free from the *Darluca*. Microscopic study of this fungus has not extended far enough to warrant any opinion as to the amount of influence it has in checking the growth and spread of the rust, and as 1897 was the first season that the *Darluca* has been met with, it is impossible to make any statement as to the favorable effect its presence may have upon the following crop. But upon general principles the *Darluca* may be looked upon as a friend by the asparagus growers, and its presence in the rusted field is to be encouraged.

This view of the *Darluca* opens up a further consideration of the subject of spraying, for it is to be expected that the spores of the *Darluca*, from their smaller size and thinner coat, would be more quickly killed by the fungicide than the larger, thicker-walled spores of the rust. It is possible, therefore, that it might be a disadvantage to spray asparagus plants that are already covered like a mold with the spores of the *Darluca*. In short, the grower is in a dilemma, and it is not safe, with the present limited knowledge at hand, to decide satisfactorily for him. It is true that the rust comes before the

Darluca, and if the rust fails to appear there is no use for the Darluca. If early spraying has only a small retarding effect upon the rust, but kills off effectively the Darluca, that might otherwise make a vigorous attack upon the rust, it is possible that spraying to check the rust might defeat its own end. It is clear, therefore, that the whole question must be left open until further experience is had and experiments made with the case.

Another natural enemy of the asparagus was found in the early part of the season upon the cluster-cup form of the asparagus rust. This is the fungus *Tubercularia persicina* Ditt. Plate II, figure *d*, shows a piece of asparagus stem, with a cluster of the cups in the center, and around this are five spore-bearing patches of the parasite, which are large, irregular and black where the skin of the asparagus stem has been broken.

A portion of one of the spore-patches is shown in sectional view at *e*, where the spores in great numbers are to be seen produced upon the ends of threads. These spores are oval and purplish, and are shown highly magnified at *f*.

If the cluster-cup stage is essential to the development of the asparagus rust and must precede it, this *Tubercularia* preying upon the cup fungus may be a particularly valuable auxiliary in checking the later and more destructive forms.

Thus far this parasite has been met with only upon asparagus plants that grow wild and produce the cluster-cups in early spring. Spraying in the field may not, therefore, interfere with the good work of this fungus. It remains to be determined how much this parasite and the Darluca may be depended upon to hold the rust in check, and it is encouraging to have these friends of the asparagus grower come to his rescue so early in the history of the asparagus rust in this country.

EXPERIMENTS WITH ASPARAGUS RUST IN 1899.*

During the present season experiments in spraying have been pursued in the asparagus field at the College Farm. Only one fungicide was used, namely, standard Bordeaux, and upon Plot II the middle three rows of the fifteen being left as check. The sprayings were five in number and upon the following dates: June 15th and 22d, July 1st, 11th and 21st. On August 5th it was noticed that the treated

* The remaining portion of this article is extracted from the annual report of the Experiment Station for 1899.

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plants showed slight signs of burning and the sprayings were discontinued. During August and September sprayings were made of half-strength Bordeaux upon the most vigorous plants to be found in the field, and at the time of writing no ill effects have been observed.

The test this season confirms the opinion of last year that Bordeaux of the standard strength is to some extent injurious to asparagus and cannot be recommended. It was also again demonstrated that the fungicide does not adhere closely to young plants; but upon old "brush" it holds remarkably well. Some adhesive mixture might be used with the half-strength Bordeaux, but even then the results do not indicate that the rust will be prevented by it.

The results of the spraying for the present season show that the per cent. of rust upon all the sprayed hills was 49.4, while those that were untreated had 66.3 per cent. This gives a difference of 16.9 per cent. in favor of the sprayed plants. It is true that the applications ceased at the close of July and before the plant showed any rust, and therefore it is not possible to predict the results, provided they had continued through the season with a mixture that is harmless to the asparagus.

The amount of rust was estimated in terms of per cent. upon all the plants, and the following table is made up of the averages for each row of fifteen plants as they appear in the various plots:

	Plot I.	Plot II.	Plot III.	Plot IV.	Average.
Barr's Mammoth.....	53, 70	55, 72	79, 89	78, 87	73
Elmira.....	63, 69, 81	61, 67, 54	82, 82, 78	80, 80, 87	74
Columbian White.....	72, 81	68, 72	76, 82	86, 87	78
Palmetto.....	40, 52, 42	14, 16, 19	31, 64, 53	43, 63, 67	42
Conover's Colossal.....	73, 67	76, 66	88, 81	85, 85	78
Giant Brunswick.....	83, 81	78, 68	90, 84	81, 81	81
Moore's Cross-bred.....	75	51	75	86	72
Giant Argenteuil.....	15	23	30	29	24

From this it is seen that there are two varieties much less susceptible to the rust than the others, namely, the "Argenteuil" and "Palmetto." These two are not quite comparable, because the "Argenteuil" is from seed and much younger than the "Palmetto" plants that were set in 1896, and seedlings are generally less infested than older plants of the same sort. The other six varieties are attacked nearly equally, the "Brunswick" having the highest percentage, and the "Moore's Cross bred" the lowest of that class.

OBSERVATIONS IN THE FIELD.

During September trips were made to the leading asparagus fields in the vicinity of Middletown, Red Bank and Hazlet for Monmouth county, and Woodbury and Thoroughfare for Gloucester county. All fields were somewhat affected, and some of them brown with the rust. The age of the plants seemed to have very little to do with the amount of the rust, for some year-old beds were badly and others only slightly affected. The variety seems to have much to do with the condition of the plants. All leading varieties except the "Palmetto" seem to be equally and badly affected, while the "Palmetto" fields are generally green and in a healthy condition. It is needless to state that the more resistant "Palmetto" is being used almost exclusively, and the demand for this stock far exceeds the supply the present year. In the Monmouth county region there is something of a revival in the asparagus industry, due in part to the resistant nature of the "Palmetto" and the good prices that have obtained during the past three years. The total yield of the crop has been less than formerly, and this has prevented a glut in the market, and good prices were maintained throughout the season.

The best growers are taking better care of the fields than formerly, and this has resulted in their favor. Those who use commercial fertilizers are finding that it is very important to keep the plants stimulated to vigorous growth as a means of resisting the inroads of the rust.

Take it all in all, the advent of the rust has not been so harmful to the asparagus industry, as a whole, as was to be expected. The threatening enemy has led to a more careful consideration of their fields on the part of the better class of growers, while the careless have in many cases turned their attention to less exacting crops. A study of the resistance of varieties has resulted in the almost exclusive use of the "Palmetto," and the search for any other stock that may be even better able to withstand the rust.

At one place a large amount of seed of a French stock has been imported and it remains to be seen what the result may be. There is one middle-aged field of this stock known to the writer, and in a visit to it last year but little rust could be found, while the present season there was still less; in fact, it might be considered as practically free from the rust. Should the new importations prove equally resistant,

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the whole difficulty as regards rust would seem to be at end; but whether this stock is productive and of high quality is another matter, but there is no reason to think it is less so than the common sorts.

Growers are noting the effect of clean culture upon the vigor of the plants and now use considerable quantities of commercial fertilizers, particularly nitrate of soda, to produce a strong growth of top that insures a crop where careless treatment would result in a failure. In so far as the rust has brought about a more rational treatment, it has been a lasting benefit to the best class of asparagus-growers.

THE SPREAD OF THE RUST.

In the South Carolina region of asparagus growing, where the rust has been found for the past three years, the reports indicate that it is increasing in extent and virulence. Letters from Michigan are to the effect that from the few places where it was met last season it has spread to a considerable extent. Early in the summer it was reported by Prof. Selby as found at the Experiment Station in Ohio. In early October it was stated in a letter from a correspondent in Illinois that the rust was appearing there for the first time and in considerable quantity. Shortly after this it was reported as present in Indiana, and last of all, a recent letter from Prof. Hitchcock announces the finding of badly rusted plants in Kansas. This adds four great interior States to the list of affected localities, and in general it is safe to conclude that the trouble is spreading widely through the country but outside of distinctly asparagus-growing regions it is not expected to be harmful for at least some time to come.

Description of Plate.

PLATE II.

- Fig. a.** A Uredo sorus infested by the Darluca ; magnified 25 times.
- Fig. b.** A section of Uredo sorus infested by the Darluca ; magnified 70 times.
- Fig. c.** Spores of Darluca—three of them germinated ; magnified 590 times.
- Fig. d.** A cluster of *Æcidium* cups infested by the Tuberculina—the cups are in the center and the Tuberculina marginal near the spermagonia ; magnified 15 times.
- Fig. e.** Portion of a section of the Tuberculina ; magnified 175 times.
- Fig. f.** Spores of the Tuberculina ; magnified 590 times.

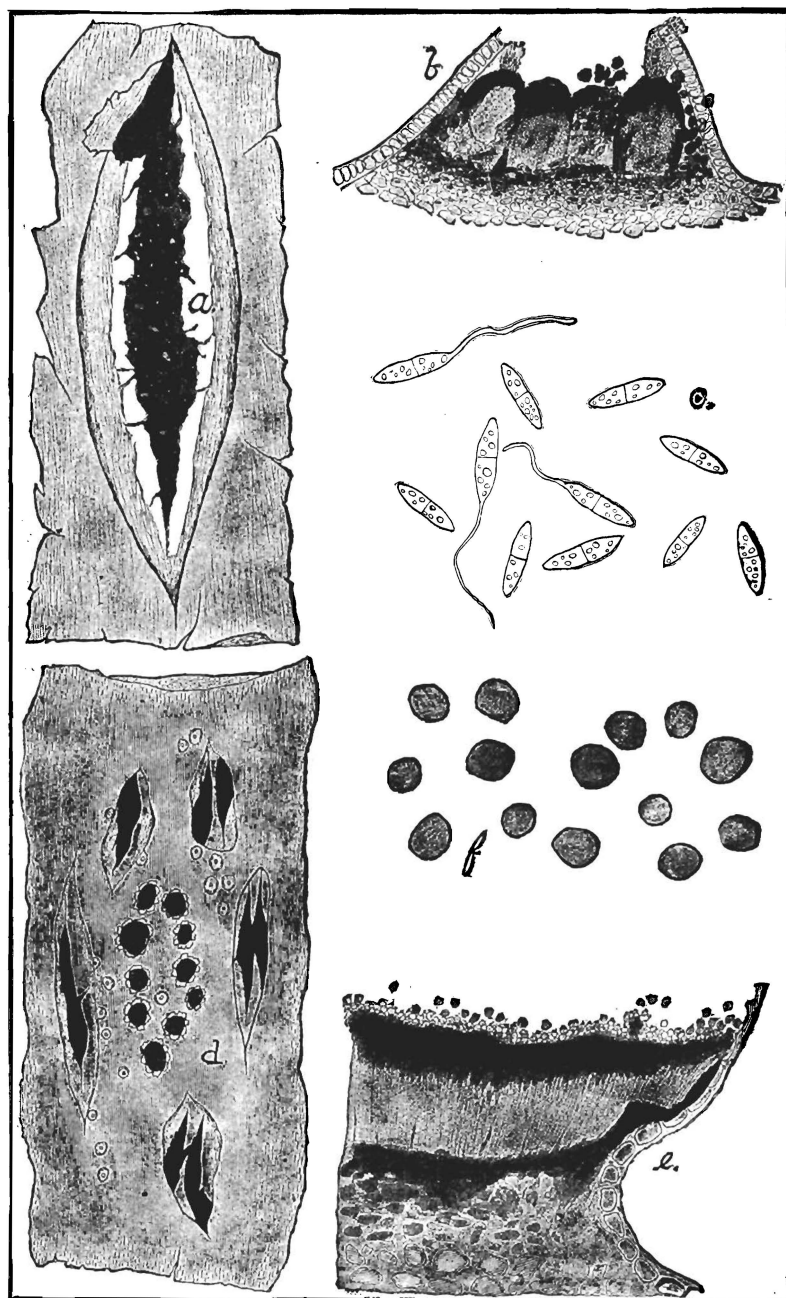


PLATE II.

REPORT OF TUBERCULOSIS COMMISSION.

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POINTS OBSERVED IN JUDGING DAIRY CATTLE.

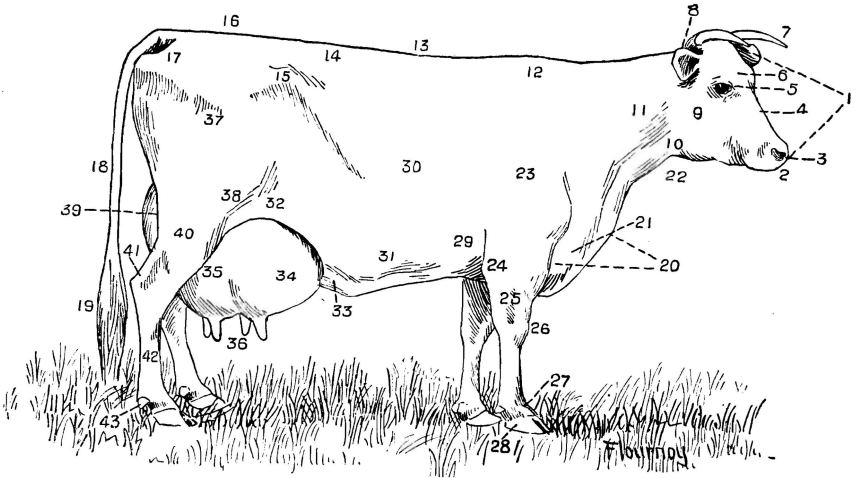


FIG. 21.—Diagram of cow, showing points.

- | | | | |
|--------------|------------------|---------------------|--------------------|
| 1. Head. | 12. Withers. | 23. Shoulder. | 34. Fore udder. |
| 2. Muzzle. | 13. Back. | 24. Elbow. | 35. Hind udder. |
| 3. Nostril. | 14. Loins. | 25. Forearm. | 36. Teats. |
| 4. Face. | 15. Hip bone. | 26. Knee. | 37. Upper thigh. |
| 5. Eye. | 16. Pelvic arch. | 27. Ankle. | 38. Stifle. |
| 6. Forehead. | 17. Rump. | 28. Hoof. | 39. Twist. |
| 7. Horn. | 18. Tail. | 29. Heart girth. | 40. Leg or gaskin. |
| 8. Ear. | 19. Switch. | 30. Side or barrel. | 41. Hock. |
| 9. Cheek. | 20. Chest. | 31. Belly. | 42. Shank. |
| 10. Throat. | 21. Brisket. | 32. Flank. | 43. Dew claw. |
| 11. Neck. | 22. Dewlap. | 33. Milk vein. | |

The above cut is printed by permission of United States Department of Agriculture from the Fifteenth Annual Report of Bureau of Animal Industry—Dr. D. E. Salmon, Chief of Bureau; Henry E. Alvord, C. E., Chief of Dairy Division.

It is printed in the belief that it will be of much value to dairymen and students of dairy stock.

Report of Tuberculosis Commission.

The dairy business is becoming more and more a special branch of agriculture within the State. Its requirements, if a pure and healthful milk-supply is to be furnished consumers, demand special fitness of knowledge and will. Knowledge of how to breed and rear healthy cows, knowledge of the essentials as to stable conditions, foods, and the general care of dairy cows in order to keep them healthy. Knowledge of the most improved appliances for handling the milk-product so that it shall reach the consumer in a pure, uncontaminated condition.

Many of our farmers, who are also dairymen, are studying the business with the purpose of adopting every improvement in breeding, feeding and stabling of the stock, and in the care and handling of the milk so that the product of their dairies shall be healthy, clean and pure.

The will is a most important factor in this business. It is possible to ignore and disregard many of the essential matters referred to while yet supplying the market with milk. And with all the knowledge available, unless the will to do right be present, the product will fall below highest conditions of purity and healthfulness. There are over 200,000 dairy cattle in the State. Their product, as is the case with a large number of our other leading industries, can only be guessed at.

Investigations for the eradication of tuberculosis from dairy cows have been carried on by the Tuberculosis Commission according to the provisions of the law, and as far as the appropriation would allow. The law does not permit the Commission to make examinations unless requested to do so by the State Board of Health, the State Dairy Commissioner or the owner of cattle supposed to be affected. This restriction prevents a uniform and general inspection. More than half of the appropriation is expended in the examination of small herds, frequently from one to six or seven in number, while commercial dairies, *i. e.*, dairies from which milk is sold, are not all examined. It is thought by some that the chief purpose of the law was intended

to cover, or should do so, all commercial dairies, thus guaranteeing to purchasers of milk a supply from cows regularly inspected. The appropriation of \$7,500 for use last year, ending with October 31st, was practically exhausted June 30th. Applications received since that date and prior to November 1st, to the number of forty, were placed on file and received first attention after November 1st, 1899.

These applications, postponed to the beginning of the present fiscal year, have made a heavy demand on the appropriation now available. Should the applications continue with the same frequency as heretofore (and there are large sections of the State that have been scarcely touched), the appropriation will again be exhausted before the year closes.

The restriction of the work of the Commission referred to makes it impossible for it to make examinations on its own executive volition. For this reason, no matter though the appropriation were double the present one, they would not expend more than is called for by actual application.

On this latter point, dairymen and farmers who applied for examinations after the appropriation was exhausted made strong and seemingly just criticisms, claiming that the State has, by the law, stamped bovine tuberculosis as subversive of healthful milk; has established a commission to investigate dairy herds with a view to removing affected animals and, if possible, eradicating the disease, thus marking the man who sells milk from cows having a suspicion of tuberculosis.

But when such a dairyman applies to have his herd examined he is met with the reply, "No funds for further work till next fiscal year." The insistent made is that sufficient funds should be available to carry on the work through the entire year. If this were possible, it is fair to presume that, with the law now in force for the examination of all cattle that may be brought into this State from other States, the dairy herds of New Jersey would, in the near future, be in a greatly improved condition of healthfulness, and the milk product above suspicion of tuberculosis germs.

The Commission will, in the future, insist that all who apply for examination of cattle make immediate and persistent efforts to carry out such requirements as may seem to be necessary in the way of improving stables and surroundings, where this is needed, and also as to the introduction of diseased animals into dairies that have been examined. The sale of suspicious cows for dairy purposes to those

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who are ignorant of their condition is a crime demanding severe treatment. A number of instances of this kind have been brought to the notice of the Commission.

It is highly important that every dairyman should have healthy animals for breeding and milk-producing purposes; then create and maintain such conditions of stable-life, feeding and environment that the bacilli of tuberculosis will not find a congenial spot for development. Avoid close, dark, damp, poorly-ventilated stables. Such conditions are calculated to reduce the vitality of the animals and make them more easily susceptible to invasion of disease.

As so much is now written on the general subject of tuberculosis, both of scientific research and experience in dealing with the disease, the Commission will not burden this report with a repetition of similar statements. They would, however, publish, for the benefit of milk-producers who desire to keep in the van of progress, a set of rules promulgated by the United States Department of Agriculture—Dairy Division—based on Farmers' Bulletin No. 63, "Care of Milk on the Farm," believing that by so doing much good will result to the dairy interests of the State.

THE OWNER AND HIS HELPERS.

1. Read current dairy literature and keep posted on new ideas.
2. Observe and enforce the utmost cleanliness about the cattle, their attendants, the stable, the dairy and all utensils.
3. A person suffering from any disease, or who has been exposed to a contagious disease, must remain away from the cows and the milk.

THE STABLE.

4. Keep dairy cattle in a room or building by themselves. It is preferable to have no cellar below and no storage loft above.
5. Stables should be well ventilated, lighted and drained; should have tight floors and walls and be plainly constructed.
6. Never use musty or dirty litter.
7. Allow no strongly smelling material in the stable for any length of time. Store the manure under cover outside the cow-stable and remove it to a distance as often as practicable.
8. Whitewash the stable once or twice a year. Use land plaster in the manure gutters daily.
9. Use no dry, dusty feed just previous to milking; if fodder is dusty, sprinkle it before it is fed.
10. Clean and thoroughly air the stable before milking. In hot weather sprinkle the floor.
11. Keep the stable and dairy-room in good condition, and then insist that the dairy, factory, or place where the milk goes be kept equally well.

THE COWS.

12. Have the herd examined at least twice a year by a skilled veterinarian.
13. Promptly remove from the herd any animal suspected of being in bad health and reject her milk. Never add an animal to the herd until certain it is free from disease, especially tuberculosis.
14. Do not move cows faster than a comfortable walk while on the way to place of milking or feeding.
15. Never allow the cows to be excited by hard driving, abuse, loud talking or unnecessary disturbance. Do not expose them to cold or storm.
16. Do not change the feed suddenly.
17. Feed liberally, and use only fresh, palatable feed-stuffs. In no case should decomposed or moldy material be used.
18. Provide water in abundance, easy of access and always pure, fresh, but not too cold.
19. Salt should always be accessible.
20. Do not allow any strong-flavored food, like garlic, cabbage and turnips to be eaten except immediately after milking.
21. Clean the entire body of the cows daily. If hair in the region of the udder is not easily kept clean it should be clipped.
22. Do not use the milk within twenty days before calving nor within three to five days afterwards.

MILKING.

23. The milker should be clean in all respects; he should not use tobacco; he should wash and dry his hands just before milking.
24. The milker should wear a clean outer garment, used only when milking, and kept in a clean place at other times.
25. Brush the udder and surrounding parts just before milking, and wipe them with a clean, damp cloth or sponge.
26. Milk quietly, quickly, cleanly and thoroughly. Cows do not like unnecessary noise or delay. Commence milking at exactly the same hour every morning and evening, and milk the cows in the same order.
27. Throw away (but not on the floor, better in the gutter) the first few streams from each teat; this milk is very watery and of little value, but it may injure the rest.
28. If in any milking a part of the milk is bloody or stringy or unnatural in appearance, the whole mess should be rejected.
29. Milk with dry hands, never allow the hands to come in contact with the milk.
30. Do not allow dogs, cats or loafers to be around in milking-time.
31. If any accident occurs by which a pail full or partly full of milk becomes dirty, do not try to remedy this by straining, but reject all this milk and rinse the pail.
32. Weigh and record the milk given by each cow, and take a sample morning and night, at least once a week, for testing by the fat test.

CARE OF MILK.

33. Remove the milk of every cow at once from the stable to a clean, dry room, where the air is pure and sweet. Do not allow cans to remain in stables while they are being filled.

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34. Strain the milk through a metal gauze and a flannel cloth or layer of cotton as soon as it is drawn.

35. Aerate and cool the milk as soon as strained. If an apparatus for airing and cooling the milk at the same time is not at hand, the milk should be aired first. This must be done in pure air, and it should then be cooled to 45° if the milk is for shipment, or 60° if for home use or delivery to a factory.

36. Never close a can containing warm milk which has not been aerated.

37. If cover is left off the can, a piece of cloth or mosquito netting should be used to keep out insects.

38. If milk is stored, it should be held in tanks of fresh, cold water (renewed daily), in a clean, dry, cold room. Unless it is desired to remove cream, it should be stirred with a tin stirrer often enough to prevent forming a thick cream layer.

39. Keep the night milk under shelter so that rain can not get into the cans. In warm weather hold it in a tank of fresh cold water.

40. Never mix fresh warm milk with that which has been cooled.

41. Do not allow the milk to freeze.

42. Under no circumstances should anything be added to milk to prevent its souring. Cleanliness and cold are the only preventives needed.

43. All milk should be in good condition when delivered. This may make it necessary to deliver twice a day during the hottest weather.

44. When the cans are hauled far they should be full, and carried in a spring wagon.

45. In hot weather cover the cans, when moved in a wagon, with a clean wet blanket or canvas.

THE UTENSILS.

46. Milk utensils for farm use should be made of metal and have all joints smoothly soldered. Never allow them to become rusty or rough inside.

47. Do not haul waste-products back to the farm in the same cans used for delivering milk. When this is unavoidable, insist that the skim milk or whey tank be kept clean.

48. Cans used for the return of skim milk or whey should be emptied and cleaned as soon as they arrive at the farm.

49. Clean all dairy utensils by first thoroughly rinsing them in warm water; then clean inside and out with a brush and hot water in which a cleaning material is dissolved; then rinse, and lastly, sterilize by boiling water or steam. Use pure water only.

50. After cleaning, keep utensils inverted in pure air and sun, if possible, until wanted for use.

The report of the Treasurer of the Commission presented herewith shows the work of the Commission for the past year in detail.

The law enacted last winter (Chapter 181) became operative November 1st. The Commission, being charged with its enforcement, have promulgated such rules as, in their judgment, seemed to be needful. Importers of cattle and transportation companies seem disposed to comply with its requirements and to co-operate with the Commission

to make it effective. While at the first it may seem to cause some inconvenience, those in position to know believe it will work good results to our dairy interests and help our farmers in the way of procuring fewer cows affected with the disease it is intended to guard against. The total number of cows imported and examined from November 1st to December 31st, 1899, is eleven hundred and eighty-one.

The report of examinations made, cattle condemned, &c., is as follows:

County.	Total No. Examined.	Total No. Condemned.	Total Sum Paid.
Burlington.....	296	47	\$1,002 00
Camden.....	3	2	39 00
Cape May.....	31	2	27 00
Cumberland.....	1	1	18 00
Gloucester	8	1	30 00
Hunterdon.....	97	15	340 50
Mercer.....	344	87	2,243 25
Middlesex.....	13	2	36 00
Monmouth.....	5	1	30 00
Morris.....	8	6	165 00
Salem.....	377	25	459 00
Somerset.....	179	39	879 00
Sussex.....	41	4	94 50
Warren.....	12		
Total appropriation.....			\$7,500 00
Total sum paid for cows.....		\$5,363 25	
Expenses of inspection.....		946 12	
Expenses of Commission.....		117 87	
Secretary and stenographer.....		912 00	
Expressage, printing, stationery and blanks.....		160 76	
			\$7,500 00

CHARLES HOWELL COOK,
Treasurer.

Mr. Cook—Ex-Governor Hoard from Wisconsin has asked me concerning the percentage of those condemned to those examined. The idea is prevalent that there is a great deal of tuberculosis in our State. I wish to say that it is not true. The herds that we have examined were suspicious herds. The Commission only go where the Board of Health, the Dairy Commissioner or the owner call us to go and make an examination for the owner, so that when we go to a herd we go into a known diseased herd. Of these known diseased herds we examined 1,400 head and condemned 232, so that the percentage is not very great considering the conditions.

Contagious Diseases of Animals.

HENRY MITCHELL, M. D.

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Report on Contagious Diseases of Animals.

Mr. Franklin Dye, Secretary Board of Agriculture, Trenton, N. J. :

DEAR SIR—In conformity with the provisions of the act approved May 4th, 1886, we herewith submit a report of the proceedings of the Board of Health of the State of New Jersey for preventing the spread of contagious diseases of animals during the year ending November 30th, 1899.

Reports of communicable diseases of animals were received as follows :

LIST OF CASES OF CONTAGIOUS DISEASES OF ANIMALS REPORTED BETWEEN NOVEMBER 7TH, 1898, AND OCTOBER 1ST, 1899, TOGETHER WITH A STATEMENT SHOWING THE ACTION TAKEN FOR THE PREVENTION OF THE SPREAD OF THE DISEASE IN EACH CASE.

When Reported.	Owner's Name and Address.	Disease.	By Whom Reported	Action Taken.
Nov. 7.....	—, Elizabeth.....	Tuberculosis.....	Dr. Zucker	Animal destroyed.
" 7.....	—, West Orange.....	"	Dr. Ogden.....	Referred to Tuberculosis Commission.
" 10.....	Tokey & Sons, 200 Passaic Av., Harrison.....	Glanders 1	Dr. Runge.....	Animal examined.
" 10.....	—, Beesley's Point.....	Tuberculosis.....	Willard Young.....	Referred to Tuberculosis Commission.
Dec. 7.....	—, Karrrsville	Diseased meat.....	M. Cole.....	Advised action.
" 10.....	Louis Cohen, Rose St., N'r'k	Glanders 1	Dr. Runge.....	Animal destroyed.
" 12.....	—, Lusenhop, Kearny	" 2	Health officer.....	"
Jan. 27.....	—, Clifton.....	" 1	Dr. Lowe.....	Destroyed.
" 30.....	—, Woodbury.....	Rabies 10	Dr. T. B. Rogers.....	Referred to law.
Feb. 27.....	Henry Phiffer, Coigue... ..	Cerebro-s p i n a l meningitis..... 3	Wm. S. Fink, D V.S.	Died.
" 27.....	—, Rio-Grande.....	Tuberculosis.....	Wm. A. Harris	Referred to Tuberculosis Commission.
Mar. 9.....	F. Yokow, Belleville.....	Glanders 4	Dr. Runge.....	Two destroyed.
" 21.....	Julius Leahy, Harrison.....	" 1	"	Animal destroyed.
" 21.....	—, Taggerts, Kearny	" 1	"	"
" 28.....	—, Merz, Jacob St., N'r'k..	" 1	"	"
" 28.....	—, Schiengert, Newark.....	" 1	"	"
" 30.....	—, Jersey City.....	" 24	Mr. Benjamin.....	Animals
April 26.....	—, Hartman, Elizabeth.....	" 1	Dr. Zucker	Animal
May 22.....	George Taylor, Cedar Grove, Reservoir Place, Newark.....	Tuberculosis	James McDonough..	Tuberculosis Commission.
" 22.....	—, Clayton	Glanders 2	D. D. Chandler.....	Animals destroyed.
" 23.....	John Blatr, Hanover Neck ..	Tuberculosis.....	W. M. Pierce.....	Tuberculosis Commission.
" 23.....	—, Little Ferry.....	Pleuro pneumonia.....	Dr. Runge.....	No case.
July 4.....	—, Traders' Express, Orange.....	Glanders 1	A. Woods	Animal destroyed.
" 7.....	—,	" 1	D. D. Chandler.....	"
" 10 to	—,	"	"	"
Aug. 15.....	—, Logan Twp., Glo. Co	Anthrax Cases..... 27	Dr. Rogers	Inoculation of 205 animals.
" 13.....	Louis Brinkerman, Passaic ..	Glanders 1	Dr. J. P. Lowe	Animat destroyed.
" 14.....	S. Faber, Passaic	" 1	"	"

Anthrax cases reported.....	27	Cases of rabies reported.....	10
Deaths	22	Cases of cerebro spinal meningitis.....	3
Glanders cases reported.....	44	Cases of supposed pleuro-pneumonia examined ..	1
Animals destroyed	44	Animals inoculated (see report which follows)..	205
Cases of bovine tuberculosis reported.....	7		

Following is a report of the outbreak of anthrax which occurred in Gloucester county during the months of July and August, 1899:

To the Board of Health of the State of New Jersey :

GENTLEMEN—On July 15th, 1899, you requested me to assume the control of measures for suppressing the outbreak of anthrax in Logan township, Gloucester county, N. J., giving me authority to use such restrictive and preventive measures as should be necessary. I have the honor to report to you that when I ceased work on August 18th, 1899, the infected district was entirely free from cases of the disease, and that two hundred and five head of stock, mostly cattle, had been rendered immune by inoculation with anthrax vaccine. These injections were made without the loss of a single animal, without the development of any local irritation and without diminution in the milk-flow from the inoculated herds. The virus used was obtained from the laboratory of the H. K. Mulford Company, of Philadelphia. It is a three-injection virus, the second injection following five days, and the third fourteen days, after the first. In my opinion this slow method is fraught with much less danger than the method of Pasteur, the two-injection method. Great care was taken with the injections, the skin being sterilized by destruction of the hair and superficial layer of epithelium with the thermo cautery. This is a more rapid way of skin sterilization than the method of shaving the hair and disinfecting the skin with creolin or bichloride of mercury, there being no risk of weakening the virus by admixture with antiseptics, and the cautery mark prevents the same animal from being inoculated twice with the same virus. Especial precautions were taken against any loss of virus from the injection wounds, this step being necessary to prevent insufficient protection. Several tubes were condemned, these being evidently contaminated; two of them having the deep yellow color that is seen in cultures of certain chromogenetic species of bacteria. It is, in my opinion, essential that the field-worker in this department of preventive medicine should himself be a bacteriologist, as lack of this knowledge may lead to discredit of good laboratory work by careless field methods, or on the other hand, careless laboratory methods can receive no check if the field-worker has to take things on trust.

A written release was taken from each owner and the injection dates endorsed on the back thereof; these releases are submitted with this report. The cadavers were deeply buried, and the burial plots fenced in; but this is not a good way to dispose of them, as reinfection of the pasture through the agency of earth worms is a possibility, and I recommend to your favorable notice the method used in Delaware. In that State nine dollars is allowed for wood, oil and labor, and the bodies are thoroughly cremated. I trust that we shall be enabled to follow this method in dealing with future outbreaks.

An isolated case of acute anthrax occurred on Mantua creek, between Mount Royal and Paulsboro. A bacteriological diagnosis was made from blood from this case, through the kindness of the Messrs. Mulford, and their bacteriologist's letter anent the matter is submitted herewith. Two owners declined to allow their herds to receive the third injection, but a prospect of quarantine for their herds, and the urgent remonstrances of their influential neighbors, brought them to their senses, and the inoculations were completed. The origin of this outbreak must always remain in doubt. From the map submitted herewith it

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will be seen that all the cases except one (the Burk case) occurred, either on one piece of overflowed meadow or on streams flowing from it. The infection may have been washed there from the Wilmington tanneries, or it may be that the meadow contained the germ, which only waited for proper "*milieu*" for its development, or it may be from other sources beyond our ken. An old resident described an outbreak of diseases in this locality that certainly must have been anthrax, which destroyed a large number of horses and cattle some fifty years ago, and I have seen two isolated outbreaks in Salem county, one on the farm of Michael Hogan, in Mannington township. I think Mr. Hogan lost nearly twenty head of horses and cattle. A report of these cases was made to the State Board of Health about fifteen years ago.

It is interesting to note that anthrax exists in the State of Delaware at this writing. The successful stamping-out of this outbreak in Logan township was much facilitated by the cordial co-operation of a most intelligent body of farmers. Especial attention should be made of Messrs. Holdcraft, Dawson, West and Fletcher Myers. To the last-named gentleman I am indebted for the accompanying map of the infected area.

My assistant, Dr. L. D. Horner, of Woodstown, proved to be one of the most untiring and painstaking workers that it has been my pleasure to meet, and though he had a long daily drive in most oppressive weather he was always on time to a minute. Below you will find a list of cases and of the infected herds. I have the honor to be

Your obedient servant,

THOMAS B. ROGERS,

Woodbury, N. J., August 25th, 1899.

D. V. S.

LIST OF OWNERS OF ANIMALS INFECTED WITH ANTHRAX, WITH NUMBER OF CASES.

OWNER.	No. cases	Cows.	Horses.	Hogs.	Recoveries	Deaths.
Wm. Norton.....	3	3	.....	.....	.....	3
Wm. M. Hewes.....	3	2	1	.....	.....	3
Libby Roberts (Mrs.).....	1	1	.....	.....	.....	1
Joseph G. Davis.....	2	.....	2	.....	.....	2
F. A. Norton.....	1	1	.....	.....	.....	1
S. L. Kille.....	5	5	.....	.....	1	4
Wm. M. Shipman.....	4	3	.....	1	1	3
Frank Dawson.....	5	5	.....	.....	1	4
Geo. Whitaker.....	1	1	.....	.....	.....	1
Wm. Burk.....	1	1	.....	.....	1	.....
Robert M. Holdcraft.....	1	1	.....	.....	1	.....
Total.....	27	23	3	1	5	22

STATE BOARD OF AGRICULTURE.

NAMES OF OWNERS OF ANIMALS INOCULATED WITH ANTHRAX VACCINE, LOGAN TOWNSHIP, GLOUCESTER COUNTY, N. J., BETWEEN JULY 15 AND AUGUST 25, 1899.

OWNERS.	No. Cows.	No. Horses.
C. F. Myers.....	5	.....
F. S. Dawson.....	6	.....
Jacob Zane.....	2	.....
S. L. Kille.....	5	.....
James Brannan.....	3	.....
Robert M. Holdcraft.....	2	.....
James West.....	3	.....
Wm. H. Shipman.....	8	.....
Wm. L. Chew.....	6	.....
Wm. Reisner.....	4	.....
Clarence B. Hampton.....	7	.....
Samuel Holdcraft.....	3	.....
F. A. Norton.....	8	.....
J. B. Wright.....	1	.....
Wm. C. Kelly.....	6	.....
E. J. Dawson.....	4	.....
J. G. Myers.....	8	.....
Wm. R. Hewes.....	1	.....
C. R. Richardson.....	3	.....
Hugh McGlinchy.....	4	.....
Wm. H. Moore.....	7	.....
S. Stokes Hunt.....	12	.....
Wm. M. Burk.....	15	.....
Wm. S. Norton.....	5	.....
Elsie Weatherby.....	15	.....
R. F. Davis.....	5	.....
Joseph G. Davis.....	1	2
Isaac N. Patterson.....	5	.....
S. Russell Parker.....	11	.....
Fred. Rapp.....	3	.....
Lidie Whitaker.....	.....	1
Harry R. Steward.....	10	.....
O. J. Zeigler.....	4	.....
Geo. Messick.....	5	.....
Thos. Lyons.....	4	.....
E. M. Springer.....	.....	.....
Total.....	202	3

Very respectfully,

HENRY MITCHELL,

Secretary.

Dairy Economics—The Economy of Dairy Practice.

W. D. HOARD.

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LOADING MILK FOR THE PHILADELPHIA MARKET AT THE PENN., W. J. AND S. S. R. R. DEPOT, CAMDEN, N. J.
20,500,000 Quarts of Milk, the product of South Jersey Dairy Farms, was handled
at this Station during the year 1899.

Dairy Economics—The Economy of Dairy Practice.

BY HON. W. D. HOARD.

Mr. President and Gentlemen—In the progress of all industrial thought there seems to be a stage of evolution. You take the first settlement of Wisconsin, and all of its agricultural processes were crude. This crudeness was made up by the fertility in our soil, which answered with a harvest even to the very crude tickling with a hoe. Then when we finally evolved from the crude farming and grain-growing into the more elaborate farming of animal husbandry, into dairy farming, our first processes and our first efforts were marked again by crudeness. A large degree of easy-going, shiftless thought and management came over with the change, and the idea of the profit that should come to man from a clear, close study of the economy of the business was not entertained, and I may say that this proposition applies all over this Union to a very large number of men. Men to-day are making milk in New Jersey as expensively as they ever did, and the thought that there is a large profit in a more careful study of the economics of the business is not entertained by a great many who are in business.

Now my talk to-day will be the general treatment of dairy economics, and I want to call attention to some specific ideas and principles. As a teacher, it may be said, in this department, I have been obliged in the nature of things in my own practice, and in my advice to others, to hammer things down closely to their ultimate result.

No piece of machinery ever went onto the farm or into a factory that is half so delicate or complicated as the cow. Inside and out she is a bundle of mysterious forces, putting the wisest man to his trumps to manage her to a profit.

Blind, stupid management when she is a heifer will ruin her future. I once had a Jersey cow that brought me three heifer calves. The

first I handled in a way I thought would be conducive to the making a good cow of her, and she proved a good cow. The next was a heifer, and I handled and fed so as to make her beefy; developed the tendency to flesh and kept down the tendency to develop the maternal organs. Consistent with my idea of the thing, she proved to be worthless as a milker, but she would produce good heifers when well mated, because of the dairy heredity in her. The third heifer I handled as I did the first, and she proved to be a good cow.

Now this to me was a conclusive demonstration that the making of the cow is very much in the wisdom of her handling from calf-hood to maternity. Start her right, give her the right kind of a father and mother and grandmother and grandfather back of her; with all that in her favor, even, you can spoil her, and it was proved to me, and it has proved true in thousands of instances that I have observed.

The dairy farmer stands at the switch. He can send one cow down this track and that one down another. How important, then, that he know what he is about, that he put into his business all the good judgment and intelligence he can. How important that he know enough to know that he needs to "know a heap" about cows, if he is to manage his own business wisely.

There is no more interesting field in which to study the finer economies of business than on the dairy farm.

The broad-minded, well-posted dairy farmer sees it. To illustrate: The cow—but she must be a good one—stands in the position of a machine to work up the coarser products of the farm into the finer products of the dairy. It is estimated that a bushel of oats, if fed to a good cow, will produce three pounds of butter. Is there any market for oats that you know of that can beat this?

And I have neighbors who draw oats to the market and sell them for twenty-five cents a bushel, when butter is twenty-five cents a pound, and I have asked those men if they would give fifty cents for a dollar greenback, and they have looked at me in astonishment.

The corn-plant is a compound of stalk and ear. Forty per cent. of the food value of the plant, if harvested at the right time, is in the stalk; well-cured corn-fodder, cut when the ear is fairly glazed, is worth as much for butter production, ton for ton, as the best timothy hay. Do you know of any market for corn-stalks that can beat a good cow? The whole plant, ear and all, if put into a silo at the right stage, stands in relation to timothy hay for butter-making in the

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ratio of two and a half to one. That is, two and a half tons of good ensilage will produce as much butter as one ton of best timothy hay.

And I will take it by choice. Those conclusions have been worked out in the experiment stations and by thousands of private individuals, and yet we make but little impression upon some persons, who clamor for the crucifixion of the truth and the release of Barabas.

Fifteen tons of corn ensilage can easily be grown on one acre of good land. To get the same food-value in timothy, you would have to produce six tons to the acre.

By turning the coarse, bulky feed of the farm into butter or cheese, a product is involved that brings a large profit in the reduction of cost of transportation alone. To illustrate: To transport a dollar's worth of wheat from Wisconsin to New York by rail will cost twenty cents. To transport a dollar's worth of cheese will cost six cents. A dollar's worth of butter will cost five cents.

I remember that at one time I went out to see a lot of farmers, at the solicitation of two or three of them, that had got into a wrangle concerning a creamery; and they called on me and invited me to come before them; and they were going to quit dairying; they said they didn't want to continue the business. The fact was they had made too much money, and they got indifferent, and they did not propose to be tied up to the cow, and they were going into grain-growing. I said very good, but let us look into it a little. If you produce a dollar's worth of wheat, how much easier it is, and less labor and all this and that. I said a dollar's worth of wheat will cost you to transport it to New York—and New York prices govern—it will cost you twenty cents. A dollar's worth of butter will cost you five cents, and there is but one hundred cents concerned in either dollar, and the wheat-dollar costs three hundred per cent. more to transport it to market than the butter-dollar. In addition you take out of your land a larger amount of fertility than you do with the butter-dollar. A ton of butter takes only twenty-five cents worth of fertility out of your land. I said to those men, "You pretend to be intelligent and be arbiters of your fortune, governing it, and yet will engage in the production of a dollar's worth of product that costs you three hundred per cent. more than another to get it to market. There is not a man among you that would not work his finger-nails off to get money to loan at three hundred per cent., and you pretend to me, my farmer friends, that you are thinking the best you can in

behalf of your own interests." Then they began to look at me. The wastefulness of agriculture is appalling to-day; the wastefulness and lack of clean-cut economy, and the study of economy.

Now there is only one dollar, one hundred cents involved in each dollar, yet one dollar pays three hundred per cent. over the other in the cost of transportation alone.

We must drop mere notions, tradition or prejudice, and allow ourselves to be educated on the basis of hard facts, and what is the best profit; we must let the cow herself teach us what we ought to know about her. It will cost only five dollars for a Babcock tester, and not more than a day's time to bring a flood of light into the mind of any intelligent man concerning his cows. If he has studied the true conformation of a dairy cow, by putting the test and such knowledge together, he will see more light.

I often think, my good friends, in the clamor and the noise and the confusion that surround you and me, as we struggle along to the end of the story, how hard it is to see the light and get the light, and the story of Abraham Lincoln in 1864, in the darkest period of the war, comes to my mind. He was waited upon by a delegation of fault-finders from Chicago, and they had nothing but fault-finding to make concerning the conduct of the war, not a suggestion to help the old man out, who was carrying this burden like an Atlas. Finally he said, after listening to them with wonderful patience, "Gentlemen, you remind me of my old friend Jack Armstrong, down on the Sagamon bottom. It was at a time of unfathomable mud, and he wanted a drink, and finally he struggled up to the grocery and got not one but many drinks. Then he started home, and, between deep mud and whiskey, he had a hard time to make any progress, and there came up a thunder storm, all thunder and little lightning. A little lightning would have been a friendly thing, but it was mainly thunder, all confusing and distracting. Finally there came a big crash which brought Jack to his knees, and he thought he would pray, and I would commend his prayer to your careful consideration: 'Oh, Lord God! if it is all the same to you, I would like a little more light and less noise.'" [Laughter and applause.]

What we ask is light, and we must struggle toward the light and not sit down and expect the light to be brought to us.

It is very expensive to allow ourselves to be ignorant of these things. Disappointment, waste of labor, wasted food and a pinched

pocketbook are the punishments that come to thousands of men because they will not dig down to a true understanding of a dairy cow.

I saw a carload of cows in my town going East—I do not know, perhaps to New Jersey—that were sold for \$50 on the car, and I asked the man what they were for—not one in ten would I give, for real dairy work, \$40 for; but they were large, handsome looking cows—and he said the Eastern fellows would buy them. [Laughter.] The man was smarter a good deal that sold the cows than the men are that will buy them.

If men would try and make themselves more intelligent on questions, it would pay a big profit. They would not be seen paying \$50 for cows merely because they are “good lookers” and have size, when not one in ten will earn even \$40 in a year.

We do not need to go far for testimony on these things. A year’s reading of a good dairy paper will bring us in contact with the experience of a host of witnesses who have learned the better way and whose prosperity is proof that it pays to know the cow.

C. W. Jennings took a cow-census of Ellisburg, New York. He enumerated 5,507 cows and interviewed their owners. According to his figures the annual average cost of keeping each of the cows was \$36.30. The annual average of the product from each cow was only \$31.74. The annual average loss per each cow was \$4.51.

I will go back and say that the town of Ellisburg, New York, was losing annually \$25,000, and it was only felt in the pockets of the farmers and not in their brains, not in their thoughts, not in their conceptions, not in their considerations; they felt the pinch, but could not tell where. It makes me think of the Persian story of a man who went to the magistrate for a divorce, and the magistrate said, “Is not your wife virtuous?” “Yes,” replied the man. “Is she not handsome?” “Yes.” “Is she not industrious?” “Yes.” “Why do you ask for a divorce?” And the man thought a while and pulled off his shoe and said, “Is not that a good-looking shoe?”

“Yes.”

“Is not that shoe well made?”

“Yes.”

“Is it not a good pattern?”

“Yes.”

“Can you tell where that shoe pinches?” (Laughter.)

Now these men felt the pinch but they would not bestir themselves enough to find out where the shoe pinched.

The manure from each cow, if carefully saved, was (according to Prof. Roberts' valuation) worth \$58.40 per annum. Prof Roberts' experiment at Cornell University of feeding three large common cows, in full milk, on good hay, cornstalks, cottonseed meal, cornmeal and malt sprouts resulted as follows: The cost of keeping each cow was twenty-three cents per day, and the manure from each cow he valued at sixteen cents per day. The value of food required to produce one quart of milk was a trifle less than one and a half cents, not counting anything for labor of feeding and milking. Prof. Roberts' valuation of the manure was greater than most farmers would place it, but his valuation was made as compared with the cost of commercial fertilizers, for the same elements contained in the manure, which is the proper method, because to maintain the fertility of the farm we must have the manure of the animals or buy commercial fertilizer.

Cows can be kept in some places cheaper than Prof. Roberts kept his. J. B. Phelps, of Conneautville, Pa., one of the vice-presidents of the Pennsylvania State Dairymen's Association, says: "I keep my cows on three cents' worth of ensilage and one cent's worth of wheat bran, making four cents per day for the *maintenance* of each cow, or \$14.60 per year." Remember this is the cost of maintenance alone, not for milk production.

In an essay read at Viroque, Wis., by Dr. C. V. Porter, it is stated that the yearly cost of keeping each cow of his herd of twenty-eight animals was \$25, or less than seven cents per day. This is \$11.30 less per year than the cows reported from Ellisburg.

An experiment made by L. H. Adams, of the Wisconsin University, gave the following results: Four thousand nine hundred and sixty pounds of ensilage made 1,688 pounds of milk that churned 62 pounds and 3 ounces of butter. The ensilage was valued at \$2.50 per ton. Counting nothing for labor and allowing nothing for skim-milk and manure, his butter cost him a fraction less than ten cents per pound.

H. C. Crawford, of Venango county, Pennsylvania, says: "Our cows (not in full milk) are receiving about thirty pounds of ensilage and straw daily, and they are in better condition than any I see through the country, or my own when I fed twenty-five pounds of hay daily, costing twice as much. I can place a ton of ensilage in the

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silos ready for feeding (not including rent or fertilizing of land) for \$1.30 per ton when I can grow ten tons per acre."

That question of cost of milk or cost of product from land is always governed very largely by the amount that each produces. If you ask the cost of making butter from a cow, it depends very much on how much she produces—very much. If you ask the cost of growing a product on an acre of ground, it depends upon how much the acre produces—and very often that is not taken into consideration.

His ensilage cost him not quite two cents per day for each cow, and if we allow the same for straw consumed, the total cost would be less than four cents per day, not counting anything for interest on capital invested in land and cows, or labor of feeding and milking, and allowing for value of manure. Mr. Crawford and Mr. Phelps kept their cows as cheaply on pasture in the summer as they did on ensilage in the winter, and their cows averaged no more than 150 pounds of butter each per annum, but what butter they got cost them less than ten cents per pound, charging the cows nothing for interest and labor, and crediting nothing for skim-milk, buttermilk or manure.

Now there is a review of some of the elements of cost and some of the principles that govern, and I have spoken to you about the fact that the cow is herself the great equation in governing the cost.

In his response to the speech of welcome to the Wisconsin Dairymen's Convention, at New London, Wisconsin, in 1895, Mr. C. P. Goodrich, one of the veteran dairymen of the State, said:

"When I travel through this State, even going at a rapid rate on an express train, and I look out of the windows of the car, I can tell every time when I am passing through the dairy districts. Why? On account of the undisputable evidence of thrift and prosperity that I see in the way of fine barns and well painted houses, and in the summer time, cultivated fields and splendid crops, saying nothing about the beautiful dairy cows. Then I say to myself, 'The dairyman has been the man who is doing more to build up the State of Wisconsin than any other class of men, and the Dairymen's Association has stood at their back, and led them on.' If you wish to pursue your investigations farther than a glance over the fields, go into the business houses, go into the banks, as I do. I go in and ask: 'Are farmers depositing money with you?' 'Oh, yes; there is a million of dollars deposited in our banks of their money.' (Mr. Goodrich had reference to the banks of Jefferson county, in Wisconsin.) Then

I ask: 'What class of farmers are these—grain-raisers, tobacco men, dairymen, or what?' 'It is the dairymen every time.' 'Who is borrowing money, mortgaging their farms?' 'It is the grain-raisers, the tobacco farmers; they are borrowing the money that the cow gave the dairymen.' Now, this is true in just so far as the farmers have adopted improved ideas and methods. We have pushed such ideas vigorously in Wisconsin. But it is an individual matter every time. Each farmer must stand for himself; must be his own schoolmaster. This is true in every State."

Farmers have been slow to see these finer economies that contain the largest profit. It is for this, and the reason of keeping up the fertility of the farm, that we hear the constant injunction, "Don't sell your hay or grain; feed it out, and transform it into some product, like wool, meat, butter or cheese. The bushel of grain or ton of hay, the pound of wool, meat, butter or cheese, is not the unit to reckon by. It is the dollar's worth of each. How shall one dollar's-worth of product be made to pay a larger profit by changing its form, by the use of brains, than it would in another form, without the same intelligence? That is the question.

The farmer who cannot see these finer economies keeps on raising the bulky products with but little margin. The farmer that sees farther is a better business reasoner, puts the cow on the farm as a machine, to manufacture the unprofitable dollar over into a profitable dollar.

It is both interesting and instructive to know the effect of well-trained dairy intelligence in reducing the cost of butter production.

Let me say right here that the milk farmer, butter farmer, and cheese farmer are identical in their economies. There is no way in which you can separate these three. That which is most conducive to the cheapness and economy of butter production will prove the same in the production of milk. So let us settle at once upon the proposition that these three things are indissoluble and cannot be separated.

This has been shown very conclusively at the Minnesota Experiment Station, where the problem was put in the hands of Prof. T. L. Haecker, who is a thoroughly practical man, and who recognizes the great value of experience, wide reading and scientific study in making a financial success with cows.

The cheap food of Minnesota, particularly in the form of bran, of course gave him a great advantage, but the ruling factor after all was the productive capacity of the cows he employed. Prof. Haecker had

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been a very successful breeder of Jersey cattle before he went to Minnesota, consequently he had made an exhaustive study of this cow machine and how to get the largest possible profit out of her. Here are some of the facts.

"During 1895 the average cost of food per cow was \$28.47, the average amount of milk yielded per cow being 7,418 pounds, making an average of 352 pounds of butter per cow. The average cost to produce a pound of butter was eight cents. During 1896 it cost \$22.12 to feed a cow, and the average milk yield was 7,454 pounds per cow. This made the average butter-yield per cow 349 pounds, and the cost per pound was 6.3 cents per pound."

So you see the factor is not always the largest gross production, but when it comes to the net profit the percentage of profit often follows in a contrary line.

"During 1897 the average cost of producing a pound of butter was 4.7 cents. Taking the average for the last two years," Prof. Haecker says, "we have the several costs as follows ;

"Cost of butter production.....	45 cents.
Cost of manufacture.....	2. "
Cost of transportation to seaboard.....	1.25 "
Commission.....	1. "
	<hr/>
	975 cents.

"Our butter during that period sold on an average for 18½ cents a pound, leaving a net return over the cost of production of 8¾ cents per pound ; or, in other words, by marketing our feed stuff, through the cow, the farmer nets \$1.59 for every dollar's worth of feed consumed."

Those were interesting figures and I say to you that they were conscientiously and truthfully wrought out. They give us some sort of a guiding line by which we can judge for ourselves if we study them.

If we add to this the value of the skim milk for feeding purposes we have a net return for the feed consumed by the cow of nearly 200 per cent. When we take into account the fact that under dairy farming the fertility of the land is constantly increasing, we begin to realize why intelligent dairying never fails to bring prosperity. It is an unfailing rule, that if a farmer converts his farm products into milk, and the fat in the milk into butter, and the skim milk is used in rearing young stock, the receipts will be double what they would

be if the feed were sold in the market. All these facts were published in Hoard's Dairyman, together with a cut of the several cows and their individual product.

There comes in the finer economies, and the farmer himself becomes a manufacturer. When the farmer estimates himself to be only a producer, then he is amenable to the cruder conditions of his life; but the moment he considers himself a manufacturer, he studies the finer economics of a manufacturer, and therein lies the profit.

The whole made a most triumphant vindication of the contention we have made for years, that if the farmer wants to make the most money possible out of the dairy business he must pay more attention than he has been doing to the breeding and production of a special-purpose dairy cow.

One point more, in his report on the creameries of Minnesota, Prof. Haecker shows up clearly what great losses the patrons of those creameries sustain in not giving this question of a better cow more consideration.

He says: "The gross income per cow contributing milk to creameries was, in round numbers, \$25. At the University farm, the receipts per cow, crediting them only fifteen cents per pound for butter, was for 1895, \$61, and for 1896, \$61.70"

See what a discouraging state of intelligence that difference indicates. He says again:

"In examining the reports from the different creameries I notice that the patrons of the older creameries receive more per cow than do those that are comparatively new in the business. There are two reasons for this: first, they seem to have learned that it pays to feed cows liberally; second, the cost of manufacture has been reduced by the gradual increase of the milk supply."

Again comes in that factor that the cost of producing a crop on an acre of land, and the cost of milk from a cow, &c., is fixed always by the amount that is produced.

Those taking their milk to the one hundred creameries of the first class receive on an average about \$26 per cow, while those contributing milk to the two hundred creameries of the second class receive \$23 per cow. Those of the third class get about \$20 per cow and the other about \$18.

If you had the same clear, steady investigation into the conduct of dairying in your State, I say to you, what I believe, that you would

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be amazed at the number of men in New Jersey that are keeping cows for a starvation return, for a modicum of profit and in many cases absolute loss.

I wish to say a few words on a subject that deeply concerns every man that would successfully handle cows. It is upon the construction of the cow. We must study the cow from her structural standpoint; understand this, and you will then see the reason of some things. You will see why it is profitable to be gentle and watchful over the cow, why some men are successful and others fail, why the cow responds to one man and will not to another. She is a wonderful mother, and only to the man who is obedient to the laws of motherhood will she yield her best profit.

I thank you, gentlemen, for the opportunity of once more expressing the faith that is within me.

In answer to some questions, Governor Hoard said: "The same thing prevails around Elgin—the same idea of buying cows of low dairy quality with nothing in their favor but size. Buying those cows and turning costly feed into them, feeding them, for instance, for twenty-five-cent butter, and at the same time with that costly feed, producing five-cent or three-cent beef. There is a lack of clean-cut economy, the same as though I would feed a race-horse to run a race and turn him off for a draught-horse. Why not?

"I know these men are not making the money that is made by following the clean-cut dairy lines in my section. I know that; I have been among them; I have taken their cows and figured up their returns, and they are identically in the same position you are, and I know they are wasting money; they are not feeding economically for beef even, and they are not feeding in an economical manner for milk.

"Now, those matters are hard for me to get over, and I am not saying that you people are dumb; I am saying this—that there has not been that clean cut, intelligent thinking to divide these lines, to know how to produce milk at the greatest economy. To me that kind of milk-production is exceedingly expensive. I think the man who will start out to breed a herd of fine milk cows, and keep a cow until she is 12 or 14 years old, will in the end find a very large increase of profit over the other practice. You are beguiled by the idea that you can get within ten dollars as much for the beef cow as

you paid for her, when you paid for her a confounded sight more than she is worth for profitable milk-production."

Mr. ——— Will you tell us how you would raise those cows that you spoke of. Should they all be sired by the same bull?

Gov. Hoard—If you have reference to the heifers I spoiled, as I stated at the beginning, I would say they were sired by a Jersey bull. They were grade Jersey heifers. Two were sired by the same bull, the first and second, and the third was sired by another thoroughbred Jersey bull. When I commenced with the first heifer I took her from the mother's milk on the fourth day. When I commenced feeding her, gave her about two quarts of whole milk after she was taken off the mother, and I gradually decreased the whole milk and substituted skimmed milk, warmed, and gave her ground flaxseed, scalded. I commenced with a teaspoonful of the flaxseed, and I watched the nose and the excrement. This little animal has a baby stomach, and you know how difficult it is to introduce solids into a baby's stomach, until about six weeks, when she commenced chewing the cud, and I fed her so as to develop her muscular growth and keep down the flesh and a fattening tendency. I started with a calf of high dairy temperament, and it is much harder to flesh her. I fed her so as to keep her lean, and at the same time manipulated her little udder to develop the maternal organs and develop the tendency toward maternity.

Now the second, I handled her in a totally different way. As quick as I could get her to eat corn meal I fed her corn meal. I didn't manipulate her udder, but tried to promote her fattening tendency. When she was two years old she was thick and beefy, and had a very small udder. When I bred her she brought a calf, but she gave but very little milk. I kept her three years and she never was worth much. I had ruined this little heifer by developing an opposing tendency from that of maternity—developed the fleshing tendency.

The third heifer I raised as I did the first and she turned out fine. So, as I said to you, the dairyman stands where he can switch one animal down one track or another, according to the intelligence with which he handles the switch.

Mr. Wright—The Governor spoke of the relative worth of timothy hay compared with ensilage as two and a half to one. What difference would he ascribe to nicely-mixed clover hay? Has it a value over timothy hay?

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Gov. Hoard—Yes; the more clover there is in it the more value it has to me. I confess to you, gentlemen, that long study and investigation, as near as I could get at the truth, has convinced me that the poorest hay I can find for dairy purposes is timothy hay.

Mr. Fitzga—I would like to ask you if you can keep a milk cow on four cents a day.

Gov. Hoard—I told you that was done from the standpoint of Minnesota cheap feed.

Mr. Fitzga—What do they feed there?

Gov. Hoard—Ensilage and bran, and prairie hay costs \$5 a ton.

Mr. Fitzga—Mr. President, I would like to know a little more definite about the raising of cows kept on ensilage twenty-five cents per pound.

Gov. Hoard—No; ensilage is reckoned at \$2.50 per ton.

Mr. Fitzga—Twenty-five pounds per day. That is \$2.50 per ton, ensilage put in the silo. That is cheap.

Gov. Hoard—No; I can put ensilage in cheaper than that.

Mr. Fitzga—Then how many pounds of hay?

Gov. Hoard—Those men in Pennsylvania were simply trying to see how cheap they could keep a cow. They only got 150 pounds of butter.

Mr. Fitzga—And still there was the frame left.

Gov. Hoard—I can't vouch for that, that is speculation. I won't talk of that. These men simply by feeding ensilage and straw to the cow produced 150 pounds per year, and they reduced the keep to such an extent that they produced butter low. Here comes the combination of cheap feed and a high-producing cow: low cost of feed and a high-producing cow made Prof. Heacker's butter cost a little over five cents a pound. Now these are facts; I never quarrel with facts. All I want, like yourselves, is to know what their relations are to other facts; * * * then there is another factor: that the men with us who are studying for the lowest cost of production are producing on their farms the very best and finest feed, and are the lowest purchasers of feed. You will find that in this case on the University Farm Prof. Haecker, I think, bought nothing but bran, and he got that very cheap right across the way at the mill.

Mr. Fitzga—Now our Prof. Voorhees conducts a dairy at the College Farm; I know he can give us some figures of what a cow can be kept for.

Gov. Hoard—I think Prof. Voorhees will tell you that since he has got to producing alfalfa—of which very little is produced in New Jersey, and I find it to be one of the finest things in the world for me to reduce the cost of butter-making and milk-making—I think he will tell you since he got to producing alfalfa he can see a very perceptible decrease in the cost of production. That simply says to you and to me that there are yet fields to conquer; that there are yet some things to be learned. Although you and I are working for a profit to the very best of our ability, still may be we are a long ways from where we will be a year from now.

Mr. Evans—I object to the way they estimate this grain. We find some figure-up the cost of grain and some put in their coarse feed, and some don't count anything for labor; all these things are misleading. I contend that the whole cost should go in and all come out in dollars and cents. If a man feeds a cow, and maintains a dairy, and pays interest and taxes, lands and buildings, and all these things, I don't believe a man can feed a cow on that basis at four cents per day.

Gov. Hoard—I give you the facts; I did not say you could do it.

Mr. Evans—That is just where the misleading part is.

Gov. Hoard—Why?

Mr. Evans—Some parties understand it and some do not, and I wish to bring that out.

Gov. Hoard—I am glad you do bring it out. One thing I will say, whatever the problem is, everybody must govern themselves from the environments that surround them. I told you what clear, intelligent work was doing in Minnesota, and I take it that you have some intelligence to adjust some things with you here.

Mr. Evans—I attended a public sale in Pennsylvania a short time ago and that illustrates the Governor's point. It was not a hundred miles from Philadelphia, I won't mention any names, but in the stock that was sold, I don't remember the number, I think ten or twenty calves, yearlings and two-year-olds, and some of them the owner seemed to breed for size. And when they came to be sold, I think his two-year-olds that were fleshy and large ran from \$35 to \$40, and when he came to sell his yearlings and less than a year, and some nine months old and some six months old, they brought from \$70 to \$80. It just shows that somebody there understood that point and was willing to give more for those calves, in some cases only six months

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old. If they gave it the right kind of treatment it was worth five times as much as the others for a future cow.

Mr. Lanning—The Governor in making his comparison in ensilage and timothy makes it as two and a half to one. I think in New Jersey we feed largely clover hay, as we grow that. I would like to know what the comparative value of clover hay is, as compared with ensilage and also with dry corn-fodder, if the Governor can give that?

Governor Hoard—I can only tell you so far as my experience goes. I don't wish to tell you any further than I have gone. I consider that clover hay is worth to me—well cured, young clover—is worth to me at least fifty per cent. more than timothy for the production of milk and butter. I consider that corn-fodder cut at the time when it is fit to cut for ensilage and put up, rightly handled and cured and housed, is very nearly, not quite, the equal of ensilage; but who ever sees such corn-fodder? it is almost inevitable that corn-fodder of that character must be exposed to the weather, and the weather rapidly deteriorates corn-fodder at a rate you would be astonished at, if you could see the real figures.

So it goes. The only way I can take that corn-fodder and at once put it where it cannot deteriorate is into the silo, and then I feed it at its greatest succulent value. Now, the after-history of corn-stalks, if they are even cut when ensilage corn is cut, the after-history is that it is robbed of twenty-five or thirty per cent. of its feeding value before it gets to the cow, because you cannot dry it as you would hay and put it in your barn.

You know very well you cannot get the moisture out of these stalks; you cannot stack it without its heating and moulding. You have to leave it in the field a long time before it is safe to stack and house, and that deteriorates the value of it very much and very rapidly.

It seems to me as though it was the clearest economy to catch that corn crop and put it in the silo and seal it the same as you do canned corn. With us in Wisconsin it is no problem at all, and I am amazed when I see in some sections how men are opposed to it. There is hardly a man in some townships in my section that has no silo. I think there are only three farms in one township that have not a silo. You can ride for miles, and you will find a silo just as steadily as you go along and find a barn. And the town adjoining has the

largest silo in that section. I saw 160 acres of corn in it, and then it was not full. It will take 200 acres to fill it. It was not economical. It was 60 feet wide and 40 feet high, and the man who built it made a mistake; he had better built two or three silos, a good deal, than build that one. But he was a good deal like the boy who set the hen. He put twenty-five eggs under her just because he wanted to see the old thing spread herself. (Laughter and applause.)

Mr. Anderson—What kind of silo has been used?

Governor Hoard—I am to build two new silos and a new barn, and I am thinking some of buying the Cypress Stave Silo. I will have to pay more than men are willing to pay, because I don't want to have but one silo on hand until I die.

Mr. J. M. Lippincott—It is the universal custom in storing ensilage to store the whole crop of corn and all. What is the comparative difference in food value between the two kinds, with corn and without the corn? We see the comparison between the ensilage as compared with dry corn-fodder, that is, without the grain. Now, what is the comparative difference in the value?

Gov. Hoard—So far as my judgment goes I could never feed corn to a cow as cheaply as I could in the silo. Now, many men say husk the corn, and the stalks will make just as good ensilage; but that is not true, because if you wait for the corn you carry the stalk beyond its best value. But if you take the stalk and the ear combined at the right time, at the right pinnacle, just when they are both at the acme of their feeding value, that is when the corn is about well glazed, you cannot feed that corn to your cows with as little cost as you can from the silo.

If you have got to have corn, and you desire to save some corn, husk it off, if you choose to, snap it early; put the stalks, what is left of them, into the silo, and put on water, because there is but little juice, as a rule, in the stalk when the ear is fit to snap; there is not juice enough to create fermentation sufficient to keep it. In that case we sprinkle water to create fermentation. But I do not know of any way in which I can place that corn so cheap before the cow as I can by cutting it into the silo. It is a question of economy with me. Now the husking it, and the grinding it, and all that, is a process that costs, every step of the way.

Mr. Gould—About the deterioration of corn in the silo—I want to ask the Governor this question—I meet this inquiry all over the State—whether the loss of corn in the ear put into the silo is not greater

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than would balance the expense of husking and grinding and feeding back to the cattle? That they cannot afford to wait for the fermentation, that they had better pay for the husking.

Gov. Hoard—I don't believe it. I think men can speculate so fine that it is simply a tweedle-dee and tweedle-dum. They get right down to so fine a point that most everybody will fall off after that. (Laughter).

I do not want to be misunderstood, and I do not want to be taken at another man's interpretation, always. If you gain in the corn you will lose in the stalk. We must keep the feeding value of the stalk in our mind continually, for it takes the place of hay.

Mr. Evans—Mr. Chairman, that very subject of husking corn and putting corn in the silo—I am like Gov. Hoard. I have a steam-mill in my yard, and I believe I can grind corn as cheap as any man in the State, and I can grind a bushel a minute, and it costs me nothing but labor. I think I can compete with any man I ever met in grinding the feed, but I know I can feed it cheaper from the silo. And while some of my neighbors have been trying to convince me to the contrary I am satisfied they are wrong. It saves them buying corn for the horses, I will admit that, but of course they will buy feed for the cows before the year is over.

Mr. Lippincott—I believe my question was not answered. I said that it was the universal custom to place the full crop in the silo unhusked. Now, I believe that is the proper way to get most out of the corn. I only ask the question, what was the comparative difference in the feed-value of the two crops, taking dry fodder and the corn, or taking the corn crop and putting it in the silo? That has not been answered.

Gov. Hoard—On that question, I don't think we have yet authoritative experiments, and only that conjectural judgment that men have by long time study. There have been station experiments and there have been other experiments which contradict them, and there we stand. But there is one thing that should be kept in mind all the time, that is, if you ripen the ear and then take the stalk and do the best you can with it, you have got disastrous circumstances attending the history of that stalk all the way through until it reaches the cow. Then another thing, there is one important thing which a cow always demands, and that is succulent food, if she gives you the best milk and the largest amount of milk for the smallest cost. You take the dry

corn-fodder, and you might wet it if you choose, cut it up, and wet it and soften it, you haven't got the succulence there that it had at the right stage, nor have you got the succulence that is in the silo. So there is that one great factor of succulence which plays a wonderful part in determining the value, because on succulence we depend largely for the least waste in digestion.

I said to you two years ago in my talk here, when I talked on the cow, that I cut $2\frac{1}{2}$ inch June grass with a lawn mower, and no one could tell me how many pounds a day of that grass a cow could eat—no one had found out. So I put a cow in the barn and cut June grass with a lawn mower and weighed it into that cow, every bit of it, and weighed all she did not eat, and on that she made a pound and a half of butter a day; and I found she ate 80 pounds a day of $2\frac{1}{2}$ -inch June grass. Then I said to myself, that cow would graze that much; that is about what a cow would eat if she could get it. Now she held right up in her butter yield when given that grass in that way.

At the same time I dried eighty pounds a day, thoroughly dried out, and it made from fifteen to twenty pounds, depending somewhat upon the soil it came from. It was the same kind of grass and I fed her this equivalent of eighty pounds a day of the green succulent pasture-grass, and all water she could drink, and she at once shrunk in her milk and butter. What had gone out of the grass? What had been dried out? Theorists will tell you water, simply. The cow will tell you something that would make milk and butter had gone out.

Therefore, gentlemen, you see that the dried grass lacks the succulence that the green grass has, and it also lacks the same kind of water. The water that is in the plant is a distilled water; the water that you feed your cow is another kind of water. The distilled water evidently has a different effect on the digestion of the cow, and the cow takes the grass and digests it thoroughly and gets out of it sufficient to make me a pound and a half of butter, taking the green grass. With the dry equivalent of that grass she could not make a pound and a half of butter.

Therefore I want to say that there is a difference in the succulent, digestive value of ensilage over dry corn-fodder. That value I cannot estimate, but I know it exists.

Mr. Voorhees—I think Mr. Lippincott's idea is to find out whether it would pay to take the whole corn and put it into the silo, over taking that same corn and husking it. We conducted

an experiment two or three years ago on that line. Four acres of corn, right alongside of the corn that was put into the silo, was cut at the same time, put in shocks as carefully as possible and then brought to the barn, ears and all, and, when ready to feed, cut up and not shredded, both lots analyzed and rations prepared, whereby the animals would receive the exact amount of matter from the ensilage as from this dry corn-fodder. Records of yield and composition were accurately kept, as well as the cost, and it was found that the ensilage gave us $12\frac{1}{2}$ per cent. more milk than the dry corn-fodder. The corn did not constitute the entire, but the bulk of the ration, and we got $12\frac{1}{2}$ per cent. more milk from the same cow from the silage than from the corn fodder. An analysis was made of the milk at the same time and we got not quite $12\frac{1}{2}$ per cent. more butter-fat.

Now, following that up, and applying it to the crop of corn from which the silage and the corn-fodder were derived, we find it was purely a difference between succulence and non-succulence. It is the difference between the succulent ration and one that is not succulent. As a further example, we feed a cow on forage crops, and sometimes for two or three days we lacked sufficient amount of this and substituted hay. They have exactly the same amount of nutriment but of a different kind, and it is of a kind which has not that succulence that is in the green material.

Now, I have to say, in the matter of succulent forage and dry forage there is a loss of something other than water. That is, we know that the chief difference between the dry and the green is water, but in the green forage there are a number of organic acids which do not exist in the dry forage. That is my opinion, and I think it is verified by such experiments as have been conducted along that line with these materials. Those acids in that combination do have a very decided influence upon the digestibility of the material that is given to the animals, and we lose that in part in the drying of the forage.

We all know that clover hay, when it is first cured, no water on it, is much better than clover hay which has been allowed to lay out in the dew and rain. The aromatic flavors in that plant, before wetting or drying, have influence in aiding digestion. I believe it is not only a question of water, but a change in the chemical composition during the process of drying.

Now then, it is my judgment, although we haven't absolute data to base it upon, that there is a very considerable change in the silo which

is right along that line. For example, this sample of dry corn-fodder and silage, a chemical analysis was made when the corn was cut, and a chemical analysis was made when the corn-fodder was brought to the barn; and then it was made again when the silage was fed and the corn was fed, and there was a very material difference in the composition of the corn as it went into the silo and the composition of the corn as it came out. Not a difference in the total amount simply, but a difference in the form of the constituents. In the one case there was a change in the protein or nitrogen compounds. The nutritive substance has been changed. Investigations are going on along this line, and I believe that we will ultimately have information that will enable us to say exactly what the difference is between the dry and the green.

On the other hand, the matter of water. It is not altogether water, and I believe we as dairymen can not afford, even with the light we have—and we have not got all we would like to have—we can not afford to go on and feed dry corn-fodder in winter, when we have an opportunity of feeding it in better form.

We have evidence enough at the present time to make it the wisest thing to do, to adopt the silo or adopt such methods as will enable us to feed our animals on succulent rations during the winter.

One thing more in regard to the point the Governor made in regard to the cows I think is even more important than the matter of food, that is, we can feed a poor cow and it makes very little difference how we feed her, we cannot get much of a profit any way; but we can feed a good cow and it does make a difference how we feed her.

In one herd we have animals which range in yield from 4,000 to 12,000 of milk per year, while the cost to feed each is practically the same. In one case we keep the cow and in the other she keeps us.

The cow is the factor which, after all, determines the profit, and there is nothing better than a good selection of a dairy cow.

Mr. Wright—What was the breed of these two cows?

Mr. Voorhees—One was between a grade Holstein and the other was a pure-bred Jersey.

Mr. Fithian—It shows New Jersey is not a whit behind other States in their Experiment Station, but I would like to ask one question, and that is in reference to the amount of butter-fat.

Mr. Voorhees—In the matter of these two animals, I have to say that the cow giving 4,500 averaged 6.4 butter-fat, and she was not a poor cow; but the cow that gave 12,500 averaged 4.1 of butter-fat.

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She was a better cow, but the difference is not so marked when you come to the question of the actual value of the two products on the butter basis, but when you sell it on a milk basis there was a difference between the two products. That was the Jersey cow, 6.4 butter fat. As to the difference between the Jersey and the Guernsey, that is a matter of individual preference.

Mr. Fithian—Didn't you make an experiment between them at one time?

Mr. Voorhees—Yes; our experiment showed that the Guernsey produced butter at a lower cost than any other of the five breeds. But there was very little difference between what we call the butter breeds—Jersey and Guernsey.

Gov. Hoard—Your 4,500 cow was a good butter-maker?

Mr. Voorhees—Yes; and our consumers recognize it now that they are getting a milk which runs very nearly five per cent. fat, and we have got to have in the mixture the product of a high-quality cow in order to make it the proper average.

Gov. Hoard—That shows the value of a clear distinction as to the use to which a cow is put. One cow didn't pay for herself on a milk basis, but on a butter basis she did.

Mr. Voorhees—A great many have heard me make that distinction between a cow that produced six or seven thousand pounds of milk with a low percentage of butter-fat, and one with a lower yield of milk, but with a higher percentage of butter-fat. I still stand on the same rock that I always stood on, that we ought to sell our product on the basis of quality, and no other basis.

Mr. Evans—In regard to dry corn-fodder, and corn and fodder put in the silo, it is put in the silo in the green state and preserved in that condition until used. If it is yellow and dry, how much loss do you think there was in it?

Mr. Voorhees—It was measured by that $12\frac{1}{2}$ per cent., because the constituents were the same. There was $12\frac{1}{2}$ per cent. loss, or even more than that.

Mr. Evans—How much loss in digestibility? I know there was loss in fodder, but fodder is just like old clover cut for hay, but how much loss was there in the digestibility of that corn and corn-fodder, how much did it lose in the value in the drying process?

Mr. Voorhees—It was not exactly determined, but I should say about twenty per cent. It will vary in different seasons.

Mr. Pancoast—I would like to ask Gov. Hoard if he can tell us the average life of the stave silo made out of the commoner kinds of wood, hemlock or some cheaper wood?

Governor Hoard—That is pretty hard. I can only give you some instances. Mr. Goodrich has a silo. It is a square silo, cut off at the corners, which I believe he has had in use eleven years, and neighbors have had silos that have been in use all the way from six to fifteen years. One of them has been in use fifteen years. I think it has been repaired some in that length of time. I can't really determine that myself. I can get my hemlock a great deal cheaper than I can get the cypress, but I am afraid of it a little. Can you give me any information about hemlock silos?

Mr. Pancoast—No, I cannot.

Gov. Hoard—Can any one else?

Mr. Evans—About six years ago I built a hemlock silo, and gave it a coat of crude oil, and it has had no repairs. It does its work right, and I believe it will last as long as it has already lasted.

Secretary Dye—Is it a stave silo?

Mr. Evans—It is hemlock boards, undressed, with two layers of paper between. It is a square silo, with the corners cut off about eight inches, to get rid of that sharp corner, and I believe it will last twenty years longer. I attribute its durability to coating it with crude oil. I think it is often lost sight of that hemlock we put out in the weather, where they are wet and dried probably one hundred times a year, and it rots. But you must not forget that you fill this silo once a year. It is saturated with moisture, and has a roof on it, and will last a good deal longer there than it would out in the weather; and good hemlock lumber I have got a good deal more respect for than I used to have. I am satisfied I can take a hemlock board and put on crude petroleum and it will last pretty near as long as a good many men live.

Mr. Comfort—I would like to ask if there is any economy in stave silos? Is it not a fact that they cost more per ton than a well-built silo of some other kind?

Mr. Evans—I always contend that stave silos dry out so in dry weather. How is it in your neighborhood?

Gov. Hoard—We have a good many, and nearly all that have been built in the last three years are stave silos. We had a very low temperature last winter. We had it 30° or 25° below zero, and those stave silos froze in about a foot, but they thaw out before the cattle.

Mr. Evans—Do you feed ice water to your cattle?

Gov. Hoard—No. When I am after a fact there is no fun in me. In some instances, I told you, there were places in silos where it seemed to frost. In one instance it froze in—not our own, but in the neighborhood—about a foot. Now, that frozen silage was taken out, placed in the barn and allowed in the warmth of the barn to thaw out. The cows could not see absolutely that there was any injury to it. Another thing, I will take frosted corn and put it in a silo and I defy anybody to see any injury to that corn.

Mr. Evans—In what stage of maturity is the corn?

Gov. Hoard—As mature as corn will be when it goes in the silo. We have frosts in August, once in a while, that destroy our whole corn crop. I remember, on the 16th of August, 1886, we had a frost that swept over that country that did millions of dollars' worth of damage, but there was no appreciable injury to that corn put in the silo.

That frozen corn when put in the silo, compared with the same corn cut up and fed out, was all right. Then again repeated frosts have come as it goes into the silo. Our ensilage corn is planted the earliest of all corn. We plant it upon what we call our quickest land. We want to get that in and get it ahead of the summer drought if we can.

Mr. Evans—Do you say that corn frozen after it matures, that freezing would not injure the silage very materially?

Gov. Hoard—No; and I say neither do we find, when we put corn in the silo and it becomes frosted, any material injury to that silage after it comes out of the silo.

Mr. Lindsey—How soon after the corn is frosted is it put in the silage?

Gov. Hoard—Just as soon as we possibly can.

Mr. Lindsay—It won't do to let it stand very long.

Gov. Hoard—I can't speak positively as to that, because the conditions govern on a farm. For instance, we have men to work to-day and cut over silage and put it in the silo and to night comes a frost. We don't consider that it has injured it to any material extent. But mind you, if it did not go into the silo, it would be very materially injured.

Mr. Evans—Above one day, if it was frosted, would almost destroy it, if it was not cut.

Gov. Hoard—With us it don't make much, if any, difference.

Mr. Anderson—What breed of cows do you think is most profitable for general milk-selling that would yield milk of about five per cent. butter-fat?

Gov. Hoard—That is very rich milk. The standard milk is four per cent. Five per cent, you see, would be twenty-five per cent more.

Mr. Anderson—Then give us what you would consider the best dairy cow, the best breed, and the best cross.

Gov. Hoard—I can only give you a little experience. One of the finest herds of dairy cattle that I know of in our section have been bred from grade Ayrshires topped with either thoroughbred Jersey or Guernsey sire. The Ayrshire and the Jersey or Guernsey seem to nick kindly. By “nick” I mean coming together harmoniously, going on and holding together. Now with Holsteins and Jerseys particularly, there are two breeds of such tremendous potentiality on either side that they don’t come together and “nick” well. Occasionally we find a case that is different. Theoretically it would be a good thing. Some men think they will get the flow of the Holstein and the butter-fat of the Jersey, and unite them and get a better cow. But the first you know you will find them swinging one way or the other, and the general result has been that they don’t nick kindly, as does the ordinary native cow with a thoroughbred Jersey or Guernsey sire, or the Ayrshire grade, or the Shorthorn grade with a Jersey or Guernsey sire. That has been my observation. I don’t believe in crossing much. I know the average farmer is all the time crossing, and he mixes the breeds of his cows a good deal as the Frenchman who wanted the barkeeper to put him up some Jacob. “What is that; what is your Jacob?” “Well,” he said, “I tell you that thing. You put in ze brandy to make him strong, and ze water for to make him weak, and ze lemon for to make him sour, and zee sugar to make him sweet.” “Oh! you want a flip.” “Oui,” he said, “I will have some Phillip.” (Laughter.)

I see men breed cattle that way, the Jersey to give richness, the Shorthorn to give beef, and something else may be to give size, and when you are through you have hodge-podge. There are no clean, lasting results, and you have the average cow of the country. You go all over the great cow district of New York particularly and you will see just that kind of hodge-podge stuff, and you have low average and low quality. I believe there is only one true thing to do and that is to establish your line and breed in line.

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Mr. Loveland—I would like to ask whether when the corn is put in the silage you get the full benefit of it.

Gov. Hoard—Theoretically it is supposed to lose a little but not as much as the stalk does if you wait and ripen the corn.

CONCERNING COUNTERFEIT DAIRY PRODUCTS.

Governor Hoard—A very interesting struggle is on foot between the forces of light and the forces of darkness.

The forces of light, who believe in whatsoever things are good, and whatsoever things are lovely and of good report, are represented to-day by the dairymen and consumers of the country who are asking for legislation that shall repress counterfeits and adulterations in food.

The forces of darkness are represented by the great army of counterfeiters and adulterators of this wicked and adulterous generation. Do you know that there is a tremendous amount of capital behind this question of food and adulteration, and it is astounding, gentlemen, when you get at it. The Senate Committee of the United States, headed by Senator Mason, which traveled over this country and took testimony last summer, were themselves completely astounded at the evidence of the adulteration of food which was presented to them.

Let me give you one little illustration: When we prepared our Dairy and Food Commission law in Wisconsin, and had got the machinery going, we took thirty samples of cream of tartar from thirty of the most reputable grocers, and twenty-four out of the thirty did not contain a trace of cream of tartar.

Now look at that percentage. They were composed of different things, and twenty-four out of the thirty were absolute frauds. And this state of things has been going from worse to worse, until the sentiment of the country is being aroused, and to-day all manner of wicked devices are sold to poison the people.

The National Dairy Union, of which I have the honor to be an officer, is composed of people from all parts of the country, boards of trade, creamery and other dairy people and members of the trade in the various States in the East and West. It was organized about nine years ago, and its object is the promotion of legislation, both State and National, for the suppression of counterfeiting in dairy products. It confines itself principally to dairy products, and has fought several distinguished battles. It took up the fight against Filled Cheese—a fraud product that is composed of skimmed cheese injected

with oleomargarine oil in place of butter-fat, and which caused the destruction of millions of dollars' worth of trade that the United States had in Europe.

In 1886 the trade of the United States with Europe in cheese amounted to about \$13,000,000 or \$14,000,000, that of Canada amounted to less than \$3,000,000. In 1899 the trade of the United States has fallen to about \$3,000,000, and that of Canada is more than \$18,000,000. What led to it? Stupid dishonesty. Canada—I am filled with admiration at the shrewdness and the smartness of these Canadians who have been smart enough and shrewd enough not to insult the consumer with a counterfeit—they enforce absolute prohibition within the lines of the Dominion in such things as the making of oleomargarine or counterfeit butter, or such a thing as filled cheese; and there is not a dollar's worth of these frauds made there. The result of it is that they reached out and secured hold of the confidence, after we had abused that confidence, of the English consuming public; they reached out and took it; and they righteously were entitled to it. When we are frauds and cheats, it is good service of any nation that takes the place of that nation in providing honest food.

I have no excuse for any man that is a swindler and a fraud, and I tell you we need to lift up the moral sentiment of our country and begin to look at this question from the standpoint of ethics, or we are gone.

We are losing the confidence of our own people. Look at this investigation of embalmed beef. See the scuffling that was done to save our foreign trade. Oh! gentlemen, it is time that the moral sense of this people begin to say to the adulterer "Get thee hence." I want to say that New Jersey has got a duty to perform in that direction as well as every other State.

We are at work at the present time on National legislation. I am to go to Washington on Saturday to spend, I do not know how much time, in behalf of the Grout Bill. We have settled down upon that measure and I will explain it in a few words. You remember about 1891, the original package decision came on the shipment of liquor into Iowa, a prohibition State, and the friends of temperance all over the country were astounded and alarmed at the decision of the United States Supreme Court—the District Court at first, and confirmed by the Supreme Court—that by the terms of the inter-state commerce law any original package could be shipped from one State into another

and the laws of that State could not bar them from entering that State in that original package. At once Mr. Wilson, a United States Senator from Iowa, offered a bill, known as the "Wilson Bill," providing that all liquor should be exempt from the effect of that decision, and that it should be subject to the laws of the State when it came into the State, no matter in what package, or form or condition it was. That law was passed.

Now the Grout Bill proposes to put oleomargarine and like counterfeits in the same category, and make them subject to the laws of the several States, no matter whether they come in the original package or not. In addition the Grout Bill proposes to put a tax of ten cents per pound upon all imitations of yellow butter, taxing the counterfeit of yellow butter ten cents per pound and taxing the white or the oleo that is not counterfeit only one-fourth of a cent per pound. In the course of affairs there arose some disagreement between the National Dairy Union and some of our friends in the East, particularly in New York and on the Atlantic coast. We held a meeting at Cortland, New York, in December, in which we came together in agreement, and now I say to you that the sentiment of the East and the West is united. (Applause.)

And I am very glad of it, because nothing pleases our enemies—the men who are making oleo, and who are defrauding and doing everything they can to break down State laws—nothing pleases them so much as a division on our part. We have raised in the West about \$14,000, mostly by fifty-cent subscriptions, selling badges, and with this money we have been trying to arouse public sentiment in all parts of the nation, as far as possible—arousing the constituents behind the Congressmen.

I told you two years ago of my experience, you remember, about my going home from Chicago in 1885, and asking the dairymen to write their Congressman a postal-card. And you remember I told you that I sent the request to every agricultural paper in the United States, and it was published, and postal-cards poured into Washington to such an extent that they almost snowed Congressmen under. My own Congressman wrote me, "For God's sake, let up; I have a bushel and a half of postal-cards, and I am all right, and you know it." It was a majestic demonstration of the power of the constituent in making himself felt in the mind of his representative.

Now we want to see New Jersey organize an Auxiliary Dairy Union, and Pennsylvania, and all these different States, organize

themselves and combine their sentiment, and let their faces be as flint against any and every form of adulteration. Let me show you the economical effect: It is estimated that 25 per cent. of the food of the nation is adulterated. What does such adulteration mean? It means displacement. The farmer is the only rightful producer of food. Now take from him 25 per cent. of the production of that food and put something else in the place of it that is a fraud and an adulteration and an injury, and what is the result? Why that is cutting off from the farmer 25 per cent. of the production of food. Now has not the farmer a commercial interest in honesty, which is the best policy?

Then the dealer in the city. See how interested the farmer is that the dealer shall not corrupt milk, for every pound of adulteration that he uses robs the farmer of one pound of production. So you see we are both morally, ethically, religiously, commercially and agriculturally interested in the promotion of an honest product. [Applause].

Secretary Dye—And selfishly.

Gov. Hoard—It is a wise selfishness, and there is such a thing as a wise selfishness. Do you remember the story told by our Saviour of the unjust steward, and when he called attention to the fact that when he was about to be dispossessed of his place that he went among his master's creditors and he said: "How much do you owe my master?" and one said, "One hundred measures of oil." "Take thy bill and write fifty measures." The great Teacher did not justify that action, but he showed the importance of making to ourselves friends of the mammon of unrighteousness to that extent that we should show a clear, intelligent understanding of the forces that actuate motives.

I said to you yesterday that I believe in making the wrath of men praise God, and I do. I say if the dairymen, the farmers of this country would show a little interest in this matter, as the gentleman from Pennsylvania said, that if they would come together with common-sense plan and purpose, and each man spent no more than one cent in writing a postal-card to his Congressman, and one to his Senator, that there would be produced a sentiment that would be almost irresistible. The difficulty to-day with the average legislator is that he has no means of knowing practically what the sentiment of his people is, and we must wake up to a realization that it is our legislative, political and citizenship duty to make ourselves felt, and to make our opinions and our idea of what is right and righteous impress themselves upon those who represent us.

We hope this winter, because we have now the East and West united, to pass this Grout Bill in Congress, and we hope by that means to put a stop to this tremendous increase in these products. To-day the oleo manufactories are producing in weight, as near as we can reckon, about 25 per cent. of the production of all the creameries in the United States. Now think of that, with a counterfeit production, and men stand by, and they are honest, telling you and me that it is a legitimate business. Well, I might say that harlotry is legitimate; keeping a house of ill-fame is a legitimate business if counterfeiting butter is legitimate, for they are stealing the vestal garments of the bride to add to the seductive allurements of the harlot.

This is not a legitimate business, and I want to add one word, and I want you to take it home with you. There is a great deal of confusion among the people; they think that oleo is the poor man's butter; that it is made in the interests of the poor. I say it is not. It is to the poor man and to the rich man a fraud and a swindle. Taking from the man who buys it the price of butter, and giving him not butter, but a cheat. Mr. Armour was obliged to testify in one of the federal courts of the State of New York as to the cost of making oleo. His testimony was, that adding the two cent tax to it, the cost of making oleo was less than seven cents per pound—everything included. I saw a carload of it in the city of Ashland, Wis., bought for 11 cents, and selling for 28 cents. Was that a poor man's butter?

There is no protection to you the moment that question is turned over to greed and dishonesty. You hear men say that they would rather eat oleo than poor butter. That is no argument. Butter invariably advertises its own condition. If there is anything the matter with butter it talks right out loud, don't it? (Laughter.)

It deceives no man, but oleo under the skillful concoction of chemists and others, can deceive the very elect. It is not wholesome, and I will prove that to you. Butter is constructed by the law of nature for food for the young. Every female animal gives milk, and every animal gives butter-fat for the support of its offspring. It is the only fat known in the world that is constructed so that it can be digested by the tenderest infant. It was designed originally as food—animal food, human food.

Now, you hear men say that oleo is exactly the same as butter in its construction. That is not true. Suppose you make up an artificial milk, and you take out the butter-fat and put oleo oil in and

give that to the infant, what effect do you think that will have on the infant? The child would soon die on such milk. Mark you, butter-fat was constructed by nature, so that it melts in the human stomach at six degrees below the natural heat of the human body, or at ninety-two degrees, thus passes into pancreatic emulsion and digestion. Oleomargarine requires from 102° to 108° to melt. It cannot melt in the human body except the human stomach be at fever heat, and it must be expelled by sheer gastric force and action. Can any man who understands these facts tell you honestly that oleo is a wholesome product when such is its action in the stomach?

Then, again, gentlemen, you have no assurance that it is made of wholesome products. Turn to *Frank Leslie's* of June, 1894, and you will see there an article on the horses of America, clearly and openly stating that the dead horses of New York are taken away to rendering establishments and the oil rendered from these horses is sent to the oleo factories. There is no reason why it should not be. I defy any man to show me, for instance, that it is not possible to make just as fine oleo from the oil rendered from animals dying of disease as it is from the so-called fine suet of the hog and the ox. There is no reason in nature or in chemistry why it cannot be done, and you may rest assured it is done.

Turn again to the prosecution a few years ago of the rendering establishments at Hunter's Point, New York, who were indicted as a nuisance. There it was brought out in legal evidence that the oil rendered from dead horses, called combing oil, was sold to the oleo factories. Repeatedly oil rendered from refuse fats has been traced to the oleo factories in Chicago. These things are true, and when men claim that it is a wholesome product you should not be surprised if that is a false statement, for there is no reason on earth why oleo should be clean in the sense that we understand butter to be clean.

General Sewell, of the U. S. Revenue Department, now of the city of Boston, said recently that there was nothing in the supervision of the Revenue Department that would make men lie and cheat and swindle like oleo. He said whiskey could not compare. There is from one end of the country to the other a grand conspiracy between the manufacturers and the dealers to swindle both the government and the people, and it is time we understood this. Therefore it is time that we get together, time that we did something that is intelligent and united, and that we put our moral force and our financial force, and

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our political force together for the repression of this great crime of the present day, the manufacture and sale of counterfeit butter.

I thank you, gentlemen, for the opportunity of addressing you on this subject, even if I haven't instructed you.

Mr. Gillingham—I want to ask one question about this tax on yellow oleo and white oleo; has that been stricken out?

Gov. Hoard—No.

Mr. Gillingham—Would that legalize it?

Gov. Hoard—No, not any more than the present tax; the bill itself prevents its legalization.

One word more; the officers of the National Dairy Union are serving without pay and have done this work for years without a dollar remuneration, and I want you to understand that whatever funds come into their hands will be conscientiously and honestly administered. They ask your confidence, and they propose to do their work for love of the cause and that alone.

After a short recess Governor Hoard was again requested to speak on the dairy form and breeding of dairy cattle.

Gov. Hoard—I was giving a talk in Wisconsin at one time and it was during our famous school fight there, in which I very gracefully retired from the gubernatorial office, and I was trying to illustrate to a solid German audience the fact that the central proposition with Americans was not where they were born, or how they were born, but how the citizen confronted his duty as it stood before him right now. And like every other man, I said, I had four great grandmothers, and there was a tendency in every man to look at things from his standpoint. For a German to look at it from the standpoint of a German; a Polander to look at it from the standpoint of a Polander; an Irishman from the standpoint of Ireland, but the question before us had nothing to do with the nationality of men, but had much to do with their citizenship as Americans. I said I had four great-grandmothers and they were of four distinct nationalities—one was an Irish Catholic, and the other a Scotch woman, and the other a New England woman, and the other a Mecklenburg, or German woman. "Now," I said, "should I look at my political duty and go back and let the Dutch woman control my vote, or the Scotch, or the New England, or the Irish, or should I concentrate them, and, standing as their product, look at my duty, and look at it squarely as an American citizen?"

An old German came to me afterwards and said, "You say you got them four grandmothers?" "Yes." "And they are all kinds of nations?" "Yes." "What do you call that?" I said, "That makes a Yankee." "Och!" he said, "Dot makes hash." [Laughter.]

I am not willing to admit that I am any the worse off for having those grandmothers to my charge, or from where they came. I do not know anything about it. I believe in heredity, but I certainly would not breed cattle the way I have been bred. [Laughter.]

I would not make hash of my breedings, and in so doing I want to show you a little principle whereby you break up the line of heredity, and you have no strong, clear, well-twisted rope of descent to draw on. But you break it up, and consequently you have nothing with which to fortify the line of the sire, and you bring to him a confusion of blood that does not help him much, and yet that is the universal tendency of the average farmer in this country. You make hodge-podge cattle and the production is not over 3,000 pounds of milk per cow, and it is because men have been so debauched with the general-purpose idea that they are unable to produce cattle that are desirable or profitable.

Now, the first point with us is to breed as much as possible in lines, and, I might say, in line of this question of potentiality—let me speak a word on that.

I can illustrate by the Mississippi river that comes down from the north, meanders in a very quiet way until it gets to Alton, when the tempestuous mountain-bred stream, the Missouri, comes pouring down and strikes the current of the Mississippi almost at right angles, goes clean across it, takes possession of it, and it is the Missouri from thence on to the sea.

That is a good deal like the strong pre-potent male taking possession of the life of the female, impressing himself so powerfully upon that current that he takes possession of it, and the offspring in character takes largely from the sire. In this we do not ignore the quality of the mother, but it is not down the mother's line that usually we get the line of pre-potency. I want to speak on one or two things.

I wish I had the fine picture here of a bull that you will find in the last issue of the "Dairyman." I went to visit him the other day at Painesville, Ohio, Mr. Frank W. Hart's Jersey herd.

There stands a bull, Marigold Pedro, son of Lorna Second, one of the most impressive bulls I ever saw, four years old. He has no

daughters in milk, but has one feature that I want to call your attention to, if you look for the selection of a sire, and that is the rudimentary teats, and the way they are placed upon the body, if you want to make fine well-shaped udders in your resulting heifers.

The rudimentary teats should be placed widely apart, lengthwise of the body, and they should be full, large, and well forward of the scrotum. What is the meaning of that? Dauncey, I think, is the greatest breeder of dairy cattle that ever lived. He was the man who established the Stokes-Pogis family of Jerseys. It was to him one of the most important things in a bull to have widely-placed rudimentary teats. If the teats were placed close together, he reasoned that the udders in the heifer would be likewise, and that would result in peaked udders, and not square, large, well-shaped udders. So, following that principle, he produced in the Stokes-Pogis family of Jerseys the finest udders of the Jersey family.

Now this bull Marigold Pedro I had before me about two days. I saw all his calves, his heifers, and I never saw finer udders on year-old heifers in my life than that bull had put there by virtue of his pre-potent power, and by virtue of the make-up of the rudimentary teats in himself.

That is one point. At the meeting of the American Guernsey Cattle Club, in New York, the committee presented to the Guernsey Cattle Club a new scale. We had been charged a year ago with that duty, and I would like every one of you that are interested in and are good judges of dairy cattle to read that scale. You will find it in this week's issue of "The Dairyman," but there are some explanatory notes there.

It is a common thing to use the words "Dairy Temperament." What do we mean by that? It is well explained in that scale. Dairy temperament is that pre-disposition or pre-potent, determining power in the cow that turns her food into dairy product and not into flesh. A beef temperment is that pre-disposing power that turns the food into flesh and not into milk. A cow of high dairy temperament refuses to fatten, but turns all her food into milk. A cow of low dairy temperament, if you crowd her a little way beyond her power, will commence to dry off and commence to fatten.

It is important to keep that question of temperament in your mind. Another word, "Constitution." It is important that we have the staying powers in cattle, and constitution is always to be measured by the function the animal has followed. For instance, the function of a

race-horse is speed. It is not draught; it is not giving milk; it is not making beef; it is speed. Now we must have a constitution in a race-horse; we must have the ability to stand that strain, and go through and land his rider under the wire and win the race. That is constitution. The same thing applies to-day with dairy cattle; we must have not only capacity in the cow, but we must have the ability to endure the strain—of large capacity, take a large amount of food, manufacture it, hand it over in the form of milk, butter and cheese, and stand up under this strain and do her work.

Now, what are the best indications of constitution? You hear a great many men talk about a deep chest, a deep, brisket, indicating, they will tell you, large heart-room and lung-room. That is a fallacy. A deep brisket is not indicative of large heart or large lungs. I guarantee to-day that if you would go to any butcher-shop and see dissected a first-class dairy cow and a beef-animal, that the dairy cow's lungs are larger than a beef-animal's lungs, and the beef-animal's brisket and chest will be the largest.

There is no animal in the world that is called on for the exercise of heart power and lung power like a race-horse. Why, a mile race will exceed a week of the life of a draught-horse, in the exercise of heart and lungs, yet the build of his chest is not deep or broad or wide between the legs.

Now, physiologically, we must not follow tradition; we must begin to build our judgment of these cattle by actual facts. Therefore the build of the chest is deceptive as an indication of constitution, but here is a place that is not, right there, at the navel, the construction of the muscles of the abdomen around the navel; there you get an indication of constitution that is unfailing. I will explain it as I have several times before.

Go to a physician that you know, who is accustomed to be an observer of things that are about him, to ascertain what they mean; ask him when a baby is born, and the umbilical cord is long, thin and weak, if that baby is easy to rear? He will tell you that invariably that child is low in vitality, and that is what we mean by constitution—a strong vital temperament. But if that umbilical cord is short, and large and full of foetal circulation, may be the baby has to lie by the side of the mother for some time before they dare cut it on account of the foetal circulation. Instances of that kind have been frequently known, but the doctor will tell you that a baby who comes

into the world with a strong umbilicus will show the ability to stand up and resist disease, is not easily thrown off his feed, and is a strong constitutioned baby. Now, through this umbilical channel the mother supports her unborn offspring. If that channel be large and strong and full, it indicates that the mother has given to this offspring pre-natally full and abundant support. Constitution cannot be fed into animal life or trained into it, it must be born into it.

Therefore the construction of the navel and the muscular walls of the abdomen are indicative of the umbilical cord the animal had when it was born, and when you put your hand under it and begin to press up on the abdomen, you find that abdomen has a very powerful muscular wall, strong, unyielding, and it impresses you with its strength all around, clear up to the short ribs. If you feel of that abdomen you find it firm and unyielding to upward pressure like boiler iron; that cow is not easily thrown off her feed, resists disease, and that is a valuable indication to you as to whether she is a stayer or not. So much for constitution. Many men mislead themselves. This is not an indication of capacity, but an indication to endure the work of capacity.

One point more. Why should you feed a balanced ration? Many men simply think that is the work of the schools; the work of the theorists. Let me say this, the cow is compelled by a law that knows no yielding to produce milk. She produces milk theoretically and practically for her offspring. She don't produce milk for you. You take advantage of that, you put yourself into the place of her calf and you turn her current to your use. But she follows her law, she must produce a balanced food. How can she, and produce it abundantly, if you compel her to eat an unbalanced ration? Take the construction of milk, it is composed of four per cent. of butter-fat, and three and one-half per cent. of casein and five per cent. of milk sugar. What is casein? That is almost pure protein. How can the cow keep it up? Remember, first, she must keep this balance good, and if you give her feed from which she cannot make the casein she at once cuts down on everything. She won't give you the fat, she won't give you the milk sugar. She will cut down the amount of her milk until she can balance it. This is the provision of nature for her own protection. In order that she should give you plenty of butter-fat you must give her a balanced ration, so that she can give plenty of protein in the milk. Therefore, when you give her a balanced ration

you assist her in giving you a large flow of product in return. That is the reason why it is necessary.

One other reason. A cow must have constantly plenty of protein. Now, my friends, you heard the talk here last night, and a very interesting one it was, upon the biology of the plant, and it was interesting to note when the professor called your attention to the protoplasmic center, the beginning of life. Now, when these protoplasts are analyzed, either in the animal or vegetable world, everything commences with the seed, and what are they found to be composed of? Always and invariably of the proteids. So you see that the beginning of life finds its unvarying center in the protoplasm or in proteids. Now, the nerve centers of the body must have support, and no animal is drawing on her nervous organization with more profusion than the cow. Just think a moment! Here is this great mammary gland, that is part of her genital system, tied to the womb, and anything that affects the womb affects the udder, and anything that affects the udder affects the womb, from there to the lumbar region of the spine, and from there to the brain—one constant, quick, unbroken connection of cause and effect.

This great nervous machinery governs the action of the maternal organs more than any other portion of the body. Therefore, the mother invariably should have at her hand that consideration and that treatment which is at once wise, tender, humane and considerate, and when you do that, you are looking to your own interests. You are making merchandise of her maternity; you must support the nervous system, and it is necessary to feed a ration sufficiently balanced in protein in order that the nerve centers, the brain and spinal marrow and all this machinery from protoplasm to the udder shall have abundant support in its work of milk-giving.

I have only spoken on a few points, but gentlemen I have spoken so much to-day that if I was not tougher than I know anything about, I would have quit some time ago.

Farm Sanitation in Dairy Methods.

BY JOHN GOULD.

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Farm Sanitation in Dairy Methods.

BY JOHN GOULD.

MR. PRESIDENT AND GENTLEMEN—I am very glad, after four years' absence from your State, to be again with you, and I want to individually thank you for your cordial greeting and your many pleasant words that I have received at your State Convention here, as well as throughout the State of New Jersey.

Whether the present year 1900 is the last year of the nineteenth century or the first year of the twentieth century, it is marking in an emphatic way a radical departure from the past in dairying, in this respect, that the motto "Be ye clean in all things, and keep everlastingly at it," is to be enforced more literally, and that the consumer in the future is to draw yet closer lines about the dairy produce he buys, that whether the common law of cleanliness becomes conspicuous in enforcement or not, or remains passive, this word *sanitation* is to be brought up by the public, and all that it means respecting the produce of the dairy will have deeper significance to the producer, and have not a little to do with his success and profits as a dairyman. Strange it would be that an industry aggregating in its commerce more than a half billion dollars annually, having to do with the food and luxury of a nation and occupying a part that cannot be approached by any other food, should not have its sanitation side, and *that* with wide and far-reaching definition. Milk is the natural food of a growing race, human or animal. The milk of cows enters into the food make up of a nation, from the glass of milk and pitcher of cream upon the table, but through the list of make-up of foods, and the crowning luxury of a well-spread table and well-prepared food is the pat of yellow butter, bounties extended from the beneficence of the cow, the cow with crumpled horn; and although she may have tossed the dog that worried the cat, the facts are, that if the dog had not first been allowed to have worried her this meek old cow would not have been obliged to assume the attitude

of heroic self-defence, and to have diminished the subsequent mess of milk, through fright and worryment because of it. This leads me to say that, through neglect in the care of this cow, ignorant or criminal, and allowing something to fall into pail or can by the same owner or milker or dealer, comes the whole train of disorders in our dairy management, "for running in pasture clean, and browsing herbage sweet, and milked in grassy lane, and under blue skies," milk is pure, clean, healthful, and the only food which the hungry human can take, digest to the last grain of its solids, and assimilate without residue.

It is not the intention of this paper to be a medium of startling revelation, to be profoundly wise, or make it a vehicle of "scientific erudition," but attempt to retravel old paths, maybe, and see if at the finish we may be able to set down before the consumer some dairy produce for consumption, fairly pure, with natural flavors and clean! for this word *clean* is the sum total of the interpreted law and gospel of sanitation.

For centuries it was accepted that the great invisible foe was original sin, but now we have added other invisible foes, the great company of germ, spore, bacteria, bacilli and enzyme life, divided into two groups, destructive and constructive, the latter a necessary co-worker when kept in bounds, the other a lover of darkness, of soil and filth, a disseminator of disease, a creator of foul smells, a destroyer of substance, and in the dairy realm forever gnawing at the very vitals of its prosperity, in chains a puny, controllable existence; given its freedom, a giant irresistible in its power, wasting substance, making the finest products of the dairy worthless, a veritable "wasting at noon-day," and it is of and about some of these foes we are to discuss for a few moments, and see if in some way we may not only be able to combat them, but at the same time gain along the line of a finer product from our dairies, and tempt yet other dollars from the pockets of those who object to buying milk and real estate in the same measure.

This whole matter of a finer and better-keeping dairy product lies wholly with those who produce the milk and manufacture it; for given a healthy cow to make the milk, all the troubles that follow are the result of neglect somewhere; a badly-cared-for stable, foods unsuitable and fed in unsuitable places, and a whole train of untidy methods, and less tidy utensils, and cold water compromises with cleanliness.

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This question of sanitation has two phases. A product may be produced perfectly healthy, and yet by feeding certain foods, or placing the milk under conditions that are unfavorable, possibly letting certain solids which become quickly soluble in the milk, fall into the pail, will render the resulting product about worthless because of unpalatable flavors resulting, and yet from the point of sanitation are yet wholly without the line-menaces to health, and another line of care might and probably would make the milk, cream and butter conveyors of disease germs, but I think if we follow a line, a sanitation of a cleanliness next to godliness, we may meet the ends contemplated in this paper, and possibly give each "their meet in due season."

I shall assume that the patron—the man with the cow—is the man whom I want to first meet, for he is the man who first comes into possession of this milk, and if he orders things as he may and delivers the milk as he should, any subsequent deterioration in the product shows that it is the middleman who is above all others the "sinner in Galilee." What about the stable in which this cow passes six months of her life almost continually, and is milked there twice a day for four or five months more at least? There are two faults paramount with great numbers of our dairy barns and stables. Faulty floors, under and about which there is no end of fermenting, and decaying animal excretion, stables, save when frozen-up solid, are redolent with odors and perfumes, and with an untidiness of appearance that shows streamers of pendulant cobwebs and banners of dust, most congenial home for germs and spores galore, so that in a glint of sunlight one can see the air teeming with floating mites bearing in their company millions of germs of good and bad repute. Under too many stables are caverns of foul smells where for years unreckoned the decay of manure has been going on, and if not coming in direct contact with the milk itself permeates the air which this cow in question is compelled to breath, which must have its unsanitary effect upon the organism of the cow. Sanitation demands a better stable floor, one on the ground itself, of cement or close jointed wood, one water-tight, one in which absorbents can be used and deodorizers as well, and stop the fermentation of the manure in cracks and crannies of the stable floor by a perfect removal of the liquids and solids each few hours. In another thing sanitation demands more light in our stables, more windows, more stables on the south side of the building so that the direct rays of the sun may fall direct upon animal and floor, less dark, damp, gloomy

dungeons for our stables. Sunlight is an almost instant destroyer of disease-germs. Another point here, sweep the stable overhead frequently, whitewash the walls twice a year and have a dry stable. Do not have pools and cavities with moisture apparent in them. Use absorbents in abundance and, in addition to the usual absorbents, have some South Carolina rock as well as some land plaster, and get a few loads of road dust, or dry clay from some bank, or well-dried muck or loam, and when the stables are cleaned, use a bushel or so in the gutters and behind the cows, and not only have a cheap nitrogen catcher, but a perfect deodorizer as well. What about the air of our stable? Is our stable ventilated? Sometimes this matter is overdone with unbattened cracks and wall boards suspended by one nail, but in the closer housing now so often met with there is often too much restriction of fresh air, and there must be a menace to animal health by the rebreathing of the vitiated air. In the burning of fuel in the animal economy there must be consumption of oxygen, and a giving-off of carbon dioxide gas, which latter falls to the floor, and as the cow lies down fully one half of the time, she thus places herself in this lower strata of air, and unless there is an outward movement of this lower air strata, injury in health must follow sooner or later, by the rebreathing of this vitiated air and a sluggish illy-made blood follow, and many think much sooner to the milk, as there cannot be a purifying of the blood as should be, and sluggish blood might have its influence upon the milk to the detriment of the one that consumed it. But no chemist can find this something in the milk you are trying to make out that exists, queries some one. Possibly they cannot, but chemists cannot find the thing which is poison in strychnine. Some one must take a dose of it to find that thing out. To change the air of the stable, all sorts of shafts, chutes, chimneys and draughts have been devised; some work and some do not—when they should—but the shafts commencing close to the floor and carried up ten or more feet above the ridge of the stable, the protruding part made of galvanized iron, to draw the sun's rays and make a draught, seem to be by far the best, though about as successful a ventilator as we ever saw was a blacksmith's bellows located on the floor of a stable; a small windmill on the ridge of the barn worked the bellows, and connected with the nozzle was a tin tube that ran horizontally out over the sill and discharged the exhaust outside. There was no trouble to supply fresh air, as the supply that came in from crack and crevice kept up with the demand, and so far as I could see, the ventilation

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was all that could be desired. From what we see we are of the opinion that far more cows in the stables of the United States are suffering from an excess of fresh air than for restricted amounts.

The foods of the cow will be ably treated by other authorities, so I leave this subject with the passing remark that we think that so far as it relates to the foods themselves, very little unhealthy milk is made in the United States. Cows may be diseased, cows may be kept in unhealthy quarters and the like, to the detriment of the cows and her product, but the average foods now fed, in and of themselves do not produce the result. Feeds may be given that while wholly healthy may impart a noxious taste to the milk, and sudden changes of good foods may result in producing undesirable tastes in milk for a time, but we do not catalogue these under sanitation requirements. Keep mangers and feeding floors clean and free from decaying food.

The care and handling of milk is a matter that in detail calls for a convention of itself. Here the bacteriologist, the health officer, the sanitary police, the milk handler, transportation company, the creamery man, milk peddler, all have their innings with the consumer last, for each have their handling. I use this term in its large sense, for hands clean and unclean get into the milk from start to finish, and the consumer drinks and uses what each and all of the others in their goodness have brought to him, and too often we fear borax, formaline and freezene thrown in gratis.

Is there such a thing as clean, pure milk when ready for use? This brings up a question, whether the germs of milk are to be regarded as invalidating the claim of pure milk, and just how much other solids, not fat, casein and ash, one can allow in milk, and still class it as clean. It is doubtful if a cow can be milked nearer than 45 miles of the earth and not have some germs from the air fall into the milk. But it is possible to milk a cow on terra firma and have less than a half pound of solids not found naturally in milk to the 100 pounds fall into the pail during the operation. Prof. Harding, at Geneva, found it possible to so milk a cow with the common appliances of the farm and stable to have only a few thousand germs get into a centimeter of milk, and in another stable milk sampled as soon as possible after milking had 260,000 to the cubic centimeter, all largely of the destructive class of germs, and immediate deterioration of the milk. What does all this mean? Simply a clean cow, a clean, well-kept stable, milking done before there is any disturbance of feeding, bedding or stable cleaning; a man with clean hands, a pair of clean

milking-overalls, not a pair of pants which by long stable usage and longer estrangement from soap and water would stand alone from the stiffening of dried layers of milk and soil ; a well-brushed cow and rapid, dry-hand milking, and milk, as soon as drawn, taken into a separate milk-room to be immediately in some way aerated and cooled down to at least 65°. In the cheese-making districts, where cheese is made in winter, bitter milk is a serious trouble and the occasion of not a little loss, but the cause has not until recently been surmised, and it is found that milk subjected to hay-dust gives the same germ results, and as this germ from the hay works best at low temperatures the milk was soon made to be about worthless as food. Another trouble of bad-keeping and strong-tasting milk and sickness to consumers was traced to mouldy oat-straw bedding for the cows, and these mould-germs falling into the milk during the operation of drawing the milk there found congenial home and caused no end of trouble and loss until discovered and remedied. The lesson is, milk first and before there is any disturbance at the barn, incident to feeding, and when germ-life is as quiet as possible. Of course, pasteurizing and sterilizing milk is a remedy for neglect and "disorderly conduct" in germ-life, but it is only a method of "cooked neutrality," and the person who partakes of it has simply put in execution a process of "benevolent assimilation," and has swallowed cooked germs, instead of "on the half-shell." Have a clean, well-swept barn, cows brushed and kept clean, and do the feeding after milking, whether hay or silage, meal or corn in the ear, and if the corn-fodder has come to have mow-mould, it would be best to cut it in a separate room and wet it down twelve hours before feeding. While we are not wholly in love with the rulings of the condensary men, there is a world of right in their demand that mouldy foods of all sorts shall not be fed, not so much that it will injure the milk in the food consumed as in the food loading the air with its mould-spores, and they, falling into the milk-pail, do the damage. What about the strainer and its effects upon milk sanitation? What is the office of the strainer, anyway? Simply to catch what cannot be dissolved in the milk, and the only things ever found in the strainer at the creamery or factory are horns, hoofs, clay pipes, and the coarser hairs. All else has been dissolved—has become so much additional solids in the milk that no process can rehabilitate and separate, best expressed by a perplexed creameryman at the weigh-can one morning over a doubtful offering of milk. "Looks clean, and free of trash," said he, "but still a little too thick for

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milk, and a little too thin for fertilizer." This strainer in some hands is washed, scalded, and sunned every day, and twice a day, and now and then boiled. Another strainer is well washed by using it as a wash-rag to tidy up the cans and pails, snapped a couple of times to straighten it out, and with meshes still thick with material that could never be classed with starch, the end of a rail, or post, becomes its reposing place until the next milking, when it again does duty, and the germs of forty kinds that have been multiplying until the strainer had become of a sickly yellow, are washed through into the can of milk, and the milk soon has an old smell, and a train of evils followed that can of milk through its brief existence. At night a man rinsed that strainer in cold water, drew it through between his thumb and finger, spread it over the can edge and thanked the Lord that in dairy ways he was so much in advance of his neighbors.

Very frequently we hear of milk-poisoning, ice-cream sickness, and a train of disorders incident to summer use of milk and cream. What is it? Why, a dirty can, half washed, seams thick with rotten milk, new warm milk turned in, and in the morning the can filled up with fresh milk, the cover put on, the can started on its journey somewhere, and the deadly tyrotoxicon germ is developed, and death so often follows, often found in the cheese long weeks afterwards. What should we do?

First, everlasting cleanliness in washing milk things. Not making two quarts of water wash four pails and four cans, as well as rinse them. Plenty of cold water first, then the hot, and then boiling water for them, scald, and cans set where the sun can shine into them, not on the outside and bottom, but into them. Cotton cloth is cheap; have a new strainer every day in hot weather, get a cone strainer with a slip-ring, and five yards of cloth will make dozens of them. Cool all milk, and aerate it down to 65° before it goes very far. Do it at once. Do not put new and 12 hour milk together, and if you are a patron of cheese factory, or creamery, do not take sour whey or milk home in the milk cans you deliver milk in. The way to make sanitary milk is to make it so good that you would feel no hesitation in drinking the last half-pint of milk from the bottom of a can that had set twelve hours. Yes, the milk-buyer of the city has his work to do in this matter of sanitation. Every can, before it starts on its return trip to the country, should be thoroughly washed, scalded and sterilized with superheated steam, and dried. Old, rusty and battered cans are the congenial and fruitful home and source of germ-life, and

the men at the creamery and city platform have their duties to perform in this matter of clean milk and sanitation. A dirty-dressed man at the creamery, a dirty-kept place and festering pools of slop and filth about him, can never preach successfully the lesson of cleanliness and sanitation to patrons, and he is the fellow who should come first under the hand of the law and be compelled to clean up and keep clean and practice sanitary methods; and a dirty city milk-dip peddler should be locked up, and both, for non-compliance, should be banished to Alaska and compelled to live with the Chillcat Indians.

CERTIFIED MILK IS ONLY CLEAN MILK.

There is the health office's side in this matter—that of the health of the cows, cows with obscure diseases, tuberculosis, sores, abscesses, and the like of which we trust there is no occasion for his interference, for it would seem that the civilization of this country has attained so high a level that no dairyman would be otherwise than a health officer unto himself in this matter.

THE SANITATION FROM DISEASE.

I do think that there is not as strict quarantine as there should be in milk-selling where a member of the dairyman's family may be prostrated with some infectious disease. And over and against all this I do believe that there should be a law, stern and relentless, and carried out to the letter, against the use of any and all preservatives in milk and cream—all foods for that matter, save salt. And coupled with it Chicago renovated butter, when sold for any other brand or form save when distinctively marked, and for Chicago butter. If we are to elevate the character of our dairy products and make them the synonym of all that is good, pure and healthful, it is not too much to demand that the products of the flesh and grease pots of Chicago, even if bedecked in the stolen livery of yellow and gold—rightful trade-mark of Her Majesty the cow—shall be sold, if at all, for what it is and a clean bill of health, and that is impossible. So treat both as a dangerous counterfeit, carrying with them its mark of Cain.

Our task is completed. We have retold the story perhaps oft heard.

There is this lesson: The march of events is showing that milk to be sold in any form is to be compelled to have a clean bill of cleanliness and freedom from disease germs. Either the farmer and dealer

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must make it their supreme effort to do this or the law will compel it, and from the wisdom and understanding of the average health and sanitation officers, may the good Lord deliver us. I am sure that if the farmers who have dairies will get a book on and about the care of milk—books in abundance to be had of Experiment Station and Government free—and studied, and then few and not complex rules put in practice, it will immeasurably increase the consumption and value of milk and escape State inspection and control. But it will be demanded and enforced if we are delinquent in the matter.

We have tried to talk as one dairyman to another, simply asking for a general uplift, so that the many offerings of dairy produce shall be as good as the few, and with thanks for the honor you have accorded me, I step out into the ranks of the 1900 march of the dairy-men of this country, asking for each and all the full meed of progress, profit and prosperity in the years that are to come.

The President—You have heard this very interesting address, and if there are any questions to be asked of the speaker I am quite sure he will be glad to answer them.

Mr. Rogers—I want to ask the speaker why he cools to 65° and lower?

Mr. Gould—You cool very much lower in reaching the market.

Gov. Hoard—On this question of the ventilation of the barn I heard Prof. King, of the Wisconsin Experiment Station, last winter at our dairy meeting give the finest exposition of it that I ever heard, and I want to call your attention to it. Mr. Gould touched upon it—I mean the disposition of carbonic acid gas so as to prevent the cow from breathing it. Mr. King took an ordinary two-quart Mason fruit jar and made an interesting experiment. He took a little stick and nailed a cross-piece on the bottom, set a candle on that, lighted it, and set it down in the jar; he then took a piece of rubber pipe, ran it down by the side of the candle—the candle burning brightly—and breathed two or three times into the jar and the candle went out. He deposited so much carbonic acid gas into the jar as to stop the combustion. It is the same thing in an old well and an old cellar, and men lose their lives by going into them.

Now this gas is deposited in the bottom of the stable, and the cow lying down in it it becomes very important to get rid of that poisonous air. A cow needs just as good air as you or I. The Professor raised

the jar, turned it over and emptied it. Again he set the candle half-way up in the jar, breathed into it enough breath to cover the flame and out it went.

He said this is a simple illustration of what is going on in a barn full of cattle, and no provision made for taking out the foul air.

His system of ventilation is one of the most perfect I have ever seen. We must have our stables warm, because the natural effect of cold is to shrink the milk, and sufficiently warm so that the cow can give milk. If we warm it by the heat of the cow's body, then to keep it warm and at the same time ventilate it is a difficult question.

We will say the stable-room is eight feet high and four feet on the outside. He has a register in the wall that carries up from the outside and that leads up to even with the ceiling. The stable is ceiled over head, and the cool, fresh air comes up from the outside and falls into the stable at the top.

Now the warm air rises to the top of the room, but it cannot go down this place, because the warm air cannot sink. But at the bottom of the stable is a register and pipes made of galvanized iron going straight up through the barn, and out on the roof with a wind cowl on to protect against the wind. Two have been constructed in my neighborhood, and I shall construct mine on that plan next summer.

It is interesting to go into those stables and note the peculiar brightness and the wholesomeness of those cattle. Any man that is an ordinary observer of cows, will note at once the peculiar difference in the bright appearance of these cattle. They are living in fresh air, go there any day and time of the day and you will note the purity and the freshness of the air in that stable, and the thermometer rarely goes below fifty.

In this way I have known of dozens of barns that are kept warm and ventilated; land-plaster is used to absorb the ammonia, and the cattle are in the most perfect condition for cattle that I have ever seen.

Mr. Pancoast—How many cows?

Mr. Hoard—We allow about 800 cubic feet to the animal. That could be regulated by the height of the room somewhat. You see you are pumping this lower air out, and there is a corresponding increase of the air coming in at the top. You cannot get air into the room if the room is full of air or something else. So you pump the foul air out at the bottom and the fresh air comes in at the top, and there is a

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constant circulation, and it is warm and fresh ; and I assure you, gentlemen, that cows do a great deal better under such conditions than under the ordinary foul conditions of the stable.

Mr. Evans—Sometimes, you know, the air is heavy and damp outside ; does it work all right, then ?

Mr. Hoard—The heat of the cow is constantly ascending right around that tube, grasping and warming it, and the moment it is warm the inside air is sent up ; that causes the vacuum, and that is followed by the upward rush of foul air.

Mr. Evans—The subject is very interesting and very important.

Gov. Hoard—I know of no subject more so at the present time.

Mr. Gould—Five years ago we put that same apparatus into our own barn. We did not use galvanized iron for the chimney, but some days it pumped the wrong way and then I put a lantern in and it worked all right.

Gov. Hoard—It must be air-tight and no chance for the air to get into it.

Mr. Gould—That is right, but with a board it will not always pull upwards.

Question—What is the temperature of your stable ?

Mr. Gould—We try to keep it as near 55° as we can.

Mr. Evans—Is there a covering on the top of that ventilating tube or pipe ?

Gov. Hoard—There is a cowl on top.

Mr. Evans—How high do you say you make them ?

Gov. Hoard—Just a few feet above and so that it clears the ridge.

Mr. Evans—In my case there is a barn at one end sixty feet high and the stable only sixteen.

Gov. Hoard—That is all right, make it high above the ridge so that when the wind blows above the barn the pipe outside shall be above the ridge. I don't care if you run it up 160 feet.

I call your attention to an article published in the "Dairyman" about a year ago on this subject. I shall try to publish it again.

Mr. Fitzga—Mr. Gould, at our Institute, gave us some very interesting facts in regard to a very cheap silo, and as there are a lot of people interested in that, just a few remarks would be appreciated.

Mr. Gould—In the construction of these cheap silos we wish to get as much value as possible for the outlay, but a cheap silo need not necessarily be a poor one. In Ohio a great many are tenant farmers

who build the cheaper silos, and when they leave the farm, if the proprietor does not pay them for the silo they take them down and remove them to the next place they rent.

The cheap silo is invariably with us a tub-silo, built of two-by-four inch builders' material, usually twenty-four feet deep, made of ten and fourteen feet two-by-four, joined at the ends. This makes a cheaper silo, because it does not cost as much to get two short sticks as one long stave. The foundation is selected near the barn, above the water-level, and the ground is simply first leveled off where the silo is to be. Then the silo is constructed on this prepared piece of ground without foundation at the start. The hoops are breadths of Page wire-fence. The value of these hoops lies in the fact that it is a torsion fence, and springs or contracts, according to the pressure on the inside or the dry on the outside. These hoops are quickly made by putting the ends through two-by-four scantlings, five feet long, twisting the ends back for stays, so that when this breadth is put around the silo-tub these two clamps will come within about ten inches of each other; two bolts, sixteen inches long, with double burrs are put through these clamps, which brings them together, and with a great pressure on the silo bring the staves together air-tight. The staves are jointed on the edge, not beveled or tongued. The pressure of the hoops brings them together air-tight. Man-holes, sixteen by eighteen, are sawed in between each breadth of the hoops, four-breadths hoops for the silo. For foundation, two or three short planks are put under the bottom-end of the staves. A small trench excavated under the ends of the staves a foot wide and about the same depth. In the bottom of this trench two-inch drain tiles are placed to give a drainage. A few flat stones are laid over the tiles, a little gravel put over, and then the soil lowered down on these stones. The trench is now filled with small stones and very thin cement, which is brought up on the sides, inside and out of the silo above the ground another foot; in appearance like the roof of a building. The inside of the silo is now dug up, kettle shape in the bottom, so as to bring the bottom of the silo below the bottom of the ditch, and it is given a thin coat of cement, to prevent rats undermining and coming into the silo. A roof made of boards is now put over the silo, with battens, and our silo is complete. This silo, with lumber at \$16.00 for a thousand feet, should be completed for about \$60.

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The President—Two or three gentlemen have asked whether there is any danger of these two-by-four buckling?

Mr. Gould—You mean the staves? No, they will not buckle as quickly as two-by-six. Don't match them, don't groove them, put the square edge together and leave a little space behind, and then they won't buckle.

Greenhouse Production of Market Garden Crops.

BY WARREN W. RAWSON.

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Greenhouse Production of Market Garden Crops.

BY WARREN W. RAWSON.

MR. PRESIDENT, LADIES AND GENTLEMEN—Perhaps before I proceed with what I have to say to-day, it will be well for me to give a short description of the section of the country which I represent, and that is Arlington, Mass. Many of you, perhaps, are aware that the town of Arlington stands far ahead of any other town in this country, or of any other country, for its production per acre. I am preparing at the present time for the historical society of the town an article on that subject, and I find that to be the fact after a thorough examination. The article is "Market Gardening To-day and Market Gardening Thirty Years Ago." Thirty years ago the town, I guess, was in the same territory as it is to-day, comprising about 25,000 acres. We have the same territory to-day. At that time there was 800 acres under market gardening with a natural production of \$250,000 per year, making about \$300 per acre thirty years ago. To-day there are only 500 acres in cultivation, with an annual production of over half a million, making over \$1,000 per acre in the town of Arlington for its production. Still they say that the agriculture of Massachusetts is declining. Thirty-five years ago, I was quite a young man then, I commenced in the business of market gardening with four horses and six men. Then I was one of the very smallest taxpayers of the town, and last year I was the largest.

CONSTRUCTION OF GREENHOUSES.

This is a subject that much can be said about and there is no end to the improvements to be made. I can only inform you of those I have made from the experience I have had. The first thing to look after is the post for the back of the house, which should be good solid cedar or chestnut, sawed to a thickness of five inches down to where

the post enters the ground. The post should be ten feet long and as large as possible, the bark should be taken off, and I like to tar the bottom end that is put in the ground. Set in the ground three and a half feet on a line with the back of the house. I like to cement between the post about one foot high and provide spruce lumber 2-by-5, 16 feet long; saw off the top of post on a line of the top of the house and on a slant with the back side, which should be about one foot in two feet; nail the 2-by-5 rafters on top of posts, then cut in between the posts, which should be eight feet apart, other five-inch rafters and also place one between the bottom and top rail, leaving a small window every second space, window to be 3 feet by 3. This window can be either glass or wood and is used mostly to put in manure, change loam and for ventilation in warm weather. Both sides of this fence, which we will call it, should be covered with matched boards. After this is done, put on top of this a two-inch plank ten inches wide. This plank will project over on both sides of the fence now erected, making a good drip for water on back side and a foundation for the rafters to rest upon.

Now, the next thing to do is to prepare for the front of house. Dig down as deep as required at a distance from the back, which has been erected, the width of the house, then make frame of boards six inches apart to be filled with cement up as high as the place where the front sill should be. This, in most cases, is about three feet high. The cement wall is made of gravel and cement, three-part gravel to one of common cement, for that part of the wall that is to be beneath the ground. But the part above the ground, which should be about one foot, should be made of two parts gravel and one part cement, and if one-half of this cement was Portland cement it would stand the weather much better. After the space is filled the boards should stand by the sides at least one day before taking down. It is not necessary to board the whole length for the wall at one time, about fifty feet at a time is better, and move the boards along after they are taken away from the wall and put in another section, leaving that for another day to dry. There should be iron rods, one-half inch in diameter, put into the fresh cement and left above the cement, long enough to hold the sill, with a thread in the rod to fasten it down with a nut. Place the sill in the wall as soon as dry, then put on the uprights for the plate, leaving windows to open every ten feet. When the plate is on the front and back are ready to receive the rafters, the center piece is then erected to

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receive the other end of rafters, and when the rafters are placed they should be braced until the post and purlines are put in to support them. The rafters are placed as far apart as the width of glass to be used and one-sixteenth of an inch more to allow for play and putty. Many allow one-quarter of an inch, but this takes more putty, and the glass is more liable to get loose. The purlines are next put in place and nailed to the rafters, then the brackets to hold the iron posts are put in place on the rafters. The rafters are braced up so that the roof will be uniform, with a little crown on it. The iron posts are made of iron pipe, and a stone is placed in the ground under the post, about two feet beneath the surface. The length can then be obtained, and the post cut the length required and put in place. The posts should be seven feet apart, and if the house is thirty-six feet wide it will take three rows of posts; if wider, four rows.

The house is now ready for glazing. The ends can be put in either before or after glazing the top. The putty used should be made of clear whiting and oil, with one quarter the weight of lead worked into the putty. This will make a good body to the putty, and it will harden well and hold to the glass. In laying, it is best to have three men, and two tending these three, and they should lay seven to eight hundred squares per day of 16 by 24 glass.

In building a house for convenience, the house should slant to the boiler, which should be placed at the lowest end. The slant should be one foot per one hundred feet in length. The slant of rafters should be one foot in two feet in back side and one foot in three and a half on the front side. This will carry off most of the snow that will lodge upon the house, unless it is very heavy. When the house pitches or slants towards the boiler the steam-pipes can be placed at uniform distances from the ground. These pipes should be one and one quarter inches in diameter. This has been found the best size to use. In a house of this size eight pipes are sufficient. The distance from the ground should be about four feet. These pipes are connected to the boiler, the boiler being placed as near the house as possible, or sometimes it is inside; but I would prefer to have it just outside. The boiler should be set as low as possible, that is, all the boiler below the surface, so that the condensed water in the pipes will return readily to the boiler. In a house where eight pipes are used there should be four flow-pipes and four return-pipes, with a valve on each of the flow-pipes and a check-valve on each return. It is well to

build a good building where your boiler is located, with a large cellar to hold coal, and the building will come in use for many purposes.

I think I had better, before going into the subject of market-gardening under glass, describe to you a little something about the greenhouses that we grow the crops in. I will say that twenty years ago I had no greenhouses; nineteen years ago I built three greenhouses, and at that time the older members in the same business said that I would be in the almshouse in about three years, but I have kept on building greenhouses, and the only mistake I made was that I didn't put up a sign on my greenhouse, "This greenhouse for sale." If I had, they would not all be building greenhouses. They commenced very soon after seeing I did not get in the almshouse.

I will read a few lines which I have prepared, and after that, perhaps some would like to ask me a few questions.

Mr. Goble—You speak about having trouble with the putty is that adulterated putty?

Mr. Rawson—What do you mean by adulterated putty?

Mr. Goble—Years ago when I commenced putting up greenhouses I had no trouble with putty, and probably eight or ten years ago I bought some more, and I supposed it was the same character, but within two years it was all crumbled up and fell from the glass.

Mr. Rawson—I tried to remedy that by putting in white lead—one-third weight of lead to the quantity of putty; that is, weigh the putty after it is made with whiting, and then put in one third of that, which would make one-fourth of the whole amount of white-lead worked in there.

Mr. Evans—What pressure do you use the steam at?

Mr. Rawson—That will depend upon the temperature at which you wish to run the house, and the size of your boiler—the lower the temperature the better. If you have a very large boiler you can run it at a very low pressure. If you have a boiler that you have to force, it requires more pressure on the boiler to furnish the amount of steam required. I therefore like to have a large capacity in the boiler; about two to five pounds is what we call low pressure. We very seldom run over ten pounds.

Governor Hoard—There is no danger of getting the steam superheated and too hot?

Mr. Rawson—Yes, sir, there is; but still, when it is down to zero we have to put on high pressure; but we don't like in the growing of

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a crop of lettuce to have it in that condition. I should not like to have two nights—one night right after the other—where I had to put twenty pounds of pressure on the boiler to carry on the operations of the house.

Mr. Roberts—What is the size of your support-pipe?

Mr. Rawson—One inch and a quarter.

Governor Hoard—Do you run the steam-pipe the entire length of the house?

Mr. Rawson—Yes, the entire length of the house—the flow-pipe on the same slant as the return-pipe.

VEGETABLES GROWN UNDER GLASS.

At the present time large quantities of vegetables are grown. Many varieties can only be grown in the field, but some can be grown with better success under glass, especially in our northern climate. It is much easier to grow a crop under glass than in the field, where everything is well understood by the grower.

The principal thing to be understood by a grower is light, air, heat and moisture. That in the greenhouse can be controlled, that in the field cannot be controlled; some one else has control of it. The light is provided by the sun, moon and electric light. The air is regulated by ventilators, the heat is produced by steam and the temperature can be regulated as required, and the moisture is provided by irrigation.

I will now speak of a few varieties of crops that are grown under glass. Asparagus, beets, beans, cauliflower, cucumbers, dandelions, lettuce, parsley, radishes and rhubarb.

ASPARAGUS.

The roots are taken from the field, placed in a bed or bench and forced in the winter season, cutting every day the same as in the field. The roots are placed close together and covered with about three inches of loam. The price is very good for a crop forced in this way, and I have obtained as much as \$1 per square foot for each foot of land devoted to this crop. But on a very large scale it could not be obtained, and it required a long time to get the roots large enough to produce a good crop. The roots are of no value after forcing once. The variety grown mostly for market is Moore's Cross-bred.

temperature; that is, 60° by night and up to 100° by day, according to the stage of growth. The plants are started in a small space where the temperature can be maintained at about 90° when they are over ground, which should be in three or four days; transplant about three inches apart, then let them remain until the third leaf is started, which will be in about ten days, then transplant into pots or hills, and in about two weeks they should be large enough to place into the house where they are to mature. The distance apart for the last transplanting should be three and a half feet in the row, and the rows six or seven feet apart. The time of year to grow them successfully is the spring; that is, sow in January and they will be fit to pick in March. They are grown at all seasons under glass, but in the months of December and January the large plants, or those that are bearing, require much attention, and the crop grows very slowly and not as good shape or quality as in the spring, when there is more sunlight and warmer weather. It requires more heat, and if the price is more it costs much more to produce them.

The electric light is quite an assistance in growing this crop in the short days of winter, and some use them quite extensively for that purpose; it is next to sunlight and will more than pay the expense. After the crop has been set out where it is to remain, the vines should be trained upon wires so that you can walk under them when you wish to pick them. In this way you can easily see the cucumbers and can pick them without disturbing the vines.

In the winter season the plants require bed of heat or hot manure under them about two feet wide and one foot deep, with eight inches of loam to set the plant in. This answers for heating or keeping the soil warm and for drainage. A liberal amount of top-dressing is required, either stable manure or fertilizer.

The winter-bearing vines do not live very long. Those started in November or December will be done bearing in March, while those started in January and February will hold on picking until July, and those planted in March will last until August. The fertilization of the blossoms is done by bees placed in the houses when they begin to blossom. If the vines are not strong it is best not to put the bees in too soon, because if a set of cucumbers are on the vines when they are young and not very strong it keeps them back, and it is often best to let the first set of blossoms fall off and let the nourishment go to the vines.

The variety mostly grown is the white spine, but some grow the long or English variety. The size of white spine, when fit for picking, is about two inches in diameter and seven to eight inches long. These will pack ninety in a bushel box that is twenty by twenty, by eight outside dimensions, three layings in height. There is a very large consumption of this produced all the time and it is constantly increasing. The New England cucumbers supply to a certain extent the markets of New York, Philadelphia, Chicago and Washington. There is a large supply that comes from the south, grown out of doors, from the same variety and sent into our markets, but they are not as fresh as ours, they have been longer growing and do not look or eat as well, consequently bringing only about one-half as much in price. But they injure the market and keep down the price of the best products.

The diseases of the cucumber are spot, mildew and lice. The spot cannot be cured, but is occasioned by sudden chills and cold. The mildew can, to a certain extent, be cured by giving plenty of air and heat. The lice can be taken care of by smoking constantly.

Mr. Evans—What do you mean by smoking?

Mr. Rawson—Filling the house with smoke. We have a smoker about three feet high and fifteen inches in diameter, with a ventilator in the bottom something like a stove and a place for ashes in the bottom. Then we put tobacco stems into the smoker and a man goes in the upper end and three men walk along and fill it full, and then go into another house carrying the smoker with him.

Mr. Goble—Are not the plants susceptible to the smoke?

Mr. Rawson—The cucumber is. You cannot get any too much in the house, if you do it in the way I am saying. I say go through the house and take your smoker; but if you leave your smoker in the house, go off spinning yarns, or something else, you will probably have trouble with the cucumbers.

Prof. Voorhees—What is the appearance of that spot?

Mr. Rawson—It is on the top edge and goes right through.

Mr. Voorhees—Seems like a burn?

Mr. Rawson—It looks like a burn, but it is a chill.

Gov. Hoard—It is occasioned by allowing the heat to go down and get the house chilly?

Mr. Rawson—Yes, sir; by a sudden chill or draft on the vines. It is a thing that after you get it in a house it is impossible to get it

out, except to pull up the vines. If I saw it on some young vines I should pull them out and give that house a good warming, and get other vines to put in. The mildew can be gotten out two or three days before it shows itself. That is the time to get it out, before it shows. I can tell the minute I go into the house in the morning whether the temperature of the house has been running low. If it has been running down below fifty, I can tell it by the vines just as quick as I look at them.

Mr. Voorhees—You say the mildew is also due to the low temperature?

Mr. Rawson—Yes, sir; on a cloudy day with too much dampness. That can be remedied.

Gov. Hoard—About how high do you carry the heat to remedy that mildew?

Mr. Rawson—I should run it up to about 110°.

Gov. Hoard—And practically kill the spores by heat?

Mr. Rawson—Yes, sir; the same as killing the spores in the soil by sterilization. That is something I am doing quite extensively.

Gov. Hoard—What temperature do you bring the soil to?

Mr. Rawson—200°.

Mr. ——— —Don't your lice come from the soil?

Mr. Rawson—They do; if they crawl in they come out again.

Mr. ——— —Do you find by sterilizing the soil that you keep them away?

Mr. Rawson—Yes, sir; after the soil is sterilized there is nothing much of anything there.

Gov. Hoard—Are you going into that fully?

Mr. Rawson—No, sir; I didn't come here to tell you in one hour and fifteen minutes all I know.

Mr. Goble—You spoke of lice, do you have reference to the green fly?

Mr. Rawson—Yes, sir.

Gov. Hoard—You have no trouble with the little yellow bug, the cucumber-bug?

Mr. Rawson—Oh, no; that is in the field. We never saw any of those in the greenhouse, and they can be taken care of in the field by putting paris green in the plaster, a pound to a barrel. One pound of paris green to a barrel of plaster mixed in the day before will thoroughly saturate the plaster so that it will kill most any bug. Of course we don't use plaster on the vines in the greenhouse.

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DANDELIONS.

This crop is sown in the field in the spring, and the roots are taken up and set out in the houses in the fall. If started in December they will come into market in January, then a crop of lettuce can be grown, and in April the house can be set in cucumbers.

It is our usual custom to have three or four crops in the house; if the cucumbers are late we can get four crops. This dandelion is a very popular crop in Boston; one that is quite profitable to grow, not only in the house but in the field.

Gov. Hoard—What kind do you grow, the large leaf?

Mr. Rawson—The French variety. There is a variety that is larger, but the quality of the dandelion is not as good as the French or the ruffled leaf. It is a sort of a mixture between the old small dandelion and the broad leaf. That is the dandelion that is grown altogether now.

LETTUCE.

This crop is grown all the year, but in the climate of New England, from the middle of October to the middle of May, the houses supply all the best lettuce grown for market. It is usually very extensively grown and the products from near Boston supply the markets of New York, Philadelphia, Chicago and Washington.

It is perhaps surprising to many of you when I tell you this, but it is a fact that New York is our market for lettuce, not Boston. I have seen the time, many a time, when Boston could not take the lettuce that I grow, to say nothing about the others, and last season I sent over 100 cases a day from the first of February to the first of March to New York. Many think, perhaps, it can be grown in New York and brought to market there more cheaply than we could get it to that market, but when I say that we can get a barrel of lettuce from our place to the New York market into the store for from twenty-three to twenty-five cents, you will say then, I guess, that we can compete with anybody in New York or New Jersey.

We can compete in quality we know, and we can compete in quantity, and now we are so that we can compete in transportation. I do not think that any gardener between ten or twenty miles of New York can get his crops into New York any less than twenty-three or twenty-five cents per barrel.

The seed is sown in a small bed and in about three weeks the plants are transplanted to three and a half or four inches apart. In about four weeks they are again transplanted to eight inches apart, where they are to mature. The temperature required to grow lettuce is from 40° to 70°.

This crop requires much care to be grown in the winter season. The diseases liable to attack the crop are mildew and lice. The mildew can be kept off by attention and not allow sudden changes. The lice can be exterminated by constant smoking. The variety is the white-seeded hot-house plain or crumpled leaf. The plain is best for early winter because it will allow more forcing. The crumpled leaf is best for spring because it is much larger. The plain will pack six dozen to the barrel, the crumpled leaf, four and a half to five dozen.

The more you have in it the less you get for it. That is, if a barrel of lettuce is full at four and a half dozen at the present time, it will bring you \$4. If it is filled with six dozen, it will bring \$3 in the New York market.

It takes seven to eight weeks after the last transplanting to harvest the crop in the months of December and January, and five to six weeks in February and March.

That is, I suppose, the largest crop we produce in Massachusetts.

Mr. Lippincott—Which is the best variety for out of doors?

Mr. Rawson—The black-seed tennis ball or big Boston; either one. One is a white seed and the other is a black seed. At the South they use the big Boston, and we use the black tennis ball.

PARSLEY.

This is sown in the field in the spring; the roots are taken up and set in houses, and the crop is picked continually from fall until spring. It requires very little care and can be grown at quite a low temperature. The Moss-curled is the variety used.

That is a good lazy man's crop; that is, if it freezes it don't make much difference. If it goes up to 60° or 70° it don't make any difference. It is a crop that most anybody can grow, and most always sells for something. I call it the lazy man's crop in the greenhouse.

RADISHES.

These are grown either as a crop by themselves or between the crops of lettuce or cucumbers. They grow best with lettuce because

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the temperature is better adapted to the radish, but they can be grown with cucumbers. The turnip-rooted forcing variety is grown entirely.

RHUBARB.

This can be grown either as a standard crop or can be taken from the field, set closely in houses and forced. The standard crop remains in the land. The Giant is the variety used.

They set out roots in a bed and let them grow about two years and then put sashes upon them in winter, put them on in January and force them, and pull the crop in March. It is not grown in the greenhouse, except where they pull up the roots and set them out in a solid bunch and force them. In the first place the crop is good for two or three years; that is, they put them in and cover them three or four years before the rhubarb roots get so large, then we have to divide them and set them out in another place. The roots that are forced are of no use after forcing. The Giant is the variety used.

One of the gentlemen wished me to speak on irrigation. That is a subject which I have spent much time and money on, as much as any one, perhaps, in the country. For the last thirty or thirty-five years that I have been in the market-gardening business, I have used irrigation, and the method I have is driven-wells. That is, I procure my water by driven-wells, because I haven't the facility of obtaining it in any other way. I have always found that if you could get water from a driven-well, the longer you pump the driven-well the more water you can get, and I have never had any trouble in finding a well on any place that I ever was on. I could not tell the depth of the well, but I can locate the current for one every time. I have three driven-wells on my place that I can run night and day, one four-inch stream and the other two and a half, and they will run continually. I have three water-plants, and can supply half the town with water any time from my pumping station.

I have been to a great many market gardens miles away to locate them, and I never failed yet; I use an apple tree twig. I get near a river where I find a stratum of clay.

Governor Hoard—Is it not more in the man than in the twig you use?

Mr. Rawson—I can only say that there are only a few men that can do that. You take most any man who has electricity enough so

that sparks will come out quickly—I think he will locate a current of water if you give him a stick to do it with.

A Delegate—How deep are your wells?

Mr. Rawson—The best one I have is 70 feet. I have one 40 feet and one 30 feet. If you have rocks you must drill through them.

A Delegate—How high does that run?

Mr. Rawson—The one of 70 feet the water runs over the top. The other two the water is about 15 feet below the surface.

A Delegate—What do you use for a pump?

Mr. Rawson—The Dean pump (?), steam pump.

Mr. Flagg—What is the cost of the pump outfit?

Mr. Rawson—That is a question that it would be impossible to answer until you know the locality; but I will say this much, that a common plant with a good steam pump to irrigate about twenty acres would cost from \$2,000 to \$3,000, provided you get your well in at bottom expense. I have known people to spend \$1,000 to \$1,500 for a well. The pumping station would cost \$1,000, and \$1,500 would pay for the pump and pipes. I have one that cost me \$5,000, and that is the poorest one I have.

Governor Hoard—I am quite interested in what you are saying, in your method of getting water into the soil; how is that done?

Mr. Rawson—My method is by running it on the surface in furrows, or trenches. I do not like to spray if I can help, but if we set out small plants we must spray them. Most of our land is a little sloping, and we can carry the water to the highest end where he crop is growing and run it down as far as it will run, following the furrows, and then plough back.

Governor Hoard—Do you find any difficulty in the soil being so porous that it soaks too much at the upper end before you get to the lower end?

Mr. Rawson—No, sir; our soil is all sand. They used to call it Poverty Plains before I bought it. You could not grow anything on it; the slope was about one foot in one hundred.

Mr. Roberts—What is the sub-soil under that?

Mr. Rawson—Yellow loam.

Mr. Roberts—How deep?

Mr. Rawson—Fifteen inches of the sand and then about two feet of the yellow loam, and then a gravel of fine sand, in some cases one and some the other, fine sand underneath it, and ten or fifteen feet down you strike clay.

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Governor Hoard—There is considerable moisture rising in that land all the time under glass ?

Mr. Rawson—Yes, sir ; we do not have to irrigate a great deal under glass at this time of the year. Nobody asked me about irrigation, so I haven't said anything.

Mr. Braddock—How about irrigation under glass ?

Mr. Rawson—At this time of the year I like to wet the soil before I set the crop ; I don't want to wet it again until I pull it.

Mr. Braddock—I found in Springfield, Ill., they use tile altogether, and they said it was the system that was universally adopted ; thee has not adopted it ?

Mr. Rawson—No, sir, I do not think we need it. It would be very difficult for us to do it that way with the way we plant, because we dig up two feet in depth to put our lettuce in, and if we put our tile down two feet it would be hard to furnish water enough.

Mr. Goble—I did not notice that you said anything about the exposure of these houses.

Mr. Rawson—I want to have the house slant on the long side a little west of south, so that you get the sun in the afternoon. The afternoon sun is much better than the forenoon sun because it is much warmer, and if it is a cold night the glass would be frosted in the night and perhaps it would not get the benefit of the sunlight. Have your houses so arranged that they will get the afternoon sun.

Irrigation under glass depends a great deal upon the requirements of the crop, and to tell you just how to do that is something that it is impossible for any one to do, unless you tell me just the state of the soil and the state of your crop, and the time when you want to put the water on ; I could not tell you that unless you told me those three things.

Mr. Braddock—You irrigate this lettuce a few times ?

Mr. Rawson—Yes, sir ; I don't like to irrigate the last crop at all, if I can help it, during the months of December and January, but after that it is necessary because the sun gets quite high and absorbs the moisture more than it does in those months. Then you are more liable to mildew in the houses in the months of January and December than in any other months.

Gov. Hoard—If you irrigate in the months of January and December you lower the temperature too much ?

Mr. Rawson—We don't if we heat the water, no, sir.

Mr. Rogers—Is it not a fact that the amount of irrigation and of water in the plant has a great deal to do with the carrying qualities of the crop after it is separated from the soil—in its holding-up qualities?

Mr. Rawson—Yes, and it is different with different crops; some crops require more moisture than others. The cucumber is ninety-six per cent. water, and ninety per cent. of the rhubarb is water. Dandelions don't require any, and radishes about seventy per cent.

Mr. Morgan—Do you grow your seed?

Mr. Rawson—Yes, I do; but I had to raise them because I could not buy them.

Gov. Hoard—I would like to know something about the sterilization of the soil.

Mr. Rawson—I commenced on sterilization of the soil about three years ago. I was looking for something to treat the soil so that we would not have the drop on the lettuce and the rust or slime on cucumbers, which is produced by impurities of the soil if used a great many years without purification, and I commenced about two years ago and sterilized some soil to see the effect it would have on the crop placed in. I sterilized first by the bushel and then by the cart-load, and now I sterilize by the two cart-loads at a time. I find, by placing this soil upon a surface three inches deep I have no trouble from any vermin, mildew or anything of that kind, but anything less than two inches it works up through the soil, the soil is not thick enough to keep it down. Two inches will make a great difference, but three inches I find about the right depth of soil.

Sterilization is done by placing the soil in a pit and heating to the temperature of two hundred degrees, and leaving it cook for about an hour at that temperature, then you can handle it while it is hot and put it down anywhere you want to. It will not lump. You can handle it just as you like. It is very hot, but it has great effect, more than anything I have ever used in any shape to purify the cucumber growth, and it is a great deal better than nine-tenths of the fertilizer that you can buy to-day.

Mr. Goble—You first prepare your pit and then put this three inches on top.

Mr. Rawson—Yes, sir.

Mr. Jessup—What is the process of this heating.

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Mr. Rawson—I have a wooden box, and place the pipes very thickly, with holes in the pipes, and dump the soil right in, and run steam through it.

Gov. Hoard—I have noticed where logs were burned upon a piece of ground, and the soil calcined very thoroughly, that you might take the ashes away, but somehow or other there was strange fertility maintained in those burned spots, and I have wondered whether it was the calcining of the soil that produced the effect or what it was that did it.

Mr. Goble—In my section places that were burned over raised a good crop of cabbage.

A Delegate—That is the way to raise tobacco.

Mr. Rawson—The way I introduced the electric light, I found that after I built my house where I live, the north side received very little sun in the course of a day; perhaps up to ten o'clock, after that it received no sun. On the back of the house there is grass land, and I set out a great many flowers, and I found the plants didn't grow on that side of the house. I couldn't find anything that would grow there. About that time the town introduced electric lights, and they placed an arc light immediately opposite my house, just on the other side of the street about fifty feet from this lawn. And the first year that they placed those arc lights there I had better plants on the north side than on the south side, and, of course, not being very dull in that line, I noticed that something was the cause of it, and I immediately introduced the arc lights over my greenhouses, and for the past seven years I have used them. I use them from the first of November to the first of March.

Mr. Evans—Do you think that takes the place of the sunlight to a great extent.

Mr. Rawson—I think so.

Mr. Hoard—It is practically the same.

Mr. Rawson—It is as far as it goes. It is better than the full moon any way, because I know the crops in the greenhouse grow better under the arc lights than they do where there are none. I know that the increase is about 15 per cent. in time, and where the increase in time is 15 per cent., and where one of my greenhouses is worth \$50 per day—and I have one that is—I think I can pay about \$2.50 per night if I can get \$50 for it. That is only that one house; my arc light extends over three. My three large houses cover an area of an acre and a half.

A Delegate—How is your climate ?

Mr. Rawson—10 below zero in the winter, sometimes 15°.

A Delegate—Are you subject to sudden changes ?

Mr. Rawson—Yes, sir ; very much so. Our climate in New England has changed a great deal in the past twenty years. It is more changeable than it was twenty years ago. It has driven us out of growing melons and cucumbers in the field, and in fact squash don't grow except in certain localities, where twenty years ago we could grow them as well as they can anywhere, but now we have discarded them from field culture.

Mrs. Davis—Do you grow them under glass ?

Mr. Rawson—We do sometimes. I didn't speak of it. It is a crop that can be grown in greenhouses. They grow them in Canada under sashes to a great extent.

Secretary Dye—Do you get a honey crop from your bees ?

Mr. Rawson—No sir ; it takes a barrel of granulated sugar to feed them, and I never take a bit of honey from them. I buy about 40 swarms a year, and in the fall I have about 20, and in the spring about 10. The bees do not seem to live ; I can't keep them ; I feed them all the time. They get lost or killed in the house or something, but I could not get along with the cucumbers without the bees.

Mr. Jessup—How often do you sterilize the soil ?

Mr. Rawson—For lettuce I sterilize for every crop, unless it is practically new. If I sterilize in the fall I grow the first crop without sterilization, and the next crop I sterilize. If it is an old house I will sterilize it twice for two crops of lettuce and not sterilize it for cucumbers. When you come to cover six or seven acres you don't want to sterilize the soil every time.

Mrs. Davis—Down as far as the island of Martinique they have boiling springs, and ignorant as they are in that part, they take that soil if they can get it, to their garden.

Mr. Rawson—I would rather have this sterilized soil than fertilizer.

Origin and Development of Experiment Stations.

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Origin and Development of Experiment Stations.

In the preparation of a historical sketch of Experiment Stations it becomes necessary, in order that the layman may appreciate in some degree their influence for public good, to discuss, first, their origin and the circumstances which exerted an influence in their establishment; second, their origin and development; and, third, their present status in reference to means and equipment, and the relation of their work not only to the improvement of the agricultural industry, but their indirect importance to all classes of citizens.

The primary purpose of this paper, however, is to point out in some detail the facts connected with the establishment and growth of the institutions of our own State.

CHARACTER OF THE INSTITUTIONS.

Naturally, since the Experiment Stations are scientific institutions, and because the industry which they are primarily intended to benefit is based upon the science of chemistry, their growth in the beginning was, to a considerable degree, coincident with the growth of that science. The germs of the idea which eventually evolved the Experiment Station as it is known to-day were, however, active, or at least in motion, previous to those chemical discoveries which were of supreme importance, and upon which the applications of this science in agriculture chiefly depend. The limits of this paper, however, will not permit of a discussion of these early influences further than to say that it was recognized that because the pursuit of agriculture was, more than any other industry, dependent upon many conditions which could not be fully controlled, therefore a careful study of natural phenomena, which should result in the establishment of principles, was essential to the success of the calling, and because of its importance as the only creative industry, and upon which the success of all others in a manner depended, the study of these principles should be a public rather than a private matter.

THE ORIGIN OF THE STATIONS.

The functions of an Agricultural Experiment Station, while educative in their character, are distinct from those of schools of agriculture, because in addition to its function as a teacher, it exercises to some extent that of a detective, or police officer, and also that of an investigator. The beginnings were, however, found in the school idea. For example, a school of dairying was established by King Frederick William I, at Konighoerst, in 1722. It was in part supported by public funds, and the object was not only to teach what was then known, to such students as might present themselves, but to disseminate information by means of farmers' clubs to those not able to attend because engaged in the practical work of life; a function of the Experiment Station of the present day. Next, in 1813, King Charles John established the Royal Academy of Sweden, with branches, the object of which was to collect and disseminate information to those engaged in the business of farming. This institution received aid from the government and conducted experiments, particularly upon sugar beets, as early as 1838, and received in that year an appropriation from the government equivalent to \$14,500. The functions of this institution were quite similar to those exercised by the stations of the present day.

The Agricultural School, of Mögelin, in the Duchy of Brandenburg, was established shortly after, and was, in 1820, in charge of the celebrated writer on "Rural Economics," Von Thaer, and at that time was not only receiving students but was well equipped for agricultural research. It possessed a botanical garden, a herbarium for the classification and study of plants, a chemical laboratory for the analysis of soils, and according to its lights fulfilled the functions of an Experiment Station.

A similar institution was in existence at that time in Hohenheim, in the kingdom of Wurtemberg, supported in part by public funds. Connected with this institution was an estate of 1,000 acres, a portion of which was set apart for specific experiments in the field. The equipment included a beet sugar factory, a brewery, a distillery, and an apartment for the rearing of silkworms.

About this time (1820), though I am unable to verify the date, an institution of a little different character was established in Ireland, called the Royal Agricultural Improvement Society, with headquarters

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at Dublin, the objects of which were: (1) To encourage the foundation of district societies in different parts of the country; (2) to establish an agricultural museum in Dublin for the reception of seeds, grasses, implements, etc.; (3) to circulate practical information connected with the husbandry through the medium of cheap publications; and, lastly, to organize an agricultural college for the education and instruction of the farming classes.

In 1838 the Royal Agricultural Society of England was established. This institution, though a private one, provided for the employment of various scientists, as chemists, botanists, entomologists and others, who should inaugurate and supervise experiments; should make analyses of soils, fertilizers and plants, and report their work at meetings of the society to be held at stated times, at which meetings papers were to be presented designed to benefit and advance agricultural practice. This society published a journal of its proceedings, which is continued to the present time, and is one of the most valuable of our agricultural works. It contains a full and accurate record of the practical and scientific development of British agriculture for the past sixty years.

THE FIRST INSTITUTION NOT STRICTLY AN EXPERIMENT STATION.

These institutions, while not in the strict sense Experiment Stations, as we now understand them, and while not wholly supported by public funds, did in part exercise the functions of an Experiment Station, and were all established previous to the work of those brilliant scientists, Boussingault and Von Liebig, the results of which furnished the basis for the establishment of scientific research stations, particularly in France and Germany, and which are now permanent institutions in all countries where agriculture is a recognized industry. Sir H. Davey, in his opening lecture on "Agricultural Chemistry," in 1802, said: "Agricultural chemistry has not yet received a regular and systematic form. It has been pursued by competent experimenters for a short time only, and no general principles can be laid down respecting the comparative merits of the different systems of cultivation, and the various systems of crops adopted in different districts, unless the chemical nature of the soil and the physical circumstances to which it is exposed are fully known. Nothing is more wanting in agriculture than experiments in which all the circumstances are minutely and scientifically detailed."

THE FIRST INSTANCE OF SCIENCE WITH PRACTICE.

These statements of Davey, as well as the attempts made to establish schools and agricultural societies, indicate very clearly the general feeling that aids of some sort were required in order that the business of farming might be placed on a firm foundation, and this general feeling was crystallized into definite form only after distinct advance had been made in the "science of chemistry." The first instance of the combination of "science with practice," as separate and distinct from a school, was the farm and laboratory institution of Boussingault, at Beckelbroun, in Alsace, established in 1834. Here was first studied the scientific principles which underlie rotation systems, the composition of various crops and foods in respect to their nitrogen content, and the question of the assimilation by plants of free atmospheric nitrogen. This latter question was one of great significance, and was the fighting ground of agricultural chemists for nearly a half century, and the point at issue was not finally established until 1882; fortunately the great chemist lived to see his early views on this question absolutely verified and their correctness admitted, though in a somewhat different way than was anticipated by him. He died at the ripe age of eighty-five years, in 1887.

THE INFLUENCE OF CHEMISTRY.

In 1840 appeared the memorable report of Justin Von Liebig, Professor of Chemistry at the University of Geissen, entitled "Chemistry in Its Application to Agriculture and Physiology." This report was made at the request of the Chemical Section of the British Association, and as Sir Henry Gilbert remarked in the treatment of his subject, he not only called to his aid the previously-existing knowledge directly bearing upon his subject, but he also turned to good account the more recent triumphs of organic chemistry, many of which had been won in his own laboratory. In his dedication to the British Association he strikes a keynote, to which all true agricultural progress is tuned, when he says: "Perfect agriculture is the true foundation of all trade and industry—it is the foundation of the riches of States. But a rational system of agriculture cannot be formed without the application of scientific principles, for such a system must be based on an exact acquaintance with the means of nutrition of vege-

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tables, and with the influence of soils and actions of manure upon them. This knowledge we must seek from chemistry, which teaches the mode of investigating the composition and of studying the characters of the different substances from which plants derive their nourishment."

THE ROTHAMSTED STATION.

It is the appreciation of the truths contained in these statements by both individuals and nations that has resulted in the establishment of agricultural colleges and Experiment Stations in nearly all countries. The first direct result of the magnificent early work of Liebig was the establishment of the second Experiment Station, at Rothamsted, England, by Sir John B. Lawes, in 1843, and although the expense of this station has been borne entirely by Sir John Lawes, no single Experiment Station has ever produced such an amount of important work as the magnificently equipped research station at Rothamsted. Sir John early associated with himself the distinguished chemist, Sir Henry Gilbert, and later Mr. R. Warrington, and it may be safely said that no experimenters in the field of agricultural chemistry have made more numerous or valuable contributions to the science than these illustrious investigators. Fortunately, too, this most valuable institution is to continue its usefulness to England and the world as well, for by a trust-deed, signed February 4th, 1889, the Rothamsted station was made over to the English nation, together with the endowment of £100,000 for the continuance of the investigations after the death of Sir John Lawes. By the terms of the deed, the farmers of the United States are also to have the privilege of immediately participating in the advantages derived, for it is provided that a competent scientist is to deliver a course of five lectures in this country, biennially, on the work of the Rothamsted experiments. Three courses have already been delivered by the celebrated Sir Henry Gilbert, R. Warrington and Prof. H. E. Armstrong respectively. Sir Henry Gilbert visited this country in 1884, when the State Board of Agriculture, the State Agricultural Society, representatives from the Connecticut Experiment Station, Houghton Farm and several Farmer's Clubs of the State, joined the State Experiment Station and Agricultural College in doing honor to this veteran in the cause of Agricultural Science. He lectured in the

College chapel on October 27th of that year, on "The Results of Experiments on the Continuous Growth of Wheat on the Same Land for Forty Years."

THE ESTABLISHMENT OF STATIONS IN GERMANY.

It is worthy of note here, that although England is so fortunate in having this celebrated institution at Rothamsted, it is the only distinct Experiment Station which it possesses, the government apparently being satisfied to let private means provide in large part for agricultural research. It was in Germany, however, that Liebig's great work bore its greatest and most immediate fruit. The government recognized the importance of forwarding research work by State aid. Agricultural departments were added to some of the universities, largely at State expense, while agricultural research stations were one after another instituted in different parts of the country. The first was the now famous one of Moeckern, near Leipzig, established in 1851, whose first director was Dr. Emil Von Wolff, noted as one of the first agricultural students to supply the link between theory and practice. He had constantly in mind the application of new discoveries in agricultural science to farm practice.

In 1855, the Agricultural Institute of the University of Göttingen, Germany, was established at Weende, with Dr. Wilhelm Henneberg director, who continued as such until his death in 1890.

Next to Liebig, Henneberg and Von Wolff rank as pioneer investigators of the nutrition of farm animals. The methods of analyzing feeding stuffs, of testing their digestibility, and of experimenting upon their nutritive values; the currently accepted doctrines of animal nutrition, and the feeding standards which our stations follow in their work and in their teachings at the present time are taken for the most part from European and especially German sources. No station has done more to acquire accurate knowledge in these directions than the one of which Professor Henneberg was director.

In France, the work of Prof. George Ville, who at the end of the second empire was appointed Professor of Physiology in the Museum of the Jardin Des Plantes, and who in connection with his Professorship had the management of the experiment fields at Vincennes, is of equal importance with that of Wolff and Henneberg, in Germany, though in a different line.

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The establishment of these institutions marks the beginning of Experiment Stations which derived their income largely, if not entirely, from public sources. Others followed rapidly until in 1884 there had been established 148 stations on the continent of Europe, of which 81 were located in the different States of Germany, and 67 elsewhere. These stations were in many cases separate and distinct from universities or colleges, while in others they were made a department of educational institutions, and the question of the advantages and disadvantages from the station's standpoint of such connection has been the cause of much controversy, and is not limited to those located in Europe.

Thus the Experiment Station in Europe was the outgrowth of the various institutions described. The idea grew with the growth of the knowledge of natural sciences, and did not reach its full development until the science of chemistry was placed on a firm foundation. The other natural sciences are, however, so closely related to agriculture that the work of the institutions has recently broadened so that now an Experiment Station is not regarded as fulfilling its functions unless its staff includes the chemist, the botanist, the biologist, the entomologist and the mycologist. The influences potent here were also active in America, and as in Europe, the germ of the idea is found in the college.

THE FIRST AMERICAN AGRICULTURAL COLLEGES.

Notwithstanding the fact that a State College of Agriculture was organized in Delaware in 1834, it did little but organize, and Yale College was the first American institution to recognize officially the claims of Agricultural Science, since the first Professor of Agricultural Chemistry in this country was John P. Norton, of Yale, appointed in 1846. He was the author of a book entitled "The Elements of Agriculture," published in 1850, the first of its kind in the country. Norton was succeeded in 1863, by Dr. S. W. Johnson, who still holds the chair of Agricultural Chemistry in the Sheffield Scientific School, is the Director of the Experiment Station, and the "Nestor" of Agricultural Scientists in the United States. His books, "How Crops Grow" and "How Crops Feed," are standard works on plant nutrition at the present day, both here and in Europe. Following the

example of Connecticut, a number of other institutions were organized, which provided for instruction in Agricultural Science, notably in Michigan, in 1855, still one of the leading schools for agriculture, in Maryland, in 1856, and in Iowa, in 1858.

THE LAND SCRIPT ACT.

No organized effort was made by the different States, however, until after the passage of the National Act of 1862, called "The Land Script Act," and sometimes the Morrill Act, because accomplished largely through the efforts of the late Senator Justin A. Morrill, of Vermont, at that time a representative, and who later, as Senator, was the author of the bill providing for the further endowment of Agricultural Colleges, which was approved August 30th, 1890. This act provided that there be granted to the several States an amount of public land, to be apportioned to each State, a quantity equal to 30,000 acres for each Senator and Representative, to which the several States are respectively entitled by the apportionment of 1860, and that all moneys derived from the sale of lands shall be invested, and the proceeds shall be appropriated to each State for the endowment, support and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts. A number of conditions were imposed upon the various States accepting the gift, among which was one that prohibited the use of the fund, either directly or indirectly, for the purchase, erection, preservation or repair of any building or buildings, and another that no State should be entitled to the benefits of the act unless it shall express its acceptance thereof by its Legislature within two years from the date of its approval by the President. The result of such proviso was that in many cases the College of Agriculture and Mechanic Arts was associated with existing institutions, because the Legislatures in different States, particularly in the East, could not be prevailed upon in a short time to provide the necessary buildings and equipment for a separate institution. In some respects this has been unfortunate, since in many institutions there has been a tendency to magnify specific lines of work for which they were especially well equipped, though ample authority for their action was given in the original act. There has, therefore, been

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much criticism of the Agricultural Colleges, particularly by farmers who believed, and rightly so, that the colleges were established primarily for their benefit. This criticism was especially directed against those institutions in which the instruction in the sciences directly pertaining to agriculture was made a secondary matter, rather than the primary work of the institution. In New Hampshire, Rhode Island and Connecticut, where the Agricultural College became a department of Dartmouth, Brown and Sheffield Scientific School, respectively, the controversy has been bitter, and has resulted in the establishment of separate schools. In a number of States in which more than one college existed there was naturally a desire on the part of all to be the recipient of this generous offer of the government, notwithstanding it carried with it new and greater responsibilities. Since but one institution could benefit under the act, the result was jealousy and division, which has been hurtful to the best interests, particularly of those industrial classes which the institutions were intended to benefit.

In this State the Legislature accepted the grant in a bill approved March 21st, 1863, and in a bill approved April 4th, 1864, designated Rutgers College, or the department known as Rutgers Scientific School, as the institution that should receive the income from the fund derived from the sale of public lands.

There were two provisions in this State, act of 1864, which were significant, because it indicated the importance of experimentation in agriculture and the necessity for definite knowledge of scientific agriculture on the part of the practical farmer, and further because a fulfillment of these provisions, in a sense, prepared the way for the establishment of an Experiment Station much earlier here than in other States. One was that the trustees of the college should, in accepting the income, provide and equip an experimental farm; and the second, that they should cause to be delivered annually in each county in the State one or more public lectures upon the subject of agriculture, free of charge. The location of the Agricultural College in connection with Rutgers College was not attained without considerable effort, and its final establishment here was accomplished largely through the energetic work and influence of Hon. Thomas T. Kinney, of the Newark "Daily Advertiser," Dr. George H. Cook, at that time Professor of Natural Science in the college, and Dr. W. H. Campbell, the President of the college. In many other States, also,

the agricultural colleges were required to maintain farms for experimental and illustrative purposes, and by some of them this requirement was not regarded as an unmixed blessing, though the usefulness of a well-managed farm as an object-lesson and as an incentive to better methods of practice on the part of both students and farmers, was fully recognized; still, this connection of the farm and the college was a factor in bringing about the establishment of the stations.

The reports of the experiments and the scientific work done at these institutions, together with the successful working of the stations abroad, excited more and more attention, and the leaders in agricultural progress began to ask for their establishment here.

THE FIRST AMERICAN EXPERIMENT STATION.

In 1872, at a convention of representatives of Agricultural Colleges, held in Washington, in response to a call issued by the United States Commissioner of Agriculture, the question of the establishment of Experiment Stations was discussed, and the report of a committee in favor of such institutions was adopted by the convention. On the 17th of December, 1873, at the winter meeting of the State Board of Agriculture, at Meriden, Conn., Prof. S. W. Johnson, of Sheffield Scientific School, and Prof. W. O. Atwater, of Wesleyan University, urged the establishment of an Agricultural Experiment Station in that State, after the European plan. A committee of the Board was appointed to consider the matter, and reported that the Legislature of the State ought to furnish the means for its establishment, and a permanent committee was then appointed to bring the matter to the attention of the people and the Legislature. The matter, however, was not acted upon definitely until July 2d, 1875, when an act making an appropriation of \$2,800 per annum for two years was passed by the Legislature and approved by the Governor. This was made possible largely through the efforts of Mr. Orange Judd, who was then the editor and proprietor of the "American Agriculturist," and who had offered, on his own part, \$1,000, and on the part of the Trustees of Wesleyan University, at Middletown, the use of the Chemical Laboratory in the Orange Judd Hall of Natural Science. The station was organized immediately after the passage of the act, with Prof. W. O. Atwater as Director, and "thus the first Agricultural Experiment Station in America, to be supported by public funds, was an accomplished fact."

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The second institution established was in North Carolina, on March 12th, 1877. A station had been established in 1876 in the University of California, at Berkeley, though as far as I can learn no State funds were directly appropriated for its maintenance. One was also organized at Cornell University in February, 1879, the work being carried on by the different professors in time which could be spared from other duties, and the funds for carrying out the experiments were appropriated by the University. The third station, therefore, to be established and wholly supported by the State was that of New Jersey, under an act approved March 18th, 1880.

THE INFLUENCE OF THE STATE BOARD OF AGRICULTURE.

The agitation of the question of an Experiment Station in this State was led by the late Dr. George H. Cook, who neglected no opportunity to bring the matter before the farmers at the meetings of the various County Boards of Agriculture, and at the meetings of this State Board of Agriculture, which, largely through his influence, was organized by an act of the Legislature approved April 4th, 1872. This latter institution has, as we all know, always exerted a wide influence for good in the State. Its distinguished Presidents to the present time have been Governor Joel Parker, Governor Wm. A. Newell, Thos T. Kinney, of Newark; Thos. H. Dudley, of Camden; Hon. Edward Burrough, of Merchantville, and Hon. D. D. Denise, of Freehold, who holds this office at the present time; all of them men of commanding influence in the State, and to whose counsel and help the agricultural industry is deeply indebted. These men ably seconded the efforts of Dr. Cook in the establishment of the station. I was informed by our late President, Edward Burrough, who at the time of the passage of the act was a member of Assembly, that its final passage and Executive approval were wholly due to the personal force and influence of Thomas H. Dudley. He was the first President of the Board of Directors, and continued a valuable member until his death in April, 1893.

THE CONNECTION BETWEEN STATION AND COLLEGE.

The station is connected rather intimately with the Agricultural College, since the law establishing it requires that the Board of Visitors of the College, together with the President and Professor of

Agriculture of that institution, shall serve as the Board of Managers of the Experiment Station, whose duty it was to locate the Experiment Station and to appoint a Director, who should have the general management and oversight of the experiments and investigations necessary to carry out the objects of said institution. The Station was organized immediately after the passage of the act, March 10th, 1880, with Dr. Geo. H. Cook as its Director, and Dr. Arthur T. Neale as Chemist, and was located at New Brunswick, with a branch office in Camden, which was abandoned in 1883. The College provided room for its Chemical Laboratory in Van Nest Hall until the erection of the State building in 1888.

THE ESTABLISHMENT OF STATIONS PREVIOUS TO THE HATCH LAW.

Between the date of the establishment of the New Jersey station, in 1880, and the passage of the Hatch act, 1887, State Experiment Stations were established in ten different States. The movement grew in favor with the people, and at a convention of delegates of agricultural colleges, which met at Washington in 1883, the project for the establishment of stations in connection with colleges by appropriations from the National Treasury, in accordance with the terms of a bill already introduced in the House of Representatives by Mr. C. C. Carpenter, of Iowa, was endorsed. Congress was not, however, ready to take so large a step in the direction of scientific enterprise, and the bill was not passed. On the 8th of July, 1885, at a convention of agricultural colleges and Experiment Stations, held in Washington, a resolution was adopted which urged the necessity of legislation in favor of National aid for scientific investigations in the several States, concerning agriculture, and urged upon Congress the passage of an act to this effect. A committee on legislation was also appointed at this convention, which was very efficient in aiding the passage of a bill introduced by William H. Hatch, of Missouri, which was accomplished, and was approved by President Cleveland March 2d, 1887. By this act Experiment Stations were established under direction of the agricultural college or colleges, or as agricultural departments of colleges in each State or Territory.

THE OBJECT AND DUTY OF THE NATIONAL EXPERIMENT STATION.

In order to show the wide scope of the investigations contemplated I quote Section 2 of the act :

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"The object and duty of which institutions should be to conduct original researches, or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops, the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural and artificial, with experiments designed to test their comparative effects on crops of different kinds, the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese, and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States and Territories."

For the carrying-out of this act there was appropriated for the fiscal year ending June 30th, 1888, the sum of \$585,000, or so much thereof as may be found necessary out of any money in the treasury not otherwise appropriated. An act passed by the New Jersey Legislature, and approved March 5th, 1888, designated the Trustees of Rutgers College, in New Jersey, as the parties to whom any and all moneys appropriated by Congress under the Hatch act shall be paid for the purposes mentioned in said act of Congress, and the New Jersey Agricultural College Experiment Station was organized with Dr. Cook as Director, and with the departments of biology, botany and horticulture, entomology and chemical geology, placed in charge of Drs. Nelson, Halsted, Smith and Patton. The department of chemical geology was discontinued in 1890.

MANY STATE INSTITUTIONS WELL SUPPORTED.

The State Institutions were not abandoned on the establishment of the United States Stations, but in most cases were associated with them, and their efficiency increased by larger appropriations from the State Treasuries. In New Jersey, for example, the appropriation under the original act was \$5,000 per annum. This was increased in 1881 to \$8,000; in 1884, to \$11,000, and in 1895, to \$15,000, or a

sum equivalent to that appropriated by the United States Government. In addition to these sums, special appropriations have been made from time to time for special purposes; in 1894, \$1,500 was appropriated for the printing of bulletins, and for collecting statistics concerning our fruit industry; in 1896, \$1,000 for an investigation of the San Jose Scale, and in 1899, \$500 added per annum for printing of bulletins. In many other States, large appropriations are made in addition to the sums received under the Hatch act; the New York Experiment Station, at Geneva, receives annually \$50,000, besides special sums for the analyses of fertilizers and for special investigations which bring the total now to over \$70,000 per year in addition to special appropriations for buildings and equipment. In many States, too, the institutions have been provided with experiment farms, laboratories, greenhouses, insectaries, etc., for the pursuit of various lines of research. In New Jersey an act approved April 23d, 1888, appropriated \$30,000 for the construction of a State Laboratory for the use of the State Experiment Station, and a further sum of \$8,000 was appropriated in 1891 for paying the costs and expenses necessarily incurred in its construction and completion. This building is known as New Jersey Hall, and contains the offices and laboratories of the Experiment Station.

In 1896, the facilities of the station were largely increased by the Trustees of the College, who transferred the College Farm and its equipment for the sole use of the station, which enabled the establishment of a department of dairy husbandry. This farm, however, is in no sense a State farm, as it must be maintained entirely from the proceeds. Fortunately, thus far it has been possible not only to do this, but to contribute materially to the necessary expenses of the Station.

STATUS OF THE STATIONS IN 1898.

As indicating the present status and the lines of work now engaged in by the institutions in this country, statistics gathered by the Office of Experiment Stations show that the total income of the stations during 1898 was \$1,210,921, of which \$720,000 was received from the National Government, the remainder coming from State Governments, individuals and communities, fees for analyses of fertilizers, sales of farm products and miscellaneous sources. In addition to this the Office of Experiment Stations had an appropriation of \$35,000, for

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the past fiscal year, including \$5,000 for the Alaskan investigations. The value of additions to equipment of the stations in 1898 is estimated at \$176,469.

In that year the stations employed 669 persons in the work of administration and research, classified as follows: Directors, 75; chemists, 148; agriculturists, 71; horticulturists, 77; farm foremen, 39; dairymen, 21; botanists, 50; entomologists, 46; veterinarians, 26; meteorologists, 20; biologists, 11; physicists, 11; geologists, 6; mycologists and bacteriologists, 19; irrigation engineers, 7; in charge of sub-stations, 15; secretaries and treasurers, 23; librarians, 10; and clerks, 46. The stations published 406 annual reports and bulletins during the same year, and have a mailing-list aggregating over a half million names.

According to a recent bulletin of the Office of Experiment Stations, there are in other countries than the United States 485 different stations—in many cases these are departments of colleges rather than separate institutions, and in Russia particularly they consist of experiment fields of greater or less extent connected with large estates. With the exception of the Southern and Central American States, nearly every State or country is represented by one or more.

THE INFLUENCE OF THE STATIONS UPON THE DEVELOPMENT OF FARM PRACTICE.

In this country the relation of the work of the Experiment Station to the improvement of farm practice is shown in a practical way largely by the character of the work done and the method employed in bringing the results obtained to the attention of the farmer. The educational feature of the station, though valuable, is in a sense limited, since the instruction must be given mainly by means of the publication and distribution of bulletins of information, and by means of public lectures concerning the relation of science to practice. Before instruction in the scientific principles underlying the industry had been widely disseminated, it was difficult to present the results of scientific inquiry in such a manner as to be entirely intelligible, and thus applicable in practice.

In the beginning the police function of the station was, therefore, the most directly useful, because dealing with matters that could be understood, and which directly or indirectly appealed to the pocket-

book ; it required no previous scientific knowledge or technical training on the part of the farmer to enable him to partake of the benefits, at least indirectly, of such control work as the chemical supervision of fertilizers, manures, seeds, feeds, protecting consumers in the use of these products. The research function, the most important, because the object is to seek out and establish fundamental principles, grows as the need for the exercise of the others is in a measure diminished, and as the intelligence and education of those engaged in farming are advanced. The best work of the stations is dependent upon the good work of the schools—the two institutions are in a sense inter-dependent, each helping the other.

The stations are, however, directly responsible for considerable additions to our knowledge, and which have an important bearing upon economical farm practice. For example, the investigations of the chemists have added to our knowledge of the relations of the soil and atmosphere ; they have given us the knowledge of the nitrogen gatherers, they have given us definite knowledge concerning the composition of the soil and of its needs in reference to commercial fertilizers ; they have contributed much to our knowledge of the use of commercial fertilizers, in fact, the improvement in commercial fertilizers is due largely to the investigations of these scientists. In the domain of animal husbandry, we have received from the chemists the balanced ration, which in all its relations has perhaps done more than any other one thing toward the development of stock interests ; the Babcock test is the contribution to the world by a station chemist ; the improvement of the various forage crops, and the development of the silo are matters directly traceable to the station chemist, all contributing to the advancement of dairying in all its numerous relations. The entomologists have given us the life-history of injurious insects, and methods of their control and destruction ; the mycologist and botanist have added much to our knowledge of diseases of plants and their control ; the horticulturists have aided in the development of new varieties of plants, while the biologists have given us important facts concerning the breeding of animals and the control of the diseases to which they are subject. These are but a few instances where practice waits on science, or depends on Experiment Stations, but the true relations of the Experiment Stations to improved practice can be realized only when we stop to consider how much would be left out of our practice if we did not have what the Experiment Station scientists have given us.

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The direct value of these institutions and their influence for good are undoubtedly great, and cannot be measured by any other standard than that used to measure the value of educational work in other lines. The results of the work are not altogether, nor even largely, material; the farmer is benefited because he is first made a better man. He is taught to observe, to think for himself, to put himself in sympathy and harmony with, and thus to more intelligently direct nature's laws. The Experiment Stations were established for the farmer, and it is his privilege and should be his duty to take advantage of the results of their work. In our own State, a large proportion of the farmers do take advantage of the work of the station, as nearly 10,000 have personally requested the bulletins that are issued—perhaps a larger proportion than in any other State—and it is noticeable that those who do follow the work are among the best and most progressive farmers that we have.

Agricultural Progress and Profit.

FRANKLIN DYE.

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Agricultural Progress and Profit.*

BY FRANKLIN DYE.

Agriculture is the first industry, and the basis and support of every other ; and the plow is the pioneer agricultural implement. It prepares the way for all crop production and calls into use all the other implements of husbandry.

The plow, from the earliest history of the race, has figured not only in the soil, but also in story and in song. The pageants of kings were not complete unless it had a place with the ox in the procession. Why this honor to this implement? From the soil riches, in early times, were obtained more than by speculation. The land-owner was the man of wealth, of influence and power.

The earliest historical reference to the plow is in the Book of Job. Its evolution has been from a crooked, crotched stick, used by primitive agriculturists, to the magnificent and varied implements of this class at the present time.

Of the inventors who improved the plow, since about the beginning of the present progressive century to the present time, I cannot speak at length. But in this country progress seems to have begun with the improvement of Thomas Jefferson, in 1793. *The first cast-iron plow* was invented by Charles Newbold, of Burlington county, New Jersey, and patented by him in 1797. Although he spent large sums of money in perfecting and introducing his invention, he finally abandoned the business in despair. Why? The farmers conceived the idea that the "cast-iron plow" poisoned the land, injured its fertility and promoted the growth of weeds.

Similarly the advanced ideas of Tull, of Berkshire, England, in 1701-1731, were opposed and derided by his neighbor farmers, and his machines broken by his laborers in their ignorant zeal against

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innovations. A similar instance occurred on a farm near Freehold, N. J., on the introduction of a mowing machine. Opposition, persecution and sometimes death have been the penalties paid by men in other callings, as well as in agriculture, for leading the way to a higher development of the world's thought and industrial progress.

And there is prejudice still in certain quarters against improvement. At the present time there are about 2,000,000 acres of land annually turned over by the plow for crop production in the United States alone, and over \$70,000,000 worth of plows annually put upon the market.

Although the plow has been, from earliest times, glorified, the plowman did not receive such honors. All who were not nobles were serfs or slaves. The ruling nobles of early days did not plow, although many noble men have plowed from Elisha's time to the present. The work of the plow, as it has advanced towards perfection, has called into existence numerous other implements and machines. These also have passed through many changes, from their crude beginnings towards perfection in construction and work. Without going into details, I enumerate a few of these.

The harrow has advanced from a many-pronged sappling drawn by human force to the present "crushing," "disk," "spring-tooth" and "smoothing harrows." Now, we have cultivators and weeders that do the work of many men as it was done by the old hand methods and do it so much better. Planters that have advanced from the primitive mode of scattering the seed with one hand and forking it in with a stick with the other, to the present corn and potato-planters, seed-sowers and grain-drills that work with almost marvelous skill and rapidity.

Potato-diggers that lay them nicely upon the surface at the rate of ten acres per day as compared with the drag, the fork, the hoe of the earlier periods. Call to mind the primitive methods of mowing and reaping—the grass-hook and the sickle, followed by the scythe and the grain-cradle. Compare these with the present mowing machines, reapers and binders.

Recall the old way of freeing the grain of the straw and chaff. The threshing-floor of Arunah, which David consecrated by sacrifices thereon to Jehovah, had its counterpart in the husbandman's life for many generations after. Even yet the faithful horse is driven around the threshing-floor, in some countries, tramping out the grain, which

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is afterwards separated from the chaff by throwing it up in the air to be winnowed by the winds as it falls to the floor. Now, by horse-power or steam, the reaping, threshing, separating and bagging is done in one operation. Think of this in contrast with the old "poverty club" and then sigh for "good old times." Ten bushels per day was considered a good day's work by the latter method, providing the rye was good.

How we used to rake the hay, after mowing the grass by hand and spreading it out with a forked stick! A hand-rake, about two feet in length—a half-dozen men and boys raking hay thus! How is it done now? The mower, the tedder, the horse-rake and the loader following each other, and the hay-fork unloading, too. One man doing from ten to thirty times as much as could be done in the old way.

A few comparisons of what one man could do per day in the old way, by primitive methods, and in the new way, with improved implements and machinery, are herewith given, taken from "The Growth of Industrial Art," prepared by Hon. Benjamin Butterworth :

Implement.	Men.	Acres old way.	Acres new way
Plows.....	1	$\frac{1}{2}$	20
Harrows.....	1	1	30
Cultivators.....	1	1	10
Cultivators, walking.....	1	1	10
Planters.....	1	2	12
Seeders.....	1	4	15
Diggers.....	1	$\frac{1}{2}$	10
Corn harvesters.....	1	$1\frac{1}{2}$	10
Hemp and flax harvesters.....	1	$1\frac{1}{2}$	10
Harvester cutting apparatus.....	1	$1\frac{1}{2}$	30
Mowers.....	1	$1\frac{1}{2}$	30
Reapers.....	1	$1\frac{1}{2}$	20
Harvester binders.....	1	$\frac{1}{2}$	20
Horse-rakes.....	1	5	30
Hay-loaders.....	1	4	25
Hay-tedders.....	1	5	40

Mark the progress in butchering and dressing stock. Call to mind the old-fashioned hog-killing on the farm (formerly the market crop was all prepared for market there), and then visit the packing-houses of Cudahy and others at Omaha, and of the Armour's at Chicago.

Witness the old-time methods of dairy-work and compare them with the present cream-gathering and butter-making machinery

methods. Consider, too, the improvements made in stock. The cow is beginning to answer the chief end for which she was made—milk-production. Compare the 5,000 and 8,000-pound milk-producer of the present with the old-time ranger, browsing the dusty herbage of the wayside for a living.

Consider the steady improvements in the horse, sheep, swine and poultry, and the grand evolutions in fruit, vegetable and flower production. While this development in implements and machinery, stock and fruits has been going on there has been, in some localities great progress made in the knowledge of the soil and requirements of cultivation.

This has been brought about in part by the discovery of mineral manures, such as marl, by the wider use of clover and other green crops for soil recuperation, and, largely, by the discoveries of working agricultural chemists. What a vast blank of ignorance was spread over the agricultural world prior to the work begun by Liebig. The light that then began to shine has since poured its streams for the enlightenment of all agricultural workers. Tull, already referred to, thought upon how plants grow. His conclusion was that they in some way took up the finer particles of soil and incorporated it into their fibre and fruit. From this reasoning he deduced the proposition that the better and finer the soil was pulverized the more speedy would his crops develop. What he guessed at we now know.

The researches of the chemist have borne a most important part in agricultural progress. We now know what the crops we wish to grow and the stock we desire to keep require for best results. The sources of supply of plant-food are discovered. That which was once cast away as valueless is being used now as never before. Fifty years ago darkness brooded over the lands longest tilled and they were abandoned. No need of that now. The plow is turning over the old untilled acres for another trial, and, by the touch of scientific skill and improved methods, lo! they are crowned with pristine harvests.

It is but just, therefore, that we pay an honest tribute to our scientists who are co-operating with us to supply the world's needs. And to our Morrill, who originated and carried through the measure of land-grants to establish and maintain agricultural colleges.

There has been an increase of acreage, an average gain in yield per acre for broad acres, and a very large gain in localities for the cereals and in dairy productions, while fruit and poultry are square to the front.

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[Note—For any who wish to study this subject I would refer them to articles in the "Forum" for May and July, 1899, by J. Schoenhof, "A Centennial Stock Taking."]

How has all this advance in agricultural affairs been realized?

Man has been elevating himself by cultivating and using his intellect. In this respect agricultural progress has been very marked; in fact, intellectual progress is the basis and guide to material progress. This, developed and used wisely, is all that differentiates him from the beasts that serve him. Failing to do this he, with them, is but a plodder. And this is true of other callings also.

Greater intelligence applied to all agricultural work is the need of to-day. The chemist has revealed the laws, hitherto unknown, by which the farmer, in co-operation with nature, may secure greatest results at least cost. By the use of his intellect, by skill, by utilizing the information placed at his disposal, by better methods—one man moves forward to success on the farm, while another, failing to apply business principles and common-sense methods, loses in the game. We are face to face with new conditions. There is a revolution in thought, knowledge, business, progress. New conditions call for new requirements of fitness and ability. The tendency of human affairs is onward. The world will not wait for the man who stands still in his calling. The non-progressive man must drop out of the ranks.

EFFECT OF INCREASED PRODUCTION ON PRICE AND PROFIT.

It having been made possible, by improved implements and machinery, to enlarge the acreage of production and by a better understanding of the requirements of the soil, the plant and the animal, to increase the yield of each, we are led to inquire what has been the effect of this increase on price and profit. The natural inference is it has lowered both. If that were true, other conditions being equal and normal, it would seem we had better return to primitive conditions. Researches made in records of prices received by farmers in Pennsylvania, New Jersey and Connecticut from 1770 to 1841 (condensed, in part, from Bulletin 99, U. S. Department of Agriculture, 1892), show that the difference in the prices received by the farmers do not vary so much, for long periods, as may be supposed.

The following table gives the average price for the periods named for the articles enumerated. The one item of pork seems to have

commanded a higher price in proportion to some others, owing, perhaps, to the fact that it was the chief article of meat diet during that period. The price of labor, as averaged, includes mowing and cradling as well as other farm work. The items do not show a higher price paid per day for cradling than \$1, and mowing 75 cents.

TABLE I.

PRODUCT.	AVERAGE PRICE.	PERIOD.
Hay.....	\$0 35 per cwt.	1770-1834
Corn.....	54 " bu.	1773-1836
Oats.....	30 " "	1771-1815
Wheat.....	1 11 " "	1774-1831
Rye.....	64 " "	1777-1836
Buckwheat.....	42 " "	1788-1835
Potatoes.....	41 " "	1775-1840
Tobacco.....	11 " lb.	1770-1828
Pork.....	08 " "	1774-1840
Butter.....	14 " "	1775-1841
Apples.....	37 " bu.	1820-1841
Whiskey.....	21 " qt.	1770-1801
LABOR AND PRICE.		
Mowing.....	\$0 57 per day.	1771-1839
Reaping.....	55 " "	1774-1785
Cradling.....	1 00 " "	1813-1829
Common work.....	50 " "	1772-1830
Use of oxen.....	34 " "	1772-1818

Contrary to the prophecies of laboring men that the advent of machinery on the farm would reduce the demand and the price for farm laborers, there has been a steady reduction in the number of efficient laborers for farm work and the price has advanced in an inverse ratio to the price received by farmers for their products, notwithstanding the introduction of machinery.

While this increase in production has been going on, there has also been a rapid increase in population and a growing demand for greater variety by consumers. The ration of the farmer's table, in common with other classes, has been extended. It includes much more than formerly—pork and potatoes, corn and beans, johnny cake and butter-milk will not now suffice.

Furthermore, the United States Department of Agriculture is trying to increase consumption by extending the knowledge of our cereals abroad, by teaching their value and how to prepare them for food; a highly commendable work. Those present who attended the National

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Farmers' Congress at St. Paul, Minn., in 1897, will recall the address of President Hill of the Great Northern Railroad system on this subject.

He said, in part, that if a single province of China can be induced to consume one ounce of flour per day per capita it will absorb the whole wheat crop of the Pacific coast. Mr. Hill pointed out with special emphasis that the National Congress, in the last thirty years, had never enacted one single line of legislation with an intelligent purpose of increasing our foreign trade in agricultural products. He urged that a commission composed of intelligent, practical men, be sent to China and Japan to investigate the possibility of opening a market for our grain. He had, at his own expense, kept an expert there for a year, and the data thus secured convinced him that the way to permanently-paying wheat prices for American farmers is through the ports of China and Japan.

A statistician, writing of the awakening of the Celestial empire and its inevitable advance under the stimulus of the commercial invasion now under way, estimates that the "gain of only one cent in the purchasing power of every inhabitant of China would mean an addition to the fund that goes to support the world's trade equal to \$1,277,500,000 a year." Our trade has increased in late years under our treaty rights by leaps and bounds. As striking instances, it may be noted that our Asiatic exports of flour amounted to 1,725,388 barrels, against 1,240,563 in 1898.

The total exports of flour to all countries increased in the past year 20 per cent., while the increase in the export of flour to Asia was 39 per cent. In 1895 our exports of cotton cloth to China were only 35,000,000 yards, while in the last fiscal year we sold 221,000,000 yards to the same customer. From these figures it may be seen how vital to the health and growth of our commerce is the China trade, and no doubt every effort will be made by the Government to maintain and extend our trade in China.

Is it not worth while for us to urge our members of Congress to give consideration to this matter, and that foreign consuls be required to report upon possibilities of extending the use of our agricultural products in the countries to which they are appointed?

According to Mr. Colquhoun (See "Outlook," Sept. 10th, 1899), our entire export trade to China has increased 126 per cent. in ten years. Farmers the country over have an interest in that trade. Cot-

ton forms two-fifths of China's entire import trade. A chance here for our brother farmers of the Gulf States. Flour, breadstuffs, oil, timber, leather and similar products are included in the list. This trade, nourished and extended, will, as Mr. Hill suggests, relieve the Pacific coast farmers of their surplus. But we should do more.

The Asiatics should be taught the value of our great maize product and its uses, as well as of wheat. (Why, Mr. President, there are already twenty-nine articles of commerce made from corn.) This done, the export trade will invade the Mississippi valley, and Eastern farmers will be compelled to reclaim and restore their idle and abandoned farms to meet the home demand at advancing prices. This is no dream. The logic of events points that way. Let us hold the plow steady. The agricultural millenium is coming.

True, there has been a period during which some agricultural productions seemed to have been in excess of the demand, or in excess of the consumer's ability to buy at such a price as would yield a fair profit to the producer. We know the cause of that condition. It cannot be much longer continued nor again repeated in this country.

But the farmers, as a class, must do something more than complain if they would hasten on and share in increased profits. I do not ignore the fact, Mr. President, that there are times when individuals suffer and families are called to endure trials. Times, too, when men engaged in one calling are discouraged because of adverse conditions, while other workers seem to be more prosperous.

But, shall we eliminate from direction and control in human affairs, Infinite wisdom? Is the Fatherhood of God less than at the beginning? Look at His work *for us* in the earlier ages. Had it been possible then for some fault-finding crank to have interfered with His plans on the ground of over-production, or over-provision, we would not have had our forests, our coal, gas, oil, &c. So now, if present ability to do, which is the result of a century of study and progress, had been deferred *until and at the opening of* the twentieth century, with the same increase of population we have had, the world would perish for want of food. All this ability to produce will soon be needed in increasing measure for earth's increasing populations. Rather than complain, therefore, let us endure, if tried, and enjoy what we have and be thankful. "He fills our mouths with good things."

Reverses of a business character, if studied and improved, show where defects exist and challenge to the use of the means for improve-

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ment. Just now certain industries are striding forward with increasing demands at advancing prices, while agricultural workers receive but little, if any, increase in price for their productions. These unbalanced conditions between industries cannot continue for any long period.

HOW IMPROVE THEIR BUSINESS.

A lull in the conflict gives opportunity to reorganize the forces in order to meet new demands. What can farmers do, as a class, for their own improvement? Some suggestions have been already made. The greatest good can be secured only by organization and co-operation. There is no such proportion of the population engaged in a single calling as there is in this. By organization, local and general, the farmers should put in the State and National Legislatures men who would represent their interests. And in doing this they would advance the interests of the people.

By organization and co-operation farmers could regulate local taxation, improve their schools, keep and extend free rural mail-delivery, buy lower and sell higher, improve their business methods, and by discussion among themselves, improve their ability to take part in public affairs—a great need. They should lay hold of the market end of their business, study its demands and cater to them in order to larger profits. To do this it would not be necessary to enhance the price to the consumer so much, but to get the product to him without passing through so many hands, and in a better condition. Consumers' interests call for their co-operation in this matter. *He should learn how to advertise*, and do more of it. Please the eye and the appetite, and the pocketbook will disgorge. The farm itself and the dairy should be so well cared for that the farmer will not be ashamed to put his name and the name of his place on a bulletin board at the entrance to his home.

Do you ask what organization is best? The Farmers' Institute is the farmers' winter-school of methods. It affords a needed opportunity for improving the business of agriculture. The local club is helpful also. But for the greatest good we should belong to such organizations as are both State and National in their character. There are State and National Dairy Unions for dairymen, State Boards of Agriculture, Stock Breeders' Associations, and the National Grange, Patrons of Husbandry. A progressive farmer will also keep

in touch with progressive ideas by paying for and reading some one or more of the leading agricultural papers.

Agricultural Progress and Profit. The latter depends upon the former. No progress, no profit. True, exceptionally favorable natural conditions may give a non progressive man exceptional profits, but such instances do not contravene the statements made. Many occupants of farms are groping in darkness at noon-day. There is light, but they work on in darkness, and the end of each weary year finds them no better off than when they began it. They have made no progress.

UNNECESSARY LOSSES.

Profit is gain beyond expenditure—excess of value over cost. In a fair study of this question of profits, the expenditures on the farm and for the family now and in former times must be considered. That a wide difference is found between the forepart and the latter-half of the present century must be admitted. What the farmers of the earlier period allowed were, largely, but the plain necessities of common lives. Farmers now, in large numbers, procure and enjoy the luxuries and accessories of modern life equal to any in other callings of equal means.

I would have them live well. There is nothing better for a man, in any calling, than to eat and drink and enjoy the good of all his labor. It is his portion that God giveth him. But if he could put some money aside each year by denying some of the luxuries that are not necessities, and doesn't do so, or if he spends it foolishly in other directions, he should not complain of hard times.

Again, profit is intimately connected with economical practice. I do not speak of economy in the matter of self denial, but as it relates to wastefulness. I speak of farm manures. I believe that for every acre of agricultural land in the United States, there is an annual loss of at least fifty cents in plant-food from the barn-yard accumulations. At this low estimate, there being 4,564,641 farms in the United States, of average size of 137 acres, we have an annual loss for the whole country of \$311,667,908.50. But this waste varies in different localities. In the newer productive regions of the West it is total, nothing is saved.

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True to the American, if not the universal human, idea of exhausting all natural resources first, whether of forest or fertility, they crop and burn. The Middle West farmers are awakening to this miserable policy now; they find it necessary to husband home resources of plant-food by rotation of crops and utilization of manure in order to produce paying crops.

The story of agriculture in the Atlantic States is one of exhaustion. We are beginning to restore soil-production by the use, largely, of commercial manures. This is well. But why not, at the same time, take care of the home product? This done and wisely applied, the bill for the other could be largely reduced; or, if it were continued, the product from both would be much greater than it now is.

Another, a source of great loss in the dairy business, is the support and care of bovine boarders—dead-heads—pure and simple. And yet that farmer, while complaining, will not inaugurate a system of weighing and measuring whereby he can determine positively whether each cow is being kept at a profit or not.

We have glanced hastily at the marvelous progress made in agricultural machinery, in agricultural science, in the practice of agriculture, in stock improvement and in the better understanding of the business by farmers. We have not found that the price per bushel, pound, &c., has increased in the same proportion. But in another way the total returns are well up with the progress indicated. For the yields per acre for farm crops and per head for stock have been largely increased and at less cost by means of improved machinery and by better knowledge.

The old acre has more than doubled its yield under the new management, while the modern cow produces as much as two or three of her ancestors. We are doing better than formerly. *There is progress* and with it increasing profit under intelligent management, and no business will prosper without that.

There is one other phase of the question of profit to which I feel I ought to refer in concluding this paper. The accumulation of money is not all of life. There is the profit of intellectual growth. What intelligent man, interested in the great business of agriculture, can pursue this varied and wonderful calling—the foundation and support of every other—and not become a broader-minded man, with an enlarged conception of the works and laws of the Creator placed in his hands.

Profit of Citizenship.—Is it nothing to be a member of a common-wealth and country in which he, with others of his class, can have the say as to who shall make and administer the laws and what those laws shall be? With the farmers largely rests the question of the perpetuity of our democratic form of government and what changes, from time to time, shall be made in it.

The Profits of the Social Relations.—The sociability generally practiced among farmers is not found elsewhere. It does not exist in cities. I know whereof I speak. The summer work is interspersed with social gatherings, the winter with the old-time visiting parties. Every one knows his neighbor. These occasions are marked by hearty good feeling and social equality that is cheering when contrasted with society lines that are drawn elsewhere.

Profit of Home and Family.—The family is the crop of greatest value, but often it receives the least consideration. A young lady once told her father he thought more of his hogs than he did of his daughter. In view of facts already quoted, shall we not give more emphasis to the duty and the privilege of rearing children on the farm, away from the entangling temptations of city life—noble men and women, who shall be able to stand morally, and as citizens, for the right, always?

The home on the farm—the farmer's home. Let it be the center of the family ties, the place of greatest attraction. Let the influences there exerted be loving, wholesome, pure, so that the memory shall always revert to it, and to those who dwelt together there, as the most delightful place, the most charming circle in all the world.

The future of agriculture rests largely with the farmers. Is it not a business of such importance, variety and attractiveness as to command our admiration, our industry and our best thought?

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NOTE—The prices for farm products in Table II should be compared with the prices received for similar crops in the earlier periods given in Table I.

For short periods, during abnormal conditions, high prices were received by farmers, but there was also corresponding increase in what they had to pay. Table II shows prices received in 1864-1866 and 1899, also price of groceries, dry goods, &c.

TABLE II.

Product.	Price, 1864 to 1866.	Price, 1899.
Wheat	\$2.85 to \$3.00 per bushel.	\$0.70 per bushel.
Oats .....	.90 “	.25 “
Corn	1.25 to 1.40 “	.41 “
Hay	18.00 to 30.00 ton.	10.00 per ton.
Potatoes.....	.80 to 1.00 per bushel.	.50 per bushel.
Apples	2.00 per barrel.	1.00 per barrel.
Pork .....	.17 per pound.	.05 $\frac{3}{4}$ per pound.

The price paid for the necessities of life during this period was as follows :

Product.	Price, 1864-66.	Price, 1899.
Flour.....	\$6.00 to \$8.00 per cwt.	\$2.60 to \$3.00 per cwt.
Ham.....	.28 per pound.	.10 per pound.
Lard.....	.25 “	.10 “
Cheese.....	.25 “	.15 “
Butter.....	.50 “	.26 “
Coffee.....	.50 “	.20 “
Tea.....	2.00 and up “	.35-1.00 “
Sugar.....	.15-.20 “	.05-.05 $\frac{1}{2}$ “
Molasses.....	1.25-1.30 per gallon.	.50 per gallon.
Chocolate.....	.70 per pound.	.40 per pound.
Ginger.....	.64 “	.25 “
Tobacco.....	1.00 “	.30-.60 “

For Wearing Apparel.

Product.	Price, 1864 to 1866.	Price, 1899.
Calico.....	.45-.50 per yard.	.04-.05 per yard.
Muslin.....	.30 and up “	.03-.08 “
Muslin, bleached.....	.77 “	.12 “
Muslin, bleached (Hills), 1 $\frac{1}{2}$ yards wide.....	.68 “	.06 “

Product.	Price, 1864 to 1866.	Price, 1899.
Drilling.....	\$0.50 per yard.	\$0.10 to \$0.12 per yard.
Gingham.....	.40 to \$0.60 per yard.	.07 “
Alpaca.....	.90 to 1.70 “	.50 to 1.00 “
Spool Cotton.....	.08 to .12 per spool.	.04 per spool.
Denims.....	.40 to .70 per yard.	.10 to .18 per yard.
Double-Width Shirting..	1.35 “	.16 “

We give some other articles and the price in 1864 :

Prints.....	\$0.38½ to \$0.50 per yard.
Dleaines.....	.57½ to .85 “
Apron Checks.....	.45 to .60 “
Stripe Shirting.....	.35 to .42½ “
Brown Shirting.....	.47½ to .60 “
Canton Flannel.....	.44 to .80 “
Ticking.....	.35 to .75 “
Furniture Checks.....	.42½ to .55 “

STATE GRANGE REPORT.

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State Grange Report.

To the Officers and Members of the State Board of Agriculture:

It is with more than ordinary pleasure that I submit the report of New Jersey State Grange to this intelligent body.

During the century now closing the farmers have awakened from the slumbers that have been spreading over them, and have joined an organization that will lift them from their isolated condition, and they are receiving a greater reward for their toil through the formation and prosperity of the Grange, which has been the farmer's safeguard for over thirty-three years.

It is a complete organization, which is peculiarly adapted to the tastes, conditions and requirements of farm life in all parts of the country. It teaches co-operation in every line of Grange work, and the farmers of the whole land need this more than any other class of people. The Grange is teaching the farmer that this is an age of organized effort, an age of rapid changes, and the methods of our fathers, however successful in the past, will not succeed now.

New methods, new systems, thought, brain culture, must be applied in keeping with the changed conditions, to insure success. What the farmers need now is not more physical labor, but more thought. The farmer who expects to keep to the *front* must do so by the power of *knowledge, cultured brain, not muscle.*

We believe the farmer will succeed best who will spend one-fourth of all the hours he devotes to labor, to *mental labor*, and thinking and devising his plans for conducting his business. We believe, further, that the farmer who will spend three or four hours each week attending some good Grange, and with his mind quickened and sharpened by coming in contact with other minds, will, in the course of years, make and save more money than the same man will with all his time spent in physical labor, saying nothing of the pleasures of life and our duties to each other as citizens, and the growth of knowledge gained thereby.

The question arises, Why should not the farmers organize? They need it more than any other class, their work is isolated, and, as all other classes are organized, they need to organize for self-protection.

The wife of the farmer needs the Grange for sociability, for rest and recreation.

The young men and women can extend their education by being members of a live Grange; it will teach them how to add to the pleasures and happiness of life and the attractions of their homes, and increase the profits of the farm, add to its value, both as a home to live in and a means of making money.

All these and hundreds of other equally interesting and profitable questions are weekly considered by the Grange.

We congratulate ourselves on the progress and growing popularity of the free delivery of mail in the rural districts, of which the Grange was the originator and promoter. And, by good authority, the service so far has resulted in increased postal receipts; the enhancement of the value of farm lands reached by rural free delivery of from \$2 to \$5 per acre; a general improvement to the condition of the roads traversed by the rural carrier, besides educational benefits conferred by relieving the monotony of farm life through ready access to wholesome literature and knowledge of current events.

The National Grange Legislative Committee will continue to press its demands for appropriate legislation on the following important matters:

1st. Free delivery of mail in the rural districts, and that the service be placed on the same permanent footing as the delivery of mail to the cities, and that the appropriation therefor be commensurate with the benefits and demands for the service.

2d. Providing for Postal Savings Banks.

3d. Submit an amendment to the Constitution providing for the election of United States Senators by direct vote of the people.

4th. Enlarging the powers and duties of the Interstate Commerce Commission, giving it the power, and charging it with the duty of fixing maximum rates of fare and freight on all inter-State railways.

5th. Regulating the use of shoddy.

6th. Enacting a pure food law.

7th. Providing for the extension of the markets for farm products, making it the duties of United States consuls to render the same aid in extending the markets for farm products as for manufactured articles.

STATE GRANGE REPORT.

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8th. The enactment of an anti-trust law clearly defining what acts on the part of any corporation would be detrimental to public welfare.

9th. The speedy construction of the Nicaragua canal by the United States.

10th. Equalizing taxation so that all property will bear its just proportion of the cost of government.

There was an increase in membership in New Jersey the past year of 10 per cent., and a good prospect for this year.

One Grange was organized on the sixth of this month in Hunterdon county with 99 charter members.

Our insurance institution is very popular, and established on a business and co-operative basis, carrying nearly \$5,500,000 in risks.

In conclusion—The Grange teaches the farmers that the world respects and honors those who respect and honor themselves and work earnestly and honorably to better their condition.

Respectfully submitted,

EDMUND BRADDOCK,

Master N. J. State Grange.

Officers of the State Grange of New Jersey, P. of H., 1900.

Master.....	EDMUND BRADDOCK.....	Medford, Burlington county.
Overseer	GEO. W. F. GAUNT.....	Mullica Hill, Gloucester county.
Lecturer.....	GEORGE L. GILLINGHAM..	Moorestown, Burlington county.
Steward.....	WINFIELD S. BONHAM...	Shiloh, Cumberland county.
Assistant Steward.....	HARRISON QUIMBY.....	Parsippany, Morris county.
Chaplain	JOHN M. TAGGART.....	Williamstown, Gloucester Co.
Treasurer.....	CHARLES COLLINS.....	Moorestown, Burlington county.
Secretary.....	M. D. DICKINSON.....	Woodstown, Salem county.
Gate-Keeper... ..	E. E. HOLCOMBE.....	Mt. Airy, Hunterdon county.
Ceres.....	ANNA E. FLITCRAFT....	Woodstown, Salem county.
Pomona.....	MARY D. BODINE.....	Locktown, Hunterdon county.
Flora.....	ELLA H. BROWN.....	Swedesboro, Gloucester county.
Lady Assistant Steward..	MARIAH T. BURT.....	Cohansey, Salem county.

EXECUTIVE COMMITTEE.

EDMUND BRADDOCK.....	Medford, Burlington county.
JOSEPH S. GLASPEY.....	Bridgeton, Cumberland county.
NICODEMUS WARNE.....	Broadway, Warren county.
JAMES H. BAIRD.....	Marlborough, Monmouth Co.
ALBERT HERITAGE.....	Swedesboro, Gloucester county.
M. D. DICKINSON.....	Woodstown, Salem county.

State Grange Meets First Wednesday in December, 1900.

POMONA GRANGES.

MASTERS AND SECRETARIES, WITH ADDRESSES.

1. Burlington—Master..ISRAEL KIRBY.....Columbus, Burlington county.
Secretary..GEO. L. GILLINGHAM...Moorestown, Burlington county.
3. Hunterdon—Master..E. N. STRONG.....Ringoes, Hunterdon county.
Secretary..W. H. PIMM.....Flemington, Hunterdon county.
6. Salem—Master.....WM. N. HANCOCK.....Hancock's Bridge, Salem Co.
Secretary..PHEBE PERRY.....Friesburg, Salem county.
8. Gloucester—Master...HOWARD HENDRICKSON..Wenonah, Gloucester county.
Secretary..ANNIE C. BRADSHAW...Mickleton, Gloucester county.
9. Centre Dist.—Master..W. W. DeCAMP.....Roseland, Essex county.
Secretary..CHARLES E. BRYER.....Hanover, Morris county.
10. Warren—Master.....N. WARNE.....Broadway, Warren county.
Secretary..SAMUEL BOWMAN.....Washington, Warren county.

COUNTY DEPUTIES.

Burlington.....	JACOB W. STILES.....	Moorestown, Burlington county.
Camden	CHAS. C. STEVENSON....	Blackwood, Camden county.
Cumberland.....	L. F. GLASPEY.....	Shiloh, Cumberland county.
Essex.....	W. W. DeCAMP.....	Roseland, Essex county.
Gloucester.....	GEORGE H. HORNER...	Mullica Hill, Gloucester county.
Hunterdon	WM. DuBON..	Pittstown, Hunterdon county.
Mercer	THEODORE CUBBERLY...	Hamilton Square, Mercer county.
Monmouth.....	S. B. WELLS	Bradevelt, Monmouth county.
Morris.....	CHARLES E. BRYER....	Hanover, Morris county.
Salem	CHAS. F. DICKINSON ...	Friesburg, Salem county.
Somerset, Bergen, Pas- saic and Middlesex, }	J. B. ROGERS.....	1195 Broad street, Newark.
Sussex.....	JOHN DeKAY	Papakating, Sussex county.
Union.....	J. H. DOREMUS.....	Lyons Farms, Union county.
Warren.....	NICODEMUS WARNE.....	Broadway, Warren county.

SUBORDINATE GRANGES.

Number.	GRANGES.	MASTERS AND ADDRESSES.	SECRETARIES AND ADDRESSES.	LECTURERS AND ADDRESSES.
5	Swedesboro.....	Isaac R. Melvane, Repaupo, Gloucester co.....	Emma C. Warrington, Swedesboro, Gloucester co.	Albert Heritage, Swedesboro, Gloucester co.
8	Moorestown.....	Silas Walton, Jr., Hartford, Burlington co.....	Caroline B. Zelle, Stanwick, Burlington co.....	Leon Collins, Merchantville, Camden co.
9	Woodstown.....	J. Hildreth Dickeson, Woodstown, Salem co.....	Carrie Atkinson, Woodstown, Salem co.....	Aldona L. Dickeson, Woodstown, Salem co.
11	Vineland.....	Charles Chalmers, Vineland, Cumberland co.....	Ann Chalmers, Vineland, Cumberland co.....	George A. Mitchell, Vineland, Cumberland co.
12	Ringoes	George T. Dalrymple, Ringoes, Hunterdon co.....	Bessie D. Sked, Rocktown, Hunterdon co.....	E. N. Strong, Ringoes, Hunterdon co.
16	Hopewell.....	J. L. Mickle, Shiloh, Cumberland co.....	W. S. Davis, Shiloh, Cumberland co.....	J. P. Ridgway, Shiloh, Cumberland co.
18	Cumberland	Henry Bacon, Greenwich, Cumberland co.....	Maurice Goodwin, Greenwich, Cumberland co.....	A. T. Goodwin, Greenwich, Cumberland co.
20	Fenwick.....	Joseph B. Ayares, Canton, Salem co.....	W. W. Patrick, Hancock's Bridge, Salem co.....	Rosa Fogg, Harmersville, Salem co.
26	Harrisonville.....	Frank Kirby, Harrisonville, Gloucester co.....	Belle Kirby, Harrisonville, Gloucester co.....	Ella Jones, Harrisonville, Gloucester co.
32	Bridgeport.....	Frank Holdcraft, Bridgeport, Gloucester co.....	William A. Shiveler, Swedesboro, Gloucester co...	Emma L. Kille, Bridgeport, Gloucester co.
36	Medford.....	Caleb R. Dudley, Mt. Holly, Burlington co.....	Louisa Dudley, Box 225, Mt. Holly, Burlington co	Aaron Engle, Lumberton, Burlington co.
38	Haddon.....	John M. Garwood, Haddonfield, Camden co.....	R. Levis Shivers, Box 93, Camden, Camden co....	Amos Ebert, Ashland, Camden co.
39	Mantua.....	Frank T. Hendrickson, Wenonah, Gloucester co...	Hiram S. Leap, Mantua, Gloucester co.	Mary Stratton, Mt. Royal, Gloucester co.
43	Hope.....	William N. DuBois, Bridgeton, Cumberland co.....	P. L. Wheaton, Bridgeton, Cumberland co.....	Joseph Atkinson, Bridgeton, Cumberland co.
49	Rancocas.....	Joseph Lundy, Bougher, Burlington co.....	J. Barclay Hilyard, Rancocas, Burlington co.....	
50	Pemberton.....	George W. Lundy, Birmingham, Burlington co.....	Henry R. Lippincott, Pemberton, Burlington co...	
51	Mullica Hill.....	Joseph Atkinson, Jefferson, Gloucester co.....	M. Lizzie Gaunt, Mullica Hill, Gloucester co.	Lillie H. Colson, Mullica Hill, Gloucester co.
57	Centre Grove.....	William H. Taylor, Millville, Cumberland co.	J. D. Zimmerman, Millville, Cumberland co.....	Jacob Zimmerman, Millville, Cumberland co.
58	Columbus	Joseph C. Armstrong, Columbus, Burlington co...	Ethel W. Zelle, Jacksonville, Burlington co.....	Anna B. Taylor, Columbus, Burlington co.
60	Courses Landing	E. Atkinson, Woodstown, Salem co.....	Emma J. Steward, Sharptown, Salem co.....	Mary Holton, Sharptown, Salem co.

SUBORDINATE GRANGES—Continued.

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STATE BOARD OF AGRICULTURE.

Number.	GRANGES.	MASTERS AND ADDRESSES.	SECRETARIES AND ADDRESSES.	LECTURERS AND ADDRESSES.
64	Pennington.....	John Flemming, Pennington, Mercer co.....	Ira Stout, Pennington, Mercer co.....	S. B. Ketcham, Pennington, Mercer co.
78	Wantage.....	George Vandruff, Deckertown, Sussex co.....	Ida Roy, Deckertown, Sussex co.....	Richard Holly, Deckertown, Sussex co.
79	Hamilton.....	Theo. Cubberley, Hamilton Square, Mercer co.....	C. N. Hutchinson, Robb'sville, Mercer co.....	Charles H. Smith, Mercerville, Mercer co.
81	Friesburg.....	C. F. Dickinson, Cohansey, Salem co.....	H. M. Loveland, Cohansey, Salem co.....	John Horner, Friesburg, Salem co.
85	Williamstown....	Jacob Harper, Williamstown, Gloucester co.....	James M. Tweed, Williamstown, Gloucester co....	J. R. Downer, Downer, Gloucester co.
88	Locktown.....	W. W. Bodine, Locktown, Hunterdon co.....	G. J. Fisher, Sand Brook, Hunterdon co.....	E. M. Heath, Locktown, Hunterdon co.
90	Blackwood.....	Theo. Hyder, Blackwood, Camden co.....	C. C. Stevenson, Blackwood, Camden co.....	Emma Trefe, Blackwood, Camden co.
92	Monmouth.....	William H. Reid, Tonnent, Monmouth co.....	D. Aug. Vanderveer, Freehold, Monmouth co.....	James H. Baird, Marlboro, Monmouth co.
99	Liberty.....	H. W. Polhemus, Bradevelt, Monmouth co.....	S. B. Wells, Bradevelt, Monmouth co.....	D. B. D. Smock, Wickatunk, Monmouth co.
101	Sergeantsville....	Lewis Case, Sergeantsville, Hunterdon co.....	Percy W. Bush, Stockton, Hunterdon co.....	Egbert Bush, Steckton, Hunterdon co.
104	Livingston.....	William Van Zee, Livingston, Essex co.....	Benjamin DeCamp, Livingston, Essex co.....	J. H. M. Cook, Caldwell, Essex co.
105	Morris.....	L. F. Kitchell, Hanover, Morris co.....	William A. Howell, Afton, Morris co.....	C. E. Bryer, Hanover, Morris co.
106	Kingwood.....	A. G. Hawk, Baptisttown, Hunterdon co.....	T. W. Sutton, Barbertown, Hunterdon co.....	D. Kline Fitts.
107	Caldwell.....	S. E. Harrison, Caldwell, Essex co.....	F. C. Gobel, Verona, Essex co.....	
108	Roseland.....	E. Oscar DeCamp, Roseland, Essex co.....	Emma E. DeCamp, Roseland, Essex co.....	Hattie A. Harrison, Roseland, Essex co.
109	Enterprise.....	Harrison Quinby, Parsippany, Morris co.....	H. M. Ball, Boonton, Morris co.....	Mrs. A. L. Cobb, Parsippany, Morris co.
110	Warren.....	N. Warne, Broadway, Warren co.....	Mary Oberly, Broadway, Warren co.....	
111	Mickleton.....	William H. Borden, Mickleton, Gloucester co.....	Walter Heritage, Mickleton, Gloucester co.....	Ellie H. Tomlin, Mickleton, Gloucester co.
112	Lyons Farms.....	Alexander Tunison, Lyons Farms, Union co.....	D. H. Doremus, Lyons Farms, Union co.....	J. B. Rogers, 1195 Broad street, Newark, N. J.
113	Pohatcong.....	H. W. Parsee, Shimers, Warren co.....	D. C. Donnelly, Springtown, Warren co.....	J. S. Hunt, Reigelsville, Warren co.

SUBORDINATE GRANGES—Continued.

Number.	GRANGES.	MASTERS AND ADDRESSES.	SECRETARIES AND ADDRESSES.	LECTURERS AND ADDRESSES.
115	Hurffville.....	Eli K. Gant, Hurffville, Gloucester co.....	C. J. Davenport, Hurffville, Gloucester co.....	I. L. Davenport, Hurffville, Gloucester co.
116	Rocksburg... ..	J. H. Young, Rocksburg, Warren co.....	W. Herman, Belvidere, Warren co.	Erwin Miller, Harmony, Warren co.
117	Washington.....	William Miller, Oxford, Warren co.....	Mary Lewis, Washington, Warren co.....	Samuel Bowman, Washington, Warren co.
118	Mansfield.....	P. A. Osmun, Stephensburg, Warren co.....	E. J. Vosler, Port Colden, Warren co.....	J. Miller, Anderson, Warren co.
119	Oak Grove.....	W. A. C. Robinson, Quakertown, Hunterdon co..	H. K. Wright, Pittstown, Hunterdon co.....	Rev. F. J. Tomlinson, Pittstown, Hunterdon co.
120	Spring Mills.....	M. W. Angell, Holland, Hunterdon co.....	Mrs. M. E. Woolf, Milford, Hunterdon co.....	S. S. Fry, Warren Paper Mills, Hunterdon co.
121	Stewartsville.....	H. A. Godfrey, Stewartsville, Warren co	J. C. Boyer, Stewartsville, Warren co	Mrs. H. A. Godfrey, Stewartsville, Warren co
122	Aura.....	Joseph A. Kandle, Franklinville, Gloucester co.....	John Tonkin, Aura, Gloucester co.....	John C. Tonkin, Aura, Gloucester co.
123	Cross Keys.....	Joseph H. Evans, Cross Keys, Gloucester co.....	Edw. B. Gant, Cross Keys, Gloucester co	Lizzie Hemphill, Cross Keys, Gloucester co.
124	Grandview	Theodore Larue, Copper Hill, Hunterdon co.....	William B. Pimm, Flemington, Hunterdon co.....	George Alvater, Flemington, Hunterdon co.

STATISTICAL TABLE OF FARM CROPS AS REPORTED BY SECRETARIES OF THE COUNTY BOARDS.

COUNTIES.	CORN.			WHEAT.			RYE.			OATS.		
	Product compared with last year—per cent.	Average yield per acre—bushels.	Average price.	Product compared with last year—per cent.	Average yield per acre—bushels.	Average price.	Product compared with last year—per cent.	Average yield per acre—bushels.	Average price.	Product compared with last year—per cent.	Average yield per acre—bushels.	Average price.
*Atlantic.....												
Bergen.....	105		\$0 45	90		\$0 80	100		\$0 55	70		\$0 30
Burlington.....	110	50	40	75	16	70	75	15	55	100	35	35
Camden.....												
Cape May.....	125	30	50	100	20	80						
Cumberland.....												
Essex.....												
Gloucester.....												
Hunterdon.....	125	35	40	100	17	70	100	19	45	50	22	28
Mercer.....	110	45	40	75	16	70	75	12	50	50	20	30
Middlesex.....	120	40	40	60	15	70	100	15	52	50	30	32
Monmouth.....	110	62	40	85	22	70	100	18	55			
Morris.....												
Ocean.....	100	35	35	75	16	70				100	45	30
Salem.....	100	50	38	100	20	70				75		
Somerset.....	110	30	35	75	13	75	100	15		75	30	24
Sussex.....	120	50	40	85	18	80	100 ½	20	60	100	20	40
Union.....	110	40	40				100	20	60	50	20	30
Warren.....	100	30	35	90	20	70	80	15	55	50	35	30

* For counties having partial or no statistical report, see the written statement covering crop conditions.

STATISTICAL TABLE OF FARM CROPS AS REPORTED BY SECRETARIES OF THE COUNTY BOARDS.

COUNTIES.	BUCKWHEAT.			HAY.			WHITE POTATOES.			SWEET POTATOES.		
	Product compared with last year—per cent.	Average yield per acre—bushels.	Average price.	Product compared with last year—per cent.	Average yield per acre—tons.	Average price per ton.	Product compared with last year—per cent.	Average yield per acre—barrels.	Average price per barrel.	Product compared with last year—per cent.	Average yield per acre—barrels.	Average price per barrel.
* Atlantic.....	60		\$0 65	60	$\frac{3}{4}$	\$18 00	100		\$1 75			
Bergen.....				25	$\frac{3}{4}$	18 00	75	20	1 50	100	35	\$1 50
Burlington.....												
Camden.....				50	1	16 00	100	45	1 50	100	40	1 00
Cape May.....												
Cumberland.....												
Essex.....												
Gloucester.....												
Hunterdon.....	100		60		$\frac{1}{2}$	14 00		25	2 00			
Mercer.....				40	$\frac{3}{4}$	15 00	45	25	1 50	90	30	1 50
Middlesex.....				40	$\frac{3}{4}$	16 00	45	35	1 50			
Monmouth.....				25	$\frac{1}{2}$	16 00	60	40	1 00	75	38	2 00
Morris.....												
Ocean.....					$\frac{1}{2}$		80	50	1 50	115	50	2 00
Salem.....				60	1	16 00	60	20	1 50	100	25	2 00
Somerset.....				25		15 00	60	30	1 50			
Sussex.....	80	16	50	33 $\frac{1}{3}$	1	11 00	60	30	1 00			
Union.....				50	$\frac{1}{2}$	16 00	50	25	1 70			
Warren.....				25	$\frac{1}{2}$	18 00	66	17	1 00			

* For counties having partial or no statistical report, see the written statement covering crop conditions.

STATISTICAL TABLE OF FARM CROPS AS REPORTED BY SECRETARIES OF THE COUNTY BOARDS.

COUNTIES.	APPLES.			PEARS.			PEACHES.			GRAPES.		
	Product compared with last year—per cent.	Average yield per acre—barrels.	Average price.	Product compared with last year—per cent.	Average yield per acre—barrels.	Average price.	Product compared with last year—per cent.	Average yield per acre—baskets.	Average price.	Product compared with last year—per cent.	Average yield per acre—pounds.	Average price.
*Atlantic.....												
Bergen.....	100		\$1 50	60		\$2 40						
Burlington.....	125	50	1 00	100	100	1 50	50	10	\$1 25	200	4,000	\$0 01
Camden.....												
Cape May.....	150	40	1 25	110	140	1 50	200	300	65	80	3,000	01½
Cumberland.....												
Essex.....												
Gloucester.....												
Hunterdon.....			1 25					†567,473	60			
Mercer.....	150	50	1 10									
Middlesex.....	150	50	1 25	100			25			100		
Monmouth.....	110	60	1 25	100		1 25	10		1 25	100	8,000	01½
Morris.....												
Ocean.....	50	25	1 25	80								
Salem.....	125	30	1 00	100								
Somerset.....	120	40	1 00	60		2 25	50		1 00	110		02
Sussex.....	125	45	1 00				50		90			
Union.....	100	40	1 50	50	5	2 00	40		75	100		
Warren.....	50	75	1 50	50		1 60	50		1 00	100		01

* For counties having partial or no statistical report, see the written statement covering crop conditions. † Entire crop of county.

STATISTICAL TABLE OF FARM CROPS AS REPORTED BY SECRETARIES OF THE COUNTY BOARDS.

COUNTIES.	STRAWBERRIES.			RASPBERRIES.			BLACKBERRIES.			WATERMELONS.		
	Product compared with last year—per cent.	Average yield per acre—quarts.	Average price.	Product compared with last year—per cent.	Average yield per acre—quarts.	Average price.	Product compared with last year—per cent.	Average yield per acre—quarts.	Average price.	Product compared with last year—per cent.	Average yield per acre.	Average price.
*Atlantic.....												
Bergen.....	100	2,900	\$0 05	100	500	\$0 08	100	500	\$0 08	100	500	\$5 00
Burlington.....												
Camden.....	40	1,000	05							100	1,000	5 00
Cape May.....												
Cumberland.....												
Essex.....												
Gloucester.....												
Hunterdon.....												
Mercer.....												
Middlesex.....	25			100			100			100		
Monmouth.....	50	2,500		50	700		100			75		
Morris.....												
Ocean.....		1,920	05							90	6,760	
Salem.....	80		05									
Somerset.....	100		08	40		10	40		10			
Sussex.....	75	6,000	08	100		06						
Union.....							100					
Warren.....	100		10	100		10			10			

* For counties having partial or no statistical report, see the written statement covering crop conditions.

STATISTICAL TABLE OF FARM CROPS AS REPORTED BY SECRETARIES OF THE COUNTY BOARDS.

COUNTIES.	CITRON MELONS.			CUCUMBERS.			CABBAGES.			TOMATOES.		
	Product compared with last year—per cent.	Average yield per acre.	Average price per basket.	Product compared with last year—per cent.	Average yield per acre.	Average price per basket.	Product compared with last year—per cent.	Average yield per acre.	Average price.	Product compared with last year—per cent.	Average yield per acre—tons.	Average price per basket.
*Atlantic.....												
Bergen.....	100	500	\$0 25	75	200	\$0 20	200	4,000	\$3 00	200	8	\$0 15
Burlington.....												
Camden.....	60	120	35				150	35	3 00	100	6	25
Cape May.....												
Cumberland.....												
Essex.....												
Gloucester.....												
Hunterdon.....												
Mercer.....												
Middlesex.....	50			60			100			100		
Monmouth.....				100			100		3 00	100		25
Morris.....												
Ocean.....							100	90	3 00			
Salem.....										90	6	
Somerset.....												
Sussex.....												
Union.....							100	1,500	4 00	120	12	20
Warren.....							100	5,000	2 50	50		

* For counties having partial or no statistical report, see the written statement covering crop conditions.

STATISTICAL TABLE OF FARM STOCK AS REPORTED BY SECRETARIES OF THE COUNTY BOARDS.

COUNTIES.

	HORSES.		MULES.		COWS.	
	Total number compared with December 1st, 1897— per cent.	Average price between 3 and 7 years old.	Total number compared with December 1st, 1897— per cent.	Average price between 3 and 7 years old.	Total number compared with December 1st, 1897— per cent.	Average price between 3 and 7 years old.
*Atlantic.....						
Bergen.....	100	\$100 00	100	\$125 00	100	\$40 00
Burlington.....	100	75 00	100	100 00	100	35 00
Camden.....						
Cape May.....						
Cumberland.....						
Essex.....						
Gloucester.....						
Hunterdon.....						
Mercer.....	100	125 00		125 00	100	45 00
Middlesex.....	100	75 00			110	40 00
Monmouth.....	100	100 00	100	150 00	100	40 00
Monroe.....						
Morris.....						
Ocean.....						
Salem.....	100	90 00		90 00	100	45 00
Somerset.....	100	75 00	100	95 00	100	45 00
Sussex.....		90 00			80	40 00
Union.....	100	70 00	100	40 00	100	40 00
Warren.....	80	100 00			90	35 00

* For counties having partial or no statistical report, see the written statement covering crop conditions.

FARM CROPS.

STATISTICAL TABLE OF FARM STOCK AS REPORTED BY SECRETARIES OF THE COUNTY BOARDS.

COUNTIES.	VEAL CALVES.		SHEEP.		LAMBS.		SWINE.		TURKEYS.		CHICKENS.		WINTER WHEAT.		WINTER RYE.	
	Total number compared, with December 1st, 1896—per cent.	Average price per pound for season.	Total number compared with December 1st, 1896—per cent.	Average price per head for store sheep.	Total number compared with December 1st, 1896—per cent.	Average price per head for spring lambs.	Total number compared with December 1st, 1896—per cent.	Average price per pound December.	Total number compared with December 1st, 1896—per cent.	Average price per pound November and December.	Total number compared with December 1st, 1896—per cent.	Average price per pound November and December.	Area sown compared with last year—per cent.	Average condition December 1st.	Area sown compared with last year—per cent.	Average condition December 1st.
*Atlantic.....																
Bergen.....													100	100	100	100
Burlington.....	100	\$0 05½	100	\$4 00		\$5 00	100	\$0 05	100	\$0 15	100	\$0 14	105	120	100	120
Camden.....																
Cape May.....	100	06					100	06	100	15	100	13	100	100	100	100
Cumberland.....																
Essex.....																
Gloucester.....																
Hunterdon.....	100	06	100		100		100	05	100	13	100	09	100	100	100	85
Mercer.....																
Middlesex.....									100	15	100	12	100	125	100	120
Monmouth.....	100	06	100	4 50	100	4 50	100	05½	100	13	100	10	100	100	100	100
Morris.....																
Ocean.....													100	100	100	100
Salem.....		06					75	06	100	15	100	14	100	100	100	100
Somerset.....	100	06½	100	3 75	100	4 00	100	05		13		09	100	85	100	85
Sussex.....	100						100	06½	100	10	125	09	100	110	110	110
Union.....	100	06					100	06			100	10			90	110
Warren.....	75	06	40	4 00	40	4 00	90	06	100	10	90	09	100	80	90	90

* For counties having partial or no statistical report, see the written statement covering crop conditions.

NOTE.—For table of crop yields for New Jersey, as reported by the United States Department of Agriculture, see report of Secretary, page 58.

Reports of County Boards of Agriculture.

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Atlantic County.

OFFICERS FOR THE YEAR 1900.

President.....PHILIP BERGMANN.....Egg Harbor City.
Vice-President.....CHARLES WOODNUTT.....Hammonton.
Secretary.....VALENTINE P. HOFMANN.....Egg Harbor City.
Treasurer.....FREDERICK FIEDLER.....Egg Harbor City.

DELEGATES TO STATE BOARD.

L. H. PARKHURST (two years).....Hammonton.
V. P. HOFFMAN (one year).....Egg Harbor City.

BOARD OF DIRECTORS.

JACOB E. HOLMAN, Hammonton Shippers' Union, Hammonton.
JESSE R. ABBOTT, Hammonton Fruit Growers' Union, Pleasant Mills.
CHARLES KRAUS, Atlantic County Agricultural and Horticultural Association,
Egg Harbor City.
HENRY PFEIFFER, Germania Fruit Growers' Union, Cologne.
WILLIAM KRIEG, Director-at-Large, Pomerania.

REPORT.

BY V. P. HOFMANN.

There was but one meeting of the Board held during the year 1899, at Union Hall, Hammonton, N. J., on November 22d, and had good attendance throughout the different sessions.

After the regular routine business of the Board had been attended to the Farmers' Institute was opened by Secretary Franklin Dye, of the State Board, on the subject of "Economy in Farm Management." He grouped his subject into three parts: First—Lay out farms in such a way that all land will be doing something; Second—Plant for crops in rotation, in order to increase fertility, and such diversity of crops as will give continuous work for men and horses; Third—Grow all you can for family and farm support.

Mr. J. E. Holman spoke on "Strawberry Culture." First—he would cultivate less acres, and give higher fertilization; Second—do away with growing in quantity, but endeavor to increase the quality; Third—abandon old way to sell to commission merchants, and strive to come in direct touch with consumer, as the consumer pays two to three times as much as the producer receives. The strawberry is a natural plant, easy to grow, will thrive on all soils, but prefers a rich, loamy one with water near the surface. He would prefer a grass-sod turned under in the fall, the turf well pressed down with a roller and pulverized with the harrow. If no sod, take old ground, turn under a liberal quantity of stable manure, or else bone, then apply 600 pounds of fertilizer. In the spring apply from 600 to 800 pounds of fertilizer per acre, and work it occasionally until planting time. The great secret lies in the selection of plants. Plant propagating beds as fast as the plants grow out, clip the plants to grow roots; the roots in ground should never be over four inches long. Mark out the ground and make holes with a spade; a good man will plant from 6,000 to 7,000 plants a day. Stir ground as soon as possible after the plants are set, and weed thoroughly every week or ten days until July. As soon as weeds start use a hoe, a good man will hoe over an acre in a day; continue cultivation up to September or October. Next spring apply from 600 to 800 pounds of phosphoric acid—needs not much nitrogen. To insure a good strong growth of vines during the first year, apply 400 pounds raw bone, 200 pounds potash and 200 pounds nitrogen on the ground as early as February. After this cultivate lightly between the rows, not over one to two inches deep. It depends much on picking and packing; every berry should have a short stem attached to it, and berries should be graded and packed in new crates.

Mr. William Colwell read a paper upon the subject of "Raspberry Culture." His acquaintance with varieties of raspberries has been with the Turner, Brandywine, Cuthbert, London and Miller, and his opinion is that the Miller is the best shipper, holds its color longer and is the finest all-around market berry he has grown. If he had his choice of soils, he would take a clay upland or a well-drained bottom land; he would coat it heavily with stable manure and plant it to some cultivated crop, as corn, potatoes, &c., and the next year, in a soil well filled with humus, would plant the vines, and would be able to grow raspberries successfully for several years with an application of fertilizers. He sets the plants in drills six or seven feet between rows and

ATLANTIC COUNTY.

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from two to three feet apart in the rows, depending on the number of plants he has on hand; larger berries can be grown in the hill system, but not so many per acre. The first year he grows sweet potatoes or some other crop between the rows. He has been using as a fertilizer a mixture consisting of 600 pounds fish guano, 200 kainit and 200 rock phosphate, containing about five per cent. nitrogen, twelve per cent. phosphoric acid and three per cent. potash. He plows a light furrow from the plants, spreads the fertilizer and plows back covering the same. He believes in clean culture, but did not do it in practice. He trims in August, and instead of burning the trimmings he plows a dead furrow between the rows, places the trimmings therein and covers them with the plow, and then sows rye or crimson clover as a green crop to turn under in the spring. The raspberry has many enemies: the knot in the roots, which retards the flow of the sap; the anthracnose, causing it to prematurely drop its foliage; the slug, that makes its appearance with the first foliage and cleans the vine to a barren cane; the rose-bug, that comes with the blossom and devours the bloom. All these pests tend to make the raspberry-grower anxious. This year has been a good year for raspberries, owing to the shortage of the peach crop, and they have brought fairly good prices. His crop was about 2,000 quarts per acre, realizing about \$157.00 per acre, deducting \$111.30 for expenses, leaving a net profit of \$45.70.

The next subject was, "Cow-Peas as a Fertilizer," by Peter H. Brown, of Hammonton. He had been experimenting for a number of years how to restore our fields naturally destitute of humus and nitrogen. He had sown cow-peas as a test to enrich a number of crops, and had been very successful in restoring some of the elements naturally deficient in our soils. He had harvested by its means State of Maine potatoes at the rate of 150 bushels per acre. He also showed samples of different crops which had been materially benefited by it.

"Intelligent Buying of Fertilizers," by Alva Agee, of Ohio, was the next subject exhaustively treated upon. He was followed by James E. Rice, of New York State, upon "Raising Chickens—Incubating, Brooding and Feeding."

In the evening Mr. Rice spoke upon the subject of "The Food we Eat—Showing Variation in Composition and Cost." Prof. J. B. Smith, being prevented from appearing, Mr. Agee, of Ohio, made a highly entertaining talk upon "The Rights of the Boy."

GENERAL REMARKS.

Compared with previous years, in general the farmers can be contented with the results of the harvest of products and the prices realized therefor. Although there was a reduced yield in small berries, the returns of the same more than compensated for this deficiency.

There was a decreased yield of hay, owing to the dry weather prevailing in the spring.

After having chronicled for many years in succession the failure of the grape crop, caused by the black rot, the past year's crop proved highly encouraging, there being an excellent yield of sound and rich berries, but few traces of its arch-enemy being present.

The planting of pear orchards with the Keiffer variety has been greatly extended, many parties planting several acres of the same.

Several fatal cases of cerebro-spinal meningitis occurred among the horses in this county.

During the year, under the stimulus of the Road law, the road leading from the county seat, Mays Landing, to Egg Harbor City, was completed, and one from Atlantic City to Longport started. Different sections of the county are clamoring for an extension of the same.

The season of 1899 was happily more exempt from the devastating forest fires, those occurring being of slight extent.

Bergen County.

OFFICERS FOR 1900.

<i>President</i>	MALCOM H. ANGELL.....	Etna.
<i>Vice-President</i>	H. W. COLLINGWOOD.....	Woodcliff.
<i>Secretary</i>	JOHN H. ACKERMAN.....	Englewood.
<i>Treasurer</i>	DANIEL I. DEMAREST.....	Oradell.

BOARD OF DIRECTORS.

ABRAM C. HOLDRUM.....	Westwood.
SAMUEL R. DEMAREST, JR.....	Hackensack.
MARTIN J. MYERS.....	Woodcliff.
JOHN HECK.....	Westwood.
JOHN C. VAN SAUN.....	Maywood.
JOHN F. BOMM.....	Westwood.
DAVID A. PELL.....	Saddle River.
JOHN CURTIS.....	Harrington Park.

DELEGATES TO STATE BOARD.

JOHN H. ACKERMAN (two years).....	Englewood.
SAMUEL R. DEMAREST, JR. (one year).....	Hackensack.

REPORT.

BY THE SECRETARY.

Our Board held three business meetings during the year. The past season has been unfavorable to the truck farmers, their complaints being more pronounced than usual.

The dry April and May destroyed the strawberry crop, and induced a large cherry and apple crop of excellent quality and fine appearance. Grain crops were low in yield, and not grown to any great extent. Hay a failure. Corn gave the largest yield. Tomatoes were abundant in yield, but not a paying crop. Farmers are seeing the necessity of paying more attention to fodder crops.

The Annual Institute was held at Park Ridge, on January 24th, 1900, and was well attended. Mr. Franklin Dye, Secretary of State Board, opened the meeting with an address on "Agricultural Truth." Dr. J. B. Ward explained his method of growing and marketing "Small Fruits"; John Gould and H. W. Collingwood argued the double advantage gained from "Dairy Farming"; Mr. Gould pictured the beauties attending the study of and association with "Our Feathered Friends—the Birds," and Prof. E. B. Voorhees closed the exercises with a discussion on "Preserving and Improving Soil Fertility," and methods of accomplishing the same.

The attendance at the three sessions of this Institute was quite uniform in numbers and the audience was an interested one, as was shown by the close attention and the questions induced.

Our organization is encouraged to more earnest and active endeavors to gain the attention of our brother farmers, believing that by reasoning together we will do one another good.



A BURLINGTON COUNTY WATERMELON FIELD.

Burlington County.

OFFICERS FOR 1900.

President.....EDWIN DUDLEY.....Medford.
Vice President.....HENRY R. LIPPINCOTT.....Pemberton.
Secretary and Treasurer.....HENRY I. BUDD.....Mount Holly.

DIRECTORS.

JOSHUA HOLLINSHED, Mount Laurel Farmers' Club. P. O., Hartford.
EMMOR ROBERTS, Burlington County Agricultural Society. P. O., Moorestown.
HARRY COOMES, Cooperstown Farmers' Club. P. O., Beverly.
EDMUND BRADDOCK, Medford Grange. P. O., Medford.
FRANK ZELLEY, Columbus Grange. P. O., Jacksonville.
JOSEPH HENDRICKSON, Crosswicks Grange. P. O., Crosswicks.
GEORGE LUNDY, Pemberton Grange. P. O., Mount Holly.
MARK HAINES, Rancocas Grange. P. O., Rancocas.
OWEN L. DUDLEY, Moorestown Grange. P. O., Moorestown.
DR. W. C. PARRY, Director-at-Large. P. O., Hainesport.
EZRA BUDD MARTER, JR. (two years), Delegate to State Board of Agriculture. P. O., Burlington.
FRANK P. JONES (two years), Delegate to State Horticultural Society. P. O. Delanco.

REPORT.

Our annual meeting was held on Saturday, December 9th, 1899. The room was filled with many of our most enterprising farmers from different parts of the county. The papers and remarks were exceedingly interesting and instructive.

The following subjects were considered :

"Pernicious Insects," Prof. J. B. Smith, New Brunswick, N. J.

"The Necessary Elements for Success in Poultry-Growing," Rev. E. O. Lyon, Toms River, N. J.

"Farming as a Business," Aaron Engle, Jr., Lumberton, N. J.

"Early Crops a Factor in Success," Howard Russ, Palmyra, N. J.

"Proper Use of Fertilizers," Prof. E. B. Voorhees, New Brunswick, N. J.

"Spontaneous Combustion of Hay," Emmor Roberts, Fellowship, N. J.

"Is the Character and Quality of the Potato Affected by Soil and Climate? If So, What Soil and Climate Would Produce the Best Results?" by Charles W. Ford, Moorestown, N. J.

"Is the Farmer Receiving His Share of the Prosperity He Should, Along with the Manufacturer," general discussion. This called out a very interesting discussion.

There was much interest manifested in all the papers, especially the one upon poultry. This was delivered in a very succinct and interesting manner, and provoked a great deal of inquiry.

REPORT BY THE SECRETARY, H. I. BUDD.

For the year ending December, 1899, the average financial result to the farmer has not been very flattering. Early crops brought good prices on account of the unusual condition of the season, and the shortness of Virginia and Florida supplies making a scarcity up to the first of July. After the early spring drought had ceased we had copious rains which caused an overproduction of the leading vegetables, whereby the farmers for about three months received scarcely more than the cost of producing and marketing.

Wheat, Rye and Corn.—The prices of wheat, rye and corn have been low but the yield good. The low price is largely on account of the foreign demand not being so great as the previous year.

Straw, Hay and Grass.—The season was not favorable to the growth of straw, hay and grass, making the poorest hay and straw crops known.

Fruit.—The yield of fruit has scarcely ever been greater in our county; all kinds of tree and vine products, except peaches, were loaded with thousands of bushels that, in the case of apples, were never gathered.

Wheat.—Wheat has been a moderately good crop; grains of good size; some mows damaged by the angoumois miller, but its depredations have not been so great as last year. The demand from the local millers is regular, but the price only ranges from 60 to 70 cents per bushel—too low for any profit to the farmer.

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Rye.—Rye has been a good yield of grain but a poor yield of straw ; price relatively better than wheat.

Hay.—Hay was the poorest crop known for years ; a very cold, wet spring in which nothing grew, not even weeds, followed by an extremely dry season, chilled the growth of all vegetation early, and later dwarfed it for the want of moisture ; result only about one-fourth of a crop. The price is correspondingly high, selling from \$18 to \$20 per ton.

Young Grass.—There has been an increased acreage of timothy and clover sown ; for many years we have not seen a better stand and more luxuriant growth.

Pasture.—After the harvest of hay was gathered the fall of rain was so timely that young grass made very fine growth where it was not destroyed by the early drought.

Oats.—Oats have made a good yield. The farmers think it does not pay to sow oats, consequently, the area is very limited.

Corn.—The season has been ideal for the growth of corn. The climatic conditions prevented the growth of weeds in the early part of the season ; it was so dry that the weeds did not start, but it was favorable to the early stages of corn. By the time it needed rain we had frequent and copious showers, which caused the corn to flourish without check, making for us the largest crop that has been grown in this county for many years.

Growing Winter Grain.—The conditions for seeding winter grain have been unusually good. Timely rains have moistened the ground sufficiently to enable the farmers to sow without great expense, and the mild weather is giving the early seeded most too large a top. But happily the greatest acreage was not early sown. There seems to be rather more than the average area seeded.

Milk.—The price of milk has been very low through most of the season, but now very satisfactory. The yield has not been great ; although it found a ready market, the dealers kept the price below proper remuneration. In order that the average farmer may not be shipwrecked in producing milk, it seems to be necessary for them to organize in order to obtain profitable prices. The dealers seem to have complete control of the price.

Apples.—It has been a long time since there has been such a universally good crop of apples of fine color and size in orchards that had a reasonable amount of care. The yield in Burlington county

seems to have been greater than the average throughout the United States ; as a consequence the prices were not well maintained except in the very early portion of the season, and many thousand baskets scarcely paid the expense of picking and shipping.

Pears.—Keiffer is about the only variety that has produced any quantity of fruit. On others the blight has reduced the average very much. On nearly all orchards this crop has been very large, and they have generally sold very readily from 20 up to 60 cents per basket. The canneries have consumed large quantities of them at about 25 to 36 cents per basket, or \$1.50 per barrel. On account of the late October warm season and its early freeze they ripened and rotted badly, which is an unusual experience, as they generally hold their firmness until late in the season.

Peaches.—Except in a very few orchards peaches were a failure, killed by the intense cold of February. Where fortune smiled upon the orchards the crop has been good and the prices very remunerative. The San Jose scale is playing havoc with many of the trees.

Grapes.—Grapes were a full crop, and found a market at a very low price.

Cranberries.—Cranberries have been about 75 per cent. of last year's crop. Many thousand bushels were shipped to different portions of the West and North and fair prices were realized. They sold about 25 per cent. higher than they did last year. Large quantities of them were lost on account of the early frost ; some growers lost each from this cause from one to four thousand bushels.

Cherries.—Cherries were an unusually prolific crop ; prices realized fair.

Currants.—Currants a moderate crop and sold well.

Plums.—Plums a large crop and rotted badly.

Blackberries, raspberries and strawberries were fair crops and brought ordinary prices.

Blight.—Blight has been less destructive this year than usual. The San Jose scale is developing in many of our orchards, but is being checked in some by the use of crude oil. Where orchards were systematically sprayed the yields for nearly all kinds of fruit have been large, and although there has been much perfect fruit where spraying has not been practiced, those neglecting it have lost more from the early dropping, and much has been imperfect on account of the sting of the curculio dwarfing the growth.

BURLINGTON COUNTY.

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Tomatoes.—Tomatoes have averaged a large crop, keeping our markets well supplied and producing enough to furnish our canneries with the largest pack known for years. Good prices were realized in the markets for the very early crops, but very poor for the later crops. Those that supplied the canneries probably received the best aggregate returns. The early frost destroyed many thousand baskets, preventing any realization on the finest patches, which were mostly late. The later plantings promised the most bountiful yield; consequently they suffered the greater destruction from the frost.

Melons.—Melons have been plentiful except in the early season, flooding the markets so that unprofitable prices were realized.

Pickles.—The average pickle crop has been very poor. A few succeeded in raising very fair crops which brought remunerative prices.

Asparagus.—Asparagus has been an ordinary crop; the quality has been poor, and on most beds the yield was small. From the appearance of the stalks it would seem as if the blight had worked great ravages, for after the cutting was stopped the stalk made very poor growth on account of the blight striking it so severely. The fields instead of presenting a green appearance looked like ripened straw.

Cabbage.—Cabbage, although not generally a large crop, has been of most excellent quality and brought remunerative prices on account of the failure in New York State and the West.

Corn.—Early market corn was a good crop and brought very remunerative prices. The middle corn crop also did fairly well both in crop and price, but the later crops, although good, sold for almost nothing.

Sweet Potatoes.—The sweet potato crop has been an average one, but has sold for low prices.

White Potatoes.—White potatoes were scarcely half a crop and very poor in quality. Dry weather at the time of setting stunted their growth. The crop was large in other parts of the United States. The markets were so filled that the price has been low.

Peas, Beans.—Peas and beans have produced handsomely; the quality superb and prices good.

Pork.—On account of the increase in the price of meats the price of pork has improved from $4\frac{1}{2}$ to $5\frac{1}{2}$ cents, and it is stimulating the growth of breeds that can be quickly grown. The hog cholera has not made much progress.

Poultry.—Poultry has been raised in large quantities and has sold for good prices, but at the present time is selling very low, lower than one would suppose considering the higher price of meats.

Eggs.—Eggs have been the most of the season unusually scarce and high. The farmers do not seem to be able to keep up to the demand during a long period of the year.

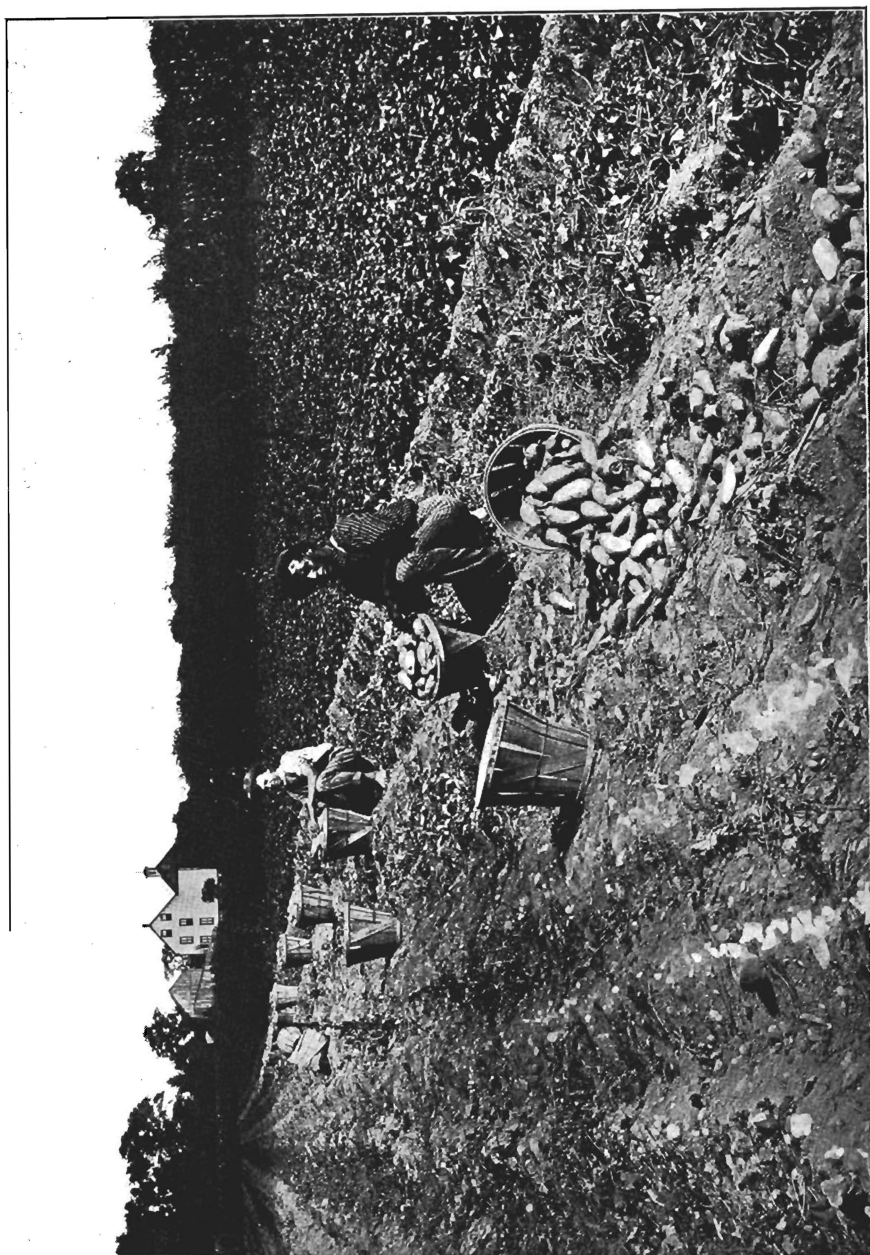
Diseases.—There has not been much roup, gap or cholera among the chickens. Cholera is not so bad among hogs as it has been in previous years. Tuberculosis among cattle is on the increase, and this is largely owing to the immense numbers that are brought from other States afflicted with the disease, and sold to the many dairies of this State. The law enacted last winter to examine the cattle before admission to the State will no doubt in a large measure prevent its progress. The angoumois miller is very common, but has not worked as great destruction this year as usual. This is largely because the farmers having threshed at an earlier stage.

CLIMATIC HISTORY OF BURLINGTON COUNTY, N. J., FOR YEAR 1899, IN RELATION TO AGRICULTURE.

Observation near Moorestown. Lat., 40°; Long., 74° 54'; above tide, 71 feet.

	TEMPERATURE.			Rain and melted snow—inches.	Snow—inches.	Number of clear days.	Number of partly cloudy days.	Number of cloudy days.	Number of days on which 0.01 inch or more of rain fell.
	Maximum—degrees.	Minimum—degrees.	Mean—degrees.						
January.....	60	1	30.3	4.46	5.85	9	10	12	9
February.....	54	—13	24.8	6.30	30.6	8	5	15	12
March.....	71	19	39.5	7.33	4.	4	17	10	13
April.....	82	26	51.1	1.61	Trace.	14	12	4	3
May.....	91	38	61.8	2.37	.....	12	12	7	11
June.....	96	52	72.9	2.08	.....	14	9	7	10
July.....	97	50	75.9	5.69	.....	11	11	9	13
August.....	94	52	72.8	5.32	.....	7	12	12	10
September.....	88	40	65.	4.12	.....	17	6	7	10
October.....	80	29	56.9	3.00	.....	13	7	11	10
November.....	64	25	44.3	2.73	.....	13	8	9	10
December.....	67	6	35.6	1.82	.....	12	11	8	8
Year.....	97	—13	52.6	46.83	40.45	134	120	111	119

The latest killing frost, April 11th, 30°; the earliest, October 3d, 29°, making period for out-of-door growth of tender vegetation 175 days. The snowfall from February 11th to 13th was the heaviest since the great snow of 1836. The total precipitation in January, February and March was 18.09 inches, nearly all of which sank into the ground so that water in the wells rose nearer to the surface and

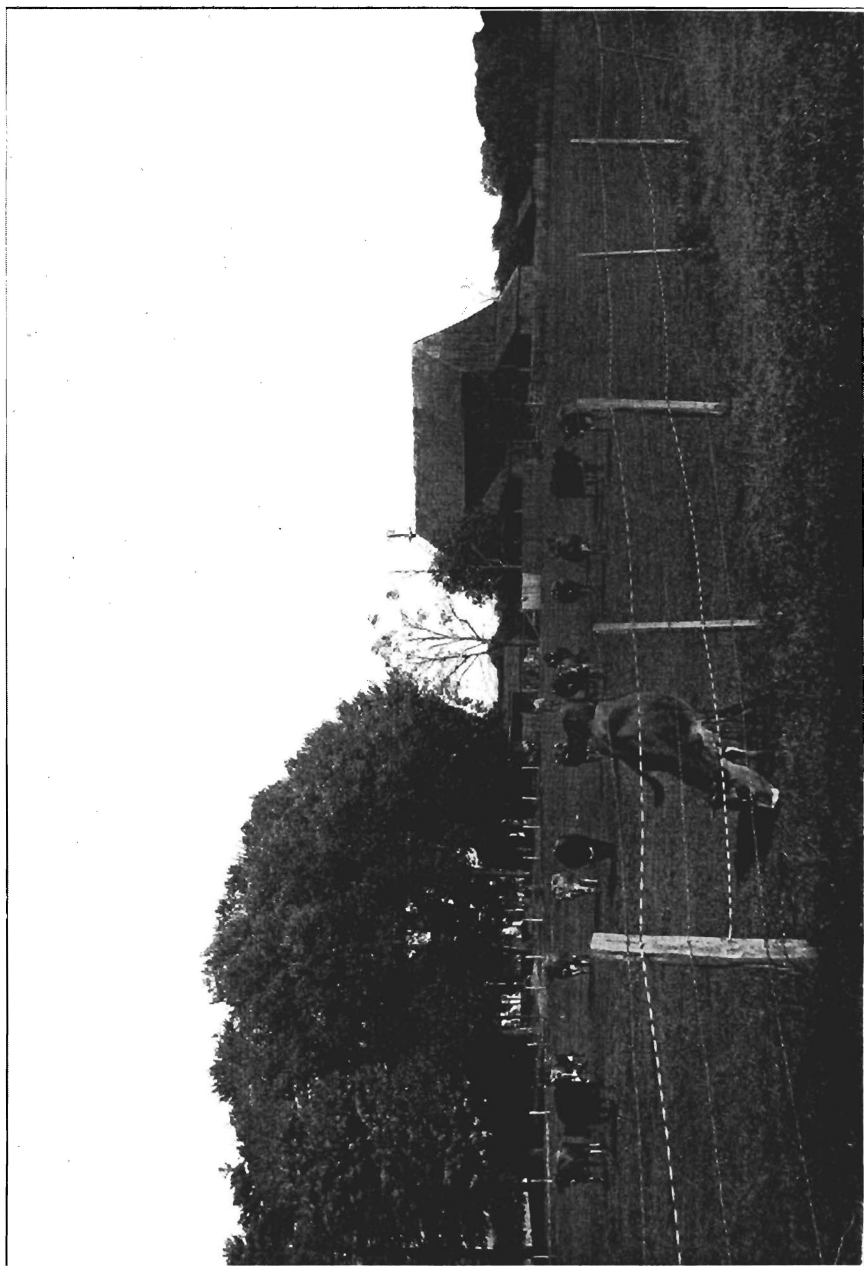


HARVESTING SWEET POTATOES, BURLINGTON COUNTY.

BURLINGTON COUNTY.

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springs discharged at higher levels than at any time during past thirty-five years, and quicksands in many fields interfered with projected plantings. April gave but 1.61 inch of rain, May and June 4.45 inches, causing light crops of white potatoes, hay and pasture and berries; interfering with germination of planted seeds and growth of tender plants. After June the supply of moisture and atmospheric conditions were ideal, and thenceforth the season was remarkable for its healthy, vigorous plant-growth, endowed with capacity to resist insect and fungous attacks. Fruits and other farm products of choice quality were in such supply that the markets were often overloaded. The increased acreage of summer-sown timothy and clover, at date, is very promising. On October 3d temperature fell to 29° in shelter, which, with added effects of radiation and evaporation on exposed fruits and tender vegetation, closed the season and caused much loss. This was followed by a long period of warm, moist weather which intensified effects from the early freeze and caused much propensity to decay among apples and pears. The Autumn months and much of December had much of beautiful Indian summer-like weather and was very favorable for farm operations and marketing the heavy sweet potato, cabbage and apple crops, and growth of pasturage and winter grain.



A RURAL HOME.

Camden County.

OFFICERS FOR 1900.

President.....HOWARD H. BELL.....Mt. Ephraim.
Vice President.....R. COOPER MORGAN.....Blackwood.
Secretary and TreasurerR. LEVIS SHIVERS.....Camden.

DIRECTORS.

ELWOOD EVANS, AMCS EBERT, DANIEL W. HORNER, JACOB C. LIPPINCOTT,
E. S. DOBBS, SAMUEL BATTON, JOSEPH BARTON, M. COOPER BROWNING.

DELEGATES TO STATE BOARD.

CHARLES C. STEVENSON (two years).....Blackwood.
J. M. GARWOOD (one year).....Blackwood.

REPORT.

BY THE SECRETARY.

The Directors of the Camden County Board of Agriculture met at the residence of Elwood Evans, Haddonfield, November 2d, and again on the 9th, and decided to hold our County Board meeting at Blackwood, on November 16th, and the Institute at Haddonfield on the 23d.

At the meeting of the County Board there was a fair attendance, though not one-half what it should have been from the efforts put forth for the meeting; however, the program as arranged by the Board of Directors was carried out, namely:

H. H. Bell—"One year's experience in raising poultry."

Frederick Sleeter—"Growing asparagus for market."

Elwood Evans—"The dairy."

Edward S. Dobbs—"The profits in the dairy."

The meeting was held in the W. C. T. U. Hall, and the ladies of the W. C. T. U. prepared a lunch in the dining-room which, of course, was enjoyed. The discussions upon the dairy and poultry for market

occupied most of the day, and I am sure all were well pleased with the meeting.

The Institute was held at Haddonfield, on November 23d, which was considered a success. At our meeting of the County Board the Secretary asked for assistance in making out the crop report, when the Board appointed a committee for that purpose, but to date I have only heard from one of them. Camden county, I am sure, is ahead on being behind.

The following report has been submitted by Mr. Rudolphus Bingham:

BETTER FARMING.

During the past year we have studied, and practically tested, the following important points: By planting in the south side of ridges instead of in the tops, the young plants have soil from five to eight degrees warmer, more moisture and are protected from chilling winds and frost by the ridge on the north side. We set tomato plants April 12th, which stood the freeze of the 17th, when a crust was frozen on the top.

We picked peas in the Greenville school garden seven days before those which were planted eight days before ours were, but this difference was not all due to the south-side planting, but partly to earlier variety.

We fed the crops after they had mouths to drink with, instead of feeding the soil to be leached out before the plants were ready to feed, and thus saved half of the food usually wasted.

We planted potatoes September 7th, and covered them October 1st and 2d with weeds, and kept them growing six weeks after others were killed. By extending the growing season we increase the time of consumption and consequently the income from products.

Not content with the earlier spring and later fall, we have designed a plant-house in which we can grow beets, parsnips, lettuce, radishes and the more hardy plants during the winter and, with sub-surface heat, tomatoes, beans, corn, strawberries, etc., and have work with fruits and vegetables all the year.

Our improved plant-house can be built for less cost, is more convenient to work and will grow better crops than any we have yet used or seen. Manure heat costs more than wood or coal, and is much more difficult to manage and only lasts about two weeks; so it

CAMDEN COUNTY.

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is not suitable for winter or very early spring plants. And the improved house can be worked in cold or storm and is more readily ventilated than other plans. There are probably more plants sickened or killed for want of air than from all other causes. Boards and paper for the north side costs two cents per square foot and glass would cost ten cents, and as we get the full force of the sun from the south side and better protection from cold with boards and paper, we save seventy-five per cent., by our plan, of the cost of the north side.

MARKET GARDEN ACCOUNT—AVERAGE PER ACRE OF BEST FARMS.

CROPS.	Rent.	Manure and fertilizers.	Preparing ground.	Seeds or plants.	Planting and cultivating.	Picking and marketing.	Ferriage and commissions.	Debtor.	Creditor.	Profit.	Loss.
Peas, for.....	\$4 00	\$15 00	\$2 00	\$1 00	\$4 00	\$18 75	\$10 00	\$57 75			
by.....	150 baskets	@ .60							\$90 00	\$32 25	
Corn, by.....									1 88		
String beans, for.....	8 00	15 00	2 00	8 00	5 00	15 00	11 50	64 50			
by.....	150 baskets	@ .70							105 00	41 50	
Strawberries, for.....	8 00	35 00	1 00	1 50	20 00	26 37	11 49	103 36			
by.....	2110 quarts	@ .045							94 85		\$8 41
White potatoes, for.....	4 00	35 00	2 00	8 00	10 00	15 00	15 75	89 75			
by.....	350 baskets	@ .45							167 50	67 75	
Corn, by.....										1 88	
Sweet potatoes, for.....	8 00	25 00	2 00	10 00	10 00	10 00	15 40	80 40			
by.....	550 baskets	@ .28							154 00	73 60	
Cucumbers, for.....	2 66	20 00	2 00		12 00	6 00	2 00	44 66			
by.....	200 baskets	@ .10							20 00		24 66
Peas, by.....										32 25	
Corn, by.....										1 88	
Squashes, for.....	8 00	20 00	2 00		6 00	10 00	15 36	61 36			
by.....	480 baskets	@ .32							153 60	92 24	
Tomatoes, for.....	8 00	15 00	2 00	10 00	7 00	5 00	12 00	79 00	120 00	61 00	
Corn (table), for.....	4 00	5 00	2 00		5 00	4 00	2 12	22 12			
by.....	85 baskets	@ .25		21 23	Fodder, 2 75				23 88		1 88
Peas, by.....										32 25	
Muskmelons, for.....	4 00	20 00	2 00		10 00	10 00	8 00	54 00			
by.....	400 baskets	@ .20							80 00	26 00	
Peas, by.....										32 25	
Cabbage (early), for.....	4 00	35 00	2 00	10 00	10 00	8 00	18 00	87 00			
by.....	450 baskets	@ .40							180 00	93 00	
Corn, by.....										1 88	
1899—Average of 11 crops.....								65 81	110 05	48 01	
1898—Average of 10 crops.....								73 55	129 36	58 81	
1897—Average of 10 crops.....								70 00	120 71	50 75	

The seasons of 1897 and 1898 were favorable. 1899 was too dry from April to July, and peas suffered by lice.

The Chinese, with their irrigation, had good crops, and report \$3,500 from less than 5 acres, with 5 men and \$610 for manure and fertilizers. They plant close, keep the ground clean of weeds and water thoroughly.

R. BINGHAM,
Camden County.

Cape May County.

OFFICERS FOR 1900.

<i>President</i>	DR. E. H. PHILLIPS.....	Cape May City.
<i>Vice-President</i>	A. B. WALTERS.....	Cold Spring.
<i>Secretary</i>	J. W. PINCUS.....	Woodbine.
<i>Treasurer</i>	VOLNEY VAN GILDER.....	Ocean View.

BOARD OF DIRECTORS.

EDWARD LEAMING.....	Cold Spring.
FRANCIS HARRIS.....	Rio Grande.
WINFIELD COONS	Goshen.
HOLLIS B. MICKEL.....	Petersburg.
A. STRATTON, ESQ.....	Beesley's Point.
SAMUEL KING	Erma Post Office.
HON. F. LUDLAM.....	South Dennis.
JESSE D. LUDLAM.....	South Dennis.
JOHN REEVES.....	West Cape May Borough.

DELEGATES TO STATE BOARD.

J. W. PINCUS (two years).....	Woodbine.
A. B. WALTERS (one year).....	Cold Spring.

REPORT BY THE SECRETARY.

THE WORKING OF THE BOARD.

The Cape May County Board of Agriculture held two meetings during the past year, besides the Farmers' Institute, which was held on December 27th, 1898, at De Hirsch Hall, Woodbine, N. J. The Institute consisted of morning, afternoon and evening sessions. The morning session was taken up by Mr. G. L. Gillingham's interesting lecture on "Building Up of a Dairy Herd." Mr. Gillingham illustrated his lecture by the aid of charts representing different types of

dairy animals. The lecture was very instructive and was followed by numerous questions and discussions.

The afternoon session was devoted to the addresses by Mr. Gillingham on "Poultry Management for Profit," by T. B. Terry, Esq., of Ohio, on "Manure Saving," and by Mr. Mitchell, of Vineland, on "Co-operation in Buying and Selling." All the three addresses were interesting and were highly appreciated by the audience. Mr. Terry's lecture on "Manure Saving" was particularly so. He said that farmers in this country lose not only hundreds, but millions of dollars in fertilizing elements through careless handling of manure. He recommended the use of cement floors in the barns, and estimated the cost of the manure from twenty-five head of cattle at two dollars per day.

In the evening, Mr. C. B. Lane, of the State Experiment Station, talked in detail about "Dairying at the State Agricultural College Farm." He also spoke about the construction and management of silos. Mr. Terry also lectured in the evening on "Clover and Tillage," and demonstrated that by constant tillage and growth of leguminous crops the farm draws all the needed fertilizing elements directly from the soil. The attendance was quite large, a number of pupils from the Baron de Hirsch Agricultural and Industrial School being present.

After the evening session the speakers were pleasantly entertained by the instructors of the above-mentioned school in the dining-hall of the school. Vegetables, fruit, butter, wine, and written work of the pupils were exhibited at the hall where the Institute was held.

The spring meeting of the Board was held in Cape May Court House, on March 17th, 1899, where Mr. F. Schmidt, of Woodbine, spoke on "Pruning Trees." Mr. Schmidt also showed a genuine specimen of San Jose Scale which he detected in an orchard in Swanton. Mr. J. W. Pincus, of Woodbine, delivered a paper on "Feeding Dairy Animals." Both were followed by questions and discussions on the subject. Prof. H. L. Sabsovich, of Woodbine, who had acted as Secretary of the Board since its organization in 1893, resigned his position and Mr. J. W. Pincus, of Woodbine, was elected in his place. A vote of thanks was extended to Prof. Sabsovich for his faithful work.

The sixth annual meeting of the Board was held in South Seaville on October 26th, 1899. At this meeting officers were elected for the

CAPE MAY COUNTY.

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ensuing year and delegates to the State Board of Agriculture, the names of which appear at the head of the report. Dr. Phillips, the President of the Board, reported on the proceedings of the National Farmers' Congress, held recently in Boston, to which he was appointed as a delegate by the Governor. Mr. F. Schmidt and J. W. Pincus, of the Woodbine Agricultural School, spoke respectively on "Bees in Relation to Fruit Growing" and "Forage Crops for Cape May County." The results of the past season in regard to crop-yields, prices, etc., were thoroughly discussed at this meeting.

The attendance at all meetings was larger than during the previous years, but still there is room for improvement. It is a pity that the farmers of this county do not take more interest in an organization which is established for their benefit. It is sincerely to be hoped that this condition of affairs will improve in the future.

The winter of 1898-1899, although quite cold during the latter part, has been very favorable to rye and crimson clover. The spring of '99 opened quite late; little plowing could be done in March on account of frequent rain. But in the forepart of April the weather was very favorable for plowing and planting, while the latter part of April, being dry, planting was retarded. The lack of rain during May and June ruined the strawberry crop as well as decreased the yield of early truck and potatoes. Woodbine was fortunate to get more rainfall during the latter part of June than other places in the county. This greatly benefited the potato crop, but did not save our strawberries. The rains during June and July were very favorable for the growth of forage crops, and these did well.

The cold weather during the latter part of the winter, which was as low as 11° below zero, killed two-thirds of the peach buds. The spring being cold and wet at the blossoming period also had some bad influence on fruit buds.

GENERAL STANDING OF AGRICULTURE.

The accompany table—No. 5—shows the per cent. of yield of different crops compared with last year, the average yield and prices received for them during the past agricultural year in Cape May County.

The Corn Crop was quite good. The farmers raise it in large quantities and find the stover quite valuable for feeding dairy animals. There are only two silos in the county.

Grain Crops are not raised much in this county. Rye and oats were somewhat grown for forage crops, and the former yielded a heavy crop, while the latter, sown with Canada peas, did not do so well on account of lack of rain during the early spring.

Among other crops grown for forage were *Crimson Clover*, *Cow Peas*, *Soja Beans*, *German and Japanese Millets*. All the forage crops yielded heavily. The crimson clover and the cow peas are particularly valuable for our county, both for green manuring and feeding, as they do not deplete the soil of its fertility. Cow peas, if planted successively, can furnish feed for several weeks during the time of the year when pastures are dry.

Potatoes did fairly well. Early potatoes yielded better in Woodbine than in the lower part of the county. Late potatoes did better in the lower part of the county.

The Sweet Potato Crop yielded about the same all over the county. Woodbine had a better average than last year.

Cabbage, compared with last year, did remarkably well.

Tomatoes yielded quite heavily.

Strawberry Culture is on the increase in the county, but the crop was very poor on account of the drought and the hot wave during the ripening season.

Of Pears, only the Keiffer bore a full crop. There were very few Bartletts.

Peaches did not yield heavily on account of the unfavorable weather, but compared with last year, which was a failure, quite a crop was harvested in the county. The varieties of peaches which did best were Old Mixon, Shipley's Late Red and Alexander.

The Japanese Plums do not seem to grow well in this county, judging from the experience in Woodbine. The native plum, especially Newman (also called Morman) and the Wild Goose, have borne abundantly for the last three years.

The crop of *Grapes* was not as large as last year, but the quality was better.

At the Baron de Hirsch Agricultural School, *Bees*, which have suffered from the intense cold, have done well through the summer, but the honey crop was small, as it was the case almost all over the United States.

The crops in the forcing-houses, such as radishes, lettuce, as well as mushrooms, did very well at the Baron de Hirsch Agricultural School.

CAPE MAY COUNTY.

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The prices for almost all the farm products were higher than last year. Good milch cows are very difficult to get, and command high prices. The San Jose Scale made its appearance in two places in the county—Dias Creek and Swainton—but severe measures have been taken to eradicate it.

The Cape May County Fair Association held its Annual Fair in Cape May Court House on October 3d, 4th and 5th. The agricultural exhibit excelled that of any previous year. The live-stock exhibit was poor, but the poultry, vegetable and fruit exhibits were very creditable. The Woodbine products have secured most of the premiums. Financially, the fair was a failure, and the fair association, after considerable deliberation, decided to move to Woodbine where a large number of shares were sold, and which, being a more central location, will probably draw larger crowds.

Before closing my report I wish to say a few words about the Woodbine settlement in general and the agricultural school located there in particular, as both are becoming quite important factors in the agriculture of the county. Woodbine has been growing rapidly, and being an industrial besides an agricultural settlement it creates a fine local market for the neighboring farmers. The industries and the population of Woodbine are growing rapidly, and everybody who knew the place eight years ago, when it was covered with scrub-oaks and pine bushes, can hardly recognize it now. The farmers of Woodbine are giving a practical illustration that the so-called South Jersey wastelands can be reclaimed.

The Baron de Hirsch Agricultural and Industrial School was started in the winter of 1893-1894, and was open at first only to the boys whose parents lived in Woodbine, as the means of the school were limited. The work of the school for the first few years was experimental, but the results were gratifying. Several of the graduates went back to their farms, some entered higher agricultural institutions, some went to floral and horticultural establishments. The object of the school is to train practical, intelligent farmers, who would be able to act as valued assistants to other farmers, or be prepared to profitably work farms of their own. The belief of the trustees of the Baron de Hirsch Fund that there was a demand for a large agricultural school led them to apply to the Jewish Colonization Association of Paris for means with which to extend the work of the school. The latter organization responded in 1898 by giving liberal aid. On receiving this aid, the

management of the school at once started to erect new buildings, clear more land and increase the number of pupils. During the past year a large hall to accommodate 100 pupils was erected; it contains sleeping, dining and study-rooms for pupils and instructors. A dairy barn for 24 head of cattle was built and a round silo was erected. The dairy barn is stocked with grades, as well as some thoroughbred animals, and the pupils have an opportunity to learn the practical side of dairy-husbandry. A small creamery is connected with the barn. This creamery is equipped with separators, coolers, churns and other modern dairy machinery. The pupils receive practical instruction in handling milk, butter-making, testing, etc. The Horticultural Department of the school has at its command a large forcing-house, 150 x 24 feet, in which radishes and lettuces are forced for the city market; also one greenhouse, 50 x 18, for flowers, and one lean-to house for mushroom culture.

The Department of Agriculture has 35 colonies of bees in the improved hives.

The Poultry Department is erecting a brooder-house, 12 x 50, also an incubator-house, and makes a specialty in raising the following breeds: Buff Cochins, Light Brahams, White Wyandottes, White Leghorns, Black Minorcas and Pekin Ducks.

The Mechanical Department has a blacksmith and wheelwright shop; plumbing and heating is also done by this department, as well as construction and repairing of wagons, tools, fire-escapes, etc. The school possesses 270 acres of land, 120 of which are in a good state of cultivation. During the past season fine crops of fruit and vegetables were raised, and many premiums were captured by the school at the County Fair. Soiling crops, such as peas and oats, cow-peas, soja-beans and millets, have also yielded heavy crops. Besides raising enough of fine ensilage corn to fill the 75-ton silo a large quantity of ears was harvested.

There are at present 72 boys cared for at the De Hirsch Hall, besides 14 girls and 10 boys who reside with their parents in the settlement. The age of the pupils ranges from 14 to 18. All the pupils receive instruction in all general subjects, also natural sciences, and all the theoretical branches of agriculture. All students are required to do practical farm-work of different kinds—in summer eight hours per day; in winter four to five hours. The girls, besides the class instruction, receive instruction in practical housekeeping at the De Hirsch

CAPE MAY COUNTY.

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Hall. The pupils come from New York city, Philadelphia, Baltimore, Washington, Chicago, Des Moines, Ohio, and the South Jersey colonies. Special teachers give instruction in the different subjects. Sufficient appropriations are on hand to erect a new three-story school-building, a cottage for teachers, a creamery with a cold storage, and a laundry with a lavatory. All these buildings will be erected during the coming spring, and will greatly improve the facilities and equipment of the institution. As the school was reorganized in 1898, only three pupils were graduated from the old school this year. In two years a large class is expected to be graduated. The graduates will be fully prepared to intelligently follow agriculture as their vocation. Undoubtedly the intelligent farmers of the State will appreciate the difference between intelligent and common help, and will avail themselves of the opportunity of securing some of the intelligent young farmers.

METEOROLOGICAL OBSERVATIONS.

In Cape May county meteorological observations are taken at least once a day in four places, namely, Ocean City, Cape May Courthouse, Cape May City and Woodbine. The first three places belong to the Sea Coast region, and are elevated above the sea level 12, 19 and 11 feet, respectively. Woodbine belongs to the Southern Interior, and has an elevation of 43 feet. This is the reason for the difference in precipitation and temperature. At the end of this report four meteorological tables are given.

Table I shows the mean, maximum and minimum temperature of the four observatories in the county, as well as the average for the county, for eight months—March to October, 1899—the time when our crops grow.

Table II shows the precipitation during the same time.

Table III compares the precipitation for the last five years—1895-1899—by seasons for the county and Woodbine. The fall and total precipitation for 1899 does not include the precipitation for November.

Table IV compares the mean temperature for the same period of years. The fall mean for 1899 lacks the month of November.

STATE BOARD OF AGRICULTURE.

TABLE NO. I.

	Woodbine.			Ocean City.			Cape May C. H.			Cape May City.			Average of Cape May County.		
	Mean.	Maxim.	Minim.	Mean.	Maxim.	Minim.	Mean.	Maxim.	Minim.	Mean.	Maxim.	Minim.	Mean.	Maxim.	Minim.
March.....	40.8	67	20	39.2	60	25	41.6	67	22	39.5	62	23	40.3	64.0	22 5
April.....	50.0	81	25	47.7	77	26	50.5	81	27	48.6	77	30	49.0	79.0	27.0
May.....	60.4	88	37	57.6	83	37	60.7	90	38	58.4	77	42	59.3	84.5	38.5
June.....	72.6	96	50	69.8	96	54	73.3	99	50	68.8	94	58	71.1	96.2	53.0
July.....	74.2	92	50	70.4	90	54	76.0	94	51	69.8	84	62	72.6	93.0	54.2
August.....	72.7	92	55	70.8	88	54	74.0	94	55	73.2	85	61	72.7	89.7	56.2
September.....	65.0	90	39	65.6	90	42	66.9	93	41	67.1	88	48	66.1	90.2	42 5
October.....	57.9	78	28	57.0	80	29	58.8	79	28	58.7	75	34	58 1	78.0	29.8

TABLE NO. II.

Precipitation, in Inches.

	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.
Woodbine.....	4.62	1.73	2.10	2.40	4.08	3.24	3.95	4.65
Ocean City.....	5.19	2.27	1.70	1.60	5.83	4.64	5.97	4.43
Cape May Court House.....	5.07	1.76	2.06	1.01	4.60	2.38	2.88	4.62
Cape May City.....	3.45	1.03	1.80	1.03	3.34	2.98	2.36	3.73
Cape May County average.....	4.58	1.70	1.91	1.51	4.46	3.31	3.79	4.33

TABLE III.

Precipitation, in Inches.

	Spring.	Summer.	Fall.	Total March to Oct.
1895 { County.....	11.65	4.73	6.21	22.59
{ Woodbine.....	12.68	4.86	6.92	24.46
1896 { County.....	8.73	13.19	8.22	30.14
{ Woodbine.....	7.10	10.21	9.92	27.23
1897 { County.....	8.86	13.06	9.51	31.43
{ Woodbine.....	8.72	11.90	9.55	30.17
1898 { County.....	12.45	11.95	12.47	36.87
{ Woodbine.....	12.65	14.02	13.95	40.62
1899 { County.....	8.19	9.28	8.12	Sept... { 25.59 Oct. ... { 26.77
{ Woodbine.....	8.45	9.72	8.60	

TABLE IV.

Mean Temperature.

	Spring.	Summer.	Fall.
1895 { County.....	48.8	72.4	56.9
{ Woodbine.....	49.3	72.0	55.1
1896 { County.....	51.4	72.0	54.0
{ Woodbine.....	53.2	70.8	56.9
1897 { County.....	50.5	70.8	57.1
{ Woodbine.....	50.1	70.5	55.2
1898 { County.....	50.2	71.9	57.8
{ Woodbine.....	50.8	71.0	57.7
1899 { County.....	49.5	72.1	62.1
{ Woodbine.....	50.4	73.2	61.5

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TABLE V.

	Per cent. compared with last year.	Average yield.	Average Price.
Corn.....	125	30 bushels.....	\$0 50
Wheat.....	100	20 bushels.....	80
Hay.....	50	1 ton	16 00
Potatoes, White.....	100	45 barrels	1 50
Potatoes, Sweet	100	40 barrels	1 00
Apples	150	200 barrels	1 25
Pears (Keiffer).....	110	300 barrels	1 50
Peaches	200	300 baskets.....	65
Grapes.....	80	3,000 pounds.....	1½
Strawberries.....	40	1,000 quarts.....	05
Watermelons	100	10 (hundreds).....	5 00
Citron Melons	60	120 baskets.....	35
Cabbages.....	150	35 (hundreds).....	3 00
Tomatoes	100	6 tons.....	{ * 25
			†6 00
Horses.....	100	Between 3 and 7 years old.....	\$75 00
Mules.....	100	Between 3 and 7 years old.....	100 00
Milch Cows	100	Between 3 and 7 years old.....	50 00
Veal Calves.....	100	Per pound for the season.....	06
Swine.....	100	Per pound December.....	08
Turkeys.....	100	Per pound Nov. and Dec.....	15
Chickens.....	100	Per pound Nov. and Dec.....	13

*Per basket for market.

†Per ton at cannery.

Cumberland County.

OFFICERS FOR 1900.

President.....W. S. BONHAM.....Shiloh.
Secretary and Treasurer.....H. O. NEWCOMB.....Cedarville.

DELEGATES TO STATE BOARD.

A. W. ONTHANK (one year).....Vineland.
W. S. BONHAM (two years).....Shiloh.

EXECUTIVE COMMITTEE.

FRANK GOODWIN.....Greenwich township.
JOHN MICKLE.....Stow Creek township.
ARTHUR SEABROOK.....Deerfield township.
F. S. NEWCOMB.....Landis township.
JEREMIAH CHAMBERS.....Maurice River township.
WM. M. BROWN.....Lawrence township.
W. S. GANDY.....Fairfield township.
OLIVER GANDY.....Commercial township.
J. S. TURNER.....Downe township.
JOS. A. BURT.....Hopewell township.

REPORT.

BY THE SECRETARY.

We have held but one meeting this year and elected the officers named above. We had a very good attendance and were addressed by Prof. Voorhees on milk production.

CROP REPORT.

Corn.—Yield was about the same as last year, with prices about the same.

Wheat.—About the same, but not raised to any great extent.

Rye.—Not grown, except for pasture and for plowing under for manure.

Oats.—Poor crop.

Hay.—About thirty per cent. off from last year.

White Potatoes.—Good.

Apples.—Very abundant.

Strawberries.—Poor, but better than last year.

Citron Melons.—Crop good; prices fair. Not troubled with lice.

Cabbage.—Twenty per cent. better than last year.

Tomatoes.—Fifty per cent. better than last year, and \$1 per ton more in price.

The Institutes held in the county have been well attended and much interest shown. The farmers of this county are beginning to see the benefits to be derived from attending them, and better results will follow if some of the suggestions given are put into practice.

Essex County.

OFFICERS FOR 1900.

<i>President</i>	A. E. HEDDEN.....	Verona.
<i>Vice-President</i>	WILLIAM DEICKS, SR.....	Livingston.
<i>Secretary</i>	J. H. M. COOK.....	Caldwell.
<i>Treasurer</i>	GEORGE E. DeCAMP.....	Roseland.

DIRECTORS OF COUNTY BOARD—C. B. Crane, I. S. Crane, S. H. Burnett
August Fund, Joseph B. Ward.

DELEGATE TO STATE BOARD (TWO YEARS)—William Van Zee.

REPORT.

BY THE SECRETARY.

The regular meetings of the Essex Board were well attended during the last year, and the members evinced a growing interest in the work of the society. Several new names were enrolled as members.

The annual meeting in December was mostly occupied with reports of officers and routine business.

Our President, in his annual address, referred to the many good results that have been accomplished through the influence of the Board in conjunction with the other agricultural societies of the county, and suggested several directions in which our united action could be exerted to good advantage. The address was favorably received, and the plans for the coming year heartily endorsed.

The second meeting was held at Livingston, January 19th, at which our delegates to the State Board gave comprehensive reports of the meetings at Trenton, and many points of interest which they had gathered were enthusiastically discussed.

The subject of the adulteration of food evoked a lively debate. The use of preservatives in milk was fully considered, the weight of opinion condemning the practice, because, in accordance with the judgment of chemists, whatever arrests decomposition or fermentation of food is calculated to interfere with the process of digestion, is

therefore deleterious to health, and milk thus treated should not be used for children.

The matter of free mail-delivery was fully considered. Mr. I. S. Crane called attention to the fact that a part of Livingston township had the free delivery system, and urged the people to patronize the carrier in every way possible, by forwarding mail by the carrier instead of sending it to near-by towns for posting.

A special meeting was also held at Roseland, February 2d, at which an important part of the program was the reports from the State Horticultural Society. The delegates gave interesting accounts of the proceedings, and brought out several points of interest. The two points most emphasized were the danger of the San José scale and the importance of selecting the very best seed for propagating any particular fruit or plant.

Our farmers have suffered materially the past season from the severe droughts in May and June, and much of the planted seed did not germinate until the rains come in July, when it was too late to mature the crop before frost; and on this account our harvests, with few exceptions, are below the average. The hay crop was especially poor. Many fields of good meadow that were expected to yield two or three tons per acre were scarcely worth mowing, and this was a serious loss to many of us, as the hay crop is an important item.

Potatoes and corn were also seriously damaged by drought. Most of the standard varieties of fruits were quite good—up to the average, we think—with the exception of small fruits, such as strawberries and raspberries, which were poor.

The bees also seemed inclined to go out on a strike, and in some cases could not store enough honey for their winter supply, and I expect to hear of winter loss where feeding is not resorted to.

The past year has developed marked improvement in roads. Our people are anxious to secure the benefits of the Road act of 1895, which provides for the permanent improvement of public roads. Several continuous lines of stone roads are being laid through the county. By this road improvement we are securing better markets and also opening up our unproductive lands for suburban residence.

Gloucester County.

OFFICERS FOR 1900.

<i>President</i>	AARON W. BORTON.....	Mullica Hill.
<i>Vice-President</i>	JOHN TONKINS.....	Aura.
<i>Secretary</i>	ALBERT HERITAGE.....	Swedesboro.
<i>Treasurer</i>	WM. H. BORDEN.....	Mickleton.

EXECUTIVE COMMITTEE.

J. HERBERT BROWN.....	Swedesboro.
WM. A. DAWSON.....	Mickleton.
REBECCA PARKER.....	Mullica Hill.
BELLE STEWARD.....	Swedesboro.
JOHN C. HERITAGE.....	Mickleton.

DELEGATES TO THE STATE BOARD OF AGRICULTURE.

JOSEPH W. SITHENS (two years).....	Swedesboro.
GEORGE H. HORNER (one year).....	Mullica Hill.

REPORT.

BY THE SECRETARY.

Four meetings of the Board were held during the year, with increased attendance. By having subjects that interest the sisters as well as the brothers these meetings have become more interesting and profitable. It is the earnest desire of the active members that a more general interest might be aroused over the county. Earnest work is needed. Organization and co-operation to meet the existing conditions is of immediate necessity. A more general understanding by the larger number of farmers would assist greatly in advancing agricultural interests.

The Annual Institute held at Swedesboro, November 15th and 16th, was fully up to the standard. Very good attendance at all the sessions. The programme was carried out, and met the approval of

those present. The display of flowers, fruit, vegetables, chestnuts, etc., were a credit to the county, showing improvement and progress.

The Annual Grange Picnic at Alcyon Park was well attended. Another feature added this year to make it more attractive was a display of farm products. The implement dealers are taking advantage of the opportunity to display their wares, of which there was quite an exhibit.

Generally speaking, the crops with few exceptions are about the same as usual.

White Potatoes.—Owing to the drought, were little better than half a crop.

Sweet Potatoes.—Average crop. Stored potatoes, better price than last year.

Corn.—About the average.

Wheat.—About two-thirds crop.

Hay.—Short crop. Three-fourths ton per acre.

Tomatoes.—Average crop.

Apples.—Exceptionally good.

Pears.—Full crop.

Watermelons and Citrons.—Light crop, owing to the vines failing or leaves scalding.

Asparagus.—Fair crop.

Pork.—Doing well. Hear of but little cholera.

Poultry raising on the increase. Prices better than last year.

Hunterdon County.

OFFICERS FOR 1900.

<i>President</i>	V. R. MATHEWS.....	Lambertville.
<i>Vice-President</i>	E. M. HEATH.....	Locktown.
<i>Secretary</i>	WM. W. CASE.....	Baptisttown.
<i>Treasurer</i>	I. H. HOFFMAN.....	Baptisttown.

DIRECTORS.

H. F. BODINE, Hunterdon County Pomona Grange.
F. S. HOLCOMBE, Ringoes Grange.
WM. B. HOCKENBURY, Locktown Grange.
JOSEPH HAGERMAN, Sergeantsville Grange.
JAMES S. KERR, Kingwood Grange.
WM. DUBON, Oak Grove Grange.
M. W. ANGELL, Spring Mills Grange.

NEW JERSEY FRUIT EXCHANGE—Uriah Sutton, Locktown, N. J.

HUNTERDON COUNTY FRUIT EXCHANGE—A. B. Allen, Flemington, N. J.

DELEGATES TO STATE BOARD—H. F. Bodine, Locktown, one year; Jno. T. Cox, Readington, two years.

COMMITTEE ON PEACH STATISTICS AND REPORTER TO STATE BOARD OF AGRICULTURE—Wm. W. Case.

Other organization in county :

NEW JERSEY FRUIT EXCHANGE.

<i>President</i>	JOHN T. COX.....	Readington.
<i>Secretary</i>	H. F. BODINE	Locktown.

HUNTERDON COUNTY PEACH EXCHANGE.

<i>President</i>	N. B. BOILEAU.....	Jutland.
<i>Secretary</i>	P. M. MECHLING.....	Pittstown.

REPORT.

BY THE SECRETARY.

The regular meetings of the County Board are held on the third Saturdays in April, August and November. The August meeting, held at Stockton, was well attended, and an interesting programme was successfully carried out. President Mathews spoke briefly of a 'Tour Through the Best Farming Sections of Mercer, Somerset, Warren and Hunterdon Counties During July,' and was quite enthusiastic over some of the immense crops grown on some of the farms visited.

Secretary Dye, of the State Board of Agriculture, addressed the Board on "Timely Topics."

Professor E. B. Voorhees, of the State Experiment Station, spoke on "The Profitable Dairy."

Prof. Voorhees was followed by Mr. John S. Turner, of Bridgeton, N. J., who addressed the Board on "The Profitable Growing of Tomatoes for Canning Purposes." The address of Mr. Turner is appended to this report.

The annual meeting was held at Locktown, on November 18th, in conjunction with the Farmers' Institute. The Institute was one of the best ever held in the county, and at its close the County Board took up the question of the natural fertility of the soil, and ordered that the Secretary should select various soils of the county and forward to the State Experiment Station for analysis. But I am informed that at present there are no funds available for such analysis.

FARM CROPS, ETC.

In spite of the severe drought of June, farm crops, hay and oats excepted, were normal.

Wheat and rye were both full crops; prices, December 15th—wheat, 70 cents; rye, 45 cents.

Buckwheat, acreage low; crop and quality good; price, 60 cents.

The corn crop was one of the best ever grown; price, 40 cents.

Hay and oats were neither more than a half crop of inferior quality: hay selling, December 15th, at \$13 to \$15 per ton; oats, 28 cents per bushel.

HUNTERDON COUNTY.

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Potatoes light yield, quality good.

The honey crop throughout the country, one of the lightest on record, yet strange to say, lower in price in the local markets than for years, ranging from 25 to 40 per cent. lower than city quotations.

TOMATOES.

The tomato crop this year was exceptionally good, Everitt & Scarborough, of Lambertville, reporting a pack of 222,000 cans against 145,000 last year.

Through the efforts of the County Board and others, we hope to see a tomato cannery erected in Stockton in the near future, and one should do extremely well there, as this part of the Delaware Valley produces a tomato equal to any grown in the United States.

FRUITS.

Cherries and strawberries were an abundant crop, and in many instances hardly paid for handling.

Apples a large crop, of as fine fruit as ever grew ; prices low, ranging from 30 to 70 cents per hundred pounds.

Peaches in the northern part of the county were a fair crop, but few in the southern.

The crop amounted to 567,473 half-bushel baskets, and probably averaged 60 cents per basket. The Rockaway Valley Road carried 192,176 baskets ; the Lehigh Valley, 133,300 ; the N. J. Central, 221,997, and the Pennsylvania about 20,000.

The Hunterdon County Peach Exchange, at Pittstown, sold 21,551 baskets (in 1894 there were shipped from this station 184,749 baskets) at an average of $67\frac{1}{2}$ cents per basket, and the same Exchange, at Jutland, sold 5,414 baskets, at an average of 70 cents per basket, while the New Jersey Fruit Exchange, at Flemington, sold 28,443 baskets, at an average of 76 cents per basket.

Dairying is still prospering, and the number of creameries in the county steadily increasing, although prices have not risen nearly to the level of other things. Cherryville Creamery reports having received 547,564 pounds of milk ; average price paid, \$1.05 per cwt. Oak Grove Creamery reports receipts of 438,072 pounds, at same average price as Cherryville. Mt. Pleasant reports receipts of 912,215 pounds, at an average of 84 cents per cwt.

The report of Locktown Creamery is given in the usual comprehensive form, and is appended to this report. It shows a slight increase in prices paid over last year.

FARM VALUES.

Few farms are changing owners, as prices for farm-lands have not advanced during the year past. The prosperity noted in other business has not reached the crops the farmer has to sell. At least not to such an extent as to offset the advance in many things farmers have need to purchase in the way of implements, hardware, lumber, etc. It is to be hoped that conditions may soon favor the tillers of the soil with prices that will encourage to greater interest in this essential industry; and to a substantial advance in price of farm-lands in the State.

REPORT OF THE WORKINGS OF THE LOCKTOWN CREAMERY FOR THE YEAR
ENDING OCTOBER 31st, 1899.

Compiled by Geo. W. Hockenbury, Secretary and Superintendent.

MONTH.	Number of pounds of milk received.	Number of pounds of butter made	Butter sold for.	Skim milk sold for.	Average test of all milk received.	Price paid per pound for butter-fat.	Average price paid per 100 pounds for milk.
1898.							
November	166,833	8,695	\$2,092 38	\$81 88	4 64	\$0 25	\$1 16
December	165,427	8,643	1,939 80	76 85	4 65	24	1 12—
1899.							
January	167,867	8,436	1,697 63	75 54	4 44	21	93+
February	149,082	7,433	1,648 59	60 45	4 38	23	1 01—
March	180,300	8,592	1,830 68	76 38	4 20	22	92+
April	177,662	8,099	1,596 58	96 10	4 04	21	85—
May	240,621	11,489	2,100 38	115 47	4 08	20	82—
June	236,794	11,275	2,069 49	119 55	4 02	20	80+
July	203,766	9,661	1,929 29	101 63	3 98	22	87+
August	210,173	10,275	2,194 02	103 79	4 12	23	95—
September	184,739	8,919	2,099 21	89 72	4 33	25	1 08+
October	172,259	9,097	2,213 98	82 57	4 41	27	1 19+
Total	2,255,523	110,614	\$23,406 03	\$1,079 93			\$11 70
Average							97½

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THE GROWING OF TOMATOES FOR CANNING PURPOSES

By John S. Turner, Secretary J. F. Brady Canning Co.,
Bridgeton, N. J.

AUTHORITY ON FARMING.

I do not want to set myself up as an authority on farming, but I want to say a few words by way of a prelude to my talk on the more particular subject of tomatoes.

It seems to me the average farmer should give more concern to the business side of farming. I take it for granted you are not farming for your health, or for glory, but for profit. What I have to say is no new thing, but I think a repetition will do no harm.

Every farmer will not grow tomatoes successfully, any more than all farmers will grow good wheat or corn crops. One farmer will have a good crop; another, with equal advantages, will have a poor crop. There are certain elements necessary to grow good crops and make farming profitable, as there are certain elements necessary to make any other industry successful.

I know of two firms of wholesale grocers in the city of Philadelphia—one house has been eminently successful, and the very name of this house is the synonym of integrity and high commercial rating, the other, with equally good advantages, possibly a better location, has gone down the scale, and now is a firm of bankrupts. Two glass companies were organized in this State. One has grown to be one of the leading factories in the State; the other is gone, made a complete failure.

In Deerfield township, Cumberland county, are two farms, side by side. The man on one farm has proven a successful farmer; the other, a failure. One now owns one farm clear, and has bought another, and is paying for it at the rate of \$500 per year; the other has had his farm sold by the sheriff, and is now seeking work, catch-as-catch-can, at \$1.25 per day.

As far as I could see, there was no difference in the soil—one had no advantage over the other, as far as location, fertility, etc., were concerned. Now, in the case of the wholesale grocer, it was in the man; so it was in the glass case, and so it was in the case of the farmers.

Tomatoes as a Paying Crop.—I cannot tell you exactly what it costs to produce or raise a ton of tomatoes. The cost varies considerably. I can tell you something of the manner in which they are grown.

Preparing the Ground.—Some farmers plow the ground twice. If ground is lumpy it is rolled and then harrowed. I have had farmers say plowing twice is the only way, and again others claim equally good results with one plowing. There is one thing I do know, and that is the ground should be in good condition, well worked and loose when plants are ready to go in. I do not care anything about the method if this result is obtained. By all means the ground should be in good shape before putting in plants. A good plan is to harrow just as long as your conscience will allow you, and then—harrow some more.

Seed.—Great care should be taken in the selection of seed, and no seed put out unless you know how it has been saved. You will find every seed-house will offer you good seed; in fact, theirs is the only seed according to their story; but when it is put out you will find it often very far from what you expected it to be. The seed-houses are not alone to blame. I can tell you better by telling you of a case that came under my own observation.

A Philadelphia seed-house made a contract with a Jersey farmer to grow seed-pumpkin. The pumpkin was offered me for canning, provided I saved the seed. Before purchasing I went to see the pumpkin, and found it utterly unfit for canning—not a pumpkin as large as your head, and every one as green as grass. The goods were utterly worthless for canning, but the farmer saved the seed from this very pumpkin and delivered it to his seedman, and of course the seedman placed it on the market, and did it unconscious of its worthlessness. He simply had been imposed upon by the farmer.

If I wanted to try a new and unknown seed I would not risk a whole crop. I would rather grow from my own seed—at least this has proven more successful among tomato-growers.

The hot-bed, as we call it, should be built in some protected spot with southern exposure, near to the farm buildings. This is advisable because of two reasons; the principal one is they will get better attention because more convenient, secondly, insects seem to be less troublesome when near the buildings.

Seed should be sowed about the middle of April, still this will be governed by climatic conditions.

Setting Out the Plants.—You will find a great difference in the time of setting out plants. Some energetic fellow will have his out as early as May, and some slothful fellow will be as late as July in getting his out. The May setting may be a trifle early, but he will be successful a dozen times to every one for the July fellow. From my own observation, about the first week in June seems to bring the best results. Take an average of years I am quite sure it is the proper time.

Plants should be short and stocky, with plenty of roots.

Plants put out during a warm spell of weather will stand best. If ground is wet and sun is not too hot, any time during the day will answer to put out the plants. If weather should be hot and dry, better mud the roots thoroughly, and put out after the heat of the day has passed, so the young plants can have the benefit of a cool, moist night. This braces them up, and they can stand the hot sun of the next day much better.

When your ground is in good condition, and weather favorable, by all means get out your plants. Don't wait for an east wind, or for the moon to be in a certain quarter. Pay no attention to signs. Put them out on Friday, if everything is ready, and it is time they should be put in the ground. Farmers have lost more tomatoes by frost than by any other way.

Plant 2,700 plants per acre.

Attending Crop.—I simply give these details in full, because you can then form some definite idea of what it will cost to raise a crop of tomatoes.

I find there is also a great difference in the attention given to the cultivation of the tomato crop. Some go through their tomatoes as few as four times, while others have gone through them as often as eleven times.

The best field of tomatoes I have seen this season has been treated as follows, with a promised yield of twelve tons per acre: Ground was plowed and rolled and harrowed early in the spring. Later, it was plowed and rolled and harrowed again—harrow kept on until the ground was perfectly mellow. Plants were good and stocky, put out during the last week in May, just previous to a rain, thus saving the trouble of mudding. They were gone through with harrow or gang-plow eleven times. About twenty loads of barnyard manure put on per acre broadcast. About 250 pounds commercial fertilizer, at a value of \$28 per ton, was put in

the hill. Not in one solid lump or heap, but scattered across the hill. I saw hills in the field with over a hundred fair-sized tomatoes on the vine. I do not think any nitrate of soda was used, but I think there is a distinct advantage in using it in a small way, say about 150 pounds to acre. Great care should be taken in using it so as not to bring it in contact with the vines. We pay at the cannery \$7 per ton for tomatoes; thus, with a yield of 10 to 12 tons to the acre, it nets the farmer a fair profit.

All this presupposes the farmer to be an energetic fellow, and of sufficient vim to get up early in the morning and work late at night. The crop ripens very rapidly, and the bulk of the work must be done in a few weeks.

Canning a Benefit.—There was a time, and not in the remote past, when a cannery was not reckoned of sufficient importance to be classified among the important industries of the State. As necessity is the mother of invention, just so the industry has been the outgrowth of a necessity. Owing to our peculiar location and extent of our land and sea, we are able to produce a surplus of farm products. These products being of a perishable nature could be only enjoyed by people living in cities and thickly-populated districts close by, and quite often these products were rushed to market within a short time, and, as a consequence, with a faulty distribution and goods of a perishable nature, combined with a commission house more interested in a ten per cent. commission than in the farmer, these goods are sacrificed and the farmer is told, if he is favored with any information whatever, that the goods did not bring the freight and expenses.

Now, this is where the cannery comes in and proves such a boon to the farmer. The factories take these goods, put them in tins and distribute them over the whole world. Canned fruit and vegetables are being shipped from South Jersey to both hemispheres. Thus you see how important a factor the cannery is in the question of the proper distribution of the products of the farm. Again, they furnish a market or outlet that is sure, no risk to run, because the factories pay a definite price for whatever produce bought. The custom is for the farmer to make contracts with the canner about the first of the year for his crop of tomatoes, beans, etc., and then put in sufficient land to produce the amount of goods contracted for. Payment for goods under contract is usually made December 15th following delivery.

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Extent of Canning Business.—There are over fifty factories now in South Jersey that contract for tomatoes. These fifty factories require about 75,000 tons of tomatoes for their annual pack. The prevailing price for tomatoes this year is \$7.00 per ton, which would make a total of \$525,000.00 to be paid the farmers for tomatoes alone.

Tomatoes are not the only thing packed by the factories. They pack berries, fruits and vegetables. In our factories alone we require about 1,200 acres of tomatoes, 25,000 baskets of pears, 150,000 quarts of lima beans, 2,000 or 3,000 barrels of sweet potatoes, beside various other fruits and vegetables.

Again, the factories are a gain to a community because they pay cash every Saturday night to their employes, and the money is spent at our local stores.

Mercer County.

OFFICERS FOR 1900.

President HENRY E. HALE Princeton.
Vice-President J. M. DALRYMPLE Hopewell.
Treasurer I. J. BLACKWELL Titusville.
Secretary FRANKLIN DYE Trenton.

DIRECTORS—J. V. Green, J. B. Horn, A. L. Holcombe, H. E. Hale, D. C. McGalliard, T. B. DeCou, Charles Black, Gilbert D. Rue, I. J. Blackwell.

DELEGATES TO STATE BOARD—S. B. Ketcham (two years), Pennington ; J. M. Dalrymple (one year), Hopewell.

REPORT.

The crop conditions and yield in some localities have not reached the average limit. Wheat, in the northern part of the county, in many cases, was almost a total failure ; many fields were scarcely worth harvesting, some farmers using the mowing machine and horse-rake for gathering instead of the binder. The cause of failure was due, mostly, to the ravages of the Hessian fly. Time of seeding did not seem to have any effect, as the late-sown grain was affected as much as the earlier.

Rye, being confined mostly to the southern half, was only fair. Straw and grain could neither be rated as satisfactory. The yield of corn was, perhaps, never exceeded. The acreage was of full average. Planted in good season, and condition of soil being favorable, germination was rapid and climatic conditions favored rapid growth, enabling the farmer to give thorough cultivation at the proper time. High winds that so frequently cause great damage did not visit the county this year, thus enabling the crop to mature in the best manner for grain and fodder.

Oats, owing to drought early in the season, did not attain the usual height, but was harvested in good condition. The yield was fair and quality good.

Hay, which is the most valuable crop to many, especially dairy-men, was the smallest for many years. Clover, being mostly winter-killed, and severe drought at the time when moisture was most needed, caused almost entire failure.

Potatoes, while not a leading crop, yet are an important one in some parts of the county; the yield not more than fifty per cent. of full average and small in size.

While the general field crops, with the exception of corn, have not been satisfactory, the yield of fruit has been almost phenomenal. Apples, in yield and quality, have been excellent. Owing to the failure in some of the apple-growing sections it was anticipated the price would be high, but the crop was largely marketed at \$1.00 per barrel, buyers furnishing the package, and the enormous yield in many orchards have, at this price, rendered a good income per acre.

Cherries were also abundant and quality good. Absence of wet weather at time of ripening favored the fruit to mature without rotting, as is often the misfortune with this favorite fruit.

Strawberries were somewhat shortened by drought; yet the crop was fair. Small fruits in general gave encouraging returns to growers.

The dairy interest continues to be one of the leading pursuits of our farmers. More attention is being given to the care of dairy cows, their shelter, feeds, &c. Many are interested in what constitutes balanced rations, and how money spent for these can be applied to the best advantage. A new creamery has been built at Pennington, furnishing a market for those who do not ship to the city dealers.

Notwithstanding the discouragement, because of some crop failures, farmers are not despondent; they hope the future will bring better days, and the general prosperity of our commercial and industrial occupations may soon come to their relief.

To the question, "Are average good farms being run at a profit?" answers are given, "Farmers are about holding their own; very few are making money." Another: "Yes, if they do not value the service of the farmer and his family too high."

To the question, "Is the new school law giving greater satisfaction than the old district system," answers are, "Yes, it combines the township and gives opportunity for securing better teachers in small schools and larger advantages for the scholars." Another says: "It

MERCER COUNTY.

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is reasonably satisfactory. Some objection is raised, because it sometimes takes away the control of a school from those living near it."

The Hopewell Valley Canning Company, at their factory at Hopewell, N. J., the past season have put up 224,000 cans of tomatoes, and all have been sold at fair prices. The majority, nearly all of them, ranged as high in price as 95 cents per dozen. They were mostly sold as futures, which is a great advantage, and is only accomplished by the established reputation of the company for putting up good clean pure goods.

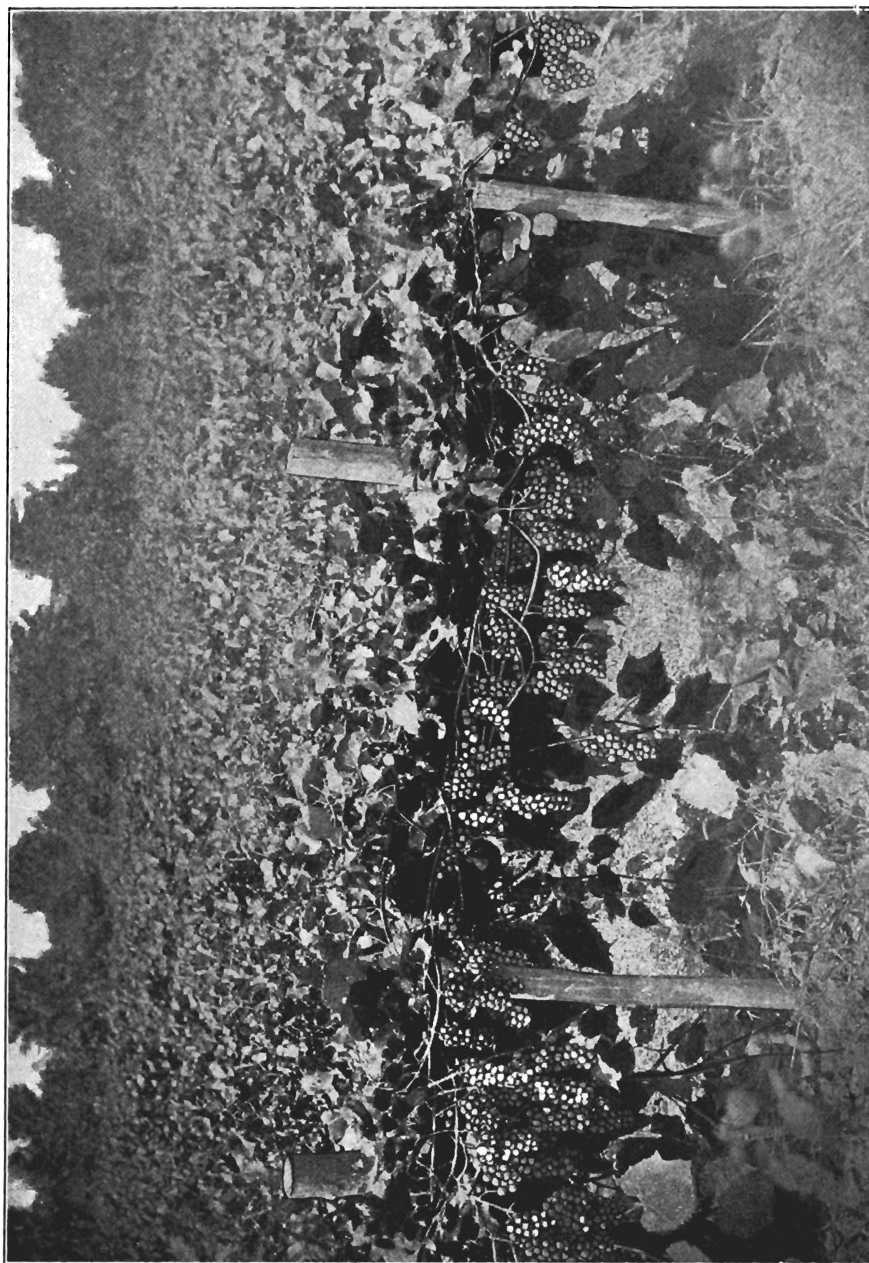
There was only a loss during the whole season of a scant five tons of tomatoes, which had to be dumped on account of the fruit ripening so rapidly that it could not be put up as fast as it was brought in from day to day, although the force worked nights.

The average of tomatoes grown on 105 acres was seven tons per acre, and the average price paid per ton was seven dollars (\$7.00). At the close of the season the company put up thirty-five thousand (35,000) cans of apples. These empty cans that were left over at the close of the tomato season were utilized in this way rather than to carry them over, thereby saving the interest on the cost of the same at least. Twelve hundred and fifty bushels of cider-apples were purchased for this purpose at a cost of thirty-five cents (35 cts.) for fifty pounds of apples. The company expect to receive for these canned apples 90 cents per dozen. The company will pay a dividend of five per cent. on their capital stock this year.

TABLE OF ESTIMATED YIELDS AND VALUES, SUBJECT TO CORRECTION.

CROP.	Acres.	Bushels per Acre.	Total Number Bushels.	Average Price.	Total Value.
Corn.....	22,000	45	990,000	\$0 40	\$396,000
Exceeds last year by..	.....	...	.....	.....	79,200
Wheat.....	12,000	12	144,000	70	100 800
Less than last year...	.....	...	.....	.....	42 000
Rye.....	4,000	12	48,000	50	24,000
Less than last year...	.....	...	.....	.....	2,000
Oats.....	11,000	20	220,000	30	66 000
More than last year..	.....	...	.....	.....	13 000
Hay.....	23,000	.75 ton.	162,500 tons.	15 00 ton.	243 750
More than last year..	.....	...	.....	.....	2,000
White potatoes.....	1,800	60	108,000	50	54,000
Less than last year...	.....	...	.....	.....	22,000

The aggregate value of above crops is \$28,200 more than reported last year, to which should be added the large fruit crop at fair prices.



A MIDDLESEX COUNTY VINEYARD.

Middlesex County.

OFFICERS FOR 1900.

President.....GEORGE SMITH.....South River.
Vice-President.....D. C. LEWIS.....Cranbury.
Secretary and Treasurer.....WM. FITZ RANDOLPH.....New Market.

DIRECTORS.

DAVID PERRINE.....New Brunswick.
JOHN B. FIELD.....Bound Brook.
AUSTIN RICHARDS.....Jamesburg.
CHARLES EDWARDS.....Plainsboro.
GEORGE W. MOUNT.....Kingston.
I. S. BENNETT.....Jamesburg.
EDWIN GULICK.....New Brunswick.
D. C. PIERSON.....South River.
CHARLES ELKINS.....New Brunswick.
DE HART VOORHEES.....Franklin Park.
I. D. BARCLAY.....Cranbury.
H. M. JAFFERS.....Plainsboro.
NOAH RUNYON.....Stelton.
WILLIAM FARR GOODWIN.....
H. H. BROWN.....Jacksonville.
H. WARNE.....
ELDRIDGE EDGAR.....Woodbridge.

DELEGATES TO STATE BOARD.

RUNYON FIELD (one year).....Bound Brook.
WM. FITZ RANDOLPH (two years).....New Market.

REPORT.

BY THE SECRETARY.

The Middlesex County Board of Agriculture held five meetings during the year, four regular meetings and one special; the special meeting was held in October for the purpose of having an exhibit of

fruits and vegetables. The northern portion of the county, where the land is red shale, suffered very badly from the severe drought in May and June, and the crops of wheat, rye, grass, oats and potatoes, as well as vegetables, were not half of an average crop, while in the southern portion of the county, where the land is a sandy loam, the early crops were much better, averaging about 75 per cent. of a good crop. Corn was above the average and fall pasture has never been better.

Both wheat and rye were sown later than last year, and, owing to the exceptionally favorable weather since seeding time, it looks fine, and there is no damage from the Hessian fly.

Owing to the building of stone roads and the consequent easy access to markets at all times of the year, the production of milk, vegetables, poultry and small fruits are increasing rapidly, and will continue to do so, especially in the northern part of the county, where we have exceptionally good local markets.

Monmouth County.

OFFICERS FOR 1900.

President.....HAL ALLAIRE.....Allaire.
Vice-President.....WILLIAM H. REID.....Tennent.
Secretary.....D. AUG. VANDERVEER.....Freehold.
Treasurer.....JOHN B. CONOVER.....Freehold.

EXECUTIVE COMMITTEE.

JOHN H. DENISE.....Freehold.
DANIEL JONES.....Freehold.
JAMES H. BAIRD.....Marlboro.

DIRECTORS.

C. D. B. FORMAN.....Freehold.
H. V. M. DENNIS.....Freehold.
H. E. HULSHAERT.....Lower Squankum.
E. A. SEXSMITH.....Como.
JOHNSON TAYLOR.....Ocean Grove.
JACOB B. CONOVER.....Baird.
G. A. BOWNE.....Middletown.
WILLIAM M. CONOVER.....Colts Neck.
W. T. PARKER.....Little Silver.
WILLIAM MORRELL.....Hazlet.
EDGAR SCHANCK.....Holmdel.
GARRET B. CONOVER.....Englishtown.

DELEGATES TO STATE BOARD OF AGRICULTURE.—Frank Denise (one year), Freehold ; William Morrell (two years), Hazlet.

REPORT.

BY THE SECRETARY.

Three meetings have been held by the board during the past year. The first, on February 18th, when Delegate D. Aug. Vanderveer read his report of the annual meeting of the State Horticultural Society, and Delegates George L. DuBois and Frank Denise read

their reports of the annual meeting of the State Board of Agriculture. Hon. Peter Forman, of Manalapan, read a paper on "The Science of Road Building."

Second meeting was held on March 18th. The subject of establishing a creamery was considered. Addresses were made by Charles Howell Cook, Esq., of Trenton; Franklin Dye, Secretary of State Board; D. C. Lewis, Esq., of Cranbury, and members of the County Board.

The third and annual meeting was held on November 25th. Officers were elected for the ensuing year. President Hal Allaire delivered his annual address. E. P. Cole, Lecturer of the New York State Grange, delivered an address on "Organization and Co-operation." Following is the Directors' report by townships:

FREEHOLD TOWNSHIP.

The year past has produced but few changes in methods of agriculturists. While some crops have been almost a failure, others have been unusually large.

The corn crop in this township was more than the average. One hundred and ten per cent. would seem a fair estimate as to quantity. The quality was damaged by high winds and rain in the fall.

Potatoes, which might be termed the money crop, after having the best lands on the farm and a liberal supply of fertilizer, and the very best of care and cultivation devoted to their growth, did not produce more than 70 per cent., although size and quality were both good.

The hay crop was probably the poorest for a number of years in this section, yielding not more than 30 per cent. Clover and mixed hay were very scarce. Wheat and rye did not do as well as the early season promised, the yield being about 75 per cent.

Apples and Keiffer pears were unusually productive. Both size and quality were remarkably good. Apple yield was not less than 115 per cent. and pears about 100.

Orchards neglected as to care and fertilizer produced fruit of inferior size and quality. Spraying little good for looks and quality. Peaches little grown; prices good; yield light. The dairy interest has grown considerably during the past two or three years, principally in the way of production and sale of milk.

C. D. B. FORMAN.

MONMOUTH COUNTY.

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HOWELL TOWNSHIP.

Last winter and spring had a great many very heavy rains and snows which packed ground very hard, and then suddenly turned hot and very dry that crops could hardly be gotten planted in first-class condition, and owing to droughty condition during parts of growing season, crops at harvesting time were not up to full average.

The grasses and clovers very short both first and second crops. Wheat and rye about an average crop. Oats very light. Corn a very heavy crop, most of it cut up in shocks about as soon as ripe enough, consequently much good fodder and feed saved.

Early potatoes only about half a crop. Late ones very poor. Prices for early quite good. Late not so good. Fruits—strawberries very nice first few pickings, but soon dried up owing to dry and hot weather. Raspberries and blackberries only medium. Plums, pears and apples quite good crops, plums especially. Burbanks rotted on the trees. Pears less blighting than during past years.

Young grass looking very good. Winter wheat fair, and rye looking fine.

Cattle looking well around this part of the country. Quite a good many farmers engaged in dairying, as they have good markets for the products from their cattle, especially milk at the seashore resorts in the summer and Lakewood in the winter, which places are taking more and more each succeeding year, and at times it is getting quite difficult to get enough of it to supply the demand. Labor quite scarce and high priced, especially help for the house.

Poultry, quite a good deal raised, and in a generally healthy condition. Eggs scarce and high.

H. E. HULSHART.

HOLMDEL TOWNSHIP.

Holmdel township has all kinds of soil, from heavy clay to light sand, and her agriculturists are engaged in diversified farming, and are fully awake to the fact that they must get out of the old ruts. More fertilizers, either ready-mixed or home-mixed, are being used, and correspondingly better results are being obtained.

The long drought of early summer made the strawberry and hay crops a failure, hay not turning over one ton per acre on an average; second crop a good yield.

Wheat and rye were not heavy crops; wheat hurt by fly.

Early potatoes gave a very small yield on account of the drought.

Late potatoes have been about 70 per cent. of a full crop; are of fine quality, good size, and fair price.

Asparagus, of which there is quite a large acreage in this township, has yielded much better than any year since the rust came, and was a very profitable crop; but the prospects are not bright for next season, as the rust struck early in the past September, and the fields now look worse than any fall since the disease first appeared.

There was a larger acreage of tomatoes than usual, both early and late-set full crop, the market became glutted, and at mid-season thousands of bushels were left to rot on the vines, because it did not pay to gather them.

Muskmelon crop was very short and unsatisfactory, on account of heavy fogs for two days and several nights, which rusted the vines and made the melons of poor quality, which lowered the price in the market. Many acres never matured a melon.

Early corn was a heavy crop, but low prices made it hardly worth shipping throughout the season.

Raspberries were a fairly good crop, and prices satisfactory.

Blackberries a full crop; prices better than for several years past.

All varieties of cherries gave fine crops and were profitable.

Japan plums bore full crops.

Pears, which set light and then dropped badly early in the season, surprised growers by yielding about 50 per cent. of a full crop. The fruits were thought very fine.

Apple crop largest in years, though during the drought they dropped so badly it was feared they would all go, but with few exceptions orchards done their best. One orchard of five acres, in which about one-fourth of the trees are fourteen years old, and the remaining eighteen years old, marketed 1,200 barrels. The fruit has been very fine, and prices, especially of winter sorts, have been profitable.

Peach crop was good and profitable, though there is but a small acreage of trees in bearing in the township. There are several young orchards not yet in bearing.

Grapes were the finest in several years.

Late corn a heavy crop.

Grass and grain look fine.

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There is not much attention paid to dairy farming in this township, though there are three or four farmers in the northern section who raise milk for Keyport.

Few raise more hogs than for home consumption.

Not much poultry raised.

Holmdel several years ago was largely interested in sheep-raising and then abandoned the business altogether; this year three or four flocks are noticed in the township.

There is a good setting of all kinds of fruit buds for next year's crops.

A good many fruit trees will be set this fall and spring coming.

WILLIAM MORRELL.

MILLSTONE TOWNSHIP.

Hay crop very light; wheat and rye fairly good. The price of straw advancing so has made the rye crop a good paying one. Very few potatoes grown; those on low ground fairly good. Apples and Keiffers, a very large crop and very good size and quality much above the average, especially apples. Not very much difference whether the fruit was sprayed or not, with the exception of Bartlett pears, which were much nicer when sprayed with Bordeaux mixture. Small fruits quite largely grown, but the turnout this year was light, especially strawberries, on account of the extreme dry weather in early summer. Some orchards of Japanese plums coming in, bearing well and selling good. Peach crop light, but sold well, making up the deficiency in yield.

JACOB B. CONOVER.

Garret B. Conover, of Manalapan, said his report was almost a duplicate of the Millstone report. Raspberries and blackberries had been a good crop, potatoes fair, although there were several very poor crops. Corn had never been better. There had been a failure of the hay crop. There were only two or three farmers engaged in dairying, but there was likely to be an increase in this number.

Morris County.

OFFICERS FOR 1900.

President..... OSCAR LINDSLEY.....Green Village.
Secretary.....W. F. ELY.....Madison.
Treasurer.....WESLEY D. HOPPING.....Hanover.

BOARD OF DIRECTORS.

WILLIAM JAMES.....Chatham Township.
S. E. YOUNG.....“ “
L. J. FISH.....“ “
JAMES COOK.....Hanover Township.
B. S. CONDIT.....“ “
S. M. HOPPING.....“ “
J. J. MITCHELL.....“ “
JOHN OLIVER.....Passaic Township.
W. B. LINDSLEY.....“ “
N. D. GOBLE.....“ “

DELEGATES TO STATE BOARD.

S. E. YOUNG (two years).....Afton.
OSCAR LINDSLEY (one year).....Green Village.

REPORT.

BY THE SECRETARY.

At the annual meeting of the Morris County Board of Agriculture the above officers were unanimously elected for the coming year, 1900.

The Secretary made his report of the proceedings of the Board the past year at the five meetings, held at Afton November 26th, December 14th, December 22d; at Morristown, 1898; at New Vernon, January 16th, Morristown February 4th, 1899—all of which were unanimously approved of and adopted by the Board.

The Board adjourned, subject to call of Secretary for next meeting at New Vernon.

Ocean County.

OFFICERS FOR 1900.

President.....CHARLES MILTON RORER.....Cassville.
Vice-President.....PATRICK DAVITT.....Toms River.
Treasurer.....H. R. WILLS.....“
Secretary.....A. B. CLUTE.....“

DIRECTORS.

E. E. APPLGATE.....Toms River.
S. GIBERSON.....“
J. POST.....“

DELEGATES TO STATE BOARD.

H. R. WILLS (one year).....Toms River.
CHARLES M. RORER (two years).....Cassville.

No report furnished.

Salem County.

OFFICERS FOR 1900.

<i>President</i>	M. D. DICKINSON.....	Woodstown.
<i>Vice-President</i>	JOEL BORTON.....	Woodstown.
<i>Secretary</i>	H. C. PERRY	Friesburg.
<i>Treasurer</i>	E. L. BORTON.....	Woodstown.

DIRECTORS.

M. D. DICKINSON	Woodstown.
JOEL BORTON.....	Woodstown.
H. C. PERRY.....	Friesburg.
E. L. BORTON.....	Woodstown.
REEVES FLITCRAFT.....	Woodstown.
GEORGE H. KIRBY.....	Woodstown.
C. R. LOVELAND.....	Cohansey.
JESSIE L. COLSON.....	Woodstown.
SAMUEL FLITCRAFT.....	Pittsgrove.
B. F. STRAUGHEN.....	Pedricktown.
HARMON HITCHNER.....	Elmer.
WILLIAM A. HARRIS.....	Harmersville.
JAMES C. BIVINS.....	Shiloh.

DELEGATES TO STATE BOARD.

S. JACKSON MORGAN (one year).....	Woodstown.
C. R. LOVELAND (two years).....	Cohansey.

SOCIETIES REPRESENTED.

Salem County Pomona Grange, No. 6.
Woodstown Grange, No. 9.
Fenwick Grange, No. 20.
Courses Landing Grange, No. 60.
Friesburg Grange, No. 81.
Naturalist Field Club, Woodstown.

REPORT.

BY H. C. PERRY.

The Salem County Board of Agriculture held four meetings the past year. The annual meeting was held in Woodstown, January 25th, 1899. At this meeting Miss Jessie L. Colson gave an excellent paper on the "Science of Nutrition," illustrating it by charts. Mr. S. J. Morgan gave a very interesting report of the twenty-sixth annual meeting of the State Board.

The next meeting was also held in Woodstown, April 26th, 1899. Franklin Dye, Secretary of the State Board, addressed the meeting. Subject: "How can we best utilize our unprofitable land?" Miss Jessie L. Colson followed with a paper on "Balanced Rations for Man," illustrating the same by the use of charts. The next meeting was held in Friesburg, July 26th. The day was very stormy and the attendance was small. The following questions were taken up and discussed: "Would it be beneficial to Salem county to take advantage of the State Road Law." "Is the net income from Dairy Farms as much now as twenty-five years ago." "Is it policy for farmers to speak disparagingly of their occupation."

The fourth and last meeting of the year was held in Harmersville, October 25th, 1899. Hon. D. D. Denise, President of the State Board, addressed the meeting. Subject: "Business Principles Applied to Farming." Mr. William A. Harris read a paper on the subject: "What course can be taken to induce farmers to adopt broad-tire wagons?" which was discussed by the members.

CONDITION OF AGRICULTURE.

Agriculture, when compared with other callings, does not seem to be so prosperous as it should be, the price of farm products has not risen in proportion to other things; or, in other words, the things that the farmer sells are lower than those he has to buy. The crops of the county have been fairly good, with the exception of the hay and late potato crops, which were light. Corn was above the average. Wheat about an average crop. August 2d a severe hail-storm passed over Lower Penns Neck and portions of Mannington and Elsinboro townships, destroying nearly all growing crops. It is estimated that 90

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per cent. of the crops were destroyed, entailing a loss of upwards of \$50,000. Owing to a greater demand for help in other callings farm help is difficult to obtain, both on the farm and in the house. The average wages paid farm hands, with board and washing, is \$14 per month; day laborers receive \$1 and board, or \$1.25 and board themselves.

Dairying is still one of the leading industries. There are numerous creameries in the county, operated both by farmers and others, which use large quantities of milk. Those farmers living near the railroad stations ship milk to Camden, Atlantic City and other places. Quite a large number make butter and sell to customers in the nearby towns, while some fatten calves for market. The breed of cows most sought after are Jerseys or Guernseys. The farmers are becoming convinced that ensilage is one of the cheapest and best foods for the production of milk, and there are now about forty silos in the county, and the number is increasing every year.

Poultry and egg production still continues to be a great industry, and while we have no farms devoted exclusively to the business, it is quite a source of revenue on every farm. Fruit is receiving more attention than a few years ago, especially the Kieffer pear, which has been set out quite extensively in the past few years. Apples were abundant the past year and the price so low that thousands of bushels were not marketed, but rotted on the ground. If farmers would pay more attention to spraying and taking care of their fruit, and marketing only the best, it would pay them better.

Tomato-canning still continues to be an important industry in the county. The tomato crop has not been quite as good as in some former years, but the price paid for them, seven dollars per ton, partly compensates for the lesser yield.

Education.—The new school law is giving the farmers' children a better chance for an education by furnishing a graded school in each township to which they have access, and there is no longer an excuse for the farmers' children to be behind those of any other calling in the matter of education. And while there may not be as great an opportunity for making money on the farm as a few years ago, yet they have more advantages, both social and educational.

Somerset County.

OFFICERS FOR 1900.

President.....JOSEPH FITZGA.
Vice-President.....C. M. WYCKOFF.
Secretary and Treasurer.....ARTHUR P. SUTPHEN.

DIRECTORS.

C. M. WYCKOFF.....Bedminster.
WILLIAM C. LANE.....Bedminster.
JOHN A. LAYTON.....Bernards.
RICHARD V. LINDERBURY.....Bernards.
DR. J. D. VANDERVEER.....Branchburgh.
LOUIS H. SCHENCK.....Branchburgh.
WILLIAM J. LOGAN.....Bridgewater.
JAMES J. QUICK.....Bridgewater.
ARTHUR F. RANDOLPH.....Franklin.
ABRAM B. VOORHEES.....Franklin.
PETER SUTPHEN.....Hillsborough.
HENRY S. VAN NUYS.....Hillsborough.
SAMUEL S. VOORHEES.....Montgomery.
ERNEST C. TAGGART.....Montgomery.
A. P. VOORHEES.....North Plainfield.
CHARLES F. DEBELE.....North Plainfield.
EDWARD E. COOPER.....Warren.
W. HENRY ROGERS.....Warren.

REPORT.

BY THE SECRETARY.

Our Board has held, during the year, three meetings. The first on December 24th, 1898, when the officers were elected for 1899, and the President, Mr. Fitzga, delivered his annual address. In it he aptly says: "One great hindrance to our meetings is the timidity and backwardness of our farmers in advancing ideas of practical importance. I will grasp any plan presented by a successful farmer more

quickly than if given by a theoretical or scientific man. The common idea is that anybody who can plow, spread manure, cut and husk the largest number of stacks of corn in a day, can farm successfully. This sort of farmer will do very nicely, if someone back of him does the headwork. To get the best results at the least cost, place the product in the market at the proper time, and deal direct with the consumer."

At this meeting we were favored with an address by Professor Smith, State Entomologist, on "Some Things About Injurious Insects," after which the most interesting points of the address were discussed by the members.

The next meeting was held on March 25th, 1899, at which meeting the members were treated to an interesting and instructive address of Professor Byron D. Halsted, upon "Rainfall, as Related to Plant Diseases," followed by an interchange of views of members as to the proper preparation of ground and selection of seeds for the crops of the coming season. Such interchange of experience is always interesting and profitable.

The next meeting was held August 12th, at which time the main address was made by Mr. Clarence B. Lane, Assistant in Dairy Husbandry at the New Jersey Experiment Station at New Brunswick, upon the subject, "Some Practical Points in Modern Dairying." Mr. Lane exhibited samples of alfalfa and cow peas grown upon the experimental farm, and also charts prepared by him, showing percentages of samples of milk. His address was particularly instructive to a large number of dairymen and farmers present, and was appreciated because of his familiarity with the subject—a knowledge evidently obtained by experience, observation and careful, painstaking study, and we infer, from the questions asked Mr. Lane by members of the board, that the lecture was profitable to them. Our farmers have not attempted to raise the cow pea to any great extent, but it is presumed that the attempt will be successfully made. Alfalfa has been tried, but has not become popular with our farmers on account of the failure generally to get the crop started.

Our meetings have been very interesting and about as well attended as last year, and the statements, questions and interchange among members shows a marked degree of intelligence, and a willingness to compare experiences and to profit by intercourse.

We have a large number of farmers in Somerset county who are making money. Of course they are hard-working, intelligent,

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economical, prudent men, and are using their knowledge and experience as a basis.

Some are raising and marketing small fruits, berries, etc.; others, hay; and others, stock. A successful farmer told us he started a few years ago very poor. He has now paid for his farm by making a specialty of small fruits, berries and poultry. He solicited and built up a trade for berries and fruits and sold his eggs the entire year to one dealer. Last year his eggs, from 120 hens, brought him \$180. One of our members receives a nice income from 30 cherry trees set out a few years ago, and now in fine bearing. He made good stock selections; had no trouble to make a ready market, and obtains the best prices.

We believe that there is good money in keeping ewes, and in raising and selling lambs. If more sheep were kept, better fences would be maintained. Our people would be better off with more sheep and fewer dogs. Why should not Somerset county, with her rich grazing soil, produce more than enough beef to supply our own market, especially these times when beef is so high and grain so low?

CROPS.

Corn.—More than an average crop, well matured. Quality good, and cribbed in good condition. Average acreage.

Oats.—Yield 75 per cent. Acreage below average.

Wheat.—Yield 75 per cent. Average price, 75 cents; usual acreage.

Rye.—One hundred per cent. yield. Average price, 50 cents. Long straw, \$12 per ton.

Potatoes.—Yield 60 per cent. Price, per barrel, \$1.50.

Apples.—Yield one hundred and twenty per cent.; fruit good; prices low during the season.

Peaches.—Yield one-half average crop; but the prices obtained were so much higher than usual that the crop realized as much money as have the average crops for the past few years.

Grapes.—One hundred and ten per cent.; quality of fruit fine; price two cents per pound.

We are of the opinion that two or three canning factories in the county would pay well and afford a good market for tomatoes, which can be largely grown, as our soil produces a fine quality.

Hay-crop extremely light ; prices from \$14 to \$18 per ton.

Under the auspices of the State Board, Farmers' Institute was held November 27th and 28th, at Millstone, conducted by Secretary Dye, at which time Mr. James E. Rice, of New York, made instructive and entertaining addresses upon the following topics: "Increasing the Productivity of the Soil by Crop Rotation, Cultivation, Corn Crops and Chemicals," "The Farmer's Poultry, Housing, Feeding, Breeding," "Home-made Fertilizers, Their Use and Abuse," "Production and Care of Fruit," all illustrated by charts, models, photographs and formulas.

Secretary Dye certainly used discretion in providing us with this able and instructive lecturer, and all who heard him are desirous of hearing him again. At this meeting the address of Prof. Voorhees upon "The Diary—How to make it Profitable," opened the eyes and ears of our farmers and caused them to wonder if it were possible to produce like results in our county. His statements would have been received with a degree of doubt were it not for the fact that he is a native of our county, and we produce only men of veracity in Somerset. His practical experience is very valuable, and it is a pity that so few, comparatively, avail themselves of the privilege of such lectures.

There are no abandoned farms in this county. The price of farmlands is about the same as last year, except in Bernards and portions of Bedminster townships, where very high prices prevail, farms with ordinary buildings selling for \$50 to \$200 per acre.

There has been built by the county, under the State aid act, about 25 miles of stone roads, and petitions are on file to build at least 50 miles more, an application having been made and accepted to build a county road from Somerville to Far Hills, which, when completed will, with the exception of about four miles in Hillsborough township, make a continuous stone road from Trenton to Morristown. This, while making taxes temporarily higher, certainly enhances the value of farms, giving our farmers better roads for marketing.

About the same number of milch cows are kept as last year, and better prices are obtained for milk. The creameries are paying higher prices than last year, and we think that our farmers are now passing through their most stringent times, and that the outlook is more encouraging ; but our farmers in Somerset county, as elsewhere, must, in order to protect themselves, organize and combine.

Sussex County.

OFFICERS FOR 1900.

<i>President</i>	NELSON DEWITT.....	Deckertown.
<i>First Vice President</i>	THOMAS ROE.....	Augusta.
<i>Second Vice-President</i>	LEBENS MARTIN.....	Deckertown.
<i>Treasurer</i>	GEORGE VANDRUFF.....	Deckertown.
<i>Secretary</i>	WILLIAM H. LEPORT.....	Deckertown.

DELEGATES TO STATE BOARD—W. H. Leport, two years; J. A. McBride, one year.

The Sussex County Board of Agriculture has held three meetings the past year. Though there was an average attendance, the farmers do not seem to take the interest that they used to take in the meetings when the board was organized in 1886. At that time, and for a number of years afterward, the meetings were well attended, and the board was composed largely of the most progressive and influential farmers of the county. But as they passed away the younger farmers who have taken their places take but little interest in the meetings, and if we cannot in some way arouse the farmer to take more interest in the meetings the organization in a few years will have to cease.

The two institutes, held under the direction of the State Board of Agriculture, one at Deckertown and one at Branchville, were largely attended. The lecture on "Dairying," by Dr. George M. Twitchell, was just such information as is needed by our dairy farmers. Similarly for fruit, the address of J. H. Hale, the king of peach growers, attracted and enlightened our peach producers.

The lecture on poultry and egg production, by Mr. Rice, was up to his usual high standard. Professor Voorhees gave us a knowledge of our Experiment Station work, not hitherto presented here, while Professor Smith enlightened us in relation to our insect enemies and how to treat them. Our farmers should show their appreciation of this work by a much larger attendance, as no one who expects to keep up with the requirements of his business cannot afford to lose such valuable instruction by practical men.

The season 1899 was very unfavorable in the first part of the year, being cold and wet from the middle of May until the first of July. It was very dry and continued cool weather which retarded the growth of nearly all crops.

Wheat was about an average crop, though the drought in the spring affected it some. The price has been good. The fall sowing is looking fine.

Rye is about an average crop, though the straw is short.

Oats.—Not more than one-half of crop, owing to the extreme dry weather.

Buckwheat.—Product low, as the acreage is much less than in former years.

Corn was a good crop and there was a large planting for fodder to take the place of hay.

Hay was only one-third of a crop.

The *Peach* industry is one of the largest of the county, but the crop was almost a complete failure this year.

Small Fruits were generally a good crop, excepting strawberries, which were injured by the dry weather and late frosts.

Dairying, the leading occupation of this county, is doing better than usual, owing to the scarcity of butter, so that both milk and beef are bringing better prices.

The *Poultry* business is still increasing and seems to be one of the most remunerative occupations of the farm.

Farm help and how to obtain it is one of the farm problems yet to be solved, as it becomes more scarce every year, and wages are high compared to what the farmer receives for his labors and products.

Union County.

OFFICERS FOR 1900.

President E. P. BEEBE Elizabeth.
Secretary and Librarian F. E. WOODRUFF Cranford.
Treasurer OGDEN WOODRUFF Elizabeth.

BOARD OF DIRECTORS.

D. G. FINK Westfield.
J. E. BREWER Westfield.
D. F. MAGIE Lorraine.

DELEGATES TO STATE BOARD.

JOHN O. MAGIE (two years) Elizabeth.
F. E. WOODRUFF (one year) Cranford.

REPORT.

BY THE SECRETARY.

The Union County Board of Agriculture has held six meetings during the year. The interest shown by farmers in this Board has perhaps been less than formerly, and there has been a slight decrease in the average attendance. The subjects discussed at our meetings were "The Dairy," "Sheep Raising," "Protection of Birds," "New Seeds and Fruits," "Corn and Potatoes—New Varieties and Method of Cultivation." Our Board numbers about twenty-five members, and no new ones have been added during the past year. It seems to be very hard to get farmers to attend. They seem to prefer to stay at home and use the same old methods, instead of spending a little time now and then in exchanging ideas and getting informed as to new ones at farmers' meetings. The towns and cities of our county are being linked together by the new trolley system, which will give our farmers better traveling accommodations, and we hope may tend to increase our attendance and membership.

The past year has not been a very prosperous one to those dependent entirely on the farm crops; but many of our farmers have had work for their teams at \$4 per day on the trolley roads, stone roads, etc., that have been built during the past year, and I think, as a rule, they are a little better off than a year ago. Farm help has been unusually scarce and high, owing to the demand for a very large number of laborers on the new trolley and other public works almost the entire season.

CROP REPORT.

The extreme drought in May, June and part of July was the means of shortening many of the crops very much. Potatoes and hay were especially affected. Potatoes came up well and never looked finer in the early season; but the extreme drought and hot winds in June shortened the crop to fifty per cent. of last year. Hay was perhaps the shortest crop ever produced in the county, and was fifty per cent. of last year. Cereals are not grown to any extent in this county, but they were about an average crop, with two exceptions, corn and oats. Corn was exceptionally fine and yielded ten per cent. more than last year. Oats were very short, both in grain and straw, and yielded forty per cent. less than last year. Apples were a very large crop, being seventy-five per cent. better than last year. Pears fifty per cent. less than last year. Peaches thirty per cent. more. Strawberries sixty per cent. less, and were never known to be so low in price, averaging about four cents a quart. Cabbage and tomatoes were about the same as last year, both yielding large crops. The past fall has been exceptionally fine for harvesting crops and for winter grain and grass, which never looked finer.

Thanking God for the degree of prosperity with which He has blessed us, we look forward to a still more prosperous year.

Warren County.

OFFICERS FOR 1900.

President. WILLIAM C. ADDIS.....Delaware.
Vice-President......NICODEMUS WARNE.....Broadway.
Secretary WILLIAM EUGENE OBERLY.....Broadway.
TreasurerOWEN OBERLY.....Stewartsville.

DIRECTORS.

W. O. WARD.....Hainesburg.
S. READMount Hermon.
A. D. ROSEBERRYBelvidere.
HENRY PURSELLPhillipsburg.
A. F. RUSH.....Stewartsville.
DANIEL FITTSWashington.
ALBERT FLEMING.....Stephensburg.

DELEGATES TO STATE BOARD.

WILLIAM E. OBERLY (two years).....Broadway.
WILLIAM C. ADDIS (one year).....Delaware.

REPORT.

BY THE SECRETARY.

The Warren County Board of Agriculture has held four meetings during the past year, which have been well attended. The farmers are showing more interest in them, and find that it is to their benefit to attend and discuss the different subjects presented at the meetings. Topics discussed: "Cultivation and Raising Potatoes," "How to Treat Our Farms to Get the Best Results," "What Is the Present Prospect for Farmers?" and "Why Should Land Depreciate So in Value?" At the annual meeting officers were elected for the ensuing year, also new members were added to our roll at each meeting.

Wheat was about an average crop; price, 70 cents. Rye an average crop. Oats were above an average crop. Hay was very short on account of dry weather. Potatoes were a good crop in the northern

part of the county, and fair in other sections. Apples, medium yield. Pears, fair average crop throughout the county. Peaches were about a total failure. Strawberries an average yield, with moderate prices. Raspberries, blackberries and grapes a full crop. Tomatoes, fair yield. Late cabbages, good crop. Milch cows—there is demand for good butter cows, and raising young stock is now very profitable. Pork has been profitable, with steady market. Poultry is very profitable; in fancy stock, a large number of first awards came to exhibitors from this county. Sheep prices are low, and not much demand. Farm help very scarce, owing to the cement industries.

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