

STATE OF NEW JERSEY.

Fortieth Annual Report

OF THE

State Board of Agriculture

1912.

NEW JERSEY STATE LIBRARY

Printed by Order of the Legislature.

Letter of Transmittal.

To the Hon. Woodrow Wilson, 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 1912.

FRANKLIN DYE,
Secretary.

Dated Trenton, December 18th, 1912.

State Board of Agriculture.

OFFICERS AND EXECUTIVE COMMITTEE FOR 1913.

PRESIDENT.

JOS. S. FRELINGHUYSEN.....Somerville, N. J.

VICE-PRESIDENT.

JOHN T. COX.....Three Bridges, N. J.

SECRETARY.

FRANKLIN DYE.....Trenton, N. J.

TREASURER.

A. J. RIDER.....Hammonton, N. J.

GEORGE E. DeCAMP.....Roseland, N. J.

THEODORE BROWN.....Swedesboro. N. J.

J. HARVEY DARNELL.....Masonville, N. J.

STATE ENTOMOLOGIST.

THOMAS J. HEADLEE, Sc. D.....New Brunswick, N. J.

STATE CHEMIST.

CHAS. S. CATHCART.....New Brunswick, N. J.

BOARD OF DIRECTORS.

New Jersey State Board of Agriculture.

CLASS A.

P. KENNEDY REEVES, Bridgeton, N. J..... Geological Survey.
 HON. D. D. DENISE, Freehold, N. J..... } Board of Visitors, Agricultural
 HON. E. T. GILL, Haddonfield, N. J.... } College.
 DR. J. G. LIPMAN, New Brunswick, N. J.. Prof. of Agriculture.

CLASS B.

GEO. W. F. GAUNT, Mullica Hill, Master of State Grange, P. of H.
 JOHN T. COX, Three Bridges, Secretary of State Grange, P. of H.

CLASS C.

J. W. DOBBINS, State Horticultural Society.
 ALBERT I. ACKERMAN, Ridgewood, Bergen Co., Pomona Grange.
 HERMAN COSHAW, Burlington Co., Pomona Grange.
 MARTIN SHUBERT, Camden and Atlantic Co.
 JOSEPH CAMP, Pierten, Cape May Co., Pomona Grange.
 R. R. SMITH, Leesburg, Cumberland Co., Pomona Grange.
 OSCAR DeCAMP, Roseland, Centre District, Pomona Grange.
 WILLARD B. KILLE, Swedesboro, Gloucester Co., Pomona Grange.
 JOS. BODINE, Flemington, Hunterdon Co., Pomona Grange.
 Mercer Co., Pomona Grange.
 WM. FITZ RANDOLPH, New Market, Middlesex and Somerset Co.
 D. H. JONES, Freehold, Monmouth Co., Pomona Grange.
 LINWOOD BORTON, Salem Co., Pomona Grange.
 GEO. W. VAN HORN, Newton, Sussex Co., Pomona Grange.
 VAN YOUNG, Phillipsburg, Warren Co., Pomona Grange.

BOARD OF DIRECTORS.

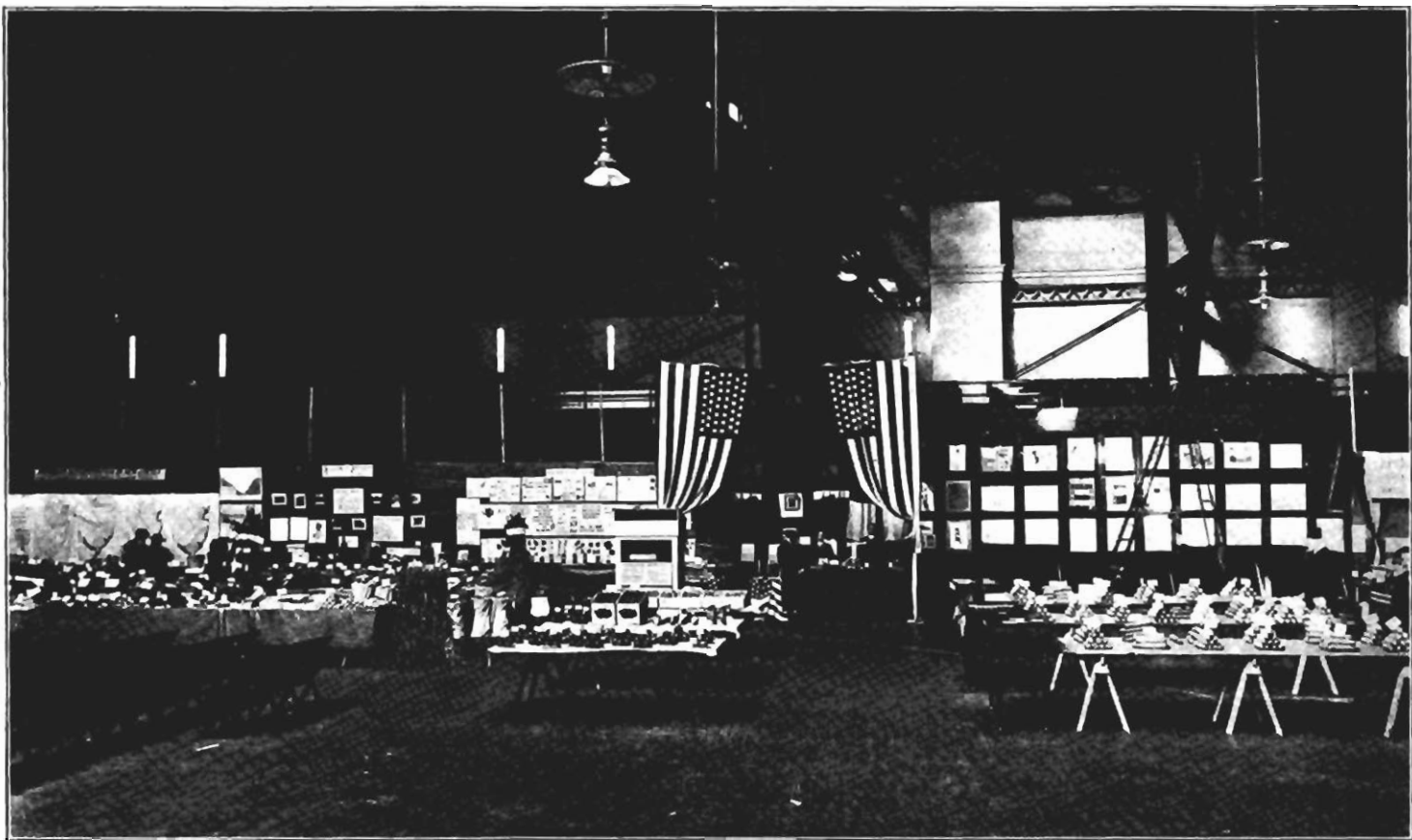
NAME.	ADDRESS.	TERM.	COUNTY.
JOHN H. HUENKE, SR.,	Egg Harbor City,.....	2 years.	Atlantic.
CARL SCHIRMER,.....	Egg Harbor City,.....	1 year.	"
ARTHUR LOZIER,.....	Ridgewood,	2 years.	Bergen.
J. F. BOMM,.....	Westwood,	1 year.	"
FRED LIPPINCOTT,.....	Moorestown,	2 years.	Burlington.
HENRY S. LIPPINCOTT,...	Moorestown,	1 year.	"

STATE BOARD OF AGRICULTURE.

NAME.	ADDRESS.	TERM.	COUNTY.
EDWARD GARWOOD,	Ashland,	2 years.	Camden.
HARRY HERFF,	Berlin,	1 year.	"
R. D. MALTBY,	Woodbine,	2 years.	Cape May.
RALPH SCHEILLINGER,		1 year.	"
ALLEN D. ACKLEY,	Deerfield,	2 years.	Cumberland.
ARTHUR P. SEABROOK,	Bridgeton,	1 year.	"
JOS. H. M. COOK,	Essex Fells, 70 Cortlandt St., N. Y.	2 years.	Essex.
HENRY F. HARRISON,	Caldwell,	1 year.	"
AARON B. SUMMERS,	Mickelton,	2 years.	Gloucester.
WILLIAM GLEASON,	Swedesboro,	1 year.	"
GEO. D. BUSHFIELD,	Stanton,	2 years.	Hunterdon.
F. J. TOMLINSON,	Pittstown,	1 year.	"
CHAS. E. RUE,	Windsor,	2 years.	Mercer.
JOHN W. HENDRICKSON,	Trenton, R. F. D. 1,	1 year.	"
WM. B. KURTZ,	Bound Brook,	2 years.	Middlesex.
LEWIS D. WALKER, JR.,	New Market,	1 year.	"
CHAS. C. BASLEY,	Farmingdale,	2 years.	Monmouth.
F. P. JONES,	Freehold,	1 year.	"
GEO. E. FELCH,	Florham Park,	2 years.	Morris.
S. E. YOUNG,	Florham Park,	1 year.	"
JOHN W. JAMISON,	Cassville,	2 years.	Ocean.
R. C. GRAHAM,	Holmeson,	1 year.	"
FRED BERDAN,	Paterson, R. F. D. 1,	2 years.	Passaic.
FRANK TORBETT,		1 year.	"
GIFFORD CHRISTSEN,		2 years.	Salem.
M. W. BUSBY,	Hancock's Bridge,	1 year.	"
GEO. B. RANDOLPH,	Bound Brook,	2 years.	Somerset.
J. D. QUICK,	South Branch,	1 year.	"
JAMES H. AYRES,		2 years.	Sussex.
J. E. DICKERSON,	Branchville, R. F. D. 2,	1 year.	"
HART S. VAN FLEET,	Roselle Park,	2 years.	Union.
E. R. COLLINS,	Westfield,	1 year.	"
CHAS. M. OBERLY,	Phillipsburg,	2 years.	Warren.
JAS. I. COOK,	Delaware, R. F. D.,	1 year.	"

OTHER ASSOCIATIONS.

J. D. HOLMAN,	Whitesville,	Mount Laurel Farmers' Club.
EZRA EVANS,	Marlton,	American Cranberry Growers' Association.
E. S. CARR,	New Egypt,	N. J. Bee Keepers' Association.
		Veterinary Medical Association of New Jersey.
		N. J. League of Poultry Raisers.
CHAS. VAN NUIS,		E. B. Voorhees' Agricultural Club.
		Princeton Agricultural Club.
EDGAR G. WURTZ,		Mercer County Farm Bureau.
		(Admitted Jan. 8, 1913.)
		Farm Bureau of Sussex County.
		(Admitted Jan. 9, 1913.)
		The Somerset County Holstein-Fresian Association.
		(Admitted Jan. 9, 1913.)



Section of Exhibits of Farm Crops at Fortieth Annual Meeting.

PROCEEDINGS
OF THE
FORTIETH ANNUAL MEETING
OF THE
NEW JERSEY STATE BOARD OF AGRICULTURE
HELD IN THE
SECOND REGIMENT ARMORY, TRENTON, NEW JERSEY,
TUESDAY, WEDNESDAY, THURSDAY and FRIDAY,
JANUARY 7, 8, 9, 10, 1913.

STATE BOARD OF AGRICULTURE

FORTIETH ANNUAL MEETING

FIRST DAY—MORNING SESSION.

Tuesday, January 7th, 1913.

The meeting of the Board was called to order in the Second Regiment Armory on the morning of January seventh, at 10:00 A.M., by President Frelinghuysen.

Prayer was offered by Rev. Judson Conklin of the Clinton Avenue Baptist Church, Trenton.

President Frelinghuysen—The next matter in order is the calling of the list of delegates. The Secretary called the list of delegates. (See page 7.)

President Frelinghuysen—There has been a request for representation by a delegate to the State Board of Agriculture from the Farm Bureau of Mercer County, what will you do with it?

A Delegate—I move that the request be granted.

This motion was seconded.

President Frelinghuysen—Would it not be better to refer it to the Credentials Committee when appointed?

This suggestion was accepted by the mover and seconder of the former motion, and on a vote the request was referred to the Credentials Committee when appointed.

President Frelinghuysen—The next matter in order is presenting the Order of Business. The Secretary will present the Order of Business.

Secretary Dye—Mr. President, I think the members have all got a copy of the programme which covers the four days or nearly four days. I do not know of any change. All the speakers engaged have signified their intention to be here and we can expect a feast of fat things.

The following Order of Business was adopted:

STATE BOARD OF AGRICULTURE.

ORDER OF BUSINESS.

January 7th, Tuesday.

FIRST SESSION.

GENERAL BUSINESS.

10:00 A. M. to 12:30 P. M.—Prayer.

Calling roll of delegates. All delegates are requested to be present at the opening session.

Presenting Order of Business.

Presenting Minutes of last meeting.

Announcing Committees appointed:

On Credentials.

On Resolutions.

On Treasurer's Accounts and any other Committees.

10:30 A. M.—Report of Executive Committee.

Report of State Grange, Hon. G. W. F. Gaunt, W. M.

Report of Treasurer, Prof. A. J. Rider.

Report of Secretary, Franklin Dye.

Report of Committee on Transportation and Freight Rates, E. R. Collins, Chairman.

11:30 A. M.—“Horse Breeding in New Jersey.” A report of progress. Prof. F. C. Minkler.

SECOND SESSION.

2:00 P. M. to 5:00 P. M.

Election of Nominating Committee of one member from each County, to nominate officers for ensuing year.

Introduction of new business.

2:30 P. M.—The Road Situation in New Jersey. Col. E. A. Stevens, Road Commissioner.

3:30 P. M.—Suggested Automobile Legislation. Hon. Job H. Lippincott, State Commission on Motor Vehicles.

4:30 P. M.—Report of the E. B. Voorhees Agricultural Society. Chas. Van Nuis.

THIRD SESSION.

7:30 P. M.—Poultry Session.

“Diseases of Poultry.” Prof. Philip B. Hadley, Biologist, R. I. Experiment Station.

8:15 P. M.—“The Poultry Industry of the United States.” Prof. H. R. Lewis, Prof. Poultry Husbandry. State Agricultural College, New Brunswick, N. J.

(The two above lectures illustrated with stereopticon slides.)

January 8th, Wednesday.

FOURTH SESSION.

SOILS AND FERTILIZERS.

9:30 A. M. to 12:30 P. M.

Prayer.

Calling roll of absentees and report of Committee of Credentials.

Introduction of New Business.

10:00 A. M.—Soy Beans as a Farm Crop. Dr. J. G. Lipman.

10:45 A. M.—Maintenance of Soil Fertility. Dr. C. E. Thorne, Director Ohio Experiment Station.

ORDER OF BUSINESS.

13

- 11:30 A. M.—Some Interrelations of Crops, Fertilizers and Soils. Dr. H. J. Wheeler, Kingston, R. I.

FIFTH SESSION.

- 2:00 P. M. to 5:00 P. M.

Address of President of the State Board of Agriculture. Hon. Jos. S. Frelinghuysen.

POTATOES.

- 2:45 P. M.—Insects Injurious to Potatoes. Dr. Thomas J. Headlee, State Entomologist.
3:45 P. M.—Potato Production from Experience. The largest crop at least expense. Dr. Geo. M. Twitchell, Monmouth, Me.

SIXTH SESSION.

- 7:30 P. M.—Lessons from the New York Land Show. Prof. M. A. Blake, Supt. N. J. Exhibit.
8:15 P. M.—Disease Affecting Potatoes. Dr. Mel. T. Cook, State Plant Pathologist.

(Illustrated with Stereopticon Slides.)

January 9th, Thursday.

SEVENTH SESSION.

DAIRY MATTERS.

- 9:30 A. M. to 12:30 P. M.—Prayer.

Unfinished Business.

Introduction of New Business.

- 10:00 A. M.—The Business End of the Milk Pail. Dr. Geo. M. Twitchell.
10:45 A. M.—Report of Commission on Tuberculosis in Animals.
11:00 A. M.—Address by Dr. B. T. Woodward, Bureau of Animal Industry, Washington, D. C.
"The Tuberculin Test and the Use of Slightly Affected Tubercular Animals for Human Food."

EIGHTH SESSION.

- 2:00 P. M. to 5:00 P. M.

Scientific Feeding of Dairy Cattle Simplified. Dr. H. E. Van Norman, Prof. Animal Husbandry, Penna. State Agricultural College.

AGRICULTURAL COLLEGE AND EXPERIMENT STATIONS.

- 3:00 P. M.—"The Agricultural College and the State of New Jersey." Dr. W. H. S. Demarest, President.
3:30 P. M.—"The Organization of Agricultural Extension Work." Prof. Alva Agee, State Agricultural College.
4:15 P. M.—Report of Committee on Resolutions and other Reports.

NINTH SESSION.

- 8:00 P. M.—"Canada from Ocean to Ocean." (Fully illustrated with stereopticon views.) L. O. Armstrong, Dept. of Natural Resources, Montreal, Quebec.

NOTE.—This lecture will be instructive and entertaining. It will show us some of the beauties and resources of the North Land and also our competitors in agricultural work.

January 10th, Friday.

- 9:30 A. M.—Prayer.
Unfinished Business.
Reports of Committees.
10:30 A. M.—Rural School Problems. Dr. C. N. Kendall, Commissioner of Education.
11:15 A. M.—The U. S. Weather Bureau—What it Means to the Farmer. Prof. Willis L. Moore, Chief of the Bureau, Washington, D. C.
Closing business of the meeting.

President Frelinghuysen—The next matter in order is presenting minutes of the last meeting.

On motion the reading of the minutes was dispensed with.

President Frelinghuysen—The next business in order is the announcement of the committees appointed, and by virtue of the authority given me by the Executive Committee I appoint the following committees:

Credentials—Willard Kille, C. C. Basley, Geo. E. Felch.
Treasurer's Accounts—Geo. E. DeCamp, J. Harvey Darnell, Wm. Gleason.
Resolutions—Aaron B. Somers, J. D. Holman, Aaron Lozier.
Transportation—E. R. Collins, J. T. Allison, J. Harvey Darnell.

President Frelinghuysen—The next order of business is the report of the Executive Committee. I request the Vice-President to read this report.

Vice-President Cox then read the report of the Executive Committee as follows:

Report of Executive Committee.

The Executive Committee held twelve meetings in 1912.

January 19th. Matters connected with the work of the Plant Pathologist were considered.

January 19th. The Assistant to the Plant Pathologist was appointed for two months and Dr. Mel. T. Cook was authorized to procure lantern slides for illustrating lectures at Farmers' Institutes, at an expense not to exceed \$100. The State Entomologist was also authorized to expend \$100 for the purchase of book cases and desks for their new office, as requested by Dr. John B. Smith. Mr. H. B. Weiss was appointed Acting State Entomologist owing to the death of Dr. J. B. Smith and was authorized to sign Inspection Certificates and to carry on official business in that department, temporarily. A report from Mr. Carr covering Bee Inspection work for the month was read and placed on file, also the report of Mr. Weiss as Assistant Entomologist. Mr. A. L. Clark was appointed to collect poultry census of the State, and give lectures on poultry and egg production in different parts of the State covering the months of March and April, total number of lectures to be forty. At this meeting the dates for the 40th Annual Meeting were made January 7, 8, 9, 10, 1913. Arrangements were

REPORT OF EXECUTIVE COMMITTEE.

15

made with the Manager, Mr. Gilbert McClurg of the Land & Irrigation Commission, for the purchase of space for the New Jersey exhibit, subject to the bill then in the Legislature being signed by the Governor and having the approval of the Appropriation Committee, and also being included in the Appropriation Bill.

May 2nd. The matter of holding the next Annual Meeting in the Armory was discussed. The Secretary was authorized to find probable cost of rental of Armory and to arrange for a general exhibit of farm products. The Field Meeting in New Brunswick was discussed and date left to the Secretary and Dr. Lipman. The reports of Mr. Weiss and Dr. Cook were received and filed. A resolution on the death of Dr. J. B. Smith was prepared and adopted.

May 10th. The question as to whether the State Board of Agriculture could co-operate with the State Board of Education in holding a Summer School of Agriculture for Teachers, in the State Agricultural College at New Brunswick, was discussed. While the Committee favored such a proposition, it was not approved by the Comptroller, and hence was not carried out.

June 25th. The Executive Committee met at the College Farm, New Brunswick, during the Field Meeting. An Assistant to the Plant Pathologist was appointed, subject to Civil Service examination. Delegates were appointed to the next meeting of the American Association of Farmers' Institute Workers. Matters relating to the Armory and an exhibit at the Annual Meeting were discussed. Mr. Weiss' monthly report was read and filed. Replies from Congressmen in relation to our resolution concerning Parcels Post were ordered to be printed in the newspapers. A Committee was appointed to arrange for a Field Day in South Jersey in the interest of the Italians and Jews, addresses to be made in their own language.

September 9th. Terms were received from Col. H. M. Reading, covering the use of the Armory for the Annual Meeting, and a Committee at the request of the Secretary to gather and set up an exhibit was appointed consisting of the entire Executive Committee with Dr. Lipman, Prof. Blake and President Jos. Barton, of the State Horticultural Society. Authority was given to publish a pamphlet setting forth the fruit and crop productions of the State as requested by Prof. Blake, 5,000 copies to be printed. Dr. Lipman, being present by invitation, stated the possibility of securing Prof. Agee of Pennsylvania State College as Superintendent of Farm Extension Work in this State, providing the Executive Committee could pay part of his salary as Conductor of Farmers' Institutes. The Committee favored the proposition if the way be clear, and Dr. Lipman was authorized to engage Prof. Agee for this work. At this meeting the Annual Appropriation to the State Horticultural Society and the various County Boards for their reports were made.

October 2nd. The final report of Mr. Weiss as Acting Entomologist was accepted and filed. The President, Secretary and Treasurer were authorized to interview the Road Commissioner and the Commissioner on Motor Vehicles and ask them to present the question of roads at the Annual Meeting. Mr. Chas. Van Nuis was engaged to take charge of collecting and setting up exhibits at the Annual Meeting. Mr. Dengler was engaged to act as Stenographer at the Annual Meeting. Dr. T. J. Headlee, successor to Dr. Smith as State Entomologist, was introduced to the Committee, and reported that his office supplies were insufficient for the workings of his department. He presented a list of articles needed, whereupon he was authorized to make the purchases, so far as the available funds would permit. Both Dr. Headlee and Dr. Cook were required to file an inventory of the property in their offices belonging to the State of New Jersey, with the Secretary of this Board.

October 18th. A new form of expense voucher presented by the Secretary was ordered printed.

October 28th. Dr. Headlee, State Entomologist, was present and presented a request for authority to employ several temporary assistants for the inspection of nursery stock from Belgium, which was found to be infested with the Gypsy Moth. The request of Dr. Headlee was granted so far as the present appropriation would allow—temporary assistants for two months and for four

Large areas that were reduced by ignorant practice to a profitless condition have been and are being restored to profitable production, and the wasted land that was made barren is now yielding golden harvests of human food.

If it were not so, our case as a people would be deplorable indeed, but in the light of present progress the future is bright with hope. Gloomy forebodings and prophecies concerning our future food supply may now be banished. We have entered upon a new era in farming affairs, the outlook for a fair reward for good work is encouraging. Our farmers may now go forward with firm purpose and clear vision, using the knowledge available and applying the essential rules of rational farm practice in the manipulation of the soil for the production of our various farm crops, in the improvement of farm stock and the perfecting of our market garden and fruit crops.

THE FOOD SUPPLY.

Intimately connected with, in fact absolutely dependent upon the success of the farmer, are the multitudes engaged in other occupations, and it is worthy of note that when agricultural production exceeded the demand and prices of farm products were so low that the farmers received but little if any profit from their business—agriculture and the farmer received little, if any, consideration from those not engaged in it. But when prices advanced, owing to increasing demand, the importance of the farming business to the general welfare assumed a prominence in public thought and consideration not hitherto expressed. The trend of thought seems to be that if we have better farming we will have larger crops, and thus lower prices for farm products. To hasten the realization of a purpose so desirable, public-spirited men are contributing generous sums for the employment of farm experts for the teaching of better methods and practice in agricultural work and a better understanding of soils and what they require. This is well as far as it goes, but in order to produce more from our farming lands the farmer needs and must have more farm help, and help that is comparatively intelligent, with some knowledge of farming affairs. To secure such help we are told by the wise ones who know nothing by experience of the farming business, "the farmer must pay higher wages for his help, that he is paying the same wages now that were paid years ago." etc., but if the farmer is to do this he must receive a larger price for his products. The average price received by the farmer for his goods is not large. The price paid by the consumer, so much greater generally than the farmer receives, is the toll paid for transportation and handling. It must be remembered too, that the value of gold is much lower now than it was a few years ago, and that it takes more of it to buy the same product now than was necessary then.

The Tribune Farmer in the January 2nd issue discussing the gift of the International Harvester Company, and the employment of Prof. Holden as an expert to instruct the farmers how to produce larger crops, endeavors to show that the profit to the farmer for his work is in the inverse ratio to the size of the crops produced, (see page 7) and says:

"Fruit and vegetables have been surpassingly abundant this year, but the prices have been ruinously low. Thousands of carloads have not returned cost to the growers, and hundreds of carloads spoiled in the fields because there did not appear to be a market. But this was not the case. The trouble was the markets were not known and the producers did not know how to reach them."

We do urge that all these good intentioned people study this problem from the other side of agriculture, too—the marketing side.

Leslie's Magazine, January 2nd issue, says:

A NATIONAL MARKET BUREAU.

"B. F. Yoakum, chairman of the Frisco lines, who has shown a deep and intelligent interest in the problems of the farmer, advocates a National Market Bureau under the Agricultural Department. As matters now stand the farmer

SECRETARY'S ANNUAL REPORT.

19

is the victim of the buyer, the ultimate consumer is compelled to pay a high price for farm products because of the number of hands they pass through, while the railroads are unjustly held responsible for robbing the farmer through excessive freight rates. By Mr. Yoakum's suggestion farmers would be kept in daily touch with the markets of their products through a department that would furnish prices of the different markets and the cost of shipping.

"Mr. Yoakum traced a carload of fine watermelons from Oklahoma to Minneapolis and St. Paul. The farmer put 1,050 melons in the car, receiving from the buyer \$52.50 or 5 cents a watermelon. Such a price did not pay the expense of raising the crop, but for the sake of getting a little ready money the farmer shipped them. For the 600 mile haul to Minnesota, the railroad received \$75 for the car, or $7\frac{1}{2}$ cents a melon. This added to the 5 cents paid the farmer made a cost of $12\frac{1}{2}$ cents a melon when landed in Minnesota or \$131 that the producer and the railroad received. The ultimate consumer paid from 60 cents to 75 cents apiece for the melons or from \$630 to 750 for the carload. Here we have from \$500 to \$600 divided up among buyer, commission merchant and retailer. Such profits and such a division of profits represent a condition that is not fair to the farmer, the railroad or the consumer."

The Country Gentleman of January 4th says:

KEEP IT UP.

"Long Island farmers were receiving from forty-five cents to a dollar a barrel for cauliflower. They sent tracers to New York and found that the commission merchants were getting \$3.50 and \$4.50 and even more.

"Their spokesman at the meeting of the State Committee for Co-operation made the statement. He added: 'The same thing is true all along the line, potatoes, beets, onions, carrots, corn, milk.' He roasted the commission men and their exchanges.

"Some of these bodies came back with stiff letters, but the Long Islanders had their fighting clothes on. They charged that the New York middlemen are the most rapacious in the country—that they are so notorious that the wise shipper has now eliminated New York unless he has a surplus. 'In New York the stuff passes through four or five men; in one case it passed through seven men, and each took a whack at it. Ezra Tuttle's Lima beans brought him 30 to 40 cents a bushel, and were sold for \$4.50 to the consumer.' Against the dignified denials of the exchange officials the farmers piled specific instances—and there was no getting away from the facts.

"Now this is good work—it is very good work. In different forms it is going on all over the country, a new national agitation. It means that the truth is struggling into the open. There are some exaggerations, some misunderstandings, some mistakes, but the total gain is fine, and already we are seeing a threefold result; the farmer is getting awake; the middleman is getting scared; and the consumer is getting wise.

"And from this new education will come better marketing from the farms and more direct buying from the cities. Good work? Of course it is. Keep it up."

A friendly discussion of this entire question is desirable, but a malignant assault on the farmer as being responsible for the higher cost of food, and unwilling to do anything to relieve the situation is contemptible, and shows incusable ignorance, or a desire to misrepresent.

The New York Times has persistently antagonized the farming interests. In a recent issue however it published the following:

"A week ago 125 carloads of cabbage reached the Pittsburgh market. The wholesale price rapidly tumbled, and finally carloads were offered for the freight charges, amounting to \$8. Cabbages were sold for \$1 a wagon load, and the buyer was allowed to pile the wagon as high as he could. Notwithstanding this only six carloads were sold and the rest rotted. According to information reaching the Chamber of Commerce, while this was happening the retail price of

cabbage was the highest ever known here. A two and one-half pound head of cabbage was sold by grocers for eight cents. It is estimated that the grocer's profit was 540 per cent. if he paid the market quotation of 50 cents per 100 pounds, but if he bought a two-ton wagon load for \$1 he made 6400 per cent.

"That tallies with our own information as regards many of the large markets. We have for years watched the potato crop, only to find that the price to consumers varies but little whether the farmers receive 30 cents or 90 cents at their station. The middlemen and handlers will hold up the consumer's price whenever they can. Yet the Times has been insisting that the farmers are responsible for high prices and that the railroads and middlemen are benefactors. Such papers are great advocates of the 'two heads of cabbage' theory. According to their logic the great trouble was that there were not 250 cars instead of 125! The Times knows very well that while the farmers got nothing for that cabbage the railroads demanded pay for hauling every carload!"—Rural New Yorker.

We need more farmers. The trend of farmer boys for a number of years past has been away from the farm. The hope is now entertained that with the increasing facilities for securing agricultural education, and the large numbers of young men seeking it, most of these will become real farmers. If this hope is fulfilled we need have no fear for an abundance of all the crops our farms are capable of producing. When the tens of thousands of acres of now unimproved and unproductive land are brought into profitable production, the addition to our marvelous yields of farm crops will exceed present computation. Added to this will be the annually increasing yield per acre of our present farms. A few years hence, some of our important crops will be increased in their yield per acre from ten to fifty per cent. To contemplate such an increase, added to such a harvest of farm crops of the United States as is reported for 1912 is confusing. "This year's yield derived from American farms is estimated at about \$8,500,000,000. This mighty reservoir of wealth poured into the American pocket is a sufficient fact in itself to dazzle the imagination. It will probably take \$500,000,000 first and last, to move and market all these crops, which will be an operation of many months. They will pass from the farms to the great distributing and exporting centres in different parts of the country, keeping the railroads full of profitable business and overtaking their resources by their incessant pressure for outlet. From the export and distributing centres they will pass as the raw material of food or for manufacturing to the handling for ultimate use. At every stage of the chain of transactions they will employ great numbers of men. Beginning with the farm, it is estimated that 1,130,000 hands are employed and the final payroll that sums up to the total at harvest means 2,500,000 more men, who will have found in such a year as 1912 generous wages for many weeks. Four millions of men employed in the harvesting of a single year's crops, the thought itself is a stupendous presentment to the mind."—New York American.

They speak of the harvesting squad of 4,000,000 men, but what about that vastly greater army of men, women and boys who prepared the ground, planted and cultivated the crop and made it ready for market and transportation?

FARM WAGES.

As to farm wages, the truth is they have made a steady advance since 1840. Then for ordinary labor, the wage averaged fifty cents per day and for harvesting seventy-five cents, including board. In 1864-65 wages were \$16 to \$20 per month and board, for nine months, and \$1.00 per day for three months. The average wage rate per month with board in New Jersey in 1909 was \$22.06 per month, without board \$33.69. In the former case, lodging and necessary washing and mending, in case of single men, were included.

Reports from eleven counties for 1912 give the average wage per month with board \$22.33, without board \$34.72.

SECRETARY'S ANNUAL REPORT.

21

STATE BOARD WORK.

The various divisions of the work of this Board have been active in their several fields during the past year, concerning which brief statements follow.

That part of the work of the State Entomologist connected by law with this Board will be reported by Dr. Thomas J. Headlee, State Entomologist. So also the work of the Plant Pathologist by Dr. Melville T. Cook and that of Bee Inspection by Mr. E. G. Carr.

FEEDING STUFFS LAW.

The report on Inspection of Feeding Stuffs is herewith given.

The results of the feed inspection for the year 1911 were published in the Experiment Station Bulletin No. 243. This report shows that seven hundred and fifty-five (755) samples were received at the laboratory, all but thirty (30) of which were collected by a representative of this Station. The official sampler visited every county in the State, and as a result the samples taken represented the stock of one hundred and fifty-one (151) dealers and consumers.

The law of March 15, 1900, recognizes two classes of feeds, one requiring a guarantee of protein and fat, and the other is exempted from this requirement. Five hundred and forty-two (542) samples represented the class requiring a guarantee.

Five hundred and eighty (580) samples representing four hundred and seventy-five (475) different brands were analyzed, four hundred and eight (408) of which belonged to the guaranteed class. The results of these analyses show that three hundred and twenty-six (326) or eighty (80) per cent. of the guaranteed samples satisfied their guarantees. The report for the previous year shows that seventy-eight and one-half (78.5) per cent. of the brands satisfied their guarantees and a comparison of the two reports will show a little improvement during the past year.

The deficiencies found in the eighty-two (82) samples consisted of the following: Protein thirty (30), Fat thirty-eight (38), and in both Protein and Fat fourteen (14).

The annual inspections show that there has been an improvement from year to year, which is due to the close inspection as required by the laws of the several States. We are not confident, however, that this condition would have been caused by our State law, as we feel that it has been influenced to some extent, at least, by the requirements of the laws of the adjoining States, and as a result, we have secured an improvement in the character of the feeds sold.

Realizing these conditions and desiring to have requirements that would meet the conditions as they exist today, a new law was prepared and presented to the last session of the Legislature for action. This law became effective on December 1, 1912. There are several requirements included in the new law which not only will be a decided advantage to the consumer, but as a State, we will be better able to pass judgment on the character of the feeds offered for sale.

CHARLES S. CATHCART,
State Chemist.

FARMERS' INSTITUTES.

Regular Farmers' Institutes have been held, covering forty days in thirty-five localities. Most of these have been conducted by Mr. Chas. D. Barton with excellent results. The attendance and interest is increasing. Arrangements are completed for about twenty more meetings. Some of these in localities not visited hitherto. In addition to the regular Institutes, Lecturers have been employed to speak on corn growing at the Boys' Corn Growing Club and to judge the corn grown by the boys.

BOYS' CORN GROWING CLUBS.

A number of these have been organized in different parts of the State under different auspices. The Y. M. C. A. Secretaries have taken an active leading part in most of them, and in several of them the corn grown by the boys was exhibited and judged in connection with the Farmers' Institute. Dr. K. C. Davis has judged a number of such exhibits. This is a movement for interesting the boys of the farm in farming affairs, and it is working well. The stimulus of a prize for the best results creates abiding interest and encourages to best endeavor. It must be well to enlarge the list of crops to include some others with corn. It is quite possible that the work of the boys in this direction may stimulate their fathers to better work. An addition of one bushel per acre would add to our annual corn crop 290,000 bushels, which at 70 cents per bushel would mean \$203,000, and the same is true of all our farm crops. This Board in the judgment of the Secretary should take an active interest in work of this kind. We have talked much about our boys leaving the farm, let us do something practical to enlist their interest in this great business.

POULTRY INSTITUTES.

In the early spring, arrangements were made with the approval of the Executive Committee for holding a series of special poultry institutes throughout the State. The number actually held was 81, with a total attendance of 8,669, counting those present at one session only. For the most part the lectures at these meetings were given by Mr. A. L. Clark, Assistant in Poultry Husbandry at the State Agricultural College Farm. It is fair to presume that the interest in poultry and egg production has been increased and stimulated by these lectures.

Immediately following the 39th Annual Meeting last winter, two institutes in the interest of potato production were held, one in Freehold and one in Mullica Hill. The attendance was between 700 and 800 persons.

SIXTH SUMMER MEETING.

The 6th Summer Meeting was held at the College Farm by invitation of Dr. J. G. Lipman on June 25th. There was no abatement of interest, the attendance was large, the several addresses were listened to with marked attention, and the growing crops on the farm in the green house and in the poultry yards were inspected by the visitors with pleasure and profit.

FARMERS' WEEK.

This period of lectures and discussion of farming questions in the Short Course Building at the College Farm has become an annual occurrence. The Fifth meeting under this head was held December 30th, 1912, to January 4th, 1913.

COUNTY BOARDS OF AGRICULTURE.

Of these there are twenty organized. The majority of them are active for the improvement of agriculture in their respective counties. The number of meetings held is from one to four a year. These Boards could be made very useful to the farming interests of the State if a larger number of farmers would take an active interest in them. They are a part of our agricultural system and should prove their value by their usefulness.

SECRETARY'S ANNUAL REPORT.

23

FARM BUREAUS.

Following the eminently successful work of the late Dr. Knapp in improving agricultural methods in the Southern States, the U. S. Department of Agriculture is creating what is called Farm Bureaus in other States. Two at least, have been opened in this State. Their success as an aid to our farmers will depend upon the experimental as well as the theoretical knowledge of the man in charge, and his ability to enlist the confidence of the farmers, and with these the co-operation of the farmers themselves. It would seem that for greatest efficiency these Bureaus should in some way be organically connected with our established State Agricultural organization in order that the work of all might be so arranged and co-ordinated as to prevent useless repetition of work and avoid unnecessary expense.

CROP YIELDS AND VALUES.

The varied work of our farmers and fruit growers throughout the State has been carried forward with unabated energy, even though natural conditions were not always and everywhere favorable. The rains of the past season were unevenly distributed. In some sections of the State dry weather prevailed throughout the entire growing season, in others showers were quite evenly distributed, so that the requirements of the growing crops were met. Adverse weather and climatic conditions reduce the yield of the crops affected, there is added to these also the various insect pests, blights and plant diseases so that the work of the farmer to secure a paying crop is not always poetical.

For the State, however, the average yield of the various crops has been larger than last year. Corn is two bushels higher, wheat one-fourth bushel (which equals 27,750 bushels) higher. Rye two bushels, oats two bushels, white potatoes 16 bushels, sweet potatoes 8 bushels lower, hay 1-4 ton higher. The general range of prices was not so encouraging as last year. The most notable reduction being in white potatoes which last year was \$1.04 per bushel, this year seventy cents. Oats five cents per bushel lower, hay \$3.52 lower per ton, wheat five cents lower. The estimates made in Table I, are based on the same average as for 1911 with a slight increase in miscellaneous vegetables and fruits, and the additional value of the poultry and egg yields. On that basis the total returns exceed those of last year by \$1,635,873. For 1911 the total was \$67,715,872, for 1912 \$69,351,745—an excess of \$1,635,873 for 1912.

If, however, the decreased acreage in farm lands devoted to the various crops as given in the U. S. Crop Reporter for December, 1912, is taken as the basis, the total returns would be \$66,434,600 or \$1,251,272 less than in 1911. (See Tables I and II.) As a State, we are giving more attention each year to orchard and market garden crops, and these have a greater value per acre than the general farm products. If a correct return could be secured covering the yield and value of these I am quite sure the total value of all our farm crops would exceed that given in Table I.

The price of milk received by farmers, average from our reports, is wholesale 4.5 cents per quart, retail 8.8.

To the question "Is the spraying of fruit trees and vines to destroy injurious insects on the increase?" eleven answered "It is." Two only say "No."

There seems to be but little change in the acreage devoted to the several crops, although potatoes are on the increase. Commercial dairying is decidedly on the decline, many who were once prominent in the business have abandoned it.

The number of swine kept has declined somewhat. The average price for dressed pork as reported has been 10¼ cents.

There is a steady decline in the number of turkeys for breeding purposes, such flocks as were common years ago on most farms are not in evidence now. The average market price for dressed turkeys was \$24.9 the past season.

The farm population of chickens is steadily increasing. The average farm price for dressed chickens has been 18.6 cents.

The following report by Prof. H. R. Lewis made up from actual figures obtained in a special Poultry Census recently begun, and referred to in another part of this report, is of exceptional value in connection with this industry. It is far more comprehensive than any yet made covering the poultry business in this State. It is as follows:

THE POULTRY INDUSTRY. REPORT BY PROF. H. R. LEWIS.

Adult birds on farms.....	1,500,000
In cities,	750,000
Total adult birds,.....	2,250,000

Eggs laid by these birds in one year at an average of 100 eggs per bird, 18,750,000 dozen.

If these eggs were sold at an average of \$.25 per dozen, it would mean an income for eggs alone of \$4,687,500.00, but these eggs were used as follows:

4,500,000 dozen were used for hatching purposes where produced; 2,000,000 dozen were sold for hatching and 12,250,000 dozen were sold for eating purposes or consumed at home.

The income from or the harvest from these different sources are estimated as follows:

Sales from day old chicks \$12,000,000.

Eggs for hatching and breeding stock \$100,000.00.

Poultry sold for meat, this including old birds and surplus cockerels, \$2,000,000.00.

Eggs sold for eating purposes, \$3,060,000.00, making a total value of products produced of \$5,172,000.00.

Note.—The estimate for eggs sold for hatching and breeding stock is only an estimate, and I think I have it very low, owing to the fact of my personal knowledge the number of birds have been sold in the State during the past month for from \$50 to \$200.00, and there are a number of such birds.

The following figures show to date some of the results of our census work in the State and may be of interest, and of value enough to be included in the report.

While the State has not been completely enumerated to date, we have located over ninety-one poultry plants wintering over 1,000 laying birds and over 200 wintering from 500 to 1,000 laying birds. In this respect the State of New Jersey holds a unique position as there is probably no other section of the country with as many large intensive egg farms. As you know we enumerated a number of cities in the State. New Brunswick has already been completed, with a population of 27,000 inhabitants, and a house to house canvass shows the presence of about 14,000 birds kept in small flocks in city back yards. This shows one bird to every two people, and if this same holds true throughout the State it will mean very nearly doubling the number of birds which are allowed the State in the Federal census since only those on farms are enumerated by them.

The development and growth of Monmouth Incubators and Brooders have been very noticeable during the past year or two. There are probably 100 such equipments in the State at the present time, and this number is being rapidly increased every day.

The greatest center of poultry production in the State is Hunterdon County; the County having over 300,000 birds; the second great district is Cumberland County in the vicinity of Vineland. It is estimated that there are approximately 200,000 birds in the Vineland township alone, kept in flocks of one hundred to two thousand, the majority being kept in flocks of 300 to 1,000.

SECRETARY'S ANNUAL REPORT.

25

TABLE I.

<i>Crops</i>	<i>Acreage.</i>	<i>Yield Per Acre.</i>	<i>Total Yield.</i>	<i>Price Per Bushel.</i>	<i>Total Value.</i>
Corn	290,000	38	11,020,000	\$.70	\$7,714,000
Wheat	111,000	20	2,220,000	1.00	2,220,000
Rye	85,000	17½	1,487,500	.83	1,234,625
Oats	60,000	30	1,800,000	.47	846,000
Buckwheat	13,000	22	286,000	.70	200,200
Hay	437,000	1½	655,500	19.00	12,454,500
Potatoes, white	95,000	108	10,260,000	.70	7,182,000
Potatoes, sweet	21,000	107	2,247,000	.86	1,932,420
Miscellaneous vegetables and fruits					12,000,000
Milk					18,396,000
Poultry and Eggs					5,172,000
Total for 1912					\$69,351,745
Total for 1911					67,715,872
Excess of 1912 over 1911					\$1,635,873

TABLE II.

ACREAGE AS GIVEN IN U. S. CROP REPORTER FOR DECEMBER, 1912.

<i>Crops</i>	<i>Acreage.</i>	<i>Yield Per Acre.</i>	<i>Total Yield.</i>	<i>Price Per Bushel.</i>	<i>Total Value.</i>
Corn	273,000	38	10,374,000	\$.70	\$7,261,800
Wheat	79,000	20	1,580,000	1.00	1,580,000
Rye	72,000	17½	1,260,000	.83	1,045,800
Oats	67,000	30	2,010,000	.47	944,700
Buckwheat	12,000	22	264,000	.72	190,080
Hay	362,000	1½	543,000	20.00	10,860,000
Potatoes, white	92,000	109½	10,074,000	.70	7,051,800
Potatoes, sweet	21,000	107	2,247,000	.86	1,932,420
Miscellaneous vegetables and fruits					12,000,000
Milk					18,396,000
Poultry and Eggs					5,172,000
					\$66,434,600

TABLE III.

Estimated number, average, price and total value of farm animals in New Jersey, January 1, 1913. Taken from February Crop Reporter, Bureau Statistics, U. S. Department of Agriculture.

<i>Animals</i>	<i>Number</i>	<i>Value Per Head</i>	<i>Total Value.</i>
Horses	90,000	\$147.00	\$13,230,000
Mules	4,000	169.00	676,000
Milch Cows	146,000	55.20	8,059,000
Other Cattle	66,000	25.10	1,657,000
Sheep	31,000	5.30	164,000
Swine	160,000	13.00	2,080,000
			\$25,846,000

A NEW LINE OF QUESTIONS.

A few questions relating to farm life and education were submitted to the Directors of this Board. The questions with the answers received, somewhat condensed, are given herewith:

Question 1—Are there as many old-fashioned country social gatherings now as there were 25 years ago? Twenty-two answer "No." This question hinges on the term "old-fashioned" and some qualify the answer by stating that other forms of social pleasure have been introduced as for example—the Grange.

Question 2—Is there a decline in rural social life? Sixteen answer "Yes." Five "No." This too is answered with such statements as: "There is a change in rural life." "Foreigners are taking the place of old English-speaking farmers." Another says, "Of the old-fashioned country life, yes. But I believe the automobile, telephone, etc., tend to build up a new social life." Another "The Grange promotes social life."

Question 3—Name the causes of this decline. Answers: "So many attractions other ways and easy access to towns that have amusements of a different character." "Better roads to get to town and quick means of travel by bicycle, motorcycle and auto." "Children of the old farmers are going to the city for employment." "The social gatherings are at Grange meetings instead of the farmers' homes." "Picnics and excursions." "Up-to-date dance customs, ball games, card parties, moving picture shows." "Neglect to attend Grange and Agricultural meetings." "So many foreigners buying the old farms who do not mingle socially with Americans." "Desire to go to the city." "Lack of sociability" and "The mainstay of the rural social life in the past was healthy enjoyment and the diffusion of information of a local and general nature. Now, the multitude of publications takes its place and people read, where they used to visit and talk."

Question 4—Are rural schools as strong in number and effective work as 25 years ago? Ten answer "No" and ten "Yes." Answers are: "Yes, except the fundamental foundations." "Not so strong in numbers and poor teachers." "We have more schools but the work is not as effective as it should be." "No, too much red tape." "They are not. The small rural school is on the decline. The children are carried from the small school to the larger school where the teachings are all of a nature to lead the child from rural life."

Question 5—Do the telephone, rural mail delivery and automobile tend to increase rural social life? The replies to this question are in the affirmative. One says, "They relieve the seclusion by bringing the farmer in touch with his neighbor and the outside world." Another says, "The 'phone and mail delivery tend to let them stay at home, and the automobile takes them to the city."

Question 6—Does the attendance of country pupils at town high schools and business colleges incline young people away from the farm? Nearly all the answers to this question are "Yes." One says "It fits them for other professions." Another, "If more agriculture were taught in the schools it would have a tendency to hold them to the farm." Another "It does. Their minds are led in channels of thought that are foreign to the farm."

Question 7—Does higher education tend to make young people dissatisfied with country life? "Yes, because they get this education in the city." "It should not, for there is more need of education in farming than most any other vocation." "They seem to like country life but want city employment." "No. It makes them better satisfied." "Yes, they can make money easier than on the farm." "It fits them for some occupation not requiring so much capital, nor so much hard bone labor as does the farm." "A healthy higher education would not, but the unhealthy, stimulated higher education of the present time does. It implants in their minds things that it does not teach how to harmonize with farm life surroundings."

TRANSPORTATION AND FREIGHT RATES. 27

Question 8—Does a course in our Agricultural College create a greater interest in and desire for farm life by our country boys and girls? "For a few that attended the Short Course at New Brunswick last winter they speak very highly of it, it has a good effect." "Yes, exceptionally so." "I believe it is a great help and encouragement." "No doubt it does, it fits them for more intelligent farming." "It won't do them any harm. Besides my College preparation course, I am going to be in New Brunswick on the 20th." "It does, for it teaches them the why of things with which they were familiar but of which they did not understand cause and effect."

Question 9—Have you a remedy to suggest for any of the seeming or real evils above named? "Get the grower and consumer closer together." "Organization among the farmers such as Grange and Church work." "Have them attend agricultural schools, join the Grange and give them an interest in the farm." Four say "Teach agriculture in the schools." "I think the schools are out of the hands of those directly interested." "More agricultural studies in the Public Schools, better prices for the products of the farm. Give the boys and girls a share in the profits of the farm."

President Frelinghuysen—I am sure we were all very much interested in that report that carried such a fund of information and advice. Are there any questions you wish to ask the Secretary in reference to any of the subjects that have been brought up in his report? The report will be received and filed, and printed in full in the annual report.

President Frelinghuysen—The next report is the report of the Committee on Transportation and Freight Rates, Mr. E. R. Collins, Chairman.

Report of Transportation and Freight Rates Committee.

New Jersey State Board of Agriculture:

Mr. President and Gentlemen:—Transportation conditions in our State were never in as good condition as they are at the present time, owing to the work of the Interstate Commerce Commission and the Public Utilities Commissioners of our own State. There seems to be a willingness on the part of the Transportation Companies to live up to the rules of both these commissions, that of the Interstate Commerce Commission, in matters relating to transportation between this and other States and those of our Public Utilities Commission.

While there has been in the past year no reduction in general transportation charges, by either rail or water routes, and in a few instances a slight increase, the very fact that there could be no arbitrary changes in transportation rates without due notice has lead to greater confidence and a feeling of security in transportation matters.

During the past year, but ten cases have been submitted to your Committee and they were of such easy adjustment that it was not necessary to call a meeting of the Committee to consider them. In each of the cases except two it was a matter of overcharge by the transportation companies and when the fact of the overcharge was shown to the companies, restitution was made without question. One case was where the railroad company had not charged enough and the consignee objected to paying the corrected amount, this he did however, when the law and conditions were explained to him. The remaining case was one in which

a small shipment of potatoes was entirely lost, being stolen while in transportation, after going to some trouble to establish the value of the lost shipment, the shipper was paid about eighty per cent. of the value of the lost shipment, which he was advised to take rather than go into litigation.

One of the far-reaching rules promulgated by the Interstate Commerce Commission during the past year is that which makes it incumbent upon the carrier at the receiving point, to forward a shipment over the shortest and least expensive route between the two points to be covered, and to do this, in the absence of any direct instructions from the shipper. In case a more extended route is requested by the shipper or consignee, such instructions must be in writing and given to the agent of the transportation company before the shipment leaves the starting point. This ruling relieves us of considerable trouble, as it is not now necessary for the shipper to study routes and mileage in order to get his goods through the least expensive route, the transportation companies are bound to attend to this and if they do not it will be at their expense and not the shipper or consignee.

After consideration and agitation covering a period of over thirty years, the parcels post was finally established a few days ago. While we do not look upon the establishment of the parcels post as the solution of our transportation problems, we do look upon it as a tremendous stride in the right direction. It will take some time to get the system in working order and for our people to appreciate what it means to them. There will be much adverse criticism and many things to cure but we think that the exercise of patience until the system is in good working order will be justified.

While considerable has been printed about the system, a brief notice of it here may not be out of place, for it is expected that the people of the farms will be the ones most benefited by it.

The service will extend over 1,435,000 miles of transportation lines. This includes 233,899 miles of railways, 164,399 miles of star routes, 29,283 miles of steamboat lines and 1,007,772 miles of rural mail routes now established. Differing from the other mail matter where the postage is the same irrespective of the distance carried, in the parcels post, the postage increases as the distance from the mailing office increases. Parcels must not weigh more than eleven pounds and the bulk including length and girth of the package combined must not exceed seventy-two inches. The utmost care must be used in packing and nothing can be mailed that is liable to injure other mail matter or the postal employees. Parcels must not be sealed so that they cannot be readily examined without destroying the covering. Each parcel must bear on its face the name and address of the sender, preceded by the word "From." This is very important as the package will not be forwarded unless this is done even though the name of the person to whom it is to go is on the package. Only merchandise can be sent by parcels post, books and printed matter are barred.

The special stamps must be used and matter for parcels post must not be put with other mail.

The amount of postage required on a given package is regulated by the distance to be covered, which is regulated by distance zones centering at the mailing office. Within the local district of any post office the rate is five cents for the first pound and one cent for each additional pound. Within fifty miles from the point of mailing, which is the first zone, the rate is five cents for the first pound and three cents for each additional pound, this rate increases with the distance until it reaches a maximum of twelve cents per pound for delivery within the eighth zone or over a distance of 1,800 miles from the mailing office.

A little attention paid to the requirements of the service will avoid mistakes and annoyances and we should work together to make the parcels post a success after all these years of fighting for it.

Regarding the extension of the freight and express service over the suburban trolley lines, the situation is unchanged. The suburban roads will not attempt to enter into the business with the conditions as they are at present under the law. So long as each municipality through which the roads operate have the

HORSE BREEDING IN NEW JERSEY.

29

power to dictate the times in which freight can be carried, each to suit itself, the matter will be no nearer a realization. In other states the trolleys carry light freight and express matter and carry it at a profit to themselves and the people served. A notable example is the system centering at Utica, New York. By means of the express service over the trolley lines operated at night, between 11 p. m. and 6 a. m., milk, butter, eggs and all classes of farm produce is gathered and taken to the city to distributing stations. The transportation is cheap, rapid and satisfactory, and the service since it was installed has grown an average of 22 per cent. each year.

One of our street railway companies offered to install the service on one of its lines, if consistent consents regulating the hours of the service could be secured. The chairman of your committee was to take up the work of securing the consents. After four meetings with Township Committees and Borough Councils he resigned the task, it was next to impossible to harmonize them. Three boards were slighted because they were not approached first; one would not agree to anything because they would not get any more taxes out of the railroad, and another said that street cars should not be run at night anyway because they made too much noise when people wanted to sleep. So there you have the situation and under present conditions it seems to be a deadlock.

At various times complaints have been made to your committee that employees of express companies frequently make demand for payment at the destination, on express matter when the charges have been paid at the shipping point in advance. Several cases of this kind have been taken up and restitution secured for the complaint. It sometimes happens, though rarely, that demand for express charges are made on the person receiving, when they have been prepaid, by a dishonest employee of the express company. Complaints of double charging, however had become so numerous that the Interstate Commerce Commission gave it attention and took the matter up with the express companies as a result, all express matter upon which the express charges have been prepaid will bear a yellow company label and all express matter on which transportation charges are to be collected on delivery will bear a white label. This rule simplifies matters. Pay the charges when there is a white label on the package and refuse when the label is yellow.

As various changes have recently been made in freight classifications, it is advisable to consult the latest classification list when a shipment of any importance is to be made. The law requires that each freight agent have a copy of the latest classifications on file.

Respectfully submitted,

E. R. COLLINS,
J. T. ALLISON,
J. HARVEY DARNELL.

President Frelinghuysen—Are there any questions that you wish to ask of the Chairman of this Committee on this excellent and comprehensive report? If not, it will be received and placed on file.

It gives me great pleasure now to introduce Prof. F. C. Minkler, who will speak on the subject of Horse Breeding in New Jersey, A Report of Progress.

Horse Breeding in New Jersey.

BY PROF. F. C. MINKLER.

Mr. President, Members and Visitors of the Board of Agriculture: It seems to me that there is no question of greater importance to the farmers of New Jersey than the question of the motive power of their farms.

A few years ago the statement was made that the invention of the tractor and

the completing of the automobile was destined to drive the horse out of business, and that farmers, as well as other people who employed horse power, would soon find it to their advantage and convenience to eliminate the draft horse or the work horse in a certain degree. Fortunately, gentlemen, that false prophet erred in judgment, because if we go to the market centers today, Chicago and some of the Western States which are notable for the production of horses, we find that instead of their being a decrease in the price and demand, that horses of useful type, that the top notchers are bringing more money today than they have ever brought. This condition seems to exist, however, that horses are relatively high if you want to buy, and, relatively low if you want to sell.

Now, a great many farmers have experienced just such a condition and it seems to me that the answer to that question is that the farmer is invariably wanting to buy the best type of horse, and oftentimes he wants to sell an inferior animal.

We hear about Marshall Field & Co., in Chicago and some of the large concerns in New York City, one of the Express Companies in particular, coming to the point of selling their horses and putting in motor trucks. Now, if I am correctly informed, and I gathered these statistics while at Chicago attending the International Live Stock Show, these large transportation concerns have satisfied themselves that on a long haul the automobile truck has a great advantage over the horse, but when it comes to making short deliveries, such as milk and other products that go to the individual consumer, that the horse deliveries have been made at forty per cent., cost less than is possible with the truck that is in use at the present time.

Now, whether or not the draft horse goes out of use among the large department stores and delivery concerns in our larger cities, the fact remains that the farms in New Jersey and the farms in every other State, are going to get smaller rather than larger, and, while a traction plow and the motive power running type of machinery may be useful and be used to advantage on the large farm, the fact remains that on the New Jersey farm, it is my judgment that there will never be a time when the horse will be ousted from his present stronghold.

Now, you ask the question oftentimes, what is the type of horse most suited or best suited to the conditions that exist on my farm?

The Iowa farmer raises horses to sell, and he has decided that the horse that weighs nearest to a ton is the animal that will bring him the greatest profit when offered at the public square.

The New Jersey farmer must not establish any such ideal. The horse for you to establish and install on your farm is the animal that can do the greatest amount of the kind of work that you have to do with the greatest ease. Now, if a 1250 pound horse in your judgment and from the experience of the most successful farmers in your locality is better adapted to doing the work on your farm than one weighing sixteen or seventeen or eighteen hundred pounds, it probably is good judgment on your part to install that type of horse.

I believe, when we take into consideration that the deep tillage plow is gaining in popularity because it has actually accomplished results in certain sections; that the potato digger is getting heavier from year to year, requiring more motive power, and that the delivery of our farm products requires more and greater strength and skill among our draft horses, it resolves itself into an individual problem of getting for the use of your farm the horse that will do your work to the best advantage.

Now, it is not thought, at least, I do not consider it so, that it is a profitable business for the New Jersey farmer to raise horses exclusively to sell, but I am satisfied that if the farmers present here today will recall the experience that they have had in buying Western horses, in acclimating them to conditions that exist in this State, taking into consideration the loss of time, the responsibility for veterinary bills, that they will find that one of the most expensive items on their farm has been the supply of their work horses.

HORSE BREEDING IN NEW JERSEY.

31

The successful dairymen in New Jersey have found out by costly experience that it is not the most profitable system to install, depending upon the drover or the adjacent brooder for his surplus animals. The question of the inferior animal arises, the danger from disease exists, and you will find if you follow out the practice followed on the most successful dairy farms in New Jersey that the farmers are breeding from the best cows to the best bull that they can buy and afford, and producing on their own farms heavier calves to replace the worn out cow.

Now, it is my judgment that it is the policy of the small farmer in New Jersey to raise one or two colts each year or every second year, to take the place of that animal that is going to be ousted because he is worn out, and that you can do that more economically than you can possibly supplement that animal by buying a Western horse. I am satisfied that this same question of home production is the most serious one affecting the New Jersey farmer today.

You go to Germany and you will find the German farmer producing a few sheep, a few head of cattle and a few swine. You go to Denmark and you will find the people that we look to today as being perhaps the most successful farmers in their given territory are growing a few animals on their own farm.

The tendency of the New Jersey farmer today is to buy his cows, buy his horses, buy his feed, buy his pork and buy his mutton.

I say, the small farmer does not begin to realize that a few animals located on his farm supply the best means of market at the highest price for the products that he is growing on his farm. And we might go into this problem, this individual problem that exists on every farm, in great detail, but suffice it to say that the time is coming in New Jersey when the farms are going to be smaller and the farmer himself is going to be satisfied and must be satisfied with conducting his farming operations on a relatively smaller scale and growing more of his products and buying fewer.

You are doubtless all familiar with the endeavors that we have made in this State to encourage and increase the activity of horse breeding in this State.

In 1908 the records of the Stallion Examining Board show that there were licensed for service in New Jersey fourteen pure bred and registered draft stallions; that sixty-one per cent. of the stallions in service were grades and not pure breeds and that only nine per cent. of the farmers in this State had raised a colt during that year.

If we would analyze these figures still further and inquire as to the type of horse that the individual farmer was producing you would find that the proportion of farm horses to light horses was about ten to one. In other words, the New Jersey farmers, instead of producing on their farms the type of horse that they could work six days out of the week, were producing the type of horse that they could utilize probably no more than once or twice a week to the best advantage. Getting away from that point that the horse that he must produce on his farm is the one that is capable of doing the greatest amount of work with the greatest amount of ease.

In 1912 the records show that there were licensed by the examining board forty-four pure bred and registered draft stallions, as compared with fourteen that were licensed four years ago.

As over and against sixty-one per cent. of grade animals that were in service, only forty-two per cent. of the stallions now licensed for service are listed as grade; showing an increase of nineteen per cent. in the number of pure bred animals and a decrease of the mongrels in the same proportion. But that is not all.

In 1908 twenty-eight per cent. of stallions examined for licensed service were found to be either unsound or unable to qualify for service due to the fact that they did not have either a pure bred sire or a pure bred dam. In spite of the fact that the examining board has been more rigid each year in the issuing of certificates for animals of questionable soundness; in 1911 only 8.4 per cent. of the stallions were refused certificates or found to be unsound, and in 1912 eleven per cent. of the stallions examined were refused certificates.

Now, that represents progress. We have eliminated the mongrel sire in a measure, and I am sure that with the present working of the law and the present framing of the law, that within a relatively few years we will be able to say in New Jersey something that cannot be said in any other State, that the majority of the stallions available for public service are animals of known breeding and recognized individuality.

Now, I do not say that every stallion that is licensed today by the Examining Board is a credit to the State. That is not true. We have to issue license service certificates to individual animals that are pure bred and sound and yet when we look around in their community we cannot find a large number of really creditable colts. The measure of the stallion is not his individuality or his actual selling value today. The value of the sire used for breeding purposes is fixed by the number and kind of colts that we find in the community, and when we find in any given section a sire that has made a noteworthy record in the State, it is certainly good judgment to patronize that stallion and increase the usefulness of the colts that you are producing in that particular section.

Now, we have attempted to organize breeders' associations in thirteen different counties. Some of them have been a success. Others have been failures. Our plan was wrong. We started out with the idea that the assessment plan of distributing the total cost of maintenance was the correct one. But we found out that it was absolutely the wrong one. For instance, a man owning a brood mare that he knew was a breeder, would keep her away from the stallion because he was afraid she would get in foal, for fear he would be taxed the assessment. Now, in each of the associations that are in existence, we have changed the plan to a uniform service fee of ten dollars with no charge to the mare that has a foal, the owner of the mare to be a member of the Breeders' Association, this membership fee being fifty cents per year.

Now, this plan is working much better, and yet, it is my judgment that the owners of mares are not making the most of the opportunity that presents itself.

But, this fact remains; in every single instance except one, where the stallion has been loaned to a community, Breeders' Associations, private individuals or organized groups of farmers have found it to their advantage to purchase stallions and offer for service in their community. Therefore, we get the increase of fourteen pure bred stallions in 1908 to forty-four pure bred stallions in 1912; and the records show that there never was as much activity along the lines of draft horse breeding or breeding of truck horses in New Jersey as exists today, and I will say in concluding that the farmers realize that the pure bred sire, above all animals, is best adapted to perpetuate his qualities in his colts.

I can see the time when it will be almost folly for the owner of a grade or mongrel stallion without a reputation of producing good foals, to attempt to offer him for service in New Jersey, because the farmers and mare owners realize that their chances are much better in case they utilize the services of a pure bred sire.

Now, I might go on still further into the workings of the various Breeders' Associations. The Live Stock Commission has taken this attitude, that if the owner of a mare will patronize a stallion of equal or even better individuality than that possessed by one of the stallions that are located in the community, so much the better.

It is not a matter in every case of the actual number of mares that a certain stallion is mating with, providing the interest is centered in producing the farmer's horse, and I am frank in saying that I believe that the system we have inaugurated in New Jersey has done more to bring the mare owners and the farmers to a realization that the useful animal on the farm is the one that they must produce, more than any other system that has been inaugurated in any of the Western States.

We have today Stallions Stamping and Registration list existing in eighteen distinct States. In one of the States all animals are licensed, regardless of whether they are sound or unsound. The certificate reads something like this:

TRANSPORTATION AND FREIGHT RATES. 33

This stallion has been examined and found that he has a spavin on his near hock. He is licensed for service in this State. Basing such an argument on the fact that publicity will eliminate that stallion from service. Now, publicity is a great thing, and it seems to me that we cannot base any system of licensing stallions for public service on a question of soundness alone. We cannot convince the average farmer that here is a draft stallion that weighs eighteen hundred pounds with good breeding, that he has a certain unsoundness, and therefore under the law he is eliminated from service. Here is another stallion that is sound, possessed of no breeding at all, and yet we give him a license service certificate, to that individual animal. You are eliminating this animal, although he has got good qualities, and you are recommending that animal, knowing that he never has produced a colt, simply because this animal is sound and that animal is unsound.

Now, the question of individuality in breeding stallions comes in, and that is the reason why the State of Pennsylvania states that it is their policy to license all stallions and simply state the fact that they are sound or unsound.

Now, just what recommendations and improvements we can make in our present law, I am not in a position to state, but the best measure of value of any system is the results, and, Mr. President, I am satisfied with the legislation that you were responsible for in establishing in 1908 has done a great deal and will do a great deal more towards stimulating interest and creating activity in the breeding of useful and more marketable horses in this State. (Applause.)

President Frelinghuysen—I am sure we all feel very grateful to Professor Minkler for his extended report, and if anyone would like to ask him any questions I am sure he will be glad to answer them to the best of his ability. I would like to ask him a question: what results have you obtained from the State stallions and how many colts are there at present alive today and what is their condition?

Prof. Minkler—Mr. President, the records show that in 1909 ten active stallions produced three hundred living colts. In 1911, nine active stallions produced 270 colts; in 1912, the ten active stallions were mated with something over three hundred mares, the reports are not quite complete.

To give you the total number of living foals that exist today, I could not give it to you accurately, because some of the reports are not complete.

President Frelinghuysen—What is their condition?

Prof. Minkler—The Commission purchased last year three additional stallions, two Clydesdales and one Yorkshire Percheron. Two of the stallions were sold because the commission doubted their usefulness; one other stallion which was owned last year is for sale and will be sold because of an injury.

The average number of mares reported on the first of November this year for the active stallions purchased last year was twenty-two, and it has been our aim to eliminate a stallion as soon as he has proved his non-usefulness and to replace him with a stallion of known usefulness, and to move a stallion from one neighborhood to another as soon as there are stallions sound and serviceable in that section that are of the desired type and offered for service under reasonable terms.

President Frelinghuysen—Are not the results a much better class? Are not the colts much better in constitution and finer colts

from these horses that have been purchased than the ones which were formerly bred?

Prof. Minkler—As the records will show, sixty per cent. of the draft stallions that we had in 1908, we raised from the colts resulting from the activities of draft stallions. I could cite you a case in Salem County of a man who had the same mares bred to a good stallion of the lighter type, and those same mares were mated later with stallions of the draft type, the State stallions, and when the draft colts were two years old they outsold by fifty dollars the light horse types of a year ago. And that is the case in a great many sections, and I have tried to get a price on some draft colts produced by the farmer on that farm and he refused to sell them.

A case exists in Somerset County of a colt out of a Clydesdale stallion, whose mother sold, as I recall it, for seventy-five dollars at auction. The colt when sixteen or eighteen months old sold for two hundred and forty dollars. The mother was re-sold and brought in the neighborhood of a hundred and seventy-five dollars, and that mare today is in foal with the same stallion and she cannot be bought.

It is the experience of the patrons of the draft stallions that were previously patronizing stallions of lesser usefulness from the farmers' standpoint that those draft colts are not only more useful on their farms because they can be worked at two years and three years of age, while they have to grow their light horses until they are five years of age and break them and mate them and have to do many other things for them in the way of education that is not necessary for the draft horse to be done.

President Frelinghuysen—What are your plans for increasing the breeding of horses?

Prof. Minkler—The plans that are outlined by the Commission for increasing the breeding of that kind of horses is to locate the stallions that we have at the present time in sections of the State where they will give us the greatest usefulness and where there is enough demand on the part of the mare owners in that section for their usefulness.

There is being organized at the present time in Morris County a breeders' association. There is being organized at the present time in Middlesex County a breeders' association, and it is the intention of the commission to take from sections where stallions have been located and where in the meantime other stallions have been brought in there, to take their place, to move those stallions from that section to another, and so to move them from place to place, so that the different farmers of any particular section may have the opportunity to avail themselves of their usefulness.

In addition to that the commission has offered a prize on the best colts out of sires of breeding, not necessarily owned by the State, but sires owned by private individuals, has put a subsidy on the service of sires that have established a reputation in their community for producing utility horses; and we want to carry on the campaign not only for better horses in the draft horse line, but better horses in other lines of horse breeding as well; and also in the line of pure bred and improved sires in the breeding of every class of live stock.

Another campaign we started is a campaign of publicity in the way of issuing circulars and instructions regarding the caring for foals, the feeding of the work horse and the management of brood mares; and in addition to this we have taken up another line of work that is very important and that is reviving the swine growing industry in this State and the suppression of the disease which has hung over that industry for so long; the serum that we have been distributing has been very effective and it is gradually helping to stamp out the ravages of this disease. It has proved very admirable, and we want to encourage that branch as far as possible.

Mr. Field—Mr. President, may I ask a question? I read in one of the agricultural papers that horses were shipped from New Jersey to the International Live Stock Show in Chicago and that they met with some success. I would be interested if Professor Minkler could tell us a little bit about the success and whether or not any of the entries shown there were the results of the State Stallions breeding?

Prof. Minkler—That point is very well taken and it touches on a subject that I have not had time to dwell on. The fact that not only has the activities of the Live Stock Commission resulted in the growing of an increased number of foals, but men of wealth who previously were inclined toward the production of the great race horse, have taken into their hands the development of the draft horse, and we have in New Jersey today some of the most famous Clydesdales that are in existence.

Fair Acre Farm, located at New Market, New Jersey, owns the Grand Champion of three countries, having won the Keener Cup in Scotland, awarded the Grand Championship at the International at Chicago and defeated the animal that was grand champion at the Kingston Show.

We also have in New Jersey the famous mare, Bessie Barring, that was grand champion American Brood mare and owned at the Fair Acre Farm.

And in addition to those a very noteworthy animal, Lady Rustis, that was purchased by Mr. Fairburn as a yearling, developed as a two year old went on to Chicago and won the General Championship in the strongest class of mares that has ever been exhibited at that Show.

Not only this fame has come to New Jersey at the International at Chicago this year, Mr. Fairburn won first on Stallion and four mares, a Clydesdale stallion and four mares, equal of which men like Prof. Gardes and the Canadian Judge stated had never appeared in a ring at the International.

I could name you many more people in New Jersey who have taken up the problem of producing draft horses, realizing that the markets in this State are excellent and that the demand on the part of the farmers is such that they could well afford to revive and add their influence to such an industry.

There were other winners at the Show in Chicago, in the foal classes, Mr. Larocque of Bernardville, purchased the first prize foal at the show. Mr. Sperry, another New Jersey proprietor, purchased some other famous individuals, and men like President Leonard of the Union Stock Yards at Chicago stated, "If all the good draft stallions and mares are not now located in the East the Eastern breeders are far-seeing enough and clever enough to purchase the winning animals, and believe in the old adage, 'breed from the best'." (Applause.)

President Frelinghuysen—Are there any further questions?

Before adjourning the morning session I want to call your attention to a subject that will later come before you. I do so now in order that you may have time to think of it before you are called upon to vote upon it, and that is, the question of making this annual meeting, in addition to the annual meeting, a permanent exposition, holding a permanent exposition every year. The thought of having these exhibits and these instructive illustrations was taken up only a short time before the time for this meeting, with scarcely time enough to make as extended an exhibition as the State of New Jer-

sey can when she is put to it. Now, the question of making it permanent will probably come before this meeting.

It is a good thing to show the world, not only from an instructive standpoint, but to show what New Jersey is doing, it is a good thing also to encourage ourselves and to realize what New Jersey can do.

I firmly believe that if arrangements can be made whereby the expenses of bringing together these exhibits and adding to them probably live stock, not an exhibition of live stock for breeding and for prizes, but a specimen of each standard animals raised in New Jersey, say, a standard of Holstein Cattle, and a standard of Jersey Cattle, and a Standard of Clydesdale Horse, etc., could be brought together in a large building every year, that it would do more for the promotion of agriculture than anything else, more than anything we have done.

Recently we had an exhibition in New York at the Land and Irrigation Show, which was a credit to the State of New Jersey. And I thought when looking at the splendid products of the farmers of New Jersey in that adjoining State and adjacent city, what it would mean to New Jersey and how we could attract thousands from all over the State to some central point at our winter meeting, if we could show the people here what we are doing. (Applause.)

Now, of course, it takes time and it is expensive, and someone has got to do it, and in considering this question, you must consider the expense. We do not want to run a show or an exposition for profit, and we do not want, in my opinion, prizes beyond honorable mention, or we might have a list of first, second, third and fourth prizes. But we should have enough money either appropriated by the Legislature or taken in by admissions from exhibitors and members of the agricultural exposition which would pay the running expenses of such a show, and, therefore, we might very properly charge a small admission for such an exhibition.

That question will come before you very probably, moved possibly from the floor and the Chair or the body will name a committee. I simply leave it to you for your consideration, in order that you may think about it before it comes up.

Now the time has come to close the morning session. Is there any other business to come before the meeting? If not, the meeting will stand adjourned until two o'clock sharp P. M.

NOMINATING COMMITTEE.

37

FIRST DAY—SECOND SESSION.

The meeting was called to order by Vice-President Cox.

Vice-President Cox—The first business in order this afternoon is the nomination from the floor of one member from each county to form a Nominating Committee for the nomination of officers for the ensuing year. The Secretary will call the list of counties and the delegates from the different counties will suggest the name of one member from that county to represent them upon this Nominating Committee.

The following Committee was nominated:

NOMINATING COMMITTEE.

Atlantic County—John H. Huenke, Jr.
 Bergen County—Arthur Lozier.
 Burlington County—Fred Lippincott.
 Camden County—Harry Herff.
 Cape May County—Ralph Schellinger.
 Cumberland County—A. P. Seabrook.
 Essex County—H. F. Harrison.
 Gloucester County—Wm. Gleason.
 Hunterdon County—Geo. F. Bushfield.
 Mercer County—John W. Hendrickson.
 Middlesex County—W. B. Kurtz.
 Monmouth County—Frank P. Jones.
 Morris County—G. E. Phelps.
 Ocean County—J. D. Holman.
 Passaic County—Frank D. Torbett.
 Salem County—M. W. Busby.
 Somerset County—George E. Randolph.
 Sussex County—George E. Van Horn.
 Union County—H. S. Van Fleet.
 Warren County—James I. Cook.

Vice-President Cox—This committee is subject to the call of Mr. Lozier, the representative from Bergen County, the first man named upon the committee.

The next matter is the introduction of new business. Has any member any new business that he desires to bring before the meeting at this time?

I would say just at this point, if there are any resolutions to be introduced they ought to be introduced as early as possible during the session so that they may be properly referred to the proper com-

mittee and reported on later. Is there any new business to be introduced at this time?

As there does not appear to be any, we will take up the next matter on the programme, which is an address by Col. E. A. Stevens, Road Commissioner of New Jersey, on the Road Situation in New Jersey. I have now the pleasure of introducing to you Colonel Stevens. (Applause.)

Colonel Stevens' Address.

The commercial necessity for good roads, acknowledged without question in any progressive commonwealth, and the growing demand for improved highways which is being daily increased by the application of the motor drive to commercial work, have most thoroughly driven home to me the need of a most thorough study of all the elements entering into the problem and of the early adoption of a comprehensive plan for its solution.

To arrive at the latter we must first state the former. We must first definitely decide what the State of New Jersey proposes to do in the way of improvements; second, reduce this general statement to miles of road to be built and kept up; third, estimate the cost of building and upkeep, including the interest and sinking fund charges on bonds, if that method of financing be adopted; fourth, work out a plan to provide the necessary funds and to properly and equitably distribute the burden.

I take it that no interest of importance in this State, and least of all the farmers, will listen to any suggestion of the abandonment of the policy of building good roads. The question is not "Shall we build good roads?" but "How shall we build good roads?"

It would seem that if any duties, beyond those mentioned in the statutes, devolves upon the road commissioner, it is the very one of carefully considering the problem with reference to the future needs of the State. It may not seem to many that such a study would require much preparation or it may be that I am not quick at absorbing facts and drawing conclusions. I would, however, here express the opinion that the term of office is only about long enough to fit a man for the job. It has, I know, taken me two years of time to realize the importance of the problem and to enable me to reach some conclusions as to the method for its solution. I trust that I shall be able to work out a detailed plan before February, 1914, when I shall turn over the office to my successor.

1. To return to the problem, I take it that New Jersey wants every road of any importance so improved that, in the words of the statute, it shall be "smooth, firm and convenient for traffic at all seasons of the year." This is our general statement.

2. To reduce this to miles would at first sight seem simple. I thought so until recently. When, however, you consider that the object of getting at mileage is to estimate cost, that the latter depends on local conditions, that our excellent geological survey maps are many of them about thirty years old, and that during that time conditions have changed, the problem is not quite so easy. Roads have been built, others abandoned, others have become city streets and hence withdrawn from our problem, which I take is one of country roads only. Then, again, to arrive at any estimate of practical value, the class of work estimated on must be known. The map does not and cannot well show whether the road indicated is a mere trail or a highway of importance. We must, to reach our object, classify our roads. This must be done upon the basis of relative importance; in other words, on the relative traffic carried by each road. We have little information on this point and locally made estimates

COLONEL STEVENS' ADDRESS.

39

are often misleading. In theory, at least, the law now classifies roads. We have the State highway, the county road and the local road. The law directs the mapping of the State highway system not exceeding 1,500 miles in length. This work has been done, not as thoroughly as I should like, nor as will in the end prove economical, but still well enough for present purposes. There is, however, no map of the county road systems. I consider this essential to any estimate that shall be of value in enabling the people of the State, among them you who are perhaps as largely interested as any other interest, to decide how we are going ahead. We must not risk our investment by overloading communities or the State with charges for which no provision has been made.

Were these county systems once mapped, and, at the same time, the mileage of other country roads determined, we would have the data on which to proceed to the third step in the program I have outlined. I cannot even estimate closely the mileage that should be assigned to county roads, nor our total mileage; without, therefore, committing myself or any one else, I shall, for the purpose of illustration, assume a mileage of 3,000 for the former and 15,000 for the latter.

In this case, taking the general estimate of road builders, we might expect the following division of traffic:

The State highways, with 10 per cent. of our total road traffic; the county roads, with 20 per cent. of our mileage, would carry 20 per cent., and the other roads, with 70 per cent. of the mileage would carry about 10 per cent. of the business.

3. While much of our county road system has been built, it is impossible to state how much until this system has been planned for each county. For the present purpose, I shall assume that 1,000 miles have been improved and that the balance of our improved roads, not included in the State highway system, is in the third class, which I shall call local roads.

From the data gathered for State highways, I can then make the following estimates merely to illustrate the proper method of solving our problem. Remember that I put these out only as illustrating what I should be able to state with much greater accuracy. We know fairly well the total improved mileage as 4,500, of which, however, a considerable part will have to be rebuilt. Of this 4,500 we know that about 1,100 is in the State highway system. Take all my other figures as guesses.

Total country road mileage, estimated 15,000

Classified as—

First class, State highways	1,500
Second class, county roads	3,000
Third class, local roads	10,500
	<hr/> 15,000

Of these there are now improved—

First class	1,100 or 73 per cent.
Second Class, estimated	2,000 or 67 per cent.
Third class	1,500 or 14 per cent.
	<hr/> 4,600 or 31 per cent.

4. There would remain to improve:

First class, 400 miles at \$15,000	\$6,000,000
Second class, 1,000 miles at \$9,000	9,000,000
Third class, 9,000 miles at \$2,000	18,000,000
	<hr/> \$33,000,000

Of course it would be possible to spend more money on the improvement.

Allowing that the State pays on each class as below, we have on the above estimate:

First class roads, \$6,000,000, 80 per cent.	\$4,800,000
Second class roads, \$9,000,000, 40 per cent.	3,600,000
Third class roads, \$18,000,000, 20 per cent.	3,600,000
Total cost, to State	\$12,000,000

The cost of maintenance of these roads is roughly estimated as follows:

First class, 1,500 miles at \$600	\$900,000
Second class, 3,000 miles at \$400	1,200,000
Third class, 10,500 miles at \$150	1,575,000
	<hr/>
	\$3,675,000
State's share, first class, 100 per cent.	\$900,000
State's share, second class, 50 per cent.	600,000
State's share, third class, 33 1-3 per cent.	525,000
	<hr/>
	\$2,025,000

4. To enable one to frame even a good outline of a plan, the total amount raised for roads should be known. We know the amounts raised by the State and the counties. Of the municipalities we know little or nothing. I have been for some time trying to gather the statistics of the amounts raised or expended by the State, the counties and the municipalities. This involves getting returns from some 500 different public bodies. There is no appropriation available for this work save that for office expense and the work has, therefore, been necessarily done very slowly and is by no means yet finished. As far as I can judge at this date, it seems not unlikely that we are in the State at large spending enough money to keep our roads in good repair. No plan would be complete that did not in some way equitably distribute the cost. Assuming, for a moment, that my rough estimate of the cost of upkeep is correct, and that the above conclusion is justified, it would seem that a financial scheme that would levy at least a part of the present expenditure in proportion to the ratables of the State and distribute it in proportion to the estimated or ascertained cost of road repair, would be only common fairness. The cost of keeping up a road bears no relation to the ability of the community through which it runs to pay the bill.

To finish our system, however, we shall have to spend many millions. We must do this thoroughly and systematically. It can be shown beyond a doubt that as rapid construction as possible with efficiency would be a good business policy. This would involve an issue of State bonds. Before any such issue is possible or advisable, we must put ourselves in shape to spend the money efficiently and must prove the fact to the people of New Jersey, otherwise there will be no bonds. When I say, "we," I mean not only the State department, but every road official in the State, be he employed by State, county or municipality.

The building and planning of roads has become a highly specialized business or profession. You cannot make a good man in some other branch proficient thereat by electing him road supervisor. We are now losing several good men throughout the State on account of changes in the boards controlling these appointments. What you must have is a tenure of office for road employes with a well-oiled and smoothly working recall for any lapse from efficiency. This will be the first step in the desired direction. The next is the proper planning of the county road systems and the gathering of the data of which I have just spoken.

COLONEL STEVENS' ADDRESS.

41

I shall draft bills to carry these into effect and I trust I can find some member of the Legislature with enough confidence to father them. They will be opposed, if by nothing else, by the usual inertia that must be overcome in order to get a move on any new thing. It is in overcoming this that I appeal for your help. I am fully aware that in asking this I am not submitting any complete plan, but I am asking for the means of gathering the information on which such a plan must be based and for some provisions that must have a place in any plan.

Unless I can impress you who have heretofore led the movement for good roads with the importance of this aspect of the subject, I have scant chances of success. It is to give some idea of the extent of the problem that I have ventured on some rather premature figures. I am not materially overstating these, I can assure you. This year's output of motor cars alone will be double that of 1912, and of these the motor truck will form an ever increasing proportion. You yourselves will be making more and more extended use of this last comer on our roads to deliver your output directly to the consumer, cutting out freight and commissions. To do this you must have the roads and they will cost much, but unless we are ready to quit, you must have them and I am here to show you the first steps in the way to get them.

That you may beyond any doubt understand what I consider necessary, I shall, in closing, repeat my argument.

Our road problem is a big proposition.

We must consider it in a thorough manner and present definite facts and figures.

To get these we must spend some money to gather the facts necessary to forecast the expense and to formulate a plan for equitably distributing the burden.

If we expect to get the people of New Jersey to do the work as it should be, we must make the whole road force of the State, counties and municipalities efficient, and must take them out of politics.

Vice-President Cox—I am sure we have all listened with great pleasure to this admirable address; and are there any members present who desire to ask Colonel Stevens any questions touching upon this subject?

Prof. Rider—What income has the State from licenses?

Col. Stevens—Last year we had for road purposes four hundred and two thousand dollars. The law increasing rates was only effective for six months. I assume that the income this year, if there is no change in the law, will be between five hundred and fifty and five hundred and seventy-five thousand dollars.

Secretary Dye—I would say to Col. Stevens, many members of the Board may know it already, that I am quite impressed with this address in the figures which Col. Stevens has given us for the cost of roads now as compared with the first appropriation. The first application was made to Gov. Abbett for an appropriation for this purpose and we asked the Governor for seventy-five thousand dollars a year to start this road proposition by

State aid. The Governor was not willing to allow so much. He said, however, that he would let us have twenty-five thousand dollars to begin this great road problem. Everything has to have a beginning, and that was the beginning of the State appropriation for State Aid Road Building. The next year we secured seventy-five thousand dollars, and made a beginning, under a former President of this Board. The road question is getting so large now that we do not know how to handle it and I think, friends, that you ought to discuss this question with the Colonel while he is here, and if we can help him to elucidate this problem of having better roads all over the State and meet the expense without too great a burden, we ought to do it.

President Cox—Are there any further questions?

Mr. Van Horn—In the matter of the cheaper roads to which the State would appropriate twenty per cent., is that the least?

Col. Stevens—That is my idea; I did say that the amount contributed by the State to the construction of the roads should vary with the amount of the through traffic. Now, there is no law about that. That is merely a suggestion, which I am not prepared to throw out as more than a suggestion, and as something that I had to formulate in order to get at some figure as to what the State should be expected to expend.

Prof. Rider—I would like to ask Col. Stevens whether in his plan as proposed, the State should also give aid to the smaller roads, sixty per cent., or more?

Col. Stevens—My idea is the State should give aid to every road and have something to say about the expenditure of its money and see that it is run right.

Vice-President Cox—Are there any further questions to ask Col. Stevens?

Senator Gaunt—Mr. President, I am quite sure there will be lots of questions and lots of suggestions made after the Colonel has gone out when the members get to discussing this among themselves. Now, I do not know why it is that the farmers who are present do not make their requests known while they have the Road Commissioner present. He has the facts and is able to answer the

DISCUSSION.

43

questions intelligently. Those questions come before the members of the Legislature and we have to decide on them. Now, I hope this meeting will resolve itself into a sort of a round table talk and ask the Colonel some questions so that we may be able to know what we are going to do when the questions come before the Legislature. I don't think we should wait until after the bills are introduced and get started and then commence to pound somebody because they are not just what we think they ought to be. Now is the time to get it started and get it started right.

Mr. Van Horn (Sussex County)—In our county there was a proposition to build a macadam road with State aid, and bids were invited, but when the bids were turned in they were considered by the Board of Freeholders as being excessive, or at least beyond the ability of the County to pay, and all the bids were rejected, and there has been a great deal of talk about building a gravel road instead, either with or without State aid. It has been a question with some of the people whether the State would appropriate the same amount or any amount for that sort of a road, or whether it must be a macadam road.

Col. Stevens—Sussex is just one of those counties in which I feel that the State should open up a little bit more widely than it has been doing.

On the question of gravel, gravel is a recognized material in the Statute and practically all the roads of South Jersey are built of gravel, but the gravel differs in character from that of Sussex; but just over the line there is a very good piece of road, at least, I think it is in Sussex, between Tranquility and Andover, there is a very good piece of road in there, which I think fully as good as any of the South Jersey gravel, and I am perfectly willing to take up that question of the gravel if the county wants to build gravel.

Mr. Van Horn—I think they would build quite a few roads there if they could be built of gravel.

Col. Stevens—I have been given to understand in Sussex that the deposits of gravel were very small in volume. I am not saying this is the fact, that is what has been told me. That the deposits of gravel are so small that there would not be enough gravel in any one bank to build a road of. You may be able to correct that statement.

Mr. Van Horn—I don't know. I fancy there may be several banks along the line of the road.

Col. Stevens—There is one bank of very good looking gravel just south of the Augusta Mountain. I don't know whether there is enough there to build a road or not.

Mr. Van Horn—I think if the matter was investigated it would be found that there were quite a good many deposits; and if in one place there was not enough to build the road, perhaps along the road we would be able to find more deposits that would be available. That would be so in some sections.

Col. Stevens—I would say that one of the subjects I would very much like to see taken up, is a thorough examination of the State for available road materials. Of course, the State is not justified in spending a cent more for a road than they can get it built for, and the secret of efficient road building is to use local material, not having to haul it. The freight is the most expensive part of a stone road. I would be only too glad to take that up and do it if I could get a chance to.

Mr. Van Horn—We would be glad to have as much improved roads as can be built, but, of course, a macadam road in our county, in the face of those bids, is out of the question.

Col. Stevens—Yes, I expect it has been a very expensive thing in Sussex County. There is no doubt about that.

Mr. Bomm (Bergen County)—I would like to ask whether it would not make a difference for lighter roads. There seems to be less trouble with some heavier roads. I know out in the county where I live we have got a main road going through there that had seven or eight inch macadam and had been tried and held perfect and the other roads are nothing like it.

Col. Stevens—That is my very object in wanting those roads classified so that we can make a lighter road in localities where they can get along with less. For instance, take your county, that Arcola road, that was originally built four inches thick and the State undertook to repair it last year and there were large areas where there was nothing left of it. We built that with four or five inches of stone work on there, and one year's use with those Pat-

DISCUSSION.

45

erson auto trucks coming over there wrecked the road. It had to be rebuilt. In other words, that was too light a construction. In other parts of Bergen County you have roads that have stood there practically without repair for fifteen years. They may be a little bit too good.

Mr. Bomm—No, I don't think so.

Col. Stevens—That is my particular object in putting weight upon this matter of classifying roads, so that we may be able to say we will build one road a little lighter than we will build the other, because it is going to carry lighter traffic.

Mr. Bomm—I know of a road that runs from Hackensack up through Westwood and up to Spring Valley. They have got heavy traffic on it, they started out pretty solid, but it don't stand it and that traffic gets so heavy now that it tears it all up.

Col. Stevens—You mean the road up towards New Millville?

Mr. Bomm—Yes, there is a lot of traffic on there and it is knocked all to pieces.

Mr. Hutchinson—Col. Stevens states that the road appropriation from automobiles will be about five hundred and fifty thousand dollars. Suppose the reciprocity feature is cut out, what difference will that make in the sum?

Col. Stevens—I cannot tell. Last year I made an estimate that we would lose, that we lost and would lose about thirty or forty thousand dollars last year. The registration, however, ran away ahead of what it had been the year before. As far as I can figure it, last year somewhere between thirty and forty thousand dollars that we would have made more if we had not had reciprocity. But I feel convinced I am wrong, that I left out some element in the problem.

A Member—Which is the best road for a general utility road, a combination road that will stand horse travel and automobile?

Col. Stevens—We are having that question now raised in Morris County quite frequently. Heretofore it has been considered that the best road is one constructed of the so-called bituminous concrete of which Amacite is the best known example. But, wherever those

roads have been laid there has been a great deal of complaint of their slipperiness. Last year we recommended to Camden County that they lay a ten foot strip of Amacite or some similar material down the centre of the road, and put two five foot wings of gravel or macadam on each side to allow horses and slower moving traffic to travel along the side of the road and the machines to go through the middle, and I believe they built a small section but that is not finished yet.

Mr. Hurff (of Camden County)—Where that was done we have got as near a perfect road as you can get, with gravel and sand on the side.

Col. Stevens—The White Horse Pike?

Mr. Hurff—Yes.

Col. Stevens—That is wider than ten feet. You have got fourteen feet there; and my idea was a ten foot strip and four or five foot wings, which would reduce the expense. In other words, the White Horse Pike is larger than what I am speaking of now. The White Horse Pike is one of the most heavily used roads in the State.

Mr. Hurff—We feel that we have a good road, and one of the best roads in the State.

Secretary Dye—Would it be possible for you to induce the Government to make an appropriation for this State?

Col. Stevens—I am trying that. I have received a letter from the Postmaster-General and the Secretary of Agriculture, saying they will give us ten thousand dollars to keep up fifty miles of post road, provided that the State and localities will put up twice as much. The trouble is they say post road, and not post roads, and there is no post road in this State fifty miles long, and I am trying to get them to modify that into post roads and let us put in a bunch of roads, in which case we may be able to get ten thousand dollars out of them.

Secretary Dye—Gentlemen, I am quite sure Senator Gaunt was right. We leave matters of legislation altogether to our representatives. They frequently desire an expression from their constituents on the various important matters that come before the Legislature,

DISCUSSION.

47

and now, if we have anything to suggest to Senator Gaunt and the other members of the Legislature, I am sure they will be glad to have it. These questions that keep coming up before the Legislature from time to time I think are very, very important.

Mr. Lippincott—I would like to ask. There was a statement made publicly in Burlington County yesterday, that the State Department proposed to take over about eighty miles of our improved roads within the next three months. Is that official?

Col. Stevens—I don't remember the exact mileage. The State Highway Department has laid out some work in Burlington County, but I don't remember the exact mileage. Mr. Weeks has the figures there, I think.

Mr. Weeks—No, sir.

Col. Stevens—You have not got that?

Mr. Weeks—No, sir.

Col. Stevens—My impression is that it is not so much as that. My impression is that it is between sixty and seventy miles. But there is this to be said—

Mr. Weeks—Yes, I have Burlington County, I remember now, it is ninety-nine miles.

Col. Stevens—Mr. Weeks has been making the figures and he has been telling them to me, so he is a better authority than I am on that. I am not going to recommend to the State Highway Commission to take over any of those roads as State Highways until I can see where the money is coming from to keep them up. I am going to ask the Legislature for the money and if they will give me enough money to keep that eleven hundred or twelve hundred miles that I propose to recommend to the State Highway Commission, I will be very glad to take them over just as soon as I can organize my force to do it. It will probably take several months. If, however, they are not going to—and I do not think they will give me the money I will ask for—I will only take over so much as I feel positive I can handle. That would be to establish the system. The road would probably go from here to Mount Holly, and from Mount Holly to Camden. What other roads in Burlington we would take, I am not as well prepared to say just now.

Mr. Lippincott—The statement is a little bit premature then?

Col. Stevens—The statement is a little bit premature. It expresses my desires, however.

A Member—There is no question but what the expense of our highways is attributed largely to the persons who are repairing and constructing them who are not competent. I want to endorse what Col. Stevens has said about the State taking over certain roads providing the State has the supervision over the roads. I know in our own county the Road Commissioner expends about fifty thousand dollars and the roads are worse to-day than they were a year ago, simply because a lot of nurserymen over their own road, had some planter, a man who knew nothing about doing the work, to do that work. I think this Association ought to put itself upon record as recognizing a thing of that kind, a State supervision of all roads.

A Member—There is the same trouble in our section also.

Col. Stevens—I find the same sentiment all over.

Mr. Camp (of Cape May County)—In my county we have eight miles of county roads, and the trouble there is the statement is going about, "is there anything in it?"

Col. Stevens—The trouble in Cape May County seems to be that we are going to take all your roads in the State system. Which one do you refer to?

Mr. Camp—On the Bay shore.

Col. Stevens—That is to be left as a county road. The idea is to build that road beginning at Friests Corner and working up.

Mr. Camp—Is there any prospect of having the road laid?

Col. Stevens—Well, the Board of Freeholders told me they are going to build the road, and they are going ahead with it. The only question is getting the appropriation from the Legislature. We will have to get a little more money before we can get any more approvals.

I hope the gentlemen will excuse me. I have two or three delegations waiting for me. The hour set was three o'clock and it is now a quarter-past three. I don't think I can keep them waiting

REPORT OF STATE GRANGE.

49

any longer. Some of them have to travel a good deal longer before they can get home after they get through with me.

A rising vote of thanks was given Colonel Stevens.

Vice-President Cox—Owing to the delay this morning, which was entirely unavoidable, and over which we had no control, it was necessary for us to omit a part of the programme for the morning session in the absence of Senator Gaunt, and we will now return to that part of the morning programme, the Report of the State Grange, by the Hon. G. W. F. Gaunt, Worthy Master of the New Jersey State Grange. I now have pleasure in presenting Brother Gaunt to the members of the Board of Agriculture. (Applause.)

Senator Gaunt—Mr. President, I have often wondered where the authority came from for the Master of the State Grange to report to the State Board of Agriculture, but I presume it is a custom, and I think a very good one. It brings the two organizations into closer touch with each other and has that one influence.

In the past few years we have been co-operating for the uplift of agriculture, and endeavoring to improve agricultural conditions in our State.

It is with pleasure that I can report to the State Board members that the State Grange was never in a more prosperous condition than it is at the present time. They have been moving steadily along. We have not attempted to go by leaps and bounds. We have endeavored to build up a constructive organization, one that would be of some assistance to the farmers of the State in moulding public opinion in matters that pertain to the agricultural activities of our State. We think that in a measure we have been very successful because of the fact that only a few years ago, it was hardly possible for the State Board of Agriculture to get recognition at the hands of our legislative bodies; while at the present time, owing to the effective organization that we have, and the co-operation that we are having between the different boards and organizations, we are a force in the legislative policies of our State.

We are beginning to impress upon the minds of our legislators that agriculture in New Jersey is worth while. It is demonstrated on all sides what the agricultural interests of the State can do when they once make up their minds to do it. We have been willing that the other fellows should do the thinking for us and do the

legislating for us. Consequently, agriculture was neglected to a certain extent. But that is not the case at the present time.

It does me good when I look over this vast room and see the exhibits of farm products, coming in from the various counties in the State. I can picture in my mind in the future, what the future State Board of Agriculture is bound to be in its meetings, in the way of exhibits of farm products and in the way of attendance at this annual meeting. We only have a beginning, and this only started a very, very few weeks ago, and the products that we had hoped to get, many of them had been used for other purposes, and it seemed as though it would be almost impossible to get a creditable showing. But I am very proud indeed of the results that have been obtained through the co-operative efforts of all of these organized forces. And that brings it right back to the key note. It is necessary for the farmers of the State and the nation to have a live, active, aggressive organization. One that is for the interests of the farmer first; and when we are going to take up the interests of the farmer and improve farm conditions we are improving every other class of people. We are bound to benefit them, because of the fact that we are the producers of property that did not exist before.

I am mighty glad that we have had our Road Commissioner here. I am only sorry that the members here assembled did not ask more questions. I wish that it had been possible for you to have kept him here for an hour or two. To let him give you information that it is very essential for the farmers to have.

There is a great revolution coming in the way of road legislation and road building. It is, I believe, the greatest question that we have to deal with in the State to-day. Perhaps you men would say the educational system is the greatest, but I think good roads is educational, and it leads to bettering educational facilities and keeping our boys and girls a little closer to the schools. It is a question that there is millions of dollars involved in, and the way to raise that money is a question that must be solved. It is one of the unsolved problems at the present time, and I wish that the farmers here assembled had gone into that question more earnestly and tried to find out just what policy we are to pursue. We do not want to go back and levy a tax on our farmers any heavier than they are at the present time.

REPORT OF STATE GRANGE.

51

It has been suggested that we might start in and tax—say, place a tax of fifty cents on each horse in the State and have that for road purposes. Well, I can hear some of our good friends say that would never do in the world. But I think there are a lot of other fellows who will say; “Well, I would like to pay a dollar on each one of my horses if I knew that it was to be used for the improvement of our highways.” I think I can hear the fellows in the great cities of Newark and Jersey City complaining about the levying of a tax on horses to be used for road purposes, but I do not think they will make very much objection. They do not seem to have any objection to coming out with their sixty, seventy or eighty or hundred horse power cars and going over our roads and, of course, we have to stand that and take the roads as they leave them and stay there with the roads after they are damaged, and they can go and find better ones if they want to.

Those are questions for us to think about. I don't know that that will be the policy. I don't know anything about what the policy will be. Whatever it is going to be, it seems to me that the farmers of the State should realize that they are an important factor in assisting to solve this question, and it is not for them to sit still and not say anything and not think it over. It is up to you to give it your very best thoughts and your very best consideration, that we may be able, those of us who are in the Legislature, to get the very best opinions we can from you and as near as we possibly can, carry out the work that you plan, and put it into effect. I had hoped that we would have some expression from this State Board as to what it wants, as to its policy, that you would like us to pursue, as the representatives of the agricultural interests of the State. We want to know what you want done, so that we may be able in our feeble manner to assist in bringing about those needed changes in the law in accord with your wishes.

We have been boasting of the best roads in the country—New Jersey, the Good Roads State. But, if we do not do something it is soon going to be known as the Bad Roads State, the way the roads are going to pieces. That is not an idle dream. It is an actual fact. At the close of each year the roads are not in as good condition as they were at the beginning of the year. And, therefore, it seems to me it is a matter of great importance to the agricultural interests and it is worthy of your very earnest consideration at this meeting of the State Board of Agriculture.

I presume I have gotten away from the report of the Master of the State Grange to the State Board of Agriculture, but I want to say in conclusion, that the same co-operation, the same cordial feeling and kindly feeling exists between the two organizations that has existed for so many years, and we are working hand in hand to do our part toward making agriculture the greatest influence in the State of New Jersey. The State of Opportunities, I think we had better begin to call it. The State that has the greatest opportunities for agricultural activities of any other State in the Union; and I am quite sure that the recent Land and Irrigation Show over in New York has given New Jersey a wider publicity, it has been advertised more in the papers for those few weeks, it has been talked about in our Western country more in the past few weeks, than it ever was before in the history of our State.

I know that there have been already negotiations started by some of those who live beyond the Mississippi River to get back to the State of Opportunities.

Now, my friends, let us ever bear this in mind, that we must join or begin to promote a boosters' club in the State, and let other people know what we are doing, what our magnificent experiment station is doing, what they are anxious to do and are willing to do if they can have your earnest co-operation along those lines.

Now, I say, those are matters that are worth while, and it is up to us as farmers, to get busy and see to it that New Jersey is placed on the most prominent part of the map as a growing State. It is up to us whether it is or whether it is not.

I therefore appeal to you as farmers to realize that agriculture in New Jersey is a great and growing industry and is going to be a greater one.

In conclusion, I want to say that the co-operation of the State Grange will be extended even further than it has been in the past, with the officials of the State Board of Agriculture in forwarding everything that we can that will advance the cause of agriculture.

I thank you. (Applause.)

Vice-President Cox—Taking up now the programme for the afternoon session again, the next matter is an address by Mr. Lippincott, the Commissioner on Motor Vehicles, but as he is not present at the moment, we will pass on to the next matter, which is the Report of the E. B. Voorhees Agricultural Society, by Mr. Charles

Van Nuis. I take pleasure in presenting Mr. Van Nuis. (Applause.)

Report of the E. B. Voorhees Agricultural Society.

BY MR. CHARLES VAN NUIS.

The year 1912 has been one of profitable development for the E. B. Voorhees Society. Having earlier passed through a stage of infancy, our adolescent period might be computed from the beginning of 1911. Boy-like, we felt our importance and started out to "do things" and we feel proud to offer to the agriculturalists of New Jersey the results of two years of co-operative experimental work conducted by our members, much of which is published in the reports of the society for the years 1911 and 1912, and other valuable data is being held for a State publication which will insure it a wider circulation than could be accomplished with the limited resources of our society. But ardent youth is prone to error and it was with pardonable enthusiasm, even if, as we now view it, we over-reached our capacity, when last season's work was planned.

Thirteen experiments were outlined: some of which were not taken up; some were abandoned; others were lost through vagaries of the weather, as early flooding in Camden county and drought in Bergen county; most of those relating to vegetable growth were much modified in final results by the equalizing effect of the excessive spring rains, which carried soluble salts beyond the borders of the experimental plots to which they had been applied in varying quantities for comparison of results; while the experiment outlined for a study of moisture conservation by early and frequent tillage seemed to be, during April and early May, a waste of energy because of the excessive rainfall.

Notwithstanding the vicissitudes which confronted us, during a season of unusual conditions, the annual report just issued contains information of value.

The average yield of hay from five meadows was increased \$7.10 per acre by an application of nitrate of soda worth \$3.75.

Seed potatoes from Maine and Northern New York showed larger yields than New Jersey bin-stored seed, the increase varying from 3.5 per cent to 10.8 per cent.; but, where the New Jersey seed was from Maine stock, cold stored until July and then planted solely for the next season's seed, the produce of such seed was 9.4 per cent. more salable potatoes than from the seed direct from Maine.

The latter experiment was conducted upon a section of Mr. Seabrook's farm and the supervisor of experiments made the following field note upon the value of irrigation to the potato crop; a plot each of irrigated and unwatered potatoes being dug the day of my visit.

Variety compared, Irish Cobbler.

Fertilization, 20 tons manure plus 1 ton of 5-8-8 fertilizer.

Yield per acre, unwatered, 92 bushels.

Yield per acre irrigated, 562.7 bushels, an increase of 505 per cent.

A field note by a member from Monmouth County reports yields of potatoes following a cover crop of wheat and one of crimson clover. The yield following the legume was 43 bushels per acre greater than that following wheat, an increase of 10.7 per cent.

The experiments upon tillage of corn ground showed an advantage in early plowing and frequent tillage until planting time.

A field note, by a member from Salem County, upon the benefit to corn of the application of 1 ton per acre of ground limestone and a cover crop of vetch upon a light sandy soil low in plant food.

The plot treated as above yielded 82.7 per cent. more corn per acre than did the untreated area.

Four experiments were made to test the value of various pure culture and soil inoculations upon the growth of Mammoth Yellow Soy Beans and the development of the nodules of nitrogen fixing bacteria upon their roots. All inoculation was beneficial; soil inoculation was frequently uneven in its effect, prob-

ably due to an uneven distribution of the applied soil particles; of the pure cultures Farmogerm gave uniformly excellent results in beneficial inoculation.

Of the advantages of association there can be no doubt and that the above experiments were conducted more easily and more thoroughly through organization is also true, but the question has arisen whether we would not better serve the common interest of agriculture in our State by using our widely distributed membership to obtain a volume of convincing data along a few chosen lines of study than to gain a few facts from each of several experiments of varying character.

At the winter meeting of the society, Prof. Alva Agee, chief of the Extension Department of the State Experiment Stations, was invited to address us, his subject being, "Possibilities of Our Student Organization," after which Prof. Agee conducted a conference upon the possible value to the State of concerted action by our members upon a chosen line of work embracing not more than two subjects. The consensus of opinion seemed to prevail that we could well adopt the slogan "Legumes for New Jersey" and that a large part of our energies, set apart for co-operative experimental work might well be devoted to the development of a single strain of Soy Bean which had proven to be especially adapted to the needs of our State. By submitting to direction from the Extension Dept., we would be compensated by the more mature judgment of one well versed in the needs of the case in hand and of long experience in co-operative experimental work. In line with the above the following resolution was presented and adopted:

Resolved, That the E. B. Voorhees Agricultural Association endorse the establishment of an Extension Department at the State Experiment Station and urge that the individual members co-operate with Professor Agee and do their utmost to make this work of value to the agricultural interests of New Jersey.

By vote the society directed the Executive Committee to confer with Prof. Agee and report how our members could best serve the Extension Dept.

Every farmer realizes the benefit he would derive from an increase of the nitrogen content of his soil; it is very generally conceded, too, that the growing of legumes is the cheapest source of soil nitrogen; but to place all legumes on an equal rating, or to call Soy beans of whatever variety of equal value as soil improvers, would be like investing money in an enterprise regardless of the rate of interest to be earned. The time has arrived when progressive men do not wait to have their soil become self-inoculated for legumes and thus lose much of the benefit of the first few years growth and it is beginning to be understood that certain strains of Soy beans are best adapted to soil improvement only over a limited territory.

The work of developing strains of Soy beans which will best serve the agricultural needs of our State is a commendable undertaking and with intelligent direction our society will be in line with the accomplishment of such a purpose.

Another line of work for which the E. B. Voorhees Society is well qualified is the development of strains of corn suited to the different sections of New Jersey.

Henry, in his book on "Feeds and Feeding," refers to corn as "The imperial agricultural plant of America."

There are large areas in New Jersey where corn can be grown more profitably than any other concentrated feed for home consumption, but, until the advent of alfalfa, it was fed rather sparingly because of the preponderance of carbohydrates it contained. With the rapidly increasing acreage of alfalfa corn is becoming more generally used in intelligent feeding of farm animals and improvement in corn breeding should be recognized as correspondingly important.

There will be 5,000 acres of alfalfa cut in New Jersey in 1913, an increase of 350 per cent. since 1909. There are men who will attend this annual meeting who own valuable work teams and fine driving horses which have been fed alfalfa and corn continuously for so long a period of time that they have probably forgotten the flavor of oats and timothy.

It is worthy of note that one of our society won the silver cup, a sweepstakes prize valued at \$500, offered by the management of the recent Land and Irrigation Exposition held in New York. Competition was open to corn grown in the United States, five states competing. This corn and the prize cup are on exhibition in this hall.

The corn which won the grand sweepstakes cup scored 94 per cent., which was not an accident, but the result of several years of careful selection and breeding of a variety which has improved each year since recovering from the first shock of Eastern environment. The demand in New Jersey for high grade seed corn is far in excess of the supply, and the study of types and the development of strains of corn, under the direction of Extension Dept., is a field upon which the E. B. Voorhees Society may enter at no far distant date.

Secretary Dye—This report, Mr. Chairman, as you have heard, shows that this Society is doing excellent work, practical growing work. But when it also perpetuates the name of that Honorable Jerseyman and Progressive Agricultural Worker, E. B. Voorhees, it is worthy of double honor. I move that the report be received and printed in full in the annual report. Carried.

Vice-President Cox—We have another very important question to consider here this afternoon, that is, the suggested automobile legislation, and that matter will be presented to us by Mr. Job Lippincott, the State Commissioner of Motor Vehicles. I take great pleasure in presenting Mr. Lippincott to the State Board of Agriculture. (Applause.)

Automobile Legislation.

BY MR. JOB LIPPINCOTT.

In discussing the subject which has been assigned me by your Honorable Board let us consider the automobile from the standpoint of a business necessity. A few years ago the automobile was in the experimental stage, and was consequently used only for pleasure by those who could afford it as a luxury.

To-day the motor vehicle has passed from the experimental stage and has become a necessary adjunct to every progressive business, both in the cities and in the country districts. The development of the motor vehicle has brought in its wake many important governmental problems which have yet to be properly solved.

There has been a disposition in the past for one portion of the community to approach this subject with prejudice, and for the other portion of the community to demand unjust privileges. This was a very natural difficulty at that time, but it now becomes our duty to seek a scientific solution of the problems which confront our state bearing upon the proper licensing and regulating of automobiles; and I am sure that a body such as yours will render every fair and honest assistance to the authorities charged with the handling of this important problem.

The farmers and the agricultural interests generally have been thought to be in opposition to the automobile. Recent events have demonstrated that this is no longer true, as the automobile has very generally invaded the field of agri-

culture, and has been placed to innumerable uses by the farmers throughout this country.

It is, therefore, proper at this time to ask that all classes and all interests which go to make up our economic life should join together in an effort to bring about a scientific motor vehicle law.

During the few months that I have been the Commissioner of Motor Vehicles, I have given considerable study and attention to a comparison of the laws of New Jersey with those of other states, and while I believe our motor vehicle law to be little better than a series of expediency rules and class legislation, yet it seems to me that we have one of the best motor vehicle laws of any state in the Union.

The whole subject, however, has been approached from the wrong standpoint, and in its development has failed to take into account any very general or underlying principle upon which a scientific law must, in its final analysis, be based.

Before discussing in detail the amendments which have been prepared by the department, let us consider for a moment the principles upon which a scientific motor vehicle act should be based and the necessary results of the practical application of such principles.

The theory on which a motor vehicle is licensed appears to be based, from a study of the laws passed in different states, is the need of the state to provide a proper revenue for the building of roads upon which motor vehicles must travel. In other words, our license fees, so far as they apply to the vehicle itself, are in the nature of road taxes. The license tag used to indicate that a vehicle has been licensed is based on the need of an easy method of identifying any fast moving vehicle for police purposes. The theory on which drivers, operators, or owners are licensed is primarily the theory of regulation through revocation of the license.

It must therefore be seen that the basis of any scientific motor vehicle law must comprise the three following principles: first, revenue for the building of roads; second, summary power to regulate through revocation of license; third, a scientific distribution of revenue from licenses between states.

To apply these principles accurately and scientifically leads us to the consideration of an interstate license system whereby no machine traveling on the roads of any state will fail to pay a proper proportion of the road tax necessary for the upbuilding of the roads.

In the effort of states to solve this problem, laws have been passed which have been euphoniously called "reciprocity" acts. While to my mind, the passage of such laws have been a step in advance, they have not been in my opinion true reciprocity laws, and have simply been laws which created a reciprocity of privilege without a reciprocity of regulation or without a reciprocity of revenue. In other words, our reciprocity laws hitherto have been acts passed in the interests of one class as against the general interests of the states. The reason for the passage of such acts has been plain. To interfere with the free passage of motor vehicles from one state to another is to place an inconvenience upon the users of automobiles, whether for business or pleasure. The very nature of an automobile, the fact that it can travel at a considerable rate of speed, and that it can travel for a long distance, makes the automobile question at once an interstate question.

The question which I desire to place before your Board to-day, however, is not the repeal of reciprocity, but rather the passage of such laws, through interstate agreement, as will conserve the general principle of a free and untrammelled passage of machines between states and yet bring about a proper distribution of revenue and an automatic means of regulation at all times.

This can be done by the adoption of an interstate license system. The scheme which I would suggest for the adoption by this state and for the adoption by other states may be briefly stated as follows: The owner of a motor vehicle resident in New Jersey should, of course, be licensed in New Jersey. At the time when licensing such machine, he should make application for a touring privilege

AUTOMOBILE LEGISLATION.

57

in the states in which he believes it will be necessary for his machine to travel. Upon receipt of such application, an additional proportionate fee should be charged for each privilege granted, and each privilege granted should be indicated by the granting of a tag of some character which may be bolted or fastened to the regular New Jersey license tag. The department of this state should then proceed after a deduction of the expenses in connection with granting such privilege, to forward its check to the department of the state in which such privilege is granted, together with a copy of the application and the number of the license granted covering the privilege in the foreign state. In this way the automobile travel in different states will at all times be subject to the department of the state in which it is traveling, and the state in which it is traveling will in addition receive a proper proportion of the revenue paid for such privilege, or in other words, will receive a road tax from every machine within its borders.

In illustration of what I mean by this, I have had certain plans drawn or picture drawn, so to speak, of what an interstate license tag, under such a scheme as this might look like. Those of you who have automobiles will recognize on top the regular New Jersey license tag as to form. A man applying to our State under this system, if adopted, for the privilege of touring in New York, would receive a tag like that, which could be bolted at the bottom of his regular tag when going to New York state, and the authorities of that State would know that he had paid for that privilege and New York State had received the money which he had paid for that privilege, as proved by the added tag. If he wanted another one, there would be the one for Pennsylvania or Connecticut, as the case might be. There are very few machines that travel in more than one State, and there are very few machines that travel very many miles away from New Jersey as a general thing. I think this would be practical.

The difficulty of the adoption of such a plan is found in the fact that it will not be practical or possible unless all states similarly located adopt similar laws providing for a similar distribution of revenue and a similar method of regulation.

I know, however, of no better body in this state or in any other state to start such a movement than the body before whom I have the honor to speak. I have brought this subject up at this time, not that I believe it possible to adopt a law along these lines by the next Legislature, but in order that bodies similar to yours in other states may take up this matter and discuss it, and if possible, bring about a conference of authorities for the purpose of drafting a model law to be adopted by the several states.

In discussing immediate legislation, it is necessary for us to consider a means of strengthening and modifying our present motor vehicle law. As I have said before, while I am not an advocate of the present reciprocity law in its entirety, I am nevertheless opposed to any repeal thereof, believing that we can pass such legislation this winter as will strengthen the reciprocity law, and make it more equitable. Reciprocity is a step in advance: now let us take another step to perfect it.

The results under reciprocity have not been entirely discouraging. For the year 1912, our gross receipts have amounted to \$496,653.46, as against the gross receipts of 1911 amounting to \$413,786.27, showing an increase in gross receipts of \$82,867.19.

We have licensed for 1912 43,056 automobiles, as against 38,401 in 1911, showing an increase of 4,655.

While possibly this year is not an entirely fair test of reciprocity, for the reason that it was not adopted until last April, yet as the business done by the department since reciprocity has been adopted compares more than favorably with the business during similar months of 1911.

I think that we can therefore confidently expect a fifteen to twenty per cent. increase in the gross receipts of the department for 1913, which would bring our revenue somewhere in the neighborhood of \$600,000.

While this sum will not be sufficient to maintain our roads at the standard heretofore maintained, I believe that with proper machinery for the law's en-

forcement and with the adoption of the amendments which I shall recommend to the legislature this winter, that it will be possible to still further increase our revenues, and very possibly, through minimizing the expenses of the department, to provide very nearly sufficient revenue for the purpose of maintaining the roads.

As I have said before, our reciprocity law is rather a reciprocity of privilege than a reciprocity of punishment. In order to correct this very glaring defect and in order to bring all machines which may be traveling in New Jersey under some direct control by the motor vehicle department, I shall recommend to the Legislature the passage of an act providing that the Commissioner of Motor Vehicles may have power to suspend the reciprocity privilege against any motorist from another state who has violated the laws of our state.

At the present time any resident of this state is subject at any time to have his license revoked; but the car bearing a license from New York or Pennsylvania which travels our roads can practically travel them free from any such supervision, and if they violate any of the minor provisions of the act they can go out of the State, and unless they are summarily arrested, they cannot be brought back, and there is nobody in the State upon whom process can be served for them in a civil action, and unless the offence is extraditable, you simply cannot bring them under the laws of the State again. Now, this proposition, while it is not an absolute method and while it is not possibly as good as it may be, yet the amendment which I recommend here would make it possible for the department to suspend privilege against that machine and to penalize it heavily if the man again came in the boundaries of the State.

At the present time with machines from New York, Pennsylvania, and other states touring in New Jersey, the motor vehicle department has no power to summarily revoke or to revoke after hearing the licenses issued by another state. In other words, tourists from outside New Jersey enjoy immunity from such prosecution, while our own licensees are at all times subject to the summary action of the commissioner of motor vehicles for cause.

The fifteen-day touring privilege contained in the reciprocity amendment is impossible of absolute enforcement. With only eight inspectors in the department, it can readily be seen that we are severely handicapped in handling so intricate a question as checking up machines to see whether they have overstayed the privilege granted by our laws. During last summer, it was necessary for the department to center its inspection force in the summer resorts of the state, and through the work of our few inspectors, it was possible to ascertain that a number of persons were violating the fifteen-day reciprocity privilege, with the result that the revenues of the state were increased many thousands of dollars.

Our recommendation to the Legislature will be that the number of inspectors in the department be doubled in order that we may further increase the revenues derived from this source. I do not believe that the reciprocity law ever contemplated the strict enforcement of the fifteen-day touring privilege. Nevertheless, I feel that with so fine a road system as we offer in New Jersey, it is the duty of our police authorities working in conjunction with the motor vehicle department to use every effort to compel tourists from other states who have been in New Jersey for over fifteen days to pay the regular license fee, and such will continue to be the policy of the department under the reciprocity agreement.

In order to facilitate this work, the department will recommend to the legislature the adoption of the Massachusetts system of garage records. This system provides that every public garage shall keep a book of records, showing the incoming and outgoing of every machine, and by whom each machine is brought in or taken out. This amendment will serve the double purpose of making it possible for our inspectors, through an investigation of these records, to determine whether a machine has been in a garage over the fifteen days, and will also provide a protection to automobile owners against the unauthorized use of their cars.

I have referred to the need of additional revenue in order to keep our road system in New Jersey intact. In order to accomplish this, it seems to me that

AUTOMOBILE LEGISLATION.

59

we must advocate a slight increase in the amount charged for the licensing of motor vehicles. I do not believe in a very large increase for the reason that I do not think that we should tax our local people for road injuries done by motorists from other states, but I do believe that in a state which has established so fine a system of public roads as to-day exists in New Jersey, the residents of the state should be willing to pay a fee commensurate with the fee exacted from such states as New York, Pennsylvania, and Maryland. After a careful examination of the laws of these states, I have prepared the following table of rates which would seem to me to be just and fair:

1 to 10 horse power	\$ 5.00
10 to 30 " "	10.00
30 to 40 " "	15.00
40 to 50 " "	20.00
50 horse power and over	25.00

By examining the number of licenses issued in 1912, basing the same on the horse power, and applying them to the above table, I find that had this table been in effect during 1912, the revenues of the department would have been increased approximately \$100,000. This great increase could have been had without undue hardship to the owners of automobiles in this state.

Considerable criticism has been recently directed against the use of an inelastic formula for determining the horse power rating of motor vehicles. Under the present law, we are compelled to use the A. L. A. M. rating in order to determine the horse power of motor vehicles for the purpose of charging the registration fees. During the past few years, the manufacturers of automobiles have made a number of important changes in the construction of combustion engines, with the result that the formula referred to no longer provides a basis for the determination of true horse power rating. In correction of this, an amendment will be recommended to the Legislature providing that the Commissioner of Motor Vehicles may determine, thirty days before the relicensing period each year, the formula upon which such rating will be determined. A conservative estimate of the result of the adoption of a formula which would provide for a truer horse power rating would indicate that the revenue of the state would be increased something like fifty thousand dollars per year.

Our present method of determining the horse power of the condensing engine is not a true method, owing to the manufacturers of cars having changed their methods of manufacture, and if the Commissioner of Motor Vehicles had the power to do so he would recommend a formula which would keep pace with the method of manufacture of such engines each year, which would increase our revenue very considerably and charge the owner of the motor vehicle a true and proper amount for his car.

Another method of increasing the revenue of the department would be through the adoption of what we might term a livery license, or a license which would be designed for the use of companies or individuals who rent cars. My experience in the department has been that a number of garages which are in the habit of renting machines have been using their manufacturers' numbers for this purpose. The manufacturers' number, as you know, is designed under the law to be used only for demonstration purposes, and is sold in sets at a much lower figure than the general car registration. Through the work of our inspectors, we have greatly reduced the misuse of manufacturers' numbers; but it is practically an impossibility to completely eliminate this abuse. By the adoption of a livery license at a higher fee than the fee charged for the manufacturer's tag, it would be possible to minimize the abuse of manufacturer's privilege, and to increase considerably the revenue of the state from this source.

These recommendations to the legislature constitute the important features of the program of the department. In addition to these, the department will recommend an amendment based on the New York law providing that the rear lights shall be so placed on machines as to shine on the number plates.

The department will also recommend an amendment prohibiting the hanging of numbers in such a way that they swing; a further amendment providing that the commissioner of motor vehicles may have power to suspend a license in such cases where he believes that to revoke would be a too extreme penalty; an amendment to the law giving the Commissioner power to summon witnesses in all hearings and also to impose fines in such cases as in his judgment may be best disposed of in that way.

The department has entered upon an important innovation this year by the adoption of an official marker to take the place of lost markers. This marker is a plate similar in every way to the regular plates issued by the motor vehicle department with the exception that in every case an O appears before the number and that there is no seal on the plate. In conjunction with the adoption of this system the legislature should pass a law prohibiting the use of painted or otherwise manufactured fictitious markers.

It has been the experience of the department that a great many accidents have occurred through the driving of machines by persons who are under age. Our present law provides that a license may be granted to any one who is sixteen years or over. The department would recommend that the legislature amend this section of the act prohibiting the granting of a license to any one under the age of eighteen years.

I do not believe a boy under eighteen years of age, as a usual thing, is a proper person to be licensed to run a motor vehicle, although there are many exceptions, where many young boys can run them even better than the older persons, but, as a general thing it is an unwise thing to license a boy to run a machine under eighteen years of age.

This constitutes the program of the department as adopted up to the present time. There is, however, a matter which may be of interest to the members of this board concerning the regulation of commercial vehicles. It has been estimated that the heavy vehicles used for business purposes in passing over our roads cause considerably more damage than is done by the average pleasure automobile. In Massachusetts, the State Highway Commission has drawn an amendment to the law of that state providing that no commercial vehicle shall pass over the roads of that state carrying a load, the weight of the vehicle included, in excess of eight hundred pounds per each inch in width of the tire.

It may be possible that a similar law should be adopted in New Jersey. Certainly something should be done either to increase radically the fee paid by heavy vehicles using our country roads, or else some method of regulating the weight on a basis of wheel diameter should be adopted. Road construction is very closely bound up with the automobile; in fact, without proper roads, the automobile becomes a useless machine; and any vehicle which from its nature causes undue injury to a road should be subject to drastic regulation.

It is a source of considerable satisfaction to us in New Jersey to note the tendency of legislation in New York State. The Secretary of State of New York has recently announced a program of motor vehicle regulation which would make the New York law very similar to the New Jersey law.

As I have said before, the New Jersey act is probably one of the best in the country, although capable of much improvement. As New Jersey has been the pioneer of automobile laws in the past, it would be very fitting if in the future we should be the first state to pass a scientific law along the lines which have been outlined to-day.

New Jersey has one of the best road systems in the United States. This road system must be continued at its high standard. I believe that with the adoption of the above-mentioned amendments and with the co-operation of bodies such as yours, that it will be possible to work out a solution of our motor vehicle problems. I can assure your Honorable Board that at all times, I shall be ready to aid you in any movement which you may undertake for the betterment of conditions in this department; and at this time I ask for your co-operation in the work which I am attempting to do.

Let us take no step backward. Let us not seek to repeal any important feature of our present law without providing a better method of dealing with the problem.

DISCUSSION.

61

Mr. Lippincott—Gentlemen, I wish to thank you for this opportunity and for your kind attention to-day. The subject, I know is rather dry, as to intelligently discuss it we are compelled to use frequently the technical terms which are used in the laws of our State and which may not be generally familiar. I have enjoyed very much the honor of being with you, and as it is my first year in this important office I feel that I need the support, and the advice, especially the advice, of every man who is interested enough in the laws of his State to attend gatherings of this kind and participate in the proceedings. We, all of us, have our opinions, some of us may differ, as to the method, but I think our objects are all one, that is, for better laws in New Jersey and better methods of handling important problems, such as this. (Applause.)

Vice-President Cox—I am sure you have listened with a great deal of pleasure to this address; and perhaps there are some members of the Board here who might wish to ask Mr. Lippincott some questions, and I presume Mr. Lippincott would be glad to answer any questions or enter into any discussion on this important subject.

Mr. Lippincott—Yes, surely.

Mr. Busby—I would like to ask Mr. Lippincott if the license fee charged in our State is the same as that charged in New York and Pennsylvania, the same in amount?

Mr. Lippincott—They are slightly in advance. That table that I suggested in the remarks that I have just made would tend to bring our license fees, as a general thing about on an equal basis with New York, and Pennsylvania and Maryland. In some of the other States like Connecticut, it is the custom to charge fifty cents per horse power, and I think as a usual thing that would result in a higher license fee than the people of New Jersey pay. As a general thing, the high-power cars, under the scheme which I outlined, would pay slightly more than what they do in New York State or Pennsylvania, but it is the high-power car that does the damage. It is generally a heavier car, and those heavier cars ought to pay more.

There is one thing, in answering your question fairly, that I ought to have called attention to; in New Jersey we license motor vehicles on the horse-power basis, charging them ten dollars addi-

tional if they weigh four thousand pounds or over. Now, in New York State they are licensed at a set rate of five dollars, irrespective of what the horse power is or even the weight. But that has been found to work out badly over there, and the Secretary of State, Mr. Lazinsky then the former Secretary of State, said—there is a new Secretary of State now—had already recommended to the Legislature that it pass a law practically making the licensing of the heavy trucks and commercial vehicles very similar to the laws of this State. Is that an answer to your question?

Mr. Busby—Yes, sir.

A Member—I would like to ask the speaker why he recommends an increase in rate on the twenty-horse-power car up to ten dollars and something over that, fifteen? Why not make the higher horse-power car a higher rate and let the twenty-horse-power car stay as it is, because it is the heavier power cars that do the damage to the roads, and they have got the greater speed and much more weight. I don't see why Mr. Lippincott should advocate that rise in the lighter cars.

Mr. Lippincott—I am not absolutely convinced necessarily that the table which I suggested would be an absolutely fair table. That is a question which I am frank to admit is open to discussion whether the twenty-horse-power car, or from twenty to thirty should be charged as high as ten dollars. What we have got to do to get at the true rating on this thing is to base it on the horse-power as outlined somewhat. Possibly a twenty-horse-power car ought not to be charged ten dollars, but yet when it gets up to thirty and over it ought to be charged more. I think you will agree with me there, it is a question of just where those changes should take place all based on the horse-power.

I think if you will examine the results in the manufacture of cars you will find that they are manufacturing a number of low horse-power cars which may be considerably heavier cars, and some of them are light. But in determining this thing absolutely, you are bound to make a dividing line somewhere, unless you go to the Connecticut system and charge fifty cents per horse-power as your license fee, and I am not sure but what that might not be a better method than the one I suggested. Charge fifty cents per horse power, run them in a series, say from one to ten so much and ten to

DISCUSSION.

63

twenty so much, etc., that is what we are doing now, and it might be better to charge fifty cents per horse-power. I am not sure that the system I recommend there is good, but there is one thing certain, the New Jersey automobile owners ought to pay as much as the automobile owners of the States next to us, and I figured that thing out on the basis of the amounts charged by the States near New Jersey and brought the thing down as far as possible to that basis; because we have got better roads than they have, and if you charge your automobile registration fee as a road tax, then the State that provides the best roads, its people should be taxed as high certainly as the other States. That is the theory on which that table is made up.

Mr. Harrison—Has there been any account taken in this matter of the high tolls they are charging each side of us? It costs, I am told, pretty heavy to get around out of New Jersey into Pennsylvania and out of Pennsylvania into Maryland, and the Jerseyman has got to pay toll in addition to the tax. Now, do we get anything for that toll? We have got no toll road here. Are we giving them anything or are we not?

As I understand it, we are not charging them tolls and they are charging us.

Mr. Lippincott—As I understand the question your idea is that reciprocity between New Jersey and Pennsylvania is not real reciprocity, for the reason that in Pennsylvania you pay tolls besides the fee?

Mr. Harrison—I want to know if that is taken into account?

Mr. Lippincott—That has not been taken into account, unfortunately. The State Road Department is taking over those roads in Pennsylvania and making them State roads.

I took a three months' trip in Pennsylvania and I think we paid as much in Pennsylvania in tolls as it would cost to get out a license in this State. The point is that if you take out a license in this State you have to pay tolls over there just the same. There is only one or two toll roads left in New Jersey, I think. One, I know, the Carlstadt road, between Bergen and Hudson counties, which is still a toll road, although they have reduced the tolls down to almost nothing. That is still operating. I was over that not so very long ago. On the question of travellers from one State to another, we

give the automobilists from other States better roads and more privileges than they give us. There is no doubt about that at all. But this business is a development. I think you will agree with me that we are developing along a certain line. As soon as the motor vehicle became general, it led to the building of roads and to the buying up of toll roads, and making State roads out of them. That has been the method, Pennsylvania is gradually acquiring those toll roads so that I think in a few years there will probably be very few toll roads left in Pennsylvania. Although the roads they do charge you to go over are pretty bad. They have a bad system of roads there, but they are improving. We are certainly far ahead of them on that and the tourist that comes here from Pennsylvania gets much more than we get from them.

Mr. DeCamp—I would like to ask the Commissioner what his idea is in regard to the speed of automobiles, where we have this immense loss of life, certainly that is the most serious part of the automobile question, I think. I don't know what the figures are here, but in New York City I see there were about two hundred and thirty killed last year with the automobile. That is a pretty serious matter.

Mr. Lippincott—Well, on the question of speed, if the automobilists obeyed the law, which they won't, of course, we would have no trouble. If they kept within the legal speed limit in this State and other States, there would be no trouble. The difficulty is, in the first place, they all like to run fast, and they take chances. That makes all the trouble.

But I do not think the speed law should be made any more drastic; they are drastic enough if they are only lived up to. The question now becomes one of enforcement.

That is just the point I tried to raise in our Department. Here we have a State Department that collects from five hundred to six hundred thousand dollars a year in revenue, and they give us eight inspectors to do the whole work of the State with. That is ridiculous. We have an inspector who has to cover the territory between Burlington, Camden and Atlantic City. You may say he cannot do it. Well, of course he can't. And the local authorities, when they start to enforce the law, they generally make more trouble than if they did not, for the reason that a lot of those local judges will start this thing for a purely money making scheme.

They will haul the automobilists up for the purpose of getting the fee, not for any other purpose, and they frequently take everybody who comes along instead of only those people who are really violating the law; and then the question of veracity between the constable and the man may arise as to whether he has been violating the speed or not, and frequently they are both wrong.

And I think if we could get some method in this State of private police regulation it might work. Of course, in the big cities there is more or less regulation of the speed; although a good many of the local police officers do not pay any attention to that matter, but for the country roads we ought to have more inspectors doing regular police duties, to travel the roads and stay there, through certain regular arteries of travel that are always being used by automobiles. Those roads should be continuously patrolled by competent men. Then you will find a great lessening of the loss of life. When a man speeds up that is the time when there is most danger of the loss of life to a certain extent.

A Member—In the case of exceeding the speed limit under the law, wouldn't it be better to make the one exceeding the speed limit do some repair work on the road?

Mr. Lippincott—Do you think the character of the repair work done would warrant that kind of a sentence? I think the best method of stopping speeding is to revoke the license. Not to let them drive any more. That is the best way, and I have used that power freely since I have been in the Department. In fact I think from August until the latter part of November, there was not a week passed that we did not on the average, revoke two or three drivers' licenses. So that we have had a pretty heavy average, two cases a week, the inspectors have brought the charges and the men were tried in the department and every time a man was found to be wilfully violating the law, that is, there was a wilful violation, we have as a general thing revoked his license, and that has had a very excellent effect, because you revoke a man's driver's license it goes all over his community, it gets into the local papers and he gets a little bit more careful. So I believe that revoking licenses has more to do with it than the power of punishing them. If he gets his license revoked he cannot drive any more, and that is a very serious matter.

A Member—How about the cut out? It used to be with us when you saw a car and held up your hand they would stop and let you go by, but now they do not only not stop, but when they get by you they turn on the cut out and make a terrific noise and scare the team, and they do it just for the fun of the thing.

Mr. Lippincott—That is another question of police regulation. There is no doubt that section of the law is being violated all the time everywhere, and it is regarded unfortunately by most police officers and most inspectors in fact, as being only a minor provision of the act and about all they seem to do is to go to the man and tell him he ought not to do it. I told the inspectors last year that I thought it was time they made a few shining examples of a few gentlemen and brought them before me for abusing that privilege. They did that, but it is a very hard thing to enforce. In the first place, it is rather hard to get anybody to come around and testify against a man who does not do any more than simply to use his cut out. The average citizen don't think that is a very serious matter. Consequently, he does not pay much attention to it.

Senator Gaunt—Mr. President, when a few minutes ago the Commissioner was talking about the fellow out of the State and revoking his license. I would like to know how can we get in touch with that fellow from the other State, who violates the law under the act he proposed to have, for the State to revoke his license. You do not seem to have it there. Do you provide for a power of attorney, for illustration, in your amendment?

Mr. Lippincott—I did not specifically state that, but in the form of act which I have drawn it would indicate the Secretary of State as the person upon whom service should be made against him. I believe he should execute such a paper at the time he takes out his license. That was in my plan. I don't know that I made that quite clear.

Senator Gaunt—That was a question that suggested itself in my mind, how were you going to have him here; after he got away, how were you going to bring him back here to have his license revoked?

Mr. Lippincott—His license in this State is the one method of punishment that you have. That is about all that you can put the penalty on him for to come back, and if he will not come back someone can be designated upon whom to make service.

DISCUSSION.

67

Senator Gaunt—I notice that there is a recommendation that the garages were to keep tabs on those. As I recollect the passage of this present act, the garage owners and the garage keepers were very anxious to have this law passed and we wondered how we could bring them to time to give us our information?

Mr. Lippincott—Well, the scheme I propose was taken bodily from the Massachusetts Motor Vehicle Act. In Massachusetts every man who has a garage is compelled to keep a book of substantially that nature in his garage. If you come after your car you have to go to that book and put down your name and license number of your car and the time you came in, then you have entered your record. Now, when you take your car out you must go to that book and indicate in some way that you take your car out, and, of course, that will be kept in chronological order, each day will be indicated and it seemed to me in enforcing the privilege, such a record would be of inestimable value to our inspectors, if they would just simply say, "Let me see your book." Say Senator Gaunt, for instance, had a New York license and had been going in and out of that garage for fifteen or twenty days or a month and you go right after him, you can see it by that book; but it would also be of a great deal of benefit to the automobile owners who have cars and leave them in garages, from the fact that those chauffeurs who are working around garages will very frequently jump into some man's car and take it out and have a joy ride, and they could be caught and you could make them trouble if they were required with proper supervision to enter it in the book. While that would not absolutely stop them it would minimize their doing it to a certain extent, and they say that scheme works very well in Massachusetts.

Senator Gaunt—I think if all the garages would enforce that perhaps it might be a benefit, but, as I sized the situation up last winter, the **last three or four winters**, the garage keepers were very insistent and very earnest that we should have this law and I wondered how you were going to make them come to time.

Mr. Lippincott—On the enforcement of that I can say this. Every garage keeper has to have manufacturer's tags for demonstration. This year if this amendment becomes a part of the motor **vehicle** law and the garage keeper does not live up to it, he

is then not within the law, he is violating the law under which he gets those license tags and the commissioner of motor vehicles has the power to immediately revoke those licenses. In that way you could compel him to keep such a record, or you could put in the act a penalty for his failure to do so.

Prof. Rider—Mr. President, if there is nothing further on this subject, I move you that a committee be appointed to invite the Governor to appear before the Board of Agriculture, at his pleasure during the session, at his convenience. Carried.

The Chairman appointed as such committee Mr. A. J. Rider, J. V. Dobbins and E. R. Collins.

Vice-President Cox—Is there any further business to come before the Board at this time?

Mr. Reeves (Bridgeton)—Mr. Chairman, I move that a vote of thanks be tendered to Mr. Lippincott for his most excellent address, by a rising vote. Carried.

Vice-President Cox—I believe there are still two counties which are not represented upon the Committee for Nomination of Officers. If they have any nominations to make we should be glad to receive them now. There is Atlantic County.

A Member—We nominate Mr. John H. Huenke, Sr.

Vice-President Cox—Then Ocean County.

A Member—Mr. J. D. Holman.

Vice-President Cox—Now, I want to call attention to the programme we will take up this evening. The poultry question will be treated this evening. Diseases of Poultry by Professor Hadley, and The Poultry Industry of the United States, by our own Professor Lewis; and then tomorrow morning we enter upon the discussion of the question of soil and fertilizers.

I want on behalf of the Board to say that the members here are free to invite their friends from outside or any other section to be present with us at these meetings. We have seating capacity now for a larger number than we have in attendance and the seats are convenient at hand, and we can soon arrange for an increased number of seats if it is necessary to do so. Now, is there any further business?

Mr. DeCamp—I would like to say that the Auditing Committee on the Treasurer's Report will meet at the Trenton House, room seventeen, after the evening session tonight.

Vice-President Cox—Is there any further business to come before the Board?

Mr. Lozier—I would like to ask the Committee on Nominations to meet their Chairman immediately after this meeting.

Vice-President Cox—If there is no further business the Board will now stand adjourned until 7.30 o'clock this evening.

FIRST DAY—THIRD SESSION.

The meeting was called to order by Vice-President Cox at eight o'clock.

Vice-President Cox—The first subject for this evening is Diseases of Poultry, and that subject will be treated by Dr. Philip B. Hadley, Biologist of the Rhode Island Agricultural Experiment Station. I take pleasure in presenting Dr. Hadley. (Applause.)

Diseases of Poultry.

BY DR. PHILIP B. HADLEY.

I have been asked to speak to you tonight on the subject of poultry diseases. Now, "poultry diseases" is a very broad term and our time tonight is somewhat limited, so with your permission I shall not treat the subject in a broad way, but take up certain definite points in the whole field of poultry diseases and dwell especially on them.

By way of introduction, let us first ascertain just what disease is. What do we mean by disease?

As you are all aware, we may look upon the body of any animal as a machine made up of parts called organs, and each of these organs has a definite function to perform. Those organs are made up into systems of organs, such as the respiratory system, the nervous system, the muscular system, and the digestive system; and each of these systems also has a particular function to perform. Now, when these organs or when these systems perform their functions normally we say that a condition of health exists, but when these organs or systems do not perform their functions normally, we say that a condition of disease exists.

We may, therefore, define disease as a life, the manifestations of which depart more or less from the normal condition. If the departure from the normal condition is great, the disease is severe. If the conditions depart only slightly from the normal, the disease may be slight.

Now, among poultry, as among all animals, we have two different kinds of diseases; we may classify our diseases under two heads: First of all, we have the so-called organic or constitutional diseases. Under this head we may group those diseases which are inherited, which are caused by habits of life or are brought about by conditions of environment.

In the human being, if I may say this for illustration, we will find the organic or constitutional diseases represented by such as nephritis, diabetes, Bright's disease, heart failure, various disorders of digestion, and of the liver, all of which diseases are inherited or are caused by habits of eating, or by the wrong sort of environment in which we live.

In the same way we have the constitutional or organic diseases in poultry. We have, in poultry, diseases of the kidney, of the liver, of the heart; we have catarrh, inflammation of the lungs, rheumatism, diabetes and a number of other diseases which belong in this category, and which are due to inheritance, habits of life or conditions of environment.

On the other hand, just as in the human being, there are diseases which may be grouped under the communicable diseases, such as typhoid, tuberculosis and diphtheria, so in poultry we have also this group of communicable or infectious diseases represented. These are diseases which are not inherited, diseases which are not caused directly by habits of life or by conditions of environment, but which are caused in all cases by certain living micro-organisms, the so-called germs, microbes and bacteria, which attack bodies of birds as they attack the bodies of animals, and produce one kind of disease or another, depending upon the particular organ or system of organs which is attacked.

In fowls the communicable diseases might be represented by white diarrhœa, as it has been studied by Prof. Rettger, and by others; also by tuberculosis, by fowl cholera, and by blackhead in turkeys.

All of these diseases belong to the so-called communicable group and, as I say, they are characterized by the fact that they are due entirely to the presence of certain disease-producing micro-organisms, which may be spread from one bird to another, or from one flock to another, in various ways, depending upon circumstances.

Now, we may classify the diseases of poultry in several different ways besides the method which I have just mentioned. They may be classified according to the organs or systems that are attacked. We may have diseases of the respiratory system, diseases of the digestive system, diseases of the nervous system; each group of diseases being characterized by different symptoms. Furthermore, the diseases of poultry may be classified according to the agents which cause them, and this brings me to the second point, and that is the *cause* of disease in poultry.

For our purpose to-night we may disregard the first large group of diseases which I have mentioned, the organic or constitutional diseases. Suffice it to say that this class of disease is present in fowls, and causes a certain amount of mortality. But, compared with the havoc which is wrought by the communicable diseases, the organic diseases are of very little importance.

Our next point then is the cause of poultry diseases, and especially the cause of the communicable diseases.

There has been a great deal of discussion by physicians and biologists and poultrymen as to what is the cause of disease in any case, but I think we are safe in assuming that the causes of disease may be grouped under two different heads. First, we have a set of causes which we may designate as the predisposing causes, and among the predisposing causes of disease we have all those things which make for vitality in the stock or strain. There are the conditions of feeding, of housing, and other conditions of management, which may make the birds more or less vigorous. Chicks, especially young chickens, are susceptible to some diseases to which older chickens are immune, and *vice versa*. This shows that age may be a predisposing factor, or cause.

Other predisposing factors to certain diseases are temperature, humidity, season, race, etc. But perhaps the most important of the so-called predisposing causes

DISEASES OF POULTRY.

71

are those which may be grouped under the general heading of heredity. What a bird is going to be physically I think depends largely upon the care that the bird gets, the management that is given to that bird in feeding and housing, etc. But, outside of these factors, I feel sure that the vigor and vitality of that bird depends upon its inheritance from the parent stock. There are weak strains of birds, just as there are strong strains of birds, and birds breed true to these characters. Professor Rice at Cornell is doing a most commendable work in emphasizing the subject of vigor in stock. That is one of the most important factors of all which make for vitality and well being in poultry.

Now, this group of causes of diseases to which I have been referring, is called the predisposing causes. They are not the actual or real causes of disease; that is to say, they are not the direct causes, but the indirect causes. We have, on the other hand, a group of causes which I may term the primary, or direct, causes. These we find chiefly in the micro-organisms, the disease-producing germs or bacteria which bring about the various specific diseases. Tuberculosis, cholera, roup, infectious leukemia, blackhead in the turkey, white diarrhoea of chicks,—all these are caused by specific micro-organisms.

We may now ask what is the relative value of these two groups of causes in the production of disease in poultry? Generally speaking, I believe that the laboratory man, the scientist and investigator, has too great a tendency to discount entirely the great value which the poultryman sees in the good management of his stock, in inherited vigor and all that. The laboratory man says, "Here we have the micro-organisms, the disease germs, and if you give them to poultry they are going to get the disease, just as sure as can be." He too often believes that the causes which poultrymen hold out as the real causes, that is, wrong methods of management, of feeding and housing, are of no particular importance.

On the other hand, I sometimes think that the poultryman has too great a tendency to discount the large amount of scientific work which has been done in the laboratory, and which has shown the relation of living micro-organisms to disease.

So far as the causation of disease is concerned, I think the truth will be found to lie between these two opinions. From one point of view disease is not a condition; it is a process; it is like a chain with many links, and each link is a distinct casual factor. Sometimes one casual factor, sometimes another casual factor, will be the deciding point, and the disease-chain may be broken by annihilating any one of these links.

Now, I don't suppose you want to hear any more about what disease is, or about the pathology or the cause of disease in general. What I assume you are all after to-night is to find out how to prevent disease, or how to cure disease in poultry. That is the practical bearing of the problem. I must confess to you, however, that as a matter of fact, we know very little regarding accurate methods for either preventing or curing poultry diseases. For some reason poultry investigators in this country have not gone very far into the subject of poultry diseases, aside from the problem of this causation. It may be that many investigators have felt that the field of poultry diseases is too far beneath their notice or too narrow in its suggestiveness. I know that this has kept many investigators away from the study of poultry diseases. But the more I see of the great American poultry industry, and the more I see of the enormous ravages caused by poultry disease as a whole, the more I am impressed with the amount of valuable work that can be done in this country by studying some of these epidemics that menace American poultry. And, although we do not know a great deal about them at the present time, we are gradually learning, and I hope the time is not far off when we will be able to tell the poultryman very much more than we are able to tell at the present time regarding practical measures for prevention and treatment.

One word first regarding the relative value of the prevention and treatment for poultry diseases. It is my present view that the actual treatment of poultry diseases has not a great deal of practical importance. What I mean is this: the average poultryman has not the time to give detailed treatment to a few more

sick birds that have to be treated individually. In case the stock is of considerable value, it may be worth his time to administer medicines of one sort or another and take particular care of a few birds.. Generally speaking, however, unless the treatment he gives is such that it can be applied to many birds at the same time, I believe that the treatment of birds is not, in the long run, a practical measure.

What we want to look for more than anything else is the *prevention* of disease. Prophylaxis or prevention is the watchword of modern medical practice, whether in the diseases of the human being or cattle. It should be so in poultry no less than any other field. Prevention of disease is what we must look for.

Now to-night I wish to take up in particular a discussion of two or three poultry diseases which are of the greatest menace and therefore of the greatest importance to the poultrymen in our part of the country, and I think the same will probably hold true for New Jersey.

I want to say a few words, first, upon the so-called brooder pneumonia; secondly, on fowl cholera, and thirdly, on blackhead in turkeys. I had intended to speak of one or two other diseases to-night, but a request has been made that I speak especially about blackhead in turkeys; so if you will allow me, I will leave out the discussion of some diseases that I had intended to speak of, and put the extra time on the subject of blackhead, the turkey plague.

Brooder pneumonia is a disease which affects primarily the young chicks, and it attacks chiefly the lungs. It shows itself sometimes within the first three or four weeks by the formation of yellow or grayish nodules in the lungs. It is a disease which many poultrymen experience every year,—a disease which causes a rather high mortality, and which is sometimes found in conjunction with white diarrhoea of chicks. This last disease, white diarrhoea, I shall not mention to-night for lack of time, and also because of the accessibility of the excellent published work of Professor Rettger at the Connecticut Station. His bulletins you can all obtain by writing to the station.

Now brooder pneumonia is caused by mold, *aspergillus*. The disease is produced as a result of breathing into the lungs the spores or seeds of the mold that are often present in the litter. In the lungs the spores develop and form the nodules which gradually increase in number and size until the respiration of the bird is interfered with and death results. It may be that toxins or poisons are produced by the mold, and the bird dies from poisoning.

We have been troubled with this disease to a considerable extent in past years at the Rhode Island Experiment Station, and it is only recently that we have been able to find a method which has proven satisfactory in ridding us of a considerable amount of this infection, and in greatly reducing the mortality.

We argued the matter like this: the spores of this particular malady are breathed into the lungs. Being breathed into the lungs, they must be taken in through the air. Being taken in through the air, they must be present in the litter of the brooders or pens. If we could add something to that litter which would keep those light spores from flying through the air, we might be able to keep them out of the bird's lungs.

For the several years, when the infection has been present, we have made a practice of spraying our litter with a wax oil. This wax oil that we are using is in reality nothing more than a preparation made by the Standard Oil Company of New York, and called "Standard Floor Dressing." The oil does not easily evaporate because of its paraffine base, and it can be spread by the use of the proper sort of a spray pump. When this is done the litter will remain nearly dust free; the oil will hold down all the dust and the mold spores, and we have found this procedure extremely satisfactory in ridding our own brooders at least of a large percentage of this infection from brooder pneumonia.

The next disease I want to speak of is fowl cholera, and by way of introduction I want to refer to a small chart that I have here.

A year or so ago I was called to a small town in Massachusetts to inquire into a poultry epidemic which had started on a certain poultry plant. When I got there I found a poultry plant of forty-five hundred birds distributed among about

DISEASES OF POULTRY.

73

one hundred and fifty colony houses. I have made this diagram to show the general lay-out of the plant. Here is the country road passing by the house; here are barns, here is the gateway to the main division of the poultry plant, containing a hundred or more colony houses arranged in rows. Northeast of the first group is another small portion of the plant, and north of it is a second small division containing possibly twenty or twenty-five houses.

When I arrived the owner of the plant told me that the latter part of June he had found a number of birds dead in one of these houses located on the southerly border of the plant. The birds died very quickly. He had not seen them sick, but picked them up dead. And the same thing continued for several days. The birds which he picked up dead he placed on a dump, which was located not a great distance from the main body of colony houses.

Before the first of July deaths were occurring in all of the houses in the southwestern corner of the main body of houses. At that time I reached the plant and it took very little time to see clearly that the disease was fowl cholera and that it was spreading rapidly through his flock.

I advised him first to fence off the entire southwestern corner of this group of houses; and also to bury or burn all of the dead birds, and to put certain germicidal materials into the drinking water.

But the poultryman found fencing impossible and he continued for some days to put the dead birds out on the pile, and little else was done. The other birds from the southeast corner of the plant came down and began to eat the carcasses of the birds which had died. The disease next spread through other houses until the mortality began to mount up to ten or fifteen birds a day. Very soon death appeared in this southeastern section of the poultry village.

I then advised him to take the dead fowls to another dumping ground. He took them after that to a location about a quarter of a mile from the first dump and not quite so far from another section of his plant. The poultryman interpreted my suggestions as meaning that he was to throw over the dead bodies a few shovelfuls of earth. This he did, and it was scarcely a day before the western breezes carried the odor of the decaying carcasses over to the third little group of houses, and these birds were making daily pilgrimages to that dump to **consume these bodies.** The disease developed here in a very short time.

Now the epidemic was well established on all corners of his poultry plant except the northwest corner. The disease spread like wild fire within a short time, practically all of the houses in his system had shown a number of deaths, while some were entirely cleared of birds. By the middle of July the poultryman had lost about four thousand of his forty-five hundred birds. Since there had been no infection in one small group in the northwest corner, I advised him **to kill and market those birds as early as possible before the disease reached them.**

This man had built up a fine poultry business through a period of about eighteen years. He obtained his birds in the spring as young chicks, raised them and marketed them in the winter. He had the cream of a large city trade. Now everything was gone,—business and stock together.

Now, that is fowl cholera, and this case shows you what this terrible disease is doing, in a greater or a lesser degree, throughout the New England States, and I presume in some other States as well. I am sure that there is no disease which threatens the American poultry world at the present time in an equal degree with fowl cholera,—a disease which has been known in Europe for more than a century, and which is wholesomely feared by all European poultrymen.

It is a disease which has caused in Europe more poultry legislation and poultry policing measures than any other one factor. The legislations regarding the quarantining of birds on international boundaries are very strict, and it is only by this means of conforming to strict quarantine laws that fowl cholera in Europe has been held in check.

Fowl cholera has probably been present in this country since about 1875. But it is increasing very rapidly, both in severity and in distribution. Even since I have known the disease at the Rhode Island Experiment Station, the epidemics

in Rhode Island have been increasing in frequency. Some of the epidemics are not very severe; some destroy only a small number of birds and the other birds recover or not become infected. Other epidemics, when unchecked, have taken from ninety to a hundred per cent. of the flock and make a menace of any birds that remain on the poultry plant.

Now what is the nature of this disease, fowl cholera? First, it is a germ disease. It is caused by one of the smallest bacteria known in bacteriology; an organism which is approximately one twenty-five thousandth of an inch in length and something less than that in breadth; an organism which has been studied to a considerable extent in the laboratory, and one upon which we have been carrying on experiments at the Rhode Island station with a view of perhaps some day being able to perfect some means for combating this disease. I believe that this malady is an increasing menace to poultrymen all over this country; and, if we can judge from the way it has developed in Europe, it will be only a matter of years before it may be advisable for our own States to pass quarantine laws.

Now, how can a poultryman tell when he has this disease in his flock? Cholera is a term which is used very loosely by poultrymen as a whole. The very first disease which takes off a large number of birds in the flock is not necessarily fowl cholera. But there are ways in which this disease can be recognized. First of all, it is characterized by sudden death. The birds in the early part of the epidemic never seem to be ill at all. They go to roost perfectly well at night, but in the morning they are dead. The latter stages of the epidemic may be marked by a more chronic form of the disease. The birds are really *seen* to be ill. You find them collecting in corners of the poultry houses, with ruffled feathers; they are stupid, languid, weak; they do not eat; they have an obstinate diarrhoea, and the discharge is a very brilliant yellow and green. This is a very characteristic symptom.

The chronic form of the disease, after it becomes established, may sometimes last for a number of days, when finally the bird expires, either quietly or in convulsions. The temperature of the birds is remarkably high. It is higher than any known disease of fowls, running up to 110 or 112 degrees. So much for the clinical symptoms.

The disease can also be recognized by the condition of the organs when the bird is autopsied. If the bird is opened you will find a marked softening of the liver. The liver will also be studded with little pin-point hemorrhages,—small, red points, which show very clearly. The spleen will be enlarged and softened, the intestines may or may not be inflamed. The lungs may be somewhat congested or, in severe cases, they may contain a more or less solid yellowish or grayish exudate, so that in texture they resemble more liver than lung tissue. The heart, which in a normal bird is light pink, and in which the blood vessels show only faintly, is thoroughly diffused with blood. A hemorrhagic condition exists in the blood vessels of the heart, and they stand out full of blood and can be traced very easily over the surface.

These are characteristics which cannot be mistaken when one has autopsied a bird which has died of fowl cholera.

Now, suppose cholera has started in your poultry plant; what next? Your procedure depends somewhat upon the method by which you keep your birds, whether you have them in long houses with runs, or whether you have a colony system. In case the birds are in individual yards, that is, in a long house, the question is much simplified. When some of the birds have died and you are certain that you have fowl cholera in the flock, the first thing to do is to shut all the birds of those infected yards into the houses. Then thoroughly spray or cover up all excrement which you find in the yards and pens. Take out all the drinking dishes, thoroughly disinfect them either by boiling or by soaking them in some reliable disinfectant, such as Zenoleum (say a three per cent. solution). Next take out the birds which are apparently ill and kill them directly, since they will most likely die. Even if they do not die, they will be a continual

DISEASES OF POULTRY.

75

menace to the other birds in the flock. There is no safety in keeping sick birds in the flock when you have cholera epidemic.

If, after the first pens are disinfected, you find the other pens are also infected, then the treatment should be the same with them. Above all, be absolutely certain that no birds are picking up food in the runs where the infected birds have been kept. If birds pick up food in those runs they are pretty sure to be infected and come down with the disease, since the disease is transmitted by bacteria which are present in the excrement.

After this feed the fowls and water them in clean dishes, and try to keep the conditions as sanitary as possible. Put either carbolic acid or sulphate of iron in the drinking water.

What to do next depends somewhat upon what course the epidemic takes. If it is light you may have only a few deaths. If it is severe you may lose half the birds, or more. In this case, go through the houses and pick out all the sick and dead birds and disinfect thoroughly every house and every pen. If the disease is in mild form, then it is perfectly safe, I think, in most cases to keep the remaining birds and let them recover. If the epidemic is severe (over fifty per cent. mortality) the remaining birds may as well be disposed of at once.

In case you have a colony system, the method of handling the disease is radically different and much more difficult. In the epidemic of which I have spoken, if the poultryman could have recognized fowl cholera in the early deaths occurring in the lower quarter of the plant, the first thing for him to do would have been to fence in the southern part of his entire plant; to fence it in thoroughly and then pick out all the sick birds and kill them at once. Having done that, he should have proceeded to disinfect as I have suggested for the other houses. In the case of a plant of this sort, where it is possible for all the birds to mingle together freely, the segregation of the birds which are still well is the only radical and safe measure. If this poultryman could, at once, have thrown a fence through the middle of his yard running east and west (thus dividing it into halves), another fence through his yard running north and south (thus dividing it into quarters), he might have saved three thousand birds. He might have restricted the disease to a small part of his plant. Cholera does not jump fences. You can keep cholera birds and normal birds on either side of a wire fence and there is no passing of the disease from one side to the other. I have never seen an instance where cholera would jump over a fence from one pen to another. We are doing this regularly in our experimental work and have not yet had a case in which the disease has spread, although it must be admitted that wild birds, like sparrows, are a menace.

When a certain group of colony houses which contains the disease has been segregated, then that group of houses should be treated just as if it were an individual pen. The birds should be taken out and the sick ones killed; the house then being thoroughly disinfected by spraying with two or three per cent. Zenoleum or some other reliable disinfectant.

At the same time I think one can accomplish something by putting in the drinking water either a few drops of carbolic acid or iron sulphate at the rate of about one ounce to three quarts of water, producing a disinfecting solution which, when taken into the crop of the birds, is likely to kill a large number of the infecting bacteria. These measures will undoubtedly diminish the amount of infection under conditions such as I have mentioned.

I believe that we have in this Massachusetts cholera epidemic which I have outlined a very important lesson. Here is a disease becoming more and more common in all parts of the United States, a tremendously destructive disease, exceedingly virulent, one which is sure to become more and more a menace to the poultry industry of the country. It is a lesson to this effect; that when a man puts enough money in the poultry industry to keep forty-five hundred birds, unless he puts in enough more money to arrange for some method of fighting the epidemic diseases—some method of segregating his fowls into different groups—that he is laying himself open to this sort of a loss. That poultryman we have mentioned probably could have saved the equivalent of six thousand dollars if he had had

that facility. And I believe that in every instance in which birds are kept on the colony system in large numbers the procedure is not a safe one unless one has at hand a sufficient amount of fencing of some sort to segregate, at a moment's notice, certain groups of fowls and divide them into groups of infected and non-infected birds whenever a disease like fowl cholera appears in the vicinity.

In a case like this you don't have time to dig fence holes and put in posts and fence in proper fashion when the epidemic strikes. The important point then is to get the birds segregated, to get the fence up, and get it up quickly; any kind of a fence will do. The main idea is to get and keep the birds separated into groups. When the disease is shut into one corner and the main body of birds are shut out, you can handle the situation fairly well; and you can rest fairly well assured that the other groups of the plant will remain uninfected so long as they are segregated.

The other object lesson which this case has taught us is to keep the live birds away from the dead birds. Fowls will always go to a carcass and eat it if they can. Fowls have a pretty good sense of smell; they can follow up an odor and find out if there is anything there; and they will eat it if they find it. The only safe thing to do with the dead birds is to bury them, and bury them deep, so that the other birds will not get at them. Or, they may be burned; soak them thoroughly in oil and burn them altogether; otherwise the organisms remain in the ground and become a source of future infection.

Now as to what should be done at the end of the epidemic? Disinfection is the one thing which must be carried out, and it should be a thorough disinfection. Thorough disinfection by spraying with a three per cent. Zenoleum solution, or a one per cent. sulphuric acid or hydrochloric acid solution, will rid the houses of infection to a certain extent, especially if they are well scraped previously. The drying will do the rest. Sunlight will take care of the yards inside of a few weeks or months at the longest.

In case the epidemic is severe, however, I don't recommend keeping over a single bird; and no new stock should be introduced inside of six to eight months. Six months from the time the Massachusetts poultryman had experienced his epidemic, he did not have a fowl on his place. Get rid of every bird, for one bird may insure the perpetuation of the cholera bacteria in your flock, so that just about the time you think you are safe, the same trouble will start over again in your new stock. That often happens, and the only safe procedure is to get rid of your stock and then be patient enough to wait for six or more months until the infection has died out. Then it may be safe to start in again. One word more: Don't sell the remnant of your infected stock to some unsuspecting poultryman. Turn it into the market; fowl cholera does not affect human beings.

One other point which I might mention on fowl cholera is the value of inoculations with carbolic acid. In all the time that poultrymen have known of fowl cholera there has been found no practical method of treating the disease when it has once started. We have been trying within the last year or so, however, at the Rhode Island station (in the case of experimental infections), the inoculation with carbolic acid underneath the skin. All of our work so far has involved the artificial infection of the birds and then inoculating them, from twelve to twenty-four hours subsequently, with a five per cent solution of carbolic acid. This carbolic acid is usually introduced behind the wing or under the wing. We use for these inoculations a little hypodermic syringe, called an "anti-toxin syringe," which holds five cubic centimeters, and will do for the inoculation of a number of birds. This is the type of syringe we use (exhibiting). It is a small all-metal syringe with a metal piston; it can be easily sterilized.

In our work we have given from two to three inoculations of the five per cent. carbolic acid, usually inoculating each time from two to four cubic centimeters. By this method we have prevented experimental infection in about seventy per cent of the cases in which the virus has not been particularly strong. We have

DISEASES OF POULTRY.

77

not repeated these tests with very virulent organisms. Whether we can get the same results in such cases I do not know. We are still studying the problem.

I might add that the amount of carbolic acid which a bird will stand is a very large one. I have had some birds which have been inoculated with forty-six cubic centimeters of five per cent. carbolic acid solution within thirteen days. That is a great deal of carbolic acid, but I have never lost a bird as a result of the carbolic acid treatment. The excretory system of the birds is remarkable in its ability to take care of carbolic acid when it is introduced. An adult human being would not be able to stand a fraction of that amount. Fowls bear it with impunity, and it is a method which, with further perfection, we may find will be a valuable one in enabling the poultryman to cut short infections with fowl cholera. The Rhode Island station has issued a bulletin on this subject, which will be sent to you on request.

In case this method is used practically, I should recommend the inoculation of all the birds as soon as the epidemic has appeared. If a certain pen or a certain house shows infection, inoculate all the birds in that house. The inoculation is easily made. About forty inoculations can be made in an hour by one man and an assistant.

Now, a word on blackheads in turkeys, a subject on which I have been asked to speak especially this evening.

The problem of blackhead is this old turkey problem which arose in Rhode Island in the neighborhood of 1893 and which has been with us ever since. The disease has annihilated the turkey raising industry of Rhode Island, and in most of the New England States. And the very same conditions are, I believe, a severe menace to the turkey-raising industry of New Jersey, as well as of many other States.

This disease affects primarily the liver and the blind pouches, or cæca, as they are called, and is due to at least two different kinds of parasites. Unlike fowl cholera, which is due to a low form of plant life, that is, bacteria, we find that blackhead is due to two of the lowest forms of animal life which exist,—one called a coccidium, while the other is a flagellated protozoan. Which is the more important in producing the disease I cannot say at the present time. Both are involved in some cases. We have been studying this disease now in Rhode Island for a good many years, and we have done a good deal of experimenting on it. Up to within a year or two the problem has been about as difficult as any one could wish. We started out with the idea, years ago, that blackhead was a specific disease of turkeys—that it was due specifically to these organisms which I have mentioned, and to no other cause. All of our first work was along the line of trying to exclude the parasites from the turkeys. We put turkeys first in one place and then in another. We tried to pick out yards where there had been no poultry kept. We put them on islands and on farms where there had never been any turkeys. We isolated them in the midst of the deep woods. We raised them on platforms, placed them on disinfected floors, and put them on cement floors and in sterilized brooding pens; we raised them on plain sand, on sterilized sand, on sterilized sawdust, on sawdust treated with antiseptic substances. We wore rubbers when we went into the pens; handled the birds with sterilized gloves; fed them sterilized food; gave them boiled water to drink; and it all made no difference whatever; blackhead continued with us. Blackhead was not to be driven out or cured or prevented by any of these means. Wherever we put the birds, and under whatever conditions we raised them, the parasites were picked up from somewhere, and got in their destructive work.

After further study we began to see some reason for this. We found one of the parasites of the disease in rats. We found the parasites of the disease in about eighty per cent. of the English sparrows which we have examined,—sparrows which were shot in the neighborhood of the poultry plant; we also found the parasites in the intestinal tract of the thrush, of the quail and the partridge,—in which birds it sometimes produces a disease similar to blackhead. We have, therefore, ended by coming to the conclusion that it is actually im-

possible to exclude the parasite from the birds. We can no more get the birds to escape from the parasites of blackhead than we, as human beings, can escape from the parasites of pneumonia or tuberculosis. They are always with us. Of course, that does not mean that we must, therefore, have the disease. It simply means that we have got vitality enough to resist it, although the causative bacteria are with us.

Now we have come to the conclusion that the problem is exactly the same with turkeys. The parasites are so prevalent that it is out of the question to utterly exclude them from the turkeys.

We have, therefore, concluded that what we must do is to raise the birds under such conditions that, even if the parasites do get into the intestinal tract, they will not start up such a rapid rate of development that the disease will be produced. Our problem has therefore become to see what we can do in the way of modified feeding which shall not prevent the ingestion of parasites, but prevent their development in the intestinal tract after they have once entered.

We have been trying a number of intestinal disinfectant substances. We have fed the birds with the idea of combating the parasites in the intestinal tract. The first of those that we tried were apparently of no value. The parasites developed as well as ever. Then we began to study a little more carefully the biology of the organisms themselves. We studied them in the laboratory, and we found out what they required for life. We found out what they did not like; we found out under what conditions they would develop most rapidly, and we ascertained their relation to acidity and alkalinity in their media. It appeared that the parasites of blackhead are very much opposed to an acid environment. Keeping these parasites in pure cultures, we found that if the medium was alkaline they developed very well. In case the medium was brought down to a neutral condition, the development was restrained, while, if the medium was made somewhat acid, the development was held up still more. The more acid we made the medium the less and less the parasites grew.

We decided we would have to try this upon the parasites inside of the birds, and we began to look around for some acid which, fed to the birds, might possibly have the same effect. Naturally the lactic acid of sour milk was the first thing we decided to try; and for the past year or more we have been observing the effect of the lactic acid upon the development of the parasites in the intestines of the birds. We have also been trying one or two more intestinal antiseptics, and I believe that at the present time, after approximately twenty years' work at the State Experiment Station at Kingston, we are just beginning to see light in this most perplexing problem. It is not going to be a question of keeping out the parasites. It is going to be a question of combating those parasites inside the bodies of the birds by proper methods of feeding or intestinal antiseptics.

Now, probably you know that the lactic acid in ordinary sour milk is caused by one of the domestic acid-producing organisms. We were not satisfied with the small quantity of lactic acid produced in this way, so we secured some of those wonderful organisms which Metchinikoff, of Paris, has been studying, *Bacterium Bulgaricum*, the sour milk organism present in the sour milk of the Bulgarian peasants, which he claims is responsible for the fact that many of these people live to an extreme age. Some of these sour-milk theories have been exploited very much in recent years.

We secured cultures of these bacteria, and, having inoculated our milk with them, grew them in the milk for forty-eight to sixty hours. I might add that this organism responds best to a somewhat higher temperature than the optimum for the ordinary lactic acid organisms. We have to grow them at a temperature of 105 to 110 degrees, which is considerably higher than the temperature at which the ordinary sour milk organisms will grow.

We have fed this sour milk, together with the whey, to many of our birds, and to this we have frequently added a drug called Formidine, a brownish powder, which is a strong intestinal antiseptic. This method, coupled with a reduced

DISEASES OF POULTRY.

79

grain feeding, has enabled us in the last year to raise more turkeys in yards and under artificial conditions than we have ever done before; and we feel that when we have studied these methods a little more fully, we shall get even better results than we have secured at the present time.

Now, I want to refer to these charts for a moment, then we will turn to the lantern slides.

The first chart gives our present method of feeding turkeys for the first three weeks. You might think the feeding method has little to do with the question of disease. But, in the case of blackhead of turkeys, I believe it is going to be the final word on the whole problem. I will now refer to the charts.

(Charts exhibited showing the Rhode Island Turkey-feeding Schedule for 1912.)

In this first chart I have shown the method of feeding which we recommend up to the age of three weeks. You see that for the first forty-eight hours we give no food whatever. At the beginning of the third day, chopped whole eggs are given at the rate of 4 grams per bird per day. This amount is gradually increased to the end of the first week; then decreased to the end of the second week, when egg-feeding is abandoned. Other foods are added gradually: for instance, on the fourth day, green food (chickweed, lettuce, oat tops, etc.) is given and continued in ever-increasing amount; on the fifth day rolled oats are added, to be discontinued at the end of the third week. On the ninth day is given a mash consisting of the following:

Corn meal.....	6 parts
Wheat bran.....	4 "
Middlings	2 "
Linseed meal	1 "
Granulated milk	2 "

Sour-milk feeding should begin at least by the beginning of the third week (preferably earlier), at the rate of 0.3 quarts per bird per week, and should be gradually increased as the birds become older. After the sixteenth week the young turkeys may be given as much sour milk as they will consume,—both curd and whey. The latter may sometimes be given in place of water.

The mixed grain ration also begins with the third week and continues until the seventeenth week, when it is replaced by equal parts of corn and wheat,—beginning, each, at the rate of 120 grams (4 ozs.) per week per bird.

You observe that formidine is given at the rate of 1 grain per day, beginning the fourth week. The most critical period in the life of the young turkey begins at the thirty-fifth day, and the giving of formidine should anticipate this period. The drug may be mixed with the mash, and the amount is increased each week up to the thirteenth week, when it is discontinued. Whether further use of formidine is advisable, we cannot yet state.

In reading these tables, recall that all foods except the milk are given in grams, and that the milk is in quarts.

This method of feeding, here outlined, is the outcome of long experience, but as we gain further knowledge of the action of the different constituents of the rations on the development of the parasites of blackhead in the intestinal tract of the birds, it seems probable that the table will undergo certain modifications.

STATE BOARD OF AGRICULTURE.

TABLE I.
RHODE ISLAND TURKEY FEEDING SCHEDULE, 1912.
(First Two Weeks.)

Days	Egg*	Green food*	Rolled Oats*	Mash*	Milk	Mixed Grain	Corn	Wheat	Formidine
1									
2									
3	4								
4	4	2							
5	6	2	1						
6	6	2	1						
7	8	2	1						
8	8	4	2						
9	6	4	2	1					
10	6	4	2	1					
11	6	6	4	1					
12	6	6	4	1					
13	4	8	4	2					
14	4	8	4	2					

*Amounts given in grams per bird. Calculate at the rate of 30 grams to the ounce.

TABLE II.
RHODE ISLAND TURKEY FEEDING SCHEDULE 1912.
(Third week through the twenty-fourth.)

Weeks	Egg	Green food	Rolled Oats	Mash	Milk	Mixed Grain	Corn	Wheat	Grains of Formidine
3		60	30	15	0.3†	10			per day
4		80		15	0.3	15			1
5		100		20	0.5	20			1
6		120		40	0.5	30			2
7		130		60	0.5	40			2
8		140		80	0.75	50			3
9		150		100	1.0	60			3
10		160		120	1.25	80			3
11		170		200	1.5	100			3
12		180		240	1.75	120			3
13		190		300	2.0	140			
14		200		360	2.25	160			
15		220		420	2.5	180			
16		240		480	3.0	200			
17		260		600	"†		120	120	
18		280		720	"		140	140	
19		300		840	"		160	160	
20		320		960	"		180	180	
21		340		1080	"		200	200	
22		360		1200	"		220	220	
23		400		1400	"		240	240	
24		480		1600	"		300	300	

†It is safe to allow the young turkeys to consume all the sour milk they will eat, and it may be given even before the third week. This table gives *minimum* amounts.

POULTRY INDUSTRY IN THE UNITED STATES. 81

Thus, in conclusion with reference to blackhead, I just want to emphasize the desirability of keeping down the grain and mash ration to a minimum in the raising of young turkeys. Give them such amount as you think might not quite starve them; they will come through it all right. Feed them milk for all it is worth, and also large amounts of green food. If you are interested in experimenting with *Bacterium bulgaricum*, get a culture from Parke Davis Co., or some other source, try this "modified feeding" for a while and see if you are not able to raise turkeys. Furthermore, I wish to emphasize the point that turkeys can be raised in confinement, although nine out of ten turkey breeders will tell you there is something in the disposition of the bird that is opposed to confinement. I am sure that such is not the case. Turkeys can certainly be raised in confinement, and it is my impression that, in the future, the raising of turkeys in confinement—in such pens and yards as I have shown you on the slides to-night—is going to be a new and most important feature of the turkey-raising industry in this country.

I thank you for your attention. (Applause.)

A Member—Mr. Chairman, I move you that a rising vote of thanks be tendered to the speaker for his most delightful and instructive address. Carried.

Vice-President Cox—The next matter in the evening exercises will now be a lecture by our own Prof. H. R. Lewis, who hardly needs an introduction to a New Jersey audience. He will speak to us on The Poultry Industry of the United States. I have the pleasure to present Professor Lewis. (Applause.)

Prof. Lewis—Mr. President and Members of the State Board of Agriculture, I will take up little of your time this evening, and make it as brief as possible, to tell you something about the Poultry Industry as we find it, not only in the United States, but also in your State of New Jersey. This work has been made possible tonight largely through the co-operation of your own body in enabling the facts and figures to be gathered together, and we have some very interesting figures, which I am sure will please you.

THE POULTRY INDUSTRY IN THE UNITED STATES

BY PROF. H. R. LEWIS.

Poultry farming is one of those branches of agriculture which has received a great impetus during the past few years, owing to the fact that it offers exceptional opportunities for the farmer with limited means and limited acres to develop a considerable source of income in a short time. The industry has become popularized in a small way in cities and villages, and the farm flock has been increased and improved, due to more efficient and systematic methods of management. The following figures from the 1910 census will serve to illustrate the phenomenal increase which the industry has experienced:

Number of fowls in the United States in 1910, 300,000,000.

The increase over 1900 is 20 per cent.

Number of fowls in New Jersey in 1910 was 2,600,000. This is an increase over 1900 of 30 per cent.

Associated with this increase in number is a market rise in quality as well; as shown by the following figures:

Total value of domestic animals in the United States in 1910 was \$4,760,000,000.00. This is a gain of \$1,850,000,000.00 over 1900, or a gain of 60.1 per cent.

The total value of poultry in the United States in 1910 was \$154,663,220.00. This is a gain of \$68,855,302.00 over 1900, or a gain of 80 per cent. The increase in poultry as shown by the above figures is 33 per cent. ahead of all other kinds of live stock taken collectively. A comparison of these same statistics for New Jersey is interesting and shows the following results:

Total value of domestic animals in New Jersey in 1910 was \$22,325,469.00. This is a gain of 37.2 per cent. over 1900.

The total value of poultry in New Jersey in 1910 was \$2,221,610.00. This is a gain of 70.8 per cent. over 1900. These figures show the poultry increase in New Jersey to be 90.3 per cent. ahead of all other kind of live stock in the State taken collectively. The following plate shows percentage increases expressed graphically.

Increase in Poultry and Poultry Values during the years 1900 to 1910.

Percentage increase in ten years in numbers.

United States.

20%

New Jersey.

30%

Comparison of increase in the values of the domestic animals in the United States compared to the increase in value of poultry.

Increase in value of the domestic animals.

60.1%

Increase in the value of poultry.

80%

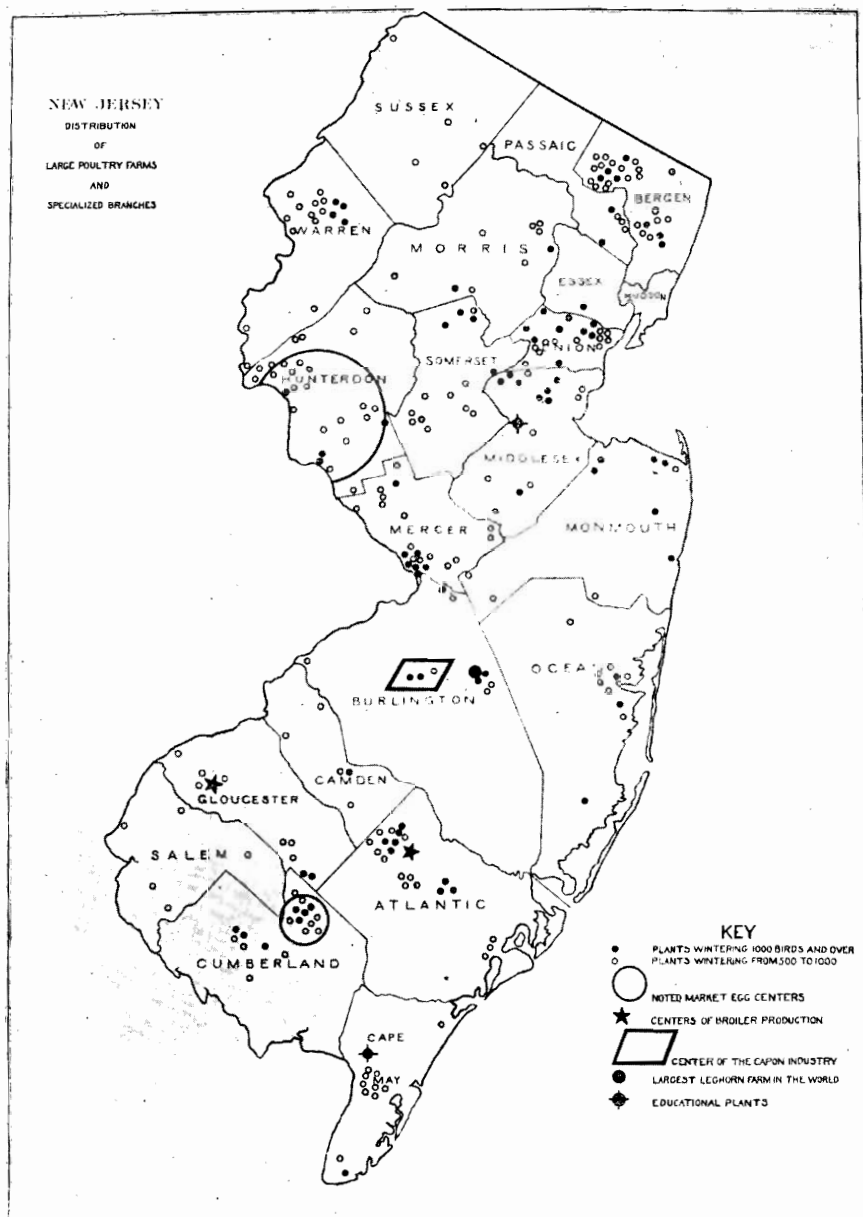


Plate 3—Distribution of Large Poultry Farms and Specialized Branches.

POULTRY INDUSTRY IN THE UNITED STATES. 83

We have seen the immense amount of money invested in the industry, and also the rapid increase both in number and quality of birds. Now let us turn our attention to the distribution of poultry farming throughout the United States.

The center of the industry is in the middle west in the States of Nebraska, Kansas, Iowa, Missouri, Illinois, Indiana, Ohio, extending into the East through Pennsylvania, New York and New Jersey. It is this great mass of birds kept on farms in this central district which causes prices to fluctuate downward so noticeably every spring. These birds are kept with no special care, and produce very few eggs during the winter, but as soon as spring conditions arrive, production increases rapidly, and it is this sudden supply of eggs in our Eastern markets which causes the price to tumble.

CENTERS OF PRODUCTION.

On the Western coast of California is one of the most intensive egg producing sections in the world, called the Petaluma District. For miles and miles the landscape is literally dotted with poultry flocks. All the hatching is done on centralized plants operated especially for that purpose, the poultryman devoting all his attention to rearing the youngsters and managing the layers. Leghorns predominate, and the white-shelled eggs produced find a ready market on the West coast.

"The South Shore Roaster District" located in South Eastern Massachusetts, a section noted for the production, in season, of large quantities of prime roasting chickens. Many farms are devoted exclusively to this purpose, special fattening methods being used. The birds are usually kept in small isolated flocks, and as high as 3,000 or 4,000 birds being marketed by an individual each season.

The Little Compton District of Rhode Island is a section where large numbers of birds are kept primarily for egg production on an extensive system (colony). The land is rather barren, quite stony and not adapted to the production of crops, so that the birds are given entire range of the farm and are kept in small houses located at intervals of from 100 to 150 feet. All the labor necessary in attending being done once or twice a day by a horse and wagon.

NEW JERSEY AN INTENSIVE POULTRY STATE.

In New Jersey there are two intensive egg-producing centers which are fast becoming famous the country over. These are the Hunterdon County district and the Vineland district. These I will discuss more fully a little later.

Owing to its nearness to ideal markets, excellent climatic and soil conditions, and rapid and frequent transportation, New Jersey is fast coming to be one of the leading poultry States in the Union.

In Hunterdon County there are over 300,000 birds, all of them being kept in flocks of from one to five hundred, with a few wintering over a thousand, in connection with general farm work. This is the leading poultry county. Cumberland County in the South is another heavy producing center and one which is growing very rapidly.

The Poultry Department of the State Experiment Station has undertaken to collect in so far as possible, without excessive expense, a poultry census of the State. The result of this census is shown on the accompanying plate.

The work has been done through correspondence, census figures, County Poultry Associations, and trips by members of the staff to leading poultry plants wintering over one thousand females. There are registered at the present time over

ninety-eight such plants. The hollow circles show the location of poultry plants wintering from five hundred to one thousand mature laying hens, and there are registered, at the present time three hundred and twenty-four such plants. The primary object of the majority of these large plants is the production of market eggs. The White Leghorn predominates, and in view of the existence of such a large number of White Leghorns, I feel that we are safe and justified in calling New Jersey the "Great White Leghorn State." There are doubtless many other large farms wintering over five hundred birds which have not yet been located.

The large semicircle in the western central part shows the location of the farm flocks in Hunterdon County. The small circle in Cumberland County shows the location of the Vineland district. In this district owing to the sandy soil and rather mild winters, hundreds of new poultry plants are being established each year. The general arrangement in this district is for each poultryman to locate on from five to ten acres, construct one or more long laying houses from 16 to 20 feet wide and from 50 to 100 or more feet in length, using artificial methods in hatching, rearing the young stock on unrestricted ranges, and keeping the layers quite closely confined.

The star in Atlantic County shows the location of Hammonton, which ten to fifteen years ago was the center of a then famous broiler industry, where the business was carried on exclusively as a main line of endeavor. At the present time, however, there are few if any broiler plants in this district. The majority of these farms have gone into the production of market eggs, and the district is developing in this respect very rapidly, and bids fair to rival the Vineland district in years to come.

The star in Gloucester County shows the center of the broiler industry as it exists to-day; it being carried on as a side line to general farming and to egg farming. The fact that broiler raising is a business of only a few months' duration, compelling the farmer to secure income enough in a short time to carry him through the year is largely responsible for the changes in the methods practised. The great mass of broilers which are produced in the State to-day are grown as a side line to egg farming, and in the majority of cases the surplus cockerels are being disposed of in this way. On many plants where equipment will permit special hatches are being run during the winter for broiler purposes. There are few, if any, large exclusive broiler plants left.

The parallelogram in Burlington County shows the center of a rapidly growing capon industry. Many farmers in this district are having their cockerels caponized by professionals and are finding it more profitable to hold them over in this way than to dispose of them as broilers. Grain farming is carried on extensively in this district, and this offers ideal conditions for the birds who are given free range, to gather a large amount of their food at little expense by grazing the grain fields after the harvest. The practice of caponizing is spreading very rapidly in the State, and the time is not far off when all poultrymen in order to market their surplus cockerels at a profit will be obliged to practise this method.

The large black circle in Burlington County shows the location of the Ranco-cas Poultry Farm, which is one of the largest specialized egg farms in the world. This farm is owned by the International Poultry Sales Company, and is run as an exclusive Leghorn farm where from fifteen thousand to eighteen thousand layers are kept during the winters in units of five hundred, each unit being isolated and having a run of from one to two acres. The land in this section is sandy, pine being the prevailing timber, the climatic conditions are very mild during the winter, and conditions are such as will materially aid in bringing about success.

POULTRY EDUCATION.

The State has two well equipped educational poultry plants within its borders. One in Cape May County, where from five hundred to six hundred birds are kept,



Plate 2—Ideal Utility Leghorn
“Belle of Jersey.” Record—246 Eggs in 365 Days.

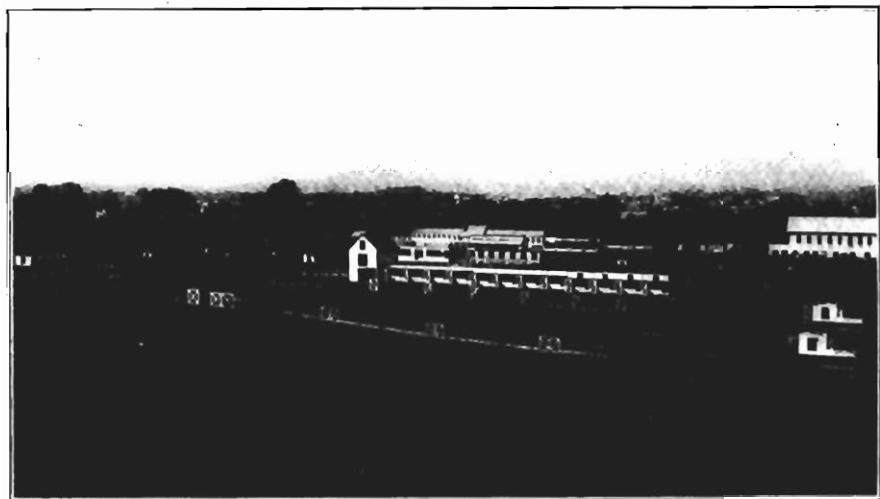


Plate 4—Poultry Farm
New Jersey Agricultural Experiment Station.

POULTRY INDUSTRY IN THE UNITED STATES. 85

and where students are instructed in the various operations essential to successful management. The State College and Experiment Station is located in New Brunswick, in Middlesex County, and is one of the best equipped plants for educational purposes in the country. The following plate shows the location and plan of this plant.

Experiments are being carried on in housing, feeding, breeding, hatching, rearing and marketing, with an idea of determining the most efficient practice applicable to New Jersey conditions. This is also the headquarters of extension work in Poultry Husbandry, and it is largely through the interest of the poultrymen in the State, in co-operation with the State Department that the poultry interests are so well organized. There are at present twenty-two Poultry Associations in the State, representing seventeen Counties. These Associations are organized primarily for educational purposes, and work under a broad constitution which allows them to co-operate in buying, selling, etc., if desired. These Associations have a combined membership of over three thousand members, and the poultry department is co-operating with them to the extent of sending out monthly circulars in the form of "Hints to Poultrymen," which consist of short discussions of seasonable topics, the idea being to aid in keeping up the interest of the members.

Co-operative experiments on twenty-one poultry plants in the State are being carried on with an endeavor to determine the exact amount, cost and duration of egg production with different breeds under farm conditions. This work is proving very interesting, and also educational.

The educational work of the department is along two lines, instruction in the four-year course of Rutgers College, and especially the Short Course in Poultry Husbandry which is given for three months every winter. The Poultry Department is now two years old, and was made possible by an appropriation from the Legislature in 1911. The department is always open for inspection, and visitors are cordially invited to inspect the plant, and their co-operation is always welcome through correspondence and advisory trips.

MODERN METHODS OF PRACTICE.

In studying the industry throughout the United States, and in attempting to analyze modern methods which are being followed, and which are largely responsible for the marked success which is attending poultry farming, the following principles have been very evident; since they are so widespread, and since success is so dependent upon them, I am including them in this talk with a brief description of their application to New Jersey conditions.

These four factors which are proving so important in making the industry successful are as follows:

- A. Continued careful selection of all stock at all ages.
- B. Early hatching and careful rearing.
- C. Efficient housing.
- D. Complete and systematic feeding.

In a brief discussion of these factors I will only attempt to point out the more important phases.

SELECTION.

From the time chicks are hatched until maturity, the flock should be watched with the purpose of removing any birds which show signs of weakness or lack of inherited vitality. It has been proved by experiments that chicks which are naturally weak at birth never make profitable birds to raise to maturity, either for egg

production or for meat purposes. Therefore, it is a good practice to examine the young chicks when they are about a week old and to separate those which show lack of vigor. They should be kept by themselves, and developed for rapid flesh growth and be disposed of at the squab broiler age.

Selection should also be practised throughout the growing period. Any birds which show lack of stamina or the presence of disease should be killed immediately or conspicuously marked so that they will never be put in the breeding pen. Of even more consideration is the importance of making special matings for breeding purposes, in an endeavor to build up one's flock through systematic selection of males and females each year. This special breeding pen can best be made by selecting only the best females from the entire flock, by mating them to good, vigorous males, and by using this special mating as a breeding pen from which all eggs for hatching should be saved. In this way one will get a continuous improvement that could not be assured if the entire flock were used to propagate the future layers. In other words, the time has come for the poultryman to pay more attention to individual birds, and less to the flock as a whole, especially when breeding for future producers. The practice of making special breeding pens in this way is bound to result in time, in larger, more vigorous birds, better layers and hence more profit.

The male bird used in this mating is of special consideration since the progeny will be represented by one-half of his blood. The following plate shows two males, one vigorous or strong, and the other non-vigorous or weak. The latter illustrates the type which should never be put in the breeding pen, for his progeny will never be profitable in producing eggs or in growing body flesh.

In the selection of birds for any purpose, constitutional vigor and stamina should be placed ahead of any other characters, for a bird not possessing these will not reproduce in a satisfactory manner any good characteristics which they might apparently possess.

EARLY HATCHING.

Early hatched birds are proving very profitable as winter layers since enough time is given them to mature before extremely cold weather comes in the fall. The exact time for hatching will depend under average conditions upon two factors.

First. The breeds kept.

Second. The method of growing and the condition of the range.

The light, active Mediterranean breeds are much quicker growers, maturing on good range in from four to six months. They can be hatched, therefore, later than the heavier general purpose breeds which require about four to six weeks longer to reach maturity. The Leghorns can be safely hatched from the middle of April to the middle or last of May; while heavier breeds like the Plymouth Rocks, Wyandottes, R. I. Reds, etc., will do better if hatched from the middle of March to the last of April. The hatching period as given above may be modified to some extent if it is necessary to hatch three times to secure the required number of chicks.

Growing chicks that have, during the summer, an abundance of range provided with shade and green food will grow much more rapidly and more evenly than those crowded into small bare yards. The character of the range must, therefore, be considered in deciding on the time for proper hatching. If the chicks are hatched too early they are apt to go into a fall moult after laying a few eggs in the late summer, and are not likely to resume laying again until well into the winter, or after one or more of the most profitable laying months have passed. On the other hand, they should be hatched early enough to allow a sufficient time for normal maturity before the coming of cold weather in the fall.

Regardless of the time of hatching, as soon as the pullets are weaned from the brooder heat they should be put under ideal conditions with reference to making

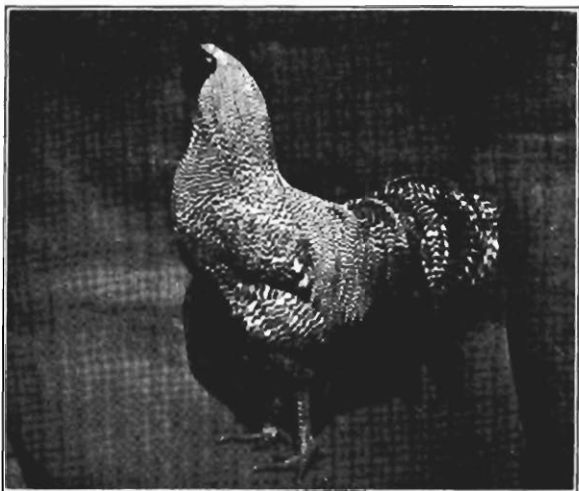


Plate 5a—Vigorous Male.

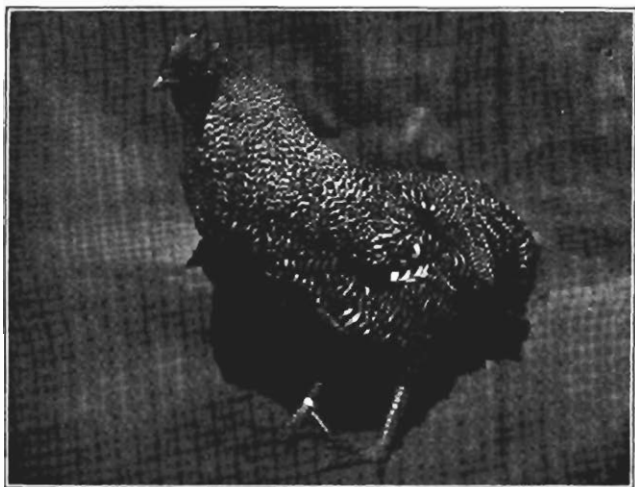


Plate 5b—Non-vigorous Male.

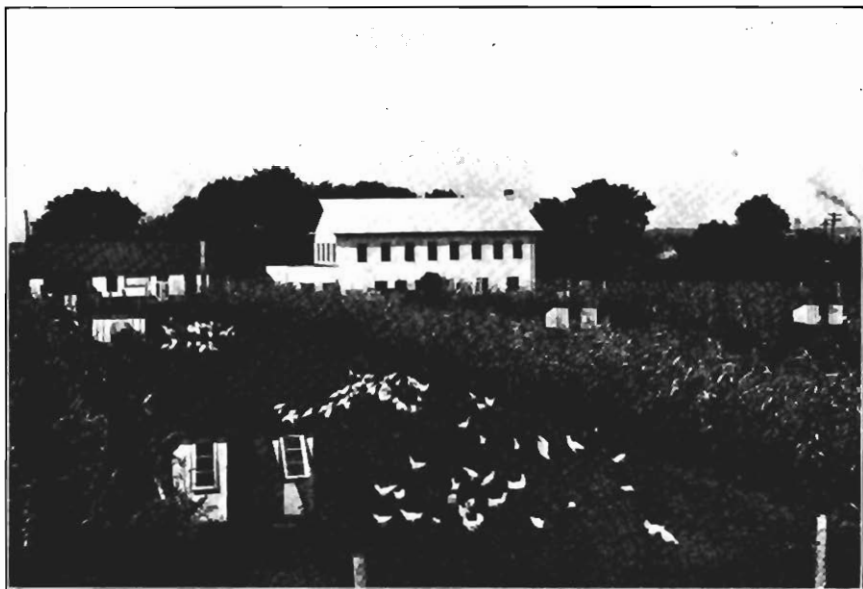


Plate 6a—An Ideal Range Scene.

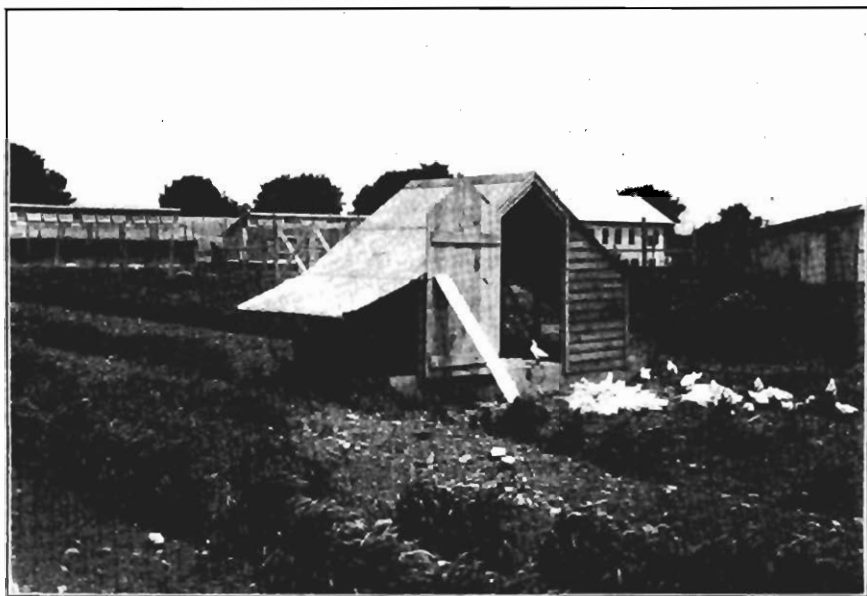


Plate 6b—A Cool Summer Colony House.

POULTRY INDUSTRY IN THE UNITED STATES. 87

a satisfactory growth. The four requirements which are essential for the most economical and uniform development are:

1. An abundance of range for the growing stock.
2. Natural shade if possible, otherwise artificial shade should be supplied.
3. Natural green food in abundance.
4. The feeding of dry mash constantly in large self-feeding hoppers.

It is impossible from the standpoint of economy and efficient growth to mature a lot of pullets in close confinement, especially on small bare yards without any natural shade and without access to an abundance of green grass. With small flocks it may be done by the expenditure of a large amount of time and by costly methods of feeding; but on a large commercial plant or under farm conditions, it is not advisable to attempt it.

The construction of a large hopper capable of holding a large quantity of feed is a great labor saver. By allowing the birds access to its contents, a better and more satisfactory growth is obtained, and an opportunity is given them to balance the grain rations fed. This hopper should be large enough to hold several bushels of feed, sufficient for one or two weeks.

Aside from meeting the four requirements mentioned above, the poultryman should provide his birds with clean, roomy, well ventilated summer colony houses where they will not be unduly crowded, and where they will have fresh air to breathe at all times. Stunted pullets are but too often produced by lack of proper sleeping and roosting quarters during the summer growing period. The feeder should always endeavor to keep the pullets growing constantly without any check, thus doing away with any danger of retarding the time of maturity or of reducing the ultimate size and vigor of the mature birds.

A PROPER HOUSE MEANS FAVORABLE ENVIRONMENT.

The study of existing conditions throughout the State and country show conclusively that the type of house which is giving the most success is that which might be described as one having a muslin front or one which has a portion of the front open, covered with muslin curtains which may be closed or opened as desired. Plate No. 7 shows one type of muslin front house which is quite common throughout the State.

There are a great many different ideas in house design represented on the majority of our poultry farms. Appreciating the variety of types recommended, the Poultry Department has constructed six special houses, and have taken moisture, temperature and production figures for the past two years, and from the results obtained, have evolved a type of house which most clearly fulfills all the requirements of a successful and economical house for laying birds.

The plans of such a house are herewith shown.

This house is known as the New Jersey Multiple Unit Laying House. Of the great majority of roof types available, the shed roof was adopted as it covers a given floor space very efficiently, and at a smaller cost than any other type. The multiple unit idea in this house is one of its greatest advantages since the same plans can be used for a house designed to keep one hundred or five hundred birds. Each unit is 20 by 20 feet, is identical with every other unit, and it is possible to build as many units as is desired. The following discussion of Plate No. 8 will answer the essential points. The outside dimensions are 40x20 feet, sills to be 4x6, and to be bolted to a concrete foundation wall eight inches wide and twenty inches deep, which is laid on tamped cinders or crushed stone, the entire depth of the foundation trench being three feet.

The shed roof type of construction is used with nine foot studding in front and four and one-half foot studding in back. All studding and rafters are 2x4 hemlock or yellow pine. A 2x6 girder runs the length of the building supporting the rafters and itself being supported every ten feet by 4x4 posts, resting on concrete piers. The plates should be made of 2x4 material doubled and joints broken.

All outside walls and roof are to be single boarded, preferably of eight or six inch tongued and grooved yellow pine; white pine can be used, but is much more expensive. The roof and back wall should be covered with a good roofing paper; all joints should be carefully lapped and cemented.

The muslin curtains in the front wall are hinged at the top and can be lifted up. The 3x5 glass sash is hinged at the side and open as indicated on the floor plan. One window in each pen should be so constructed that part of the wall will open when desired, thus making a combination door and window. This will greatly facilitate cleaning and filling hoppers, etc., in an extremely long house.

The dropping boards, perches, and nests are best arranged on the back wall, the perches being hinged to the wall so that they may be hooked up when cleaning, the nests being darkened by a hinged door in front which may be let down when it is desired to remove the eggs.

The dividing partition between the units is built of boards and extends from the back wall to within six feet of the front wall; the remaining space is left entirely open. This protects the birds from any drafts when on the roosts. When desired, portable light wire partitions may be used to separate the units. A large dry mash hopper should be built into this middle partition. If four or more units are built, it is only necessary to have a hopper in the center of each two units; the other dividing partition being utilized for nesting space. This hopper should be constructed with a wooden cover hinged at the center. There is an elevated platform under the muslin front which provides room for the water fountain and grit and shell hoppers.

When the house is completed concrete floor should be laid, and should consist of three distinct layers. First, a layer of about six or ten inches of cinders or coarse gravel tamped thoroughly to serve for drainage purposes to keep the soil moisture away from the bottom of the floor. Next, a rough coat of concrete about four inches thick, and over this a finished coat of two parts of sand to one of cement, troweled smooth and rounded at the corners. Where there is danger of much moisture coming up from below it is advisable to put a layer of tarred building paper between the rough and finish coat of cement. It should be nailed down with flat headed nails, and the heads of the latter should be left sticking out about one-quarter of an inch to hold the top coat.

Such a floor is moisture-proof, rat-proof, vermin-proof, and easily and quickly cleaned.

The following is a list of materials which will be required for building a double unit.

LIST OF MATERIALS REQUIRED AND APPROXIMATE COST.

Lumber.

Sills—6 pieces 4x6 by 20 feet Hemlock.	
Plates—8 pieces 2x4 by 20 feet Hemlock.	
Posts—2 pieces 4x4 by 14 feet Hemlock.	
2 pieces 4x4 by 18 feet Hemlock.	
Studding—9 pieces 2x4 by 14 feet Hemlock.	
Rafters—21 pieces 2x4 by 22 feet Hemlock.	
Frame for nest and dropping boards—5 pieces 2x3 by 16 feet Hemlock.	
Eight-inch tongued and grooved yellow pine boards for roof, dropping boards, walls and nests. 2200 Sq. Ft.	
1x2 white pine for curtain frames and trim. 200 linear feet.	
1x4 white pine for nests. 100 linear feet.	
One bundle plaster lath for brooder coop.	
Nails—10 lbs. 20 penny wire. 50 lbs. 10 penny wire. 20 lbs. 8 penny wire.	
Approximate cost of the above	\$75.54
Roofing paper, 1060 Sq. Ft. or 11 rolls at \$3.00	33.00
Four special sash, 3x5 feet at \$2.00	8.00
Muslin, 8 sq. yards, at 20 cents per yard	1.60
Hardware, as hinges, locks, tacks, hooks and wire	4.75

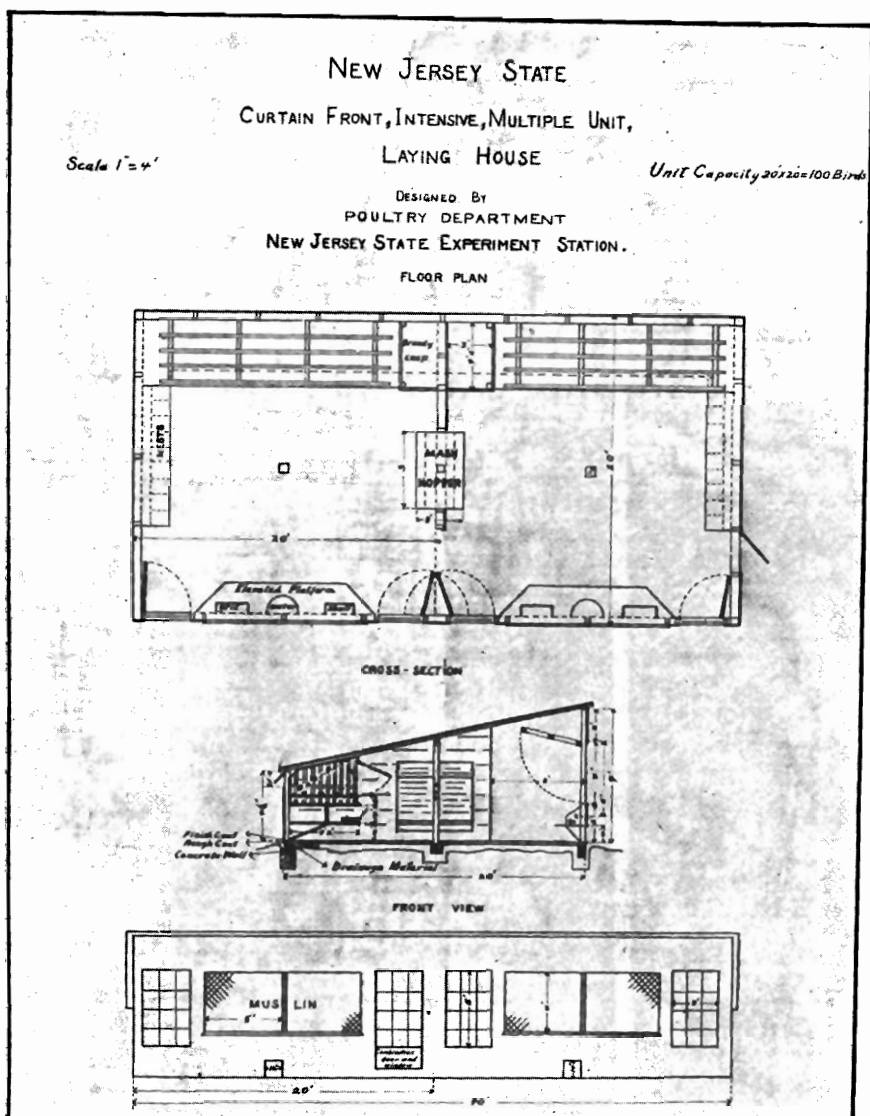


Plate 8—Curtain Front, Intensive Multiple Unit Laying House.

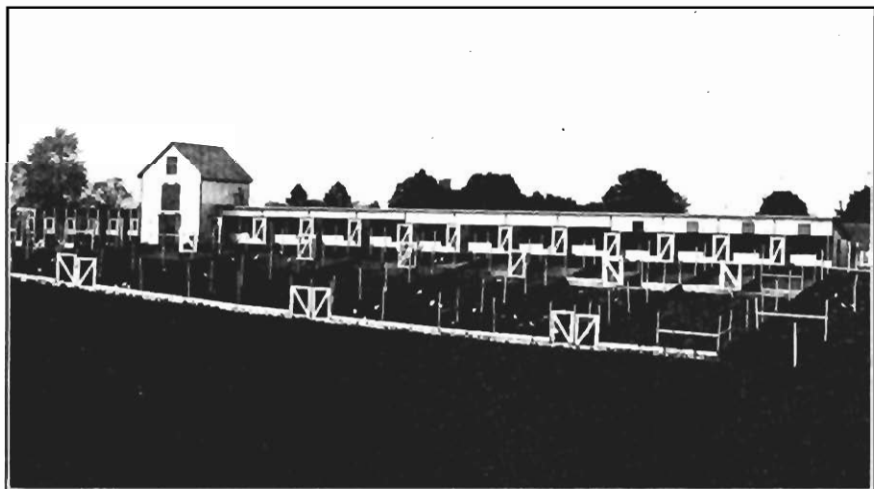


Plate 7—A Model Curtain Front House.

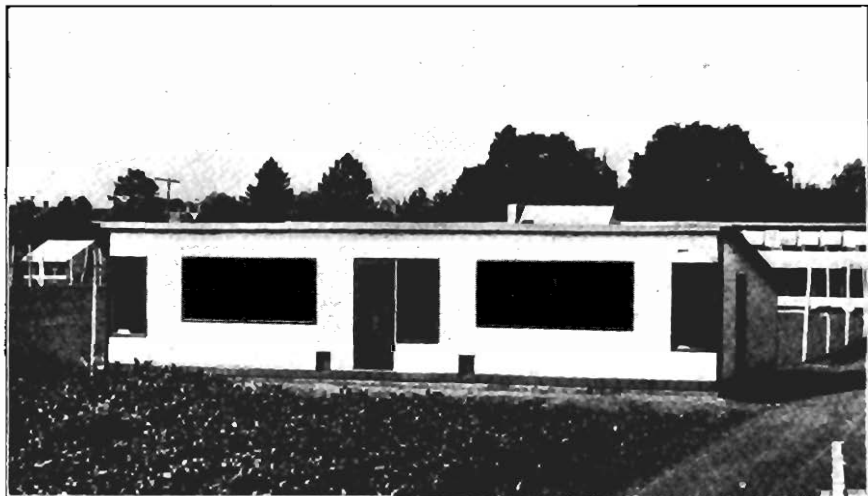


Plate 9—The New Jersey Multiple Unit Laying House.

POULTRY INDUSTRY IN THE UNITED STATES. 89

Foundation and floor—

Cement, 35 bags, at 50 cents	\$17.50
Cinders or gravel, 30 yards at \$1.00	30.00
Sand, 5 yards	7.50
	<hr/> 55.00

Total cost, not including labor if concrete floor is put in the house and cinders and sand have to be purchased.\$177.89

This gives a cost per square foot of floor space of \$0.222.

A cost per running foot of house of \$4.44.

A cost per bird, allowing 4 sq. ft. per bird, of \$0.888.

Adding labor to this at one-fourth the cost of material, the total cost is \$222.36 or \$1.11 per bird.

Many commercial poultrymen in the State are building this type of house, and it is proving to be very successful, and it has been found from a test made at the station that this type offers total freedom from moisture as well as ventilation without causing drafts, thus avoiding roup and colds. There is also sufficient room to give the birds ample exercise. It also allows the direct sunlight to strike some part of the floor during the day, and offers protection from cold, yet does not keep the birds too hot. If constructed according to these specifications, it is rat and vermin proof, and offers exceptional advantages in reference to convenience in caring for the birds, and lastly it is economical of construction, costing only about eighty-eight cents per bird for material.

The last point to which I want to call your attention to to-night, as being a fundamental factor in successful poultry management, is: that the feeding practice should be efficient and sufficient. There are a great many rations which it is possible to work out and provide the desirable food nutrients, yet there are only a few combined which will give these nutrients in the most economical form. The following system of feeding for egg production is a result of extended experimental work at our Station Plant, and conforms very closely to practices recommended by other leading Stations in the country. With good birds and good houses without proper food, the hen cannot be expected to produce a maximum product for she is nothing more than a machine into which the poultryman must put raw material of the same quality and the same proportion in which he expects to get the resulting product. Believing that feeding is one of the determining factors in successful poultry keeping I earnestly call your attention to a discussion and study of the following rations.

MIXTURE NO. 1.

Dry Mash.

KIND OF FOOD.	Amount by Weight, Lbs.	Amount by Measure, Qts.	Dry Matter.	Ash or Mineral Matter.	Protein.	Carbo-hydrates Plus Fat x 2 1/4.	Cost.
Wheat Bran	200	380	176.0	11.6	24.2	90.6	\$3 20
Wheat Middlings ...	200	240	176.0	7.6	25.6	121.4	3 50
Ground Oats	200	200	178.0	6.0	18.4	113.6	3 30
Corn Meal	100	95	89.0	1.5	7.9	76.4	1 65
Gluten Meal	100	80	92.0	.8	25.8	65.6	1 70
*Meat Scrap (H. G.)	100	86	89.3	4.1	66.2	31.1	3 00
Short Cut Alfalfa...	100	200	92.0	7.4	11.0	42.3	1 60
Total	1,000	1,381	892.3	39.0	179.1	541.0	\$17 95
Average to 1 lb..	....	1.38	.892	.039	.179	.541	\$0.18

Nutritive Ratio, 1—3.02.

Keep this mash before the birds all the time in large self-feeding hoppers. The hoppers used should be large enough so that one filling will last from one to two weeks at the least.

During the moulting season or the months of July, August and September, it is advisable to substitute oil meal for the gluten in the same proportion, to hasten the growth of feathers. As soon as the birds get on green grass, the alfalfa can be gradually omitted; also meat scraps are gradually reduced in amount as soon as the birds get out on free range, and can find insects and grubs. The extent to which the above mash can be cut during the summer will depend upon the character and amount of range which the birds have during that time.

The above dry mash is designed especially for the feeding of White Leghorns. Where heavier breeds are kept such as Plymouth Rocks or Wyandottes, especially yearling or two year old hens, the tendency will be to take on an excess of fat. Under these conditions it is the best policy to restrict the amount of mash eaten by leaving the hopper open during the afternoon only, thus inducing the birds to work more for the cracked grains fed in the litter.

The following modification of the above mash will be found very economical for summer feeding, the change from one to the other being made gradually as soon as the birds are on free range with plenty of natural forage.

MIXTURE NO. 1A.

Summer Dry Mash.

KIND OF FOOD.	Amount by Weight. Lbs.	Amount by Measure. Qts.	Dry Matter.	Ash or Mineral Matter.	Protein.	Carbo-hydrates Plus Fat x $\frac{2}{4}$.	Cost.
Wheat Bran	200	380	176.0	11.6	24.2	90.6	\$3 20
Wheat Middlings ...	100	120	88.0	3.8	12.8	60.7	1 75
Ground Oats	100	100	89.0	3.0	9.2	56.8	1 65
Gluten Meal	50	40	46.0	.4	12.9	32.8	85
Meat Scrap	25	21	22.3	1.0	16.5	8.0	75
Total	475	561	421.3	19.8	75.6	243.9	\$8 20
Average to 1 lb..	....	1.18	.887	.04	.158	.513	\$.017

Nutritive Ratio, 1—3.22.

As supplemental to the dry mash the following scratching ration of whole grain is fed every morning, both winter and summer, about 9 o'clock in deep litter. Its primary object, aside from its nutritive value, is to induce exercise. About five pounds of scratching ration is fed to each one hundred birds on the floor of the house or under some shelter, where the litter is dry and where there is protection from cold winds.

MIXTURE NO. 2.

Scratching Ration.

KIND OF FOOD.	Amount by Weight. Lbs.	Amount by Measure. Qts.	Dry Matter.	Ash or Mineral Matter.	Protein.	Carbo-hydrates Plus Fat x $\frac{2}{4}$.	Cost.
Wheat	100	53	90	1.8	10.2	73.0	\$2 20
Clipped Oats	100	98	89	3.0	9.2	56.8	1 93
Total	200	151	179	4.8	19.4	129.8	\$4 12

POULTRY INDUSTRY IN THE UNITED STATES. 91

At 4 to 5 o'clock in the afternoon, depending on the season, a night ration is fed, composed of whole grains and cracked grains at the rate of 10 pounds to each 100 birds.

MIXTURE NO. 3.

Night Ration.

KIND OF FOOD.	Amount by Weight. lbs.	Amount by Measure. qts.	Dry Matter.	Ash or Min- eral Matter.	Protein.	Carbo-hydrates Plus Fat x $\frac{2}{4}$.	Cost.
Cracked Corn	200	120	178	3.0	15.8	152.8	\$3 30
Wheat	100	53	90	1.8	10.2	73.0	2 20
Clipped Oats	100	98	89	3.0	9.2	56.8	1 93
Buckwheat	100	66	87	2.0	7.7	53.3	2 00
Total	500	337	444	9.8	42.9	335.9	\$9 43
Average in 1 lb..	....	.674	.888	.019	.085	.671	\$.018

Nutritive Ratio, 1—7.8.

It will be noted that this manner of feeding gives to the birds the materials suitable for supplying the heat to the body during the night. The above night ration is designed for White Leghorn; when feeding heavier breeds, it is desirable to eliminate one-half of the cracked corn and to substitute barley for the buckwheat. During the summer months, a night ration of equal parts of cracked corn, wheat, oats and barley will supply the requirements; the amounts to be fed, depending on the amount and condition of the range.

A good rule in feeding the night ration is to feed all that the birds will eat, or rather more, so as to have a little left for them to go to work on in the morning. A good feeder will occasionally go among the birds at night when they are on the perches and will feel their crops. If they are not full early in the evening he will conclude that either the layers are not getting enough or that they have lost their appetite. In either case, the defect should be immediately corrected.

One special advantage of the dry mash system outlined above is the fact that each bird is allowed to balance her own ration according to her particular requirements and tastes.

In addition to the grain ration herein described, an abundance of grit, shell and water should be kept before the birds at all times, and succulence in some form, such as mangel beets, sprouted oats, etc., should be fed at least once a day.

In closing I wish to leave with you the thought that our United States, although a great and growing poultry community has yet a long ways to go before we catch up with some of our European neighbors. Denmark for example is the greatest poultry producing center in the world. Also the thought that New Jersey is doing her share in bringing about this increase which has taken place, and that she need be proud of the position which she now occupies. It is up to us as poultrymen to maintain this increase, and to carry it on to even greater developments by practicing more earnestly and carefully the four factors which I have heretofore outlined and combined with our natural advantages and ideal marketing facilities there is no reason why we cannot come back a year from now with a report that our industry has increased many fold, and lastly I wish to thank you for your appreciation as exemplified by your very close attention, and to earnestly solicit your hearty co-operation in all matters pertaining to our poultry industry.

A Member—I move that a rising vote of thanks be tendered to the speaker for his very instructive and interesting address. Carried.

The meeting then adjourned to Wednesday, January 8th, at 9:30 A. M.

SECOND DAY—FOURTH SESSION.

The meeting was called to order by Vice-President Cox at 9:30 A. M.

The meeting was opened by prayer by the Rev. Andrew Todd Taylor, D.D., Pastor of the Third Presbyterian Church of Trenton.

Chairman Cox—We will now have the report of the Committee on Credentials if they are ready with their report so far as they have gone. Mr. Kille, Chairman.

Mr. Kille—Mr. President, we are not ready to report on all of the credentials. The delegates from Salem County, Cape May County and Atlantic County, we have no credentials from those, and the Committee recommends that the request of the Mercer County Farm Bureau be granted that they have a delegate in this Board. We recommend that such delegate be admitted.

Chairman Cox—Gentlemen, you have heard the report of the Committee on Credentials, with the recommendation that the Mercer County Farm Bureau have their request granted for the privilege of having a delegate to this Board. What is the pleasure of the Board on that matter?

On motion the report be accepted and the recommendation adopted.

Chairman Cox—The Mercer County Farm Bureau will therefore be accorded a delegate. Has there been one appointed?

Mr. Kille—Yes, sir, Mr. Edgar G. Wurtz.

Chairman Cox—Very well, he will be recognized as a delegate to this meeting of the Board.

We will now take up the introduction of new business. Is there any New Business to be presented at this time. Any New

Business to come before the Board ought to be presented early during the session. Are there any matters of new business, any resolutions to be presented? If there are none we will then take up the report of the Committee which the President appointed yesterday to wait upon the Governor. Mr. Rider is the Chairman of that Committee.

Prof. Rider—Mr. Chairman, the Committee report that the Governor was not at his office this morning, but interviewed his Secretary, Mr. Tumulty, and he said that he would present the matter to the Governor and he had no doubt the Governor would be pleased to appear before the Board, and we told him to make such time as suited the Governor's convenience.

Chairman Cox—What does the Board wish to do with the report of this Committee? On motion the committee was continued.

Chairman Cox—The subject which we will take up first this morning for discussion is Soy Beans as a Farm Crop, by Dr. J. G. Lipman, Director of the Experiment Station. It gives me great pleasure to present to you Dr. Lipman. (Applause.)

Soy Beans as a Farm Crop.

BY DR. J. G. LIPMAN.

Soy beans are a new crop to New Jersey. Dr. George Cook, the first director of the New Jersey Experiment Station, and Mr. James Neilson, a member of the Board of visitors of the State Experiment Station and Agricultural College, went abroad in 1879 and on their way home stopped at Vienna, where they secured some seed of soy beans from Prof. Haberland after whom one of the varieties of soy beans was named, and brought the seed to New Brunswick.

In so far as we know, that was the earliest attempt to grow soy beans in New Jersey.

The introduction of soy beans in most of the other States is even more recent. Hence we are dealing evidently with a crop that is new, whose peculiarities are not fully understood.

It came to us originally from China and Japan, where, in the course of many centuries, it has become one of the most important economic crops. If you care to secure further light on the meaning of the soy beans to the agriculture of the Orient, I would suggest that you buy a copy of the little book that was written by the late Prof. King of Wisconsin, and entitled, "Farmers of Forty Centuries." You will find that in this little book the subject of agriculture, including methods of growing soy beans, is discussed in a very entertaining and instructive way.

In China and Japan, soy beans have come to be a crop of importance not only for farm animals, but as a source of human food. Large quantities of soy bean cake are exported now from China and Japan to Europe. I am told that last year there were imported into London one and a half million tons of soy bean

cake. Two years ago the corresponding amount was between five and six hundred thousand tons.

Going back a little farther you will find that the value of soy beans and soy bean cake was not recognized in Europe until after the Russo-Japanese War. In the United States we are still more recent in our knowledge of the economic meaning of soy beans and the possibilities that are offered in the growing of this crop.

Some of our experiment stations have done valuable work in bringing to the knowledge of the farmer what soy beans may do. I see in the audience two friends from other institutions who have contributed to this knowledge, Prof. Thorne of the Ohio station, and Dr. Wheeler, late of the Rhode Island Experiment Station. Those institutions have done interesting work in acquainting us with the possibilities of soy beans. The Delaware station has done instructive work, the Massachusetts and Kansas stations have done likewise and we are indebted also to the Tennessee and Kentucky stations for a considerable amount of valuable work.

Now, while soy beans may have a certain degree of interest to us as a crop, the interest is not likely to find expression on the average farm unless we can convince ourselves that it is entirely worth while to grow the crop on a field scale. In order to make clearer the possibilities of growing soy beans on a field scale, I want to refer briefly to the advantages possessed by soy beans and to indicate why it might be worth while for us to grow them.

Soy beans may be grown as a forage crop for soiling and with corn for ensilage. They may be produced as a hay crop, and, finally, they may be produced as a seed crop. They have value from these three standpoints.

Our own experience in New Jersey, the work particularly of Dr. Voorhees, and of Mr. Lane associated with him, began in the middle nineties, 1895 or 1896, and it related particularly to the value of soy beans as a soiling crop and its value as an ensilage crop. Scarcely any work was done in studying soy beans as a hay crop or as a seed crop.

There is no doubt that for soiling purposes and ensilage purposes, soy beans are a valuable crop. They are rich in protein and may be grown after an earlier forage crop like oats and peas, wheat and vetch, barley and spring vetch or something similar has been gotten out of the way. In other words, they very nicely fit into a system of soiling crops and may be used as the second crop of the season. As a soiling crop they have much to commend them, because they are as rich in protein as alfalfa. The cured hay has as much feeding value as alfalfa hay and we can use it for hay making as effectively as we can grow it for soiling. There is no doubt that as a hay crop soy beans will have a larger area devoted to them as time goes on.

But it is my particular purpose this morning to discuss soy beans as a seed crop, a phase of soy bean production that is relatively new in this country.

The composition of soy beans, indicates to anyone who has studied farm crops and their composition that soy beans are likely to be a very valuable crop for two reasons. In the first place, they are exceptionally rich in protein. For instance, in a test of many varieties, I think eighty varieties all told, at the Ohio Experiment station, the average protein content was found to be nearly forty-two per cent. The average protein content of a large number of varieties grown at the Delaware station was nearly forty per cent. The protein content of a considerable number of varieties that we have raised at New Brunswick was between forty and forty-two or forty-three per cent.

Evidently we are dealing with a crop that is exceptionally rich in protein, the one constituent which the dairy farmer and the live stock farmer have to purchase and to supply in adequate amounts; the constituent which is likely to be deficient on the average farm where live stock necessities are important.

You will find further that there is another constituent in soy beans that promises to be of very great importance, and that is oil. The average composition of the varieties tested at the Ohio station as to oil was about seventeen per cent. In other words, every one hundred pounds of soy beans contain seventeen pounds

of oil. The average oil content of the varieties tested at the Delaware station was eighteen per cent. Now, I wish to call your attention to an interesting point which possibly we shall study in our work at the New Jersey station.

We find that the heavier the soil, everything as to variety, climate, etc., being equal, the larger will be the protein content, and the lower the fat content. Whereas, on the lighter sandy soils, we should raise, everything being equal, beans of a higher fat content and lower protein content.

The location of our soy bean fields is to be determined, therefore by the use to which the beans are to be put. If it be our purpose to grow soy beans especially for their oil, we should grow them on soils suitable for the production of beans with a high oil content. Furthermore, we should select and breed beans that will give us a larger yield of oil. Similarly, if the soy beans are to be used primarily for the feeding of live stock, we should prefer the varieties that will give us the largest yield of protein per acre.

I have here a few samples of soy beans, all of them grown at our own station. They represent the varieties that are best known in New Jersey. There are aside from these a very large number of varieties that have been tested. Generally speaking, however, differences in these varieties relate to their adaptability for soiling, and hay on the one hand, and for seed on the other. There are varieties which have too long a growing season to make them suitable for seed production in New Jersey. This applies particularly to the Mammoth Yellow, a variety that is extensively grown in the South, both as a seed and forage crop. With us it has value only as a hay and cover crop, rather than as a seed crop.

At the other extreme, we have the Ito San, an early variety, which under some conditions will mature seed in as few as seventy or seventy-five days, as against the Mammoth Yellow which will require a hundred and fifty or a hundred and forty-five days for maturing.

And between these we have other varieties, many of them capable of maturing in New Jersey. There is among them the Wilson, a black bean, which will mature in about one hundred and twenty-five or one hundred and thirty days. We have tested out two or three other promising varieties like the Brownie and the Medium Green, having a growing season of about a hundred and twenty-five to a hundred and thirty-five days.

There are still other varieties fully as promising, that we have not as yet tested out. Here are some samples of oil. This one is a crude oil from soy beans, valuable when refined as a table oil, and valuable for various industrial purposes, like the making of soaps, lubricants and paints.

This one is a sample of the refined soy bean oil; and here is a sample of the soy bean cake from which the oil has been extracted.

From the seed standpoint we naturally should prefer the crop that will give us the largest yield of seed, and it happens, of course, that the crop that has the shortest growing period, the Ito San, is not the largest yielder of seed. We have averaged this year, at the College Farm, about seventeen or eighteen bushels per acre of Ito San. I believe the average at the Ohio station is about eighteen bushels per acre.

The later varieties would do better than the earlier as to yield. At the Delaware station Ito San averaged twenty-two bushels of seed per acre. But, on the other hand, we find that the Wilson in one of our fields averaged about twenty-three or twenty-four bushels per acre this season. Yet this crop was grown on a rather rich soil and had a smaller seed yield than it would have had under the same conditions, I think, on poorer land. Some of the varieties tested at the Delaware station averaged as high as thirty-five or thirty-six bushels of seed per acre. Everything considered, I believe, that by using the proper variety, and with proper soil conditions, we can count on twenty bushels of seed per acre, and about one hundred pounds of forage for every bushel of seed. I believe that at the Ohio station they figure on about seventeen hundred pounds of forage to about eighteen bushels of seed. Is that right, Prof. Thorne?

Prof. Thorne—Yes, about that. I should say about a hundred

pounds of forage to one bushel of seed is about the proportion you will find in those varieties. It will depend upon the variety.

Taking this situation as it exists, we may ask before we pass on to a discussion of the methods of growing soy beans, what are the merits of this crop? Considering its protein content, considering its fat content, considering the yield of seed and forage, it is really worth while for us to grow it.

Now, it is proper, of course, that we consider this subject from our own standpoint; that is, from the standpoint of New Jersey soils and climate. Is there any situation in the State where the growing of soy beans would be justified for seed purposes, as a substitute for other crops? I believe that there is ample justification for growing large areas of soy beans for this very purpose. We all agree that oats are not a profitable crop in New Jersey. At least, I should conclude from the statistics of the last census, that it costs about eleven or twelve dollars to produce a crop of oats in New Jersey. And yet the average crop thus produced is worth about nine dollars, or surely less than ten dollars per acre. Taking the State as a whole, we are losing one or two dollars per acre in the growing of oats. There are, of course, individuals, especially in North Jersey, who find oats a profitable crop; but I am speaking of the average.

Now, would it be justifiable for us to suggest soy beans as a substitute for oats? Would it be practical for us to grow corn, soy beans, and wheat or rye and clover? To judge by our own experience, that would be not only justifiable but it would be desirable, especially at the present prices of soy bean seed.

We are able to sell some of our seed at three dollars per bushel. Anyone could easily obtain two dollars a bushel for soy bean seed. Assuming an average yield of eighteen or twenty bushels per acre, and a yield of forage of about one ton per acre we note at once that the crop is a valuable one. Aside from the seed there is value in the vines for hogs, sheep and cattle, a value of at least ten dollars per ton. We find, then, that soy beans are a promising crop as a substitute for oats. And if, in addition, we remember that soy beans are a legume, that when raised as a seed crop, they leave the soil in better condition because of the cultivation which they receive and because they leave the soil richer rather than poorer in protein, we find justification for growing soy beans not only for the sake of the crop itself but for the sake of the soil.

And, furthermore, it is quite possible to grow soy beans in the rotation which we have suggested. We had been growing soy beans in an experimental way for several years. Finally we decided to extend our operations and planted forty acres of soy beans this year for seed purposes. We have been able to grow wheat and vetch for hay, and, in the same season, soy beans for seed. It is somewhat difficult to mature winter vetch for seed, and in the same season to mature soy beans for seed. This is probably feasible in South Jersey. It would be entirely feasible in Delaware. It would be entirely feasible in Virginia, this growing of two crops of seed. It is practicable there to grow early varieties of corn, followed by wheat and vetch or rye and vetch, where the soil and climate will allow it. The wheat and vetch may be followed by soy beans grown for seed, and these in turn by rye or rye and timothy, or rye with clover, seeded in the spring. There are various adjustments that could be made in the rotation which I shall not attempt to discuss now.

But we see at once as a seed crop soy beans are more profitable than oats, especially now when seed is worth two dollars a bushel, and I doubt whether soy beans will ever be worth less than one dollar and twenty-five cents a bushel. Indeed under our conditions in New Jersey and elsewhere in the East, soy beans will always be worth at least a dollar and twenty-five cents a bushel. But, granting that they may be sold some day for a dollar a bushel, we still feel that soy beans can be grown as a profitable crop on a field scale.

So much then for the advantages and the promise held out to us by the soy bean crop, and the prophecy that one might make that soy beans will be one of the important crops in the United States, just as they are one of the important crops in the Orient.

SOY BEANS AS A FARM CROP.

97

As to the methods of growing soy beans, like all new crops they have peculiarities that must be learned. Unless those peculiarities are understood, failure may result.

For instance, I find the statement from one of our agricultural institutions, that it takes three years to inoculate the soil for soy beans. That means, if no attempt is made to introduce the bacteria which the soy beans need, the land will not reach its highest productive capacity for three years. There will not be enough bacteria to inoculate the crop thoroughly within that time. This statement is not borne out by the experience of other institutions, nor by our own experience.

In one instance we grew soy beans on land that had never been inoculated for this crop. In the following season seed from this uninoculated crop, without any further inoculation, produced plants that were abundantly covered with nodules. Hence the rapidity of inoculation evidently depends upon the soil. It depends on other conditions, but under any conditions soy beans are not likely to succeed for the first year or two unless the proper bacteria are supplied. Here then is one peculiarity.

We must understand further the peculiarities of the crop as related to the texture of the soil. Soy beans are adapted to growing well on a wide range of soil types. They will grow on very heavy land, they will grow on medium soil, they will grow on sandy soil, they will grow on land that is rather low and wet. Nevertheless, there are limits in the adaptability of the crop to soil texture. Where the soil is very light and leachy in character, soy beans do not grow at their best nor do they grow at their best on very heavy wet land. But, omitting those extremes, soy beans will do well on almost any soil type provided the soil itself be properly prepared. In other words, they are adapted to growing on practically every soil type in the State.

But the soil must be well prepared. Soy beans require a good seed bed. They require freedom from competition by certain weeds. They require, if they are to do their best, an abundant supply of phosphoric acid and potash, even though they are not quite as sensitive to soil acidity as are the clovers or alfalfa.

We have grown soy beans with fair success on land that had not been limed for many years, and was for this reason quite acid. It seems, therefore, that the soil need not be neutral. Acidity is no handicap to soy beans. At the same time, on this very land, the addition of lime increased the yield. So that even though soy beans are not pronounced in their demands for an abundant supply of lime, the latter will benefit the growing of this crop.

Generally speaking, therefore, the proper preparation of the soil, a good clean seed bed, an ample supply of phosphoric acid and potash, and slight but not excessive acidity in the soil, create conditions that should be favorable for the growing of this crop.

Now, the next point that we want to consider, assuming that we have the soil properly prepared, is the method of planting and the treatment of the seed.

As a seed crop, and we are now discussing soy beans as a seed crop, they should be planted in rows. We have grown them in rows twenty-eight inches apart; but at other places they have been grown variously, in rows twenty, twenty-one inches, twenty-five inches apart, and as far apart as thirty-five inches. But I think there is a general agreement that rows twenty-eight or thirty inches apart and distances of two, three or four inches in the row, are likely to give us the best results for seed production, even though there may be some modifications on account of the soil and the variety. If, however, we prefer the growing of soy beans for hay purposes, we can sow them broadcast or drill them as we drill wheat. By using then a larger quantity of seed per acre, we make certain of finer stalks, more tender and more digestible tissue.

When the crop is grown in rows twenty-eight inches apart, we find that one-half bushel of seed per acre is about the right quantity. The statement is made by the Delaware station that one-third of a bushel is about the best amount, on the other hand, the Ohio station would recommend three pecks as much better than two pecks for giving the largest yield of seed. Soil conditions and a variety

of other conditions necessarily affect the amount of seed to be used, but I think that you would be safe enough in taking one-half bushel per acre as the quantity of seed required, when the beans are grown in rows twenty-eight inches apart.

Much has also been said about the manner of planting soy beans. Some growers have been able to use an ordinary grain drill. By employing the oats feed, to sow at the rate of about five pecks per acre, medium soy beans will be used at the rate of about a half bushel per acre for rows twenty-eight inches apart. If you could adjust your rows satisfactorily a corn planter would answer your purpose. For our own work we have used a bean planter. Mr. Owen who has had charge of this work comes from northwestern New York where they grow a good many beans, and he bought one of the bean planters made at Batavia, by the Bidwell company, and has found it very satisfactory.

After the soy beans are planted they should be thoroughly cultivated for the sake of conserving moisture and the creating of favorable conditions for the formation of available plant food. This is essential. It happened that this year one of our fields was neglected, because one of the men responsible for its cultivation, was drowned, and things were upset more or less for a whole week. As a result the yield of seed was cut down very materially. Hence, thorough cultivation, clean cultivation, is just as essential for the growing of a large crop of soy beans as it is for the growing of a large crop of corn.

I should add here, that since inoculation is so essential, it is best to use soy bean soil where it can be obtained. We have used the fertilizer distributor to put the soil in the row. We had no trouble at all in securing satisfactory inoculation of land on which soy beans had never been grown.

But, if soy bean soil is not available, cultures may be used. Mr. Van Nuis reported here yesterday concerning his tests for the E. B. Voorhees Agricultural Society a number of cultures including Farmogerm, Nitrogen and Sporogen, and also soil from an old soy bean field. He found that the Farmogerm gave exceptionally good results. These cultures are variable in my own observation. At one time one brand will give better results than another. At another time another brand will give better results. Evidently some variation in the age of the culture or the condition under which they are kept, will modify their usefulness. But we can get results by the use either of soil or a good culture and secure satisfactory inoculation.

Harvesting is another point which deserves careful consideration where soy beans are used as a seed crop.

We used, at Mr. Owen's suggestion, a bean harvester, made by the Bidwell people of Batavia and we have been able to secure very satisfactory results. It is a small machine, not expensive. The knives cut the plants under ground, immediately beneath the surface, and shatter scarcely a single pod. At other stations other implements have been used successfully. The old-fashioned self-reaper and binder has been tried with satisfactory results. We may take it therefore that where soy beans are not grown extensively, the farm machinery on the place, can be used satisfactorily in most cases. Where they are grown on a larger scale, an effort should be made to find something that would be satisfactory under all conditions.

After harvesting the crop we rake it, put it up in small cocks and finally haul it to the barn. This year we had to let them lie in the barn for several weeks until we were ready to thresh. We thus allowed the beans to go through the sweat for about six or eight weeks.

When ready to thresh we at first tried to use the ordinary grain thresher, but I confess that after a great deal of time spent in adjusting pulleys and reducing speed and taking out some concaves and putting in blanks, we still were obliged to admit that the results were unsatisfactory. When the threshing was thorough enough to leave but a very slight proportion of the beans in the pod, there were either too many beans split or too many left unthreshed, and so we decided, since we had this large crop, to buy a bean thresher. We bought one and have since used it with gratifying results.

The threshed beans were placed in bins and were carefully watched for the

SOY BEANS AS A FARM CROP.

99

first week or two. No rise in temperature was noted for the beans had gone through the sweat in the mow. We now have, I think, about five hundred and fifty bushes of soy bean seed, mostly of the Ito San variety.

In a word, then, these practical questions of planting, harvesting, cultivation and threshing, involve nothing that is particularly new in principle. There should be no difficulty involved in the growing of soy beans on any farm, provided we observe the precautions that should be observed in the case of corn, and provided also, that we inoculate the soil or seed.

I should add here that much work remains to be done in adapting varieties to soil and climate by breeding and selection. When this is accomplished even in part, soy beans will place at the disposal of the man who is engaged in general farming, in dairying, and in hog and sheep raising, resources which he does not possess today.

I believe that we shall develop in this State and elsewhere in the East and in the Middle West, organizations that will handle large quantities of soy beans. Possibly some day we may have companies organized to manufacture soy bean products, perhaps a Soy Bean Products Company, similar in character to the American Corn Products Company, which is now making various foods out of corn, the starches and sugars, glucose, gluten feed, germ oil, etc. We have splendid opportunities for developing soy beans for the feeding of farm animals and human beings, for the refining of the oils, and for developing generally an industry of very large proportions and of creating a material, soy bean cake, very rich in protein that will help largely in the solving of the problem of producing home-grown protein.

We are at present starting an experiment, which we hope will turn out successfully, of maintaining our herd on the new farm that the College has bought recently, by growing alfalfa and corn and soy beans, with some oats and peas and perhaps of some vetch and wheat. We shall arrange the crops so as to permit us to be independent of the purchase of protein.

Of course, it goes without saying that as long as we can sell our soy bean seed for two dollars, two dollars and a half or three dollars per bushel, it would be best for us to sell it and buy Mammouth Yellow soy beans from the South perhaps for \$1.60 or \$1.75 per bushel. It would also pay us to buy cotton-seed meal and other concentrates rich in protein, but when we reach the point where soy beans are sold on an equal basis with other feeding stuffs, we shall be justified, I believe, in using them on the farm and shall be able to develop our crops and our cropping so as to be independent of the purchase of protein. I think that the day is coming in the East and elsewhere in this country where the problem of home-grown protein will have to be solved if dairying is to remain a profitable business. Soy beans will surely help us to solve this problem.

Now, if you have any questions concerning soy beans that you would like to ask I am ready to answer them in so far as I can. (Applause.)

A Member—Do you have any trouble with rodents or birds in the crop?

Prof. Lipman—No, we have never had any trouble. Soy beans are remarkably free from attacks by bugs and weevil and fungous enemies. Some of the insect and fungous enemies may become troublesome later on, they usually do sooner or later, but thus far we have had no trouble. Indeed we have kept soy beans for a year or two and found no injury, while ordinary beans were badly damaged by the weevil.

A Member—There is something destroys them though with us, once in a while.

Dr. Lipman—Rabbits occasionally.

The Member—I don't know what it was, but I thought it was woodchucks.

Dr. Lipman—That is possible. We don't happen to have them on the College Farm.

A Member—I was just going to ask if the soy bean cake is used in the same place for food as our linseed meal is used?

Dr. Lipman—Yes. I neglected to state that experiments have been carried out at several of our institutions, I think Wisconsin and Tennessee, and they find that soy bean cake is just as valuable, in fact, rather more valuable than cotton-seed meal for the feeding of cattle.

Mr. Haines—I would like to ask what the value of soy beans is as a cover crop to be turned in, in comparison with crimson clover?

Dr. Lipman—Soy beans are in some respects more valuable, in other respects less valuable than crimson clover. Considered from the standpoint of adding nitrogen to the soil, under average conditions where a good stand of crimson clover is secured, crimson clover gives better results in Middle and South Jersey than soy beans; we can secure through them more nitrogen. Furthermore, the subsoiling effect of crimson clover, because it is a deeper rooted plant, means more for the improvement of the soil texture than the corresponding effect of the soy beans. But I believe it will be found that it is more difficult to secure a good catch of crimson clover than it is of soy beans. So that now and then soy beans will prove more useful than crimson clover, but where crimson clover can be raised successfully, as a cover crop particularly, in rotations, in which potatoes are included, I should prefer crimson clover to soy beans, and, of course, I should add here, that crimson clover has a longer growing period, that is, everything being equal. Suppose that you are growing early potatoes, and suppose that you are ready to sow the cover crop by the middle of August, between the middle of August and the coming of cold weather the soy beans will make

DISCUSSION.

101

a certain amount of growth. They are not killed as readily by frost as the cowpeas, yet when severe frost comes they are done. Crimson clover will continue growing later in the fall and will make additional growth in the spring, which, of course, soy beans will not.

A Member—What is the difference between soy beans and cowpeas? Have they the same characteristics?

Dr. Lipman—No, there are conditions under which cowpeas are more advantageous than soy beans, but on the whole soy beans are much superior to cowpeas. In the first place they are richer in protein. Soy bean hay or soy bean vines harvested when the buds are just beginning to form may contain as much as three per cent., or three and a half per cent. of nitrogen, whereas cowpeas under the same conditions, would contain less than two per cent. They are therefore a richer food, they may have more nitrogen. In the next place they may be planted later in the season, they are not so susceptible to injury by frosts as cowpeas. They will produce larger crops of hay than cowpeas. Such are the advantages of soy beans as a hay and cover crop. But I believe that for light, sandy soil, and for a short growing period, cowpeas will give you perhaps more actual vegetable matter, will make more growth and will do better than soy beans.

A Member—For plowing in?

Dr. Lipman—Yes, for medium heavy land they are better than cowpeas, for light soils cowpeas are better.

A Member—Can seed be procured at the station?

Dr. Lipman—Mr. Owen has some seed that he will dispose of, at the prevailing market price; it will depend upon what the seed is quoted at by Nungesser, or other seed dealers. I have turned the thing over to him and he tells me he is going to sell it at the market price.

A Member—How about the inoculation?

Dr. Lipman—If soil is wanted for inoculation, we will send at the actual cost of bagging and shipping.

Mr. Dobbins—Are soy beans a warm weather crop? That is, are they planted at the same time as corn in the Spring?

Dr. Lipman—Yes. Just a little bit later. I think about ten days later. We have found that the first of June is about the best planting time. We have planted soy beans as early as the first of May, but on the whole soy beans in Middle and North Jersey should not be planted much before the last week in May or the first week in June.

A Member—Would you advise planting soy beans broadcast, that is, with a grain drill, and cut just before the seed ripens and cut it to make hay. Will that improve the soil, or do you want to plow it under to add the nitrogen to the soil; would that be advisable?

Dr. Lipman—That would be advisable. And as for the curing, some people think it is difficult. The best practice seems to be, for good results, to cut it in the afternoon, to rake it in windrows, and to let these alone for twenty-four to forty-eight hours. The soy beans are then put up in cocks that are rather high and narrow. In several days they will be cured sufficiently to haul to the barn. I usually recommended that the cocks be opened for a few hours before they are hauled to the barn.

A Member—Are the vines or the beans injurious to horses?

Dr. Lipman—No. Of course the vines are somewhat dusty for horses. They say in New York State where ordinary beans are grown that the sheep should eat pods, before the vines are turned over to the horses, because of the dust in them. But no objection could be raised from this standpoint in the feeding of sheep or hogs.

A Member—Will poultry eat it?

Dr. Lipman—Oh, yes, it is a very good food for poultry, as well as for hogs, sheep and cattle. For hogs and sheep the beans need not be ground. For cows they have to be ground. At the Ohio Station it has been found that on account of the large amount of oil it is somewhat difficult to grind them and it's recommended that about four parts of corn and one part of soy beans be mixed and ground.

I believe that Prof. Lewis of our Poultry Department has fed some of the split beans.

A Member—How long a time would it take and what variety would you recommend to sow as a seed crop?

Dr. Lipman—I believe with our conditions here in the North, the Wilson is a profitable variety. When it is not practicable to plant before the middle of June or the third week in June, it would still be possible to mature a crop, as we have done by using the Ito San. It has been found at the Tennessee Station that the later the crop is sown in the summer the shorter is its growing period. Occasionally Ito San will mature in as few as seventy or seventy-five days; but usually they take from ninety to a hundred and ten days.

A Member—The black ones, do they grow any higher?

Dr. Lipman—Yes, the Wilson grows taller than the Ito San. And that is an important point. We get more forage from the Wilson than we do from the Ito San, and also a larger yield of seed. The growing season is a little longer than that of the Ito San, but the Ito San grows usually not much over twenty-four to forty inches, it depends upon the soil.

A Member—You can ripen that in about a hundred days?

Dr. Lipman—The Ito San or Yellow, that is right.

A Member—Are the bacteria producing the nodules on the soy beans the same as on the alfalfa?

Dr. Lipman—The bacteria producing the nodules on soy beans are not the same as those which produce the nodules on alfalfa. They seem to be different.

I believe now that I have taken more time than was allotted to me. (Applause.)

Chairman Cox—We will now take up the next matter on the programme for this morning which is The Maintenance of Soil Fertility, by Dr. C. E. Thorne, Director of the Ohio Experiment Station. (Applause.)

The Maintenance of Soil Fertility.

BY DR. C. E. THORNE.

Mr. President, Ladies and Gentlemen: Before beginning my special subject I wish to emphasize and endorse everything that Director Lipman has just said to you with respect to the soy bean. We have grown it at the Ohio station for nearly twenty years. At first, in small plots, as a curiosity. Later

on, after observing its habits, we began to use it as a substitute for clover. We have an acid soil at that station and it was a long time before we knew what the failure of our clover crops meant, and when we lost the clover crop we sowed the soy bean and used it for years as a short season substitute for clover in cases of clover failure. We have recommended it for this purpose for many years. Our experience was that soy beans would produce a fair crop on this acid soil where clover was failing.

We have in Ohio a rotation of corn, oats, wheat and clover; very often the clover is followed by timothy, running two or three years, although the best farmers are leaving out the timothy. But we are finding that where we substitute the soy bean for the oat crop we are getting, at present prices, at least twice as much for the soy beans as we can get for an equivalent crop of oats, and we also get several bushels more wheat following the soy beans than we get when the wheat follows oats or corn, as it usually does in Ohio. Therefore, we believe that the soy bean is going to be one of the greatest acquisitions to the agriculture of this Central Belt of the United States that has ever been brought before us. (Applause.)

The chemist tells us that the grain ripens in our cereal crops, about three-fourths to four-fifths of the total phosphorus in the plant is transferred to the grain. Now, if we are following grain farming, and selling off the grain, as we do in Ohio, very largely, nowadays, the elevator having sprung up at every railroad station in the State, we are constantly shipping away from our fields a steady stream of this element, phosphorus.

When we come to examine our soils we find that they are relatively deficient in this element. We have eighteen to twenty tons of potash in the upper seven inches of our Ohio soils, where we have examined them. We have examined only a single ton of phosphorus, or even less than that.

If, however, instead of selling the grain, we feed it to live stock, you may say that we will retain the phosphorus, if we take care of the manure. But this is not true. For the animal which feeds upon the grain takes out of it all the phosphorus it can in order to build up its bony framework and its nervous tissues; for phosphorus is the characteristic element in bone. We purchase bone meal to use as a fertilizer, in order to get phosphorus to carry back to our soils.

But, you say, the milk farmer does not grow bone, he only sells milk. The milk, however, is the characteristic food of the young animal, and the young animal must have bone material out of which to build up its skeleton. Therefore, in milk there is an even greater drain of phosphorus from the soil than there is in the ordinary production of animals for meat.

Therefore, whatever our system of farming may be, unless it be the production of butter only, or of hay or of clover, we are drawing from the soil a constant stream of this essential element without which no living thing can exist, from the smallest bacterium, which Director Lipman has studied, to the animals which are being produced and sold for meat.

There is not so strong a draft of potash from the soil as there is of phosphorus. Potassium is not required in any large degree in the building up of the animal organism. In the plant about four-fifths of the total potassium or potash, whichever you choose to call it, although the two words do not mean exactly the same thing, remains in the straw and foliage or leaves, instead of going into the grain, as does the phosphorus. And in the feeding of the animal a very small portion of the potash is carried away in the animal products if the manure of the animal is carefully saved and restored to the land. There is, therefore, a very small loss, relatively, of this element, potassium, from the soil.

On the other hand, if we are growing hay and shipping it to the market, as too many Ohio farmers are now doing, owing to the tremendous growth of our cities,—I say, if we are growing hay and shipping that to the market, or, if we are growing grain and selling the straw to the paper mills, as the farmers of our rich Miami valley did for three-quarters of a century, or if we are growing tobacco, which some have been doing for as long a period, or, if we are growing

MAINTENANCE OF SOIL FERTILITY.

105

truck crops, as the farmers all around our great cities are coming to do, crops which are largely sold off the farm, then we are drawing off potassium as well as phosphorus from our soils.

But I have just said we have eighteen to twenty tons of potash or potassium to the acre in the upper six inches of our Ohio soils, and you probably have as much in New Jersey, and in some places even more than that.

That would seem to be an inexhaustible supply. But this potassium that we have in our soils is largely derived from the decomposition of granitic rocks. You might take a feldspar and it might contain as much as fourteen per cent. of potash, or three times as much as you would find in the average sample of wood ashes, and yet the potash in the feldspar is utterly unavailable. Potash has never yet been manufactured from feldspar on a commercial basis, unless it is being done today. Within the last season we have had advice from different directions that this search of the chemist, that has been going on for many a decade, has at last been rewarded, and that the way is now open by which the potash of the feldspar may be economically recovered. But we have not yet received the proof of its recovery; so that up to this date it is the truth to say that potash has not been economically recovered from the rocks. On the contrary we are sending to the great Stassfurt mines in Germany and importing practically all the potash that is used in the arts and industries from those mines also that which is used in fertilizing our fields.

So that this eighteen to twenty tons we have in our soil is idle capital. A little of it is made available year by year by the elemental processes, but you can see at once that if the soil sources of phosphorus and potassium and nitrogen were in such shape that they were immediately available for plant food, that is, if they were soluble in water—because our plants eat by drinking and only by drinking, their food must pass up through the tissues dissolved by the water in the ground, water that they take from the soil, and which is evaporated from their foliage, leaving the solid matter behind as the water itself is evaporated—I say, if all the plant food in the soil were in this ready condition, it would ages ago have been washed out and carried to the sea.

Nature has, therefore, very wisely locked it up in insoluble forms and combinations, and we are only slowly and gradually, little by little, now one point and then another, learning how to unlock that combination. And, therefore, this great store is simply there, awaiting our ability to unlock it in the future.

Very much the same might be said of the store of nitrogen in the soil. We may have two, three, four or five tons of nitrogen, we may have in our muck beds twenty or twenty-five tons of nitrogen per acre in the upper foot of the soil, and yet that nitrogen may be in an equally unavailable condition. Take a muck bed or peat swamp, where we easily have twenty tons of nitrogen in the upper foot of soil, and yet there it has remained for ages upon ages, accumulating instead of wasting, waiting there locked in insoluble combination, in an unavailable form.

Let us take this peat and apply it to our fields; if we apply it in large enough quantity, it will yield up a little nitrogen to our crops, but so little and so slowly that it is questionable to-day whether the using of peat as a carrier of nitrogen in commercial fertilizers ought not to be prohibited because of its very slow availability.

I mention all these things in order to bring out a few of the simpler principles which underlie the maintenance of the fertility of our soils. Until we understand these fundamental principles we cannot rationally make use of the fertilizers and fertilizing agencies which are placed at our disposal.

Ninety-one years ago President James Monroe signed the title deeds of a tract of land over in Ohio, naming Frederick Rice as the owner of the land. The next year Frederick Rice divided this land between his sons, Simon and Barnard, and they settled upon it. The land was, of course, at that time, unbroken forest, covered undoubtedly with magnificent white oaks and other timber growth, and it was the first work of the pioneer farmers to get rid of this forest and open the way for the corn field and the wheat field. I know nothing of the history of these Rice brothers for the time that they occupied this land, but what I know is that

when they left it the farms were equipped with fine houses and barns, a large stone house on one and a large brick house on the other, and a great Pennsylvania barn on each one, showing that the brothers had prospered—that the land had yielded them a good livelihood.

After about fifty years, or a little more, in 1867 in one case and 1875 in the other, the lands went into other hands. The farm belonging to Simon Rice was purchased as an investment, and for the next twenty-five years it was subject to the tender mercies of the Ohio tenant farmer, and very tender they are, under the system which prevails in Ohio, under which the tenant feels that he must extract everything possible from the land in the year that he holds his tenure, because he has no certainty of another year's lease, and under which the landlord takes no interest in maintaining the fertility of the soil, because he looks upon it as something that cannot be exhausted by ordinary systems of husbandry.

In 1892 both of these farms came into the possession of the Ohio Experiment Station.

Simon Rice's farm, after this twenty-five years of tenant husbandry, was as nearly desolate as it is possible to imagine a tract of land in our State. We selected two sites on this land for experiments in the maintenance of fertility and the recovery of stolen fertility.

Barnard Rice's farm had been sold in 1875 to a man who owned it and lived upon it and maintained its fertility by judicious crop rotation and hauling manure from the city.

The outcome of the experiments started on those farms is given in the charts.

We began by applying the different fertilizing elements separately and in combination on the grain crops in a five-year rotation of corn, oats, wheat, clover and timothy on five tracts of land on this farm, after having first underdrained the land so as to reduce it as nearly as possible to uniform condition, five tracts being used so that each crop might be grown every season.

The application of phosphorus only, carried in acid phosphate, used at the rate of eighty pounds per acre on corn and oats and a hundred and sixty pounds per acre on wheat, has given us the increased yield which you see in the first line of the table, the net increase amounting to nearly three dollars every year over and above the cost of the fertilizer for the entire period of the experiment, as shown in next to the last column of the table.

SUMMARY OF 18 YEARS' EXPERIMENTS WITH FERTILIZERS AND MANURE AT OHIO EXPERIMENT STATION.

Treatment Fertilizers or manure per annum.	Average yield per acre.					Annual value of crops. ¹	Cost of treatment ²		Net gain	
	Corn bus.	Oats bus.	Wheat bus.	Clover hay tons	Timothy hay tons		Manure 50 cents per ton	Manure \$2.00 per ton	Manure 50 cents per ton	Manure \$2.00 per ton
rotation: 18-year average:										
manure nor fertilizer	29.7	30.8	10.7	0.96	1.35	\$10.65	....	....	....	....
phosphate, 64 lbs.	37.8	40.0	18.7	1.23	1.56	14.05	\$0.48	....	\$2.97	....
phosphate, 64 lbs.; muriate of potash, 52 lbs.	44.1	43.0	19.9	1.46	1.57	15.65	1.65	....	3.35	....
phos., 64 lbs.; mur. potash, 52 lbs.; nit. soda, 96 lbs.	47.5	49.2	27.1	1.66	1.80	18.55	4.30	....	3.60	....
phos., 96 lbs.; mur. potash, 52 lbs.; nit. soda, 48 lbs.	44.1	48.2	22.9	1.55	1.66	17.72	3.13	....	3.94	....
manure, 4 tons each on corn and wheat	43.7	42.1	18.3	1.95	2.05	15.65	0.80	\$4.20	4.20	\$1.80
manure, 8 tons each on corn and wheat	49.0	37.7	22.2	1.50	1.77	18.68	1.60	6.40	6.43	1.63
rotation: 14-year average:										
manure nor fertilizer	34.4	....	11.2	1.22	....	12.35	....	....	....	....
manure, 8 tons on corn	52.5	....	20.2	1.63	....	17.67	1.33	5.32	4.00	0
manure, 8 tons on corn	59.5	....	21.7	1.98	....	19.70	1.33	5.32	6.02	2.03
manure, phosphated, 8 tons on corn	65.6	....	26.5	2.41	....	24.65	2.13	6.13	10.17	6.17
rotation:										
manure, 10 tons on wheat	48.7	52.0	19.5	1.50	....	17.80	1.25	5.00	4.20	0.45
manure 10 tons, lime 1 ton on corn }	77.0	60.0	33.0	3.67	....	29.30	4.75	8.50	12.20	8.45
plete fertilizer, 400 lbs. on wheat }										

Rating corn at 50 cents per bushel; oats at 33 $\frac{1}{3}$ cents; wheat at 90 cents, and hay at \$8.00 per ton. ²Rating 14 per cent. acid phosphate per ton, muriate of potash at \$45 per ton and nitrate of soda at \$55 per ton, freights included. Two ratings are given for manure. 50 per ton will fully cover the cost of moving manure from the barnyard to the field on the ordinary farm, while \$2.00 per ton is practically equivalent to the value of the chemical elements in average manures. Some farmers consider manure a waste product, costing only the labor, while others wish to compare it with fertilizers.

When we have used potassium only, carried in muriate of potash, the increase has been very much smaller, and when we have used nitrate of soda in addition to the muriate of potash, giving to the crop both nitrogen and potassium, but without phosphorus, the increase has still been very small; but when we have added the potassium to the phosphorus, as shown in the third line, the net increase has given us \$3.35 an acre for every year in the tests.

Passing down the table it will be seen that the complete fertilizer in these tests has given us a very much larger total increase than any combination of only two elements, showing that the land has been so reduced that it was not only deficient in phosphorus, but also in nitrogen and potassium.

The method of farming on this land, by the growing of grain or of live stock and the selling of the grain or the live stock, had been such as to reduce the phosphorus until that element has been reduced to the lowest point compatible with crop production; for you will notice that the unfertilized yield of wheat has only been about ten bushels to the acre since this experiment began.

Going further down the list, to the last two lines of the first section of the table, you will notice that the annual value of the total increase from farm manure used at the rate of four tons per acre each on corn and wheat has been practically the same as from the application of phosphorus and potassium, without the nitrogen. When we have used eight tons of farm manure on each crop, we have gathered a little larger total yield than from any combination of commercial fertilizers.

The combination of commercial fertilizers which has produced the largest total increase, namely, nitrogen, phosphorus and potassium, all three, in the form of nitrate of soda, acid phosphate and muriate of potash, has cost us \$4.70 an acre each year, but after paying for the large application of fertilizer has produced sufficient to pay for the fertilizer and to pay the rental on the land besides.

When we have reduced the nitrogen and increased the phosphorus, the total increase, as shown by the fifth line of the table, has been slightly reduced, but the cost of the fertilizer has been so much more reduced that this application has given a larger net gain than any other combination of fertilizers.

In the case of manure, we have gotten the same increase from sixteen tons of manure applied in the course of five years of the rotation, that is, the equivalent of a little over three tons of manure annually, that we have from an annual expenditure of \$4.70 in fertilizers, and a crop greater by eight dollars in annual value than when we have used no manure nor fertilizer.

But, we were not satisfied with the results that we were obtaining from these tests, in which we were using the ordinary yard manure, that had lain in the open barn yard for several months before being taken into the field, following the common Ohio practice. We, therefore, began in 1897 to experiment in the comparison of this open-yard manure with manure that had been kept in the stable until ready to take to the field. We have carried that experiment on for fifteen years, and the outcome has been that the ton of manure which has gone directly to the field from the stable, without passing through the barn yard, has given us about 75 cents worth of increase in the crop more than that which went through the barn yard.

In other words, when we were throwing the manure into the barn yard and handling it again, giving it two handlings, we have paid 75 cents a ton for the privilege of doing this extra work.

In planning this experiment we remembered that the animal which produces the manure must take out a large part of the phosphorus from its feed in order to build up its bony skeleton, and we realized that the soil on which that feed had been produced, and which had had only occasional manurings during the seventy-five years before it came to our possession, must be deficient in this element. We had noticed by that time the remarkable effect that phosphorus was having as a direct application to our land, so we began at the same time the treatment of both kinds of manure with carriers of phosphorus, using the common acid phosphate which you all use for fertilizing purposes, on one tract with both yard manure and stall manure, and using the raw phosphate rock from which

MAINTENANCE OF SOIL FERTILITY.

109

acid phosphate is made by mixing with it approximately its own weight of sulphuric acid and which comes to you from Carolina and to us from Tennessee, on another tract.

We found immediately a great benefit from the treatment. To be as brief as possible, the reinforcing of the manure with phosphorus has added nearly a dollar per ton to its value, over and above the cost of treatment.

We have confirmed this test by tests made on other soils, and we find that, where this treatment has been practised on soils that are deficient in phosphorus, the effect is at once apparent in the greater effect of the manure. In other words, a ton of manure is relatively high in nitrogen and potash, relatively low in phosphorus. In our experiments, where we have used nitrogen and potassium alone, leaving out the phosphorus, we have never recovered the cost of the fertilizer; but where we have added phosphorus to this combination of nitrogen and potassium, then we have gotten a larger net result than from any other combination of fertilizing materials.

Applying the same reasoning to the treatment of our manure, we reasoned that if we would reinforce manure with phosphorus we would get a larger result, and the outcome has fully justified our reasoning.

We produce in Ohio at least ten million tons of farm-yard manure a year. To increase the value of that manure by a dollar a ton would mean a handsome increase to the incomes of our Ohio farmers. Many Ohio farmers are taking up the idea. Not nearly so many as ought to do it, but the idea is abroad and the results are confirmatory of the tests made at the experiment station.

These experiments that I have been describing to you have been made on small plots, one-twentieth of an acre, one-sixteenth of an acre, or one-tenth of an acre, and as I have taken our Ohio farmers through our work and tried to convince them of its effectiveness, they have answered, "Yes, you can do this on those small plots and with the State behind you, but we cannot do it. Our farm yields would not give the same results, and we cannot afford the expense." Well, we did not believe we would get the same results. We had studied our fields carefully; we had studied the restrictions under which we were working; we realized that we were not able to do all on the small scale that we could do on large fields. We believed that we would have a different result, but a very different one from what the farmers thought.

We had a tract of forty acres devoted to a four-year rotation of corn, oats, wheat and clover. It had been growing this rotation for ten years. We had followed the ordinary Pennsylvania custom of putting all the manure on the wheat crop, letting it lie in the barn-yard until August and then spreading it as a top dressing over the oat stubble land that had been plowed for the wheat. A good custom, much better than the old one of hauling out the manure and dropping it in small piles, letting it lose most of its fertility in these piles and then plowing it under. A good deal better than that. Under this system we had averaged for the ten years forty-eight bushels per acre of corn; twenty of wheat and fifty-two of oats, and about a ton and three-quarters of clover hay.

We had learned one other thing in those ten years; namely, that the land of that farm must have lime before it will grow clover successfully. We therefore changed our system, and instead of leaving the manure in the barn-yard to take the weather all winter and all summer before it went out for the wheat, we applied it directly to the land intended for corn, spreading it over the clover sod. If there was any manure available in the fall, that went directly from the stable to the clover sod and was spread there, and was followed by the winter accumulations. This was plowed under for corn, and then lime was applied to the surface—a ton of burned lime, or two tons of finely powdered limestone per acre, whichever we could get on the land in the quantities named at the least cost.

After going once around on our land, we found that a little smaller quantity would do, and after that we reduced our application to half the quantity—a thousand pounds of burnt lime or a ton of powdered limestone. We found that after the larger application of lime had fully overcome the strongly acid condition of the land a smaller quantity would be sufficient.

We plowed down the manure as a matter of convenience. By putting it on the clover sod we had it on the field all winter, all spread out on the surface, then by plowing it down in the spring we got it out of the way of the lime. We did this because we realized that it would not be advisable to mix caustic lime with the manure. By plowing under the manure and applying the lime on the surface we avoided the quarreling of the two materials.

We followed the corn with oats, without any further treatment, because it is difficult to keep oats on its feet. But, when the wheat crop came on this soil, a soil well adapted to the growing of wheat, a light silty clay, not a sandy soil on the one hand, nor a real clay on the other, but a medium between the two, we then applied four hundred pounds of a 4-16-4 fertilizer. Those of you who handle fertilizers know what I mean, and those of you who buy 2-8-2 will realize that we were putting on the equivalent of eight hundred pounds of ordinary 2-8-2, and if any of you are so unfortunate as to have been persuaded into using a still lower grade than 2-8-2, you will see that you will have to multiply your figures still more to get the equivalent.

The response to this treatment was a sudden jump in the corn yield on those ten-acre fields from forty-eight to seventy-four bushels per acre as an eight-year average; the oats from fifty to sixty bushels. The wheat from twenty to thirty-three; or, taking in this last year, one of the completest wheat failures we have had in Ohio in many years, we still have an average for the six or seven wheat crops that have been grown a little over thirty bushels to the acre.

You say our treatment has cost a lot. And so it has. The quantity of manure is the same that it was before, but the manure has been treated with phosphate rock before it went to the field, involving an expenditure of say thirty cents a ton for the treatment, or three or four dollars an acre, added to the cost of the manure. The lime has cost something like four or four and a half dollars more; the fertilizer has cost six dollars and a half.

We may figure that we spent a total of something like fourteen dollars an acre on this land in lime and fertilizers for the four crops of the rotation. But we have got back twenty-five bushels of corn increase, ten bushels of oats, at least ten of wheat and to wind up, an average total yield of three and a half tons of clover hay, or double the previous yield. Our yield of clover hay this year on one of those ten-acre plots was four and three-quarter tons per acre in the two cuttings, and I venture that no New Jersey farmer ever saw a finer field of clover than that ten acres was, and yet this land was refusing to grow clover ten years ago.

Since we began this treatment of liming, manuring and fertilizing, bringing together all the lessons we had learned from our former work on fertilizers, lime and manure, work done on small plots, studying one particular question on this plot, and another question on that plot, bringing these lessons all together and applying them in this treatment, we have made this change in the productiveness of our land.

Now, the land on which this work was done is such land as had been brought down by the ordinary system of husbandry in that part of the State to an average of ten bushels of wheat and thirty bushels each of oats and corn and to less than a ton of hay per acre, for crops grown in rotation, but without any manure or fertilizers. That is what our land was capable of doing before we began this treatment, and on that land we have made the crops I have given you, over seventy-five of corn, sixty of oats, thirty of wheat and fully three and a half tons of hay.

We are ready to say, as the outcome of this work, which is being duplicated on eight auxiliary farms, widely scattered over the State, that it is practically possible to almost double the average crop yields in our State and to do it at a cost which will be recovered at least twice over in the increase of crop produced.

At our station we have made recently an agricultural survey of one of the townships going from farm to farm, inquiring into the method of management, into the income and outgo of each farm. We were able to persuade the farmers that this was for a legitimate purpose, for their benefit. And they have given

us the figures. How many of those farmers in Ohio, you New Jersey farmers, do you suppose were getting as much wages for their work as they were paying to the day laborers who were helping them to do the work? Just one-third. Two-thirds of those Ohio farmers were getting less for their labor, with all the responsibility, than they were paying to the men who were helping them by the day to raise their crops.

And that is not confined to one township in Ohio. We are growing only about fourteen or fifteen bushels of wheat per acre in our State as an average. And that means that the farmer who grows less than the average is not making day's wages. We are growing only about thirty-five bushels of corn, and that means the same thing. And that on land, every acre of which is capable of producing nearly double the crops that are actually grown. The soil is not to blame in this respect.

But I am met right here with another objection—that we are growing too much already; that the big crop brings us less money than the small crop. And I am ready to grant it. But that is not the question at all. The question is this: Why, if we can grow on half the land the same crop that we are growing now, scatter over so many acres to get so few bushels as we are growing? I don't know what your yields are in New Jersey. I know that they are better than ours.

Secretary Dye—Twenty bushels average this year.

Winter wheat twenty bushels this year, that was a good deal better than ours. Our wheat this year will not average over seven bushels. But this is one of the worst seasons we have had in a great many years. Many fields were lost entirely through the weather and other conditions. Such losses we will meet under the best system we have yet been able to devise, but these losses are becoming rarer and rarer and they will be smaller and smaller. We find as an illustration that upon taking a bad year like this, the difference between the treated and the untreated plots in our experiments is two or three times as great as it is in a good year. The treatment enables the crop to resist the unfavorable conditions and is an insurance against them.

The point is this: take our wheat yield as an example on this old farm of Simon Rice's, where we have averaged only between ten and eleven bushels of wheat an acre for eighteen years, and that after draining the land, after putting on a crop rotation which is in ordinary practice and considered a good one, in which clover occurs once in five years, or in which we try to grow it once in five years, and giving it the most thorough tillage. With all this treatment we have been able to raise less than eleven bushels of wheat per acre. And yet on plots separated by a space only two feet wide, on one plot we have grown ten or eleven bushels, and on the other plot thirty-three bushels per acre in the last eight or ten years, the plots standing side by side, on the same land. Of course, it has cost something to do this, but we have recovered the cost twice over in the clear increase of yield, saying nothing about the difference in cost of labor and seed.

Now, why plow and harrow three acres, and why sow six bushels of seed to get the produce that may be gotten from one acre and two bushels of seed?

These are points that we have not taken into consideration in determining the differences in outcome which are shown in the table. But that is what our Ohio farmers are doing. They are skimming over two or three or four acres of land to get the produce of one. They are putting on two, three, four times as much seed as is necessary to get the produce that they should get from one-half the quantity. These are factors which must be taken into consideration in all this matter. We need to get back to our old school arithmetic and study it more than we have been doing of late years.

In discussing this question of soil fertility, there is one point to which I wish to call your attention and that is, that it is not a purely chemical problem. Unquestionably the chemical elements that we find in the soil are the elements which control the production of our crops. But the conversion of those elements, the phosphorus, potassium and nitrogen, into available forms is not a purely chemical proposition.

On the contrary, the more we study this question the more sure we are that

it is very largely a biological problem. We are all familiar with the fact that our grazing animals are able to take the grass of the field, on which we would starve, and convert it into the most nourishing of human food. We are discovering that there is a similar medium between the crop which we grow and the plant food in the soil which nourishes it, that the intervention of the bacteria of the soil,—a problem on which your Director Lipman has worked so effectively—~~that is not a problem in this country~~—the intervention of these bacteria is an indispensable step in the process of converting the inert minerals of the soil into nourishing food for the lower animals and ourselves.

That is to-day the most inviting field of research in agriculture. We do not know much about it. We know enough to know that there is a tremendous field open there for us, and we have every reason to believe that in the development of this field is to lie the next great step in our control of the fertility of the land.

I thank you for your attention. (Applause.)

A Member—Mr. Chairman, I would like to ask Dr. Thorne one question, that is, during the time when it is impractical to haul the manure directly from the stable to the field and apply it just as soon as it is possible, what is the best manner of storing it, what is the proper method of storing that manure during that time?

Dr. Thorne—The method we like best when it is practicable to carry it out, is to trample the manure under foot and leave it in the stable until necessary to move it. But that is only practical in the case of feeding steers or sheep for meat. Next to that we advise the use of the manure shed, taking care to keep the manure in the manure shed as thoroughly trampled as possible, and also in a moist condition, because if the manure is allowed to become dry it heats and then the bacteria begin to do their work, and, while they are indispensable to us in the soil they may be just as injurious in the manure heap by causing a combination of the manure with the oxygen of the air or the hydrogen of the moisture in the manure heap and allowing it to pass off as nitric acid or as ammonia gas. So that we want to keep the manure as compact as possible in order to have no change in its condition.

I would like to say, while I am on my feet, that in our experiments in the use of manure, we found that manure taken directly from the stable to the corn field would produce us twenty bushels of corn to the acre, and after that give us as much wheat as did the manure that was left lying in the barnyard, waiting for the wheat to get ready for it.

A Member—I would like to ask in regard to clover. One of our troubles through this section is to get a clover stand. We can get

no clover, it seems to leave us in many cases before we commence to harvest. What is the trouble?

Dr. Thorne—That was our experience exactly. We would sow the clover in the spring, and when the harvest came there was no clover. In order to make sure that we were getting a stand we sowed it two or three times in succession, during March and April, until we were absolutely sure that we had a stand of clover. When the wheat was taken off the young plants were there, but they did not grow and they got no higher than the stubble. There would be a patch here and another there where probably a log heap had been burned in the early clearing of the land where the clover grew, but the majority of the plants had disappeared by the following spring. This trouble has been completely overcome on the station farm by liming the land, following the use of manure fertilizer.

However, it is true that we do have in Southwestern Ohio some such indication as this where the trouble does not seem to be altogether due to the lack of lime, but seems to be due, in part at least, to a disease of the clover plant. The first thing to do is to try lime, and if it is only the lack of lime that is the matter, a single liming will make the difference so conspicuous that the farmer cannot help seeing the effect.

A Member—In what time and in what crops is the lime most profitable to use?

Dr. Thorne—We prefer very much to use the lime on the corn crop. We realize that the chief function of the lime is the feeding of the microscopic organisms in the soil. It is not so much the direct feeding of the clover plant, but it is the feeding of the microscopic organisms by which the soil is made fit for the clover plant, and in order to accomplish that purpose it must be thoroughly distributed throughout all the soil and it must be adapted for its work in order to accomplish it. We put the lime on the corn crop, and then in cultivating the corn we mix it with the ground, and when we turn the corn stubble over for the oats or for the soy beans which we prefer to grow instead of oats, we get another mixing, and if we turn it back for the wheat we get another. By that time it is thoroughly mixed with the soil and we get a better crop of clover by liming two years in advance than if we leave the liming for the wheat crop.

A Member—About how much acid phosphate do you use to a ton of manure?

Dr. Thorne—About forty pounds to the ton of manure, about a pound per animal per day. These are merely arbitrary quantities, but they have worked out profitably in our case.

A Member—Would that be any better than treating the ground after manuring it with the acid phosphate?

Dr. Thorne—We find we get larger returns when the two are mixed together.

A Member—Is there any loss of fertility of the manure where it comes in contact with the ground limestone?

Dr. Thorne—No, we think not much. Still, we think it is not advisable to mix them. We think it is better to keep them separate.

A Member—Would you apply ground limestone and also apply marl?

Dr. Thorne—Either will serve the purpose.

A Member—In drawing the manure directly from the stable every day and dumping it in heaps on the field and waiting for the cold weather before spreading it, is that a good way?

Dr. Thorne—Probably of all the ways in which manure is handled that is the most wasteful.

A Member—What remedy can you give the Jersey dairyman who has a lot of manure and it has to be carted away from his barn every day, and he carts it to the field and puts it in heaps and it is left in the field in heaps until he is going to plow the next year. What remedy can you suggest to save that waste?

Dr. Thorne—He would better spread it if possible to do it, as it is hauled. The best corn we grow in our experiments is on manure spread the September before and the yield falls down as we come nearer to the time of plowing the land.

A Member—It is wasteful to leave it in heaps then?

Dr. Thorne—It is very wasteful. It is the most wasteful way in which manure can be handled, you waste the manure and waste the labor of handling it.

A Member—In mixing the manure did you ever use floats?

Dr. Thorne—We use both.

The Member—Which is the best?

Dr. Thorne—It is according to the way you interpret our figures. We cannot tell ourselves. If you figure one way, floats is the best, if you figure the other way, acid phosphate is the best. Our advice is for cold manure like steer manure, where the manure can be left some weeks in the stable or feeding pens before going to the field, then use floats; but for a hot manure like horse manure, or for cow stables that must be cleaned every day, use acid phosphate. If you do not want to handle a whole carload of material at a time, get acid phosphate, because you cannot buy floats economically in small quantities.

Chairman Cox—If there are no further questions, we will pass on to the next subject on the programme, which is Some Interrelations of Crops, Fertilizers and Soils, which will be treated by Dr. H. J. Wheeler, Manager of the Agricultural Surveys Bureau, of Massachusetts.

Some Interrelations of Fertilizers, Crops and Soils.

BY H. J. WHEELER, PH. D.,

MANAGER AGRICULTURAL SERVICE BUREAU OF THE AMERICAN AGRICULTURAL CHEMICAL COMPANY, BOSTON, MASS.

It has been interesting to observe that the advance in agriculture in the United States for many years has lagged behind the advance in practically all other lines of human endeavor. Even the establishment of an agricultural college in each state under the Federal Land Grant Act of 1861, and the later establishment of an agricultural experiment station in connection with each of these colleges under the Hatch Act of 1887, failed to give at once a marked impetus to agriculture. The people of this country generally were not only conservative, but were unfamiliar with similar undertakings in Europe. Many of the American farmers who had long been stealing the stored-up fertility of countless centuries, had not yet felt the intense severity of soil exhaustion, of unfavorable chemical and physical conditions resulting from soil robbery and wasteful agricultural practices, nor had the public felt the shortage of farm crops and the rapid rise in prices which accompanies the early stages of approaching famine. In fact, at a great "Boom Banquet" held only a few years ago in the city of Providence for the purpose of promoting the general welfare of the state, the agricultural interests were absolutely unrecognized, and not a single lawyer, banker or merchant uttered a word in recognition of its importance or concerning its relation to the other business interests of the state, which nevertheless are all dependent funda-

mentally upon agriculture. That night I expressed to a friend my surprise at such a condition, and stated that, in the wild scramble of the city man for wealth and riches, the very foundation of all state and national prosperity had been neglected, and that nothing short of a famine could bring him to his senses and to a realization of the fact that agriculture was the parent of all other industries.

Thank Heaven the famine did not come! Yet the soaring prices of human food which soon followed, the lack of farm produce to be hauled by the railroads, and the realization by the great banking interests that the prosperity of the farmer means the prosperity of all, began to work a change of sentiment which is to-day culminating in the campaign for agricultural teaching in the rural schools, for agricultural extension and demonstration, in the call for lower farm credits, and in the demand for open public markets maintained in the interest of the producer and the great consuming public.

Hand in hand with these wonderful changes have come the increasing hordes of insect pests and fungous diseases without number. At the same time soils have been put out of condition by injudicious cropping, manuring and fertilization. The difficulties and requirements of farming as a business have also increased at a marvellous rate, and the widely varied types of plants to be grown as the result of the building up of so many highly populous civic centres have all contributed to create farm problems requiring for their solution men of as great technical knowledge and business foresight as are demanded to-day in any business or profession.

It is not long since the problem of the use of fertilizers was supposed to be solved by a mere analysis of the crops and the soil, when the needs were supposed to be revealed. The problem which presents itself has become, however, more and more complex as scientific investigation has shed new light upon the whole subject.

In connection with potash fertilization it is not enough to supply merely a given amount of potassium regardless of its source and chemical combination, but the materials to be selected must often be considered in their relation to the particular crop to be grown. Tobacco for example is injured in its burning quality by chloride; potassium carbonate though excellent under certain conditions may give rise to a serious tobacco disease, or it may deflocculate and dissolve humus and render certain soils less fitted physically to the production of crops than they were before. The sulfate of potash if used on certain soils may be reduced, giving rise to a volatile toxic sulfur compound on the one hand and to carbonate of potash on the other which may deflocculate and injure the soil physically. On certain soils and under certain conditions kainit may be preferable to other potash salts, whereas under other conditions the muriate of potash, the high grade sulfate of potash, or even the double sulfate of potash and magnesia may give better results. In a dry season and on a naturally dry soil muriate of potash may be preferable to the sulfate owing to its greater solubility, whereas on sandy and gravelly soils the reverse may be true, particularly if the season is wet.

The possible importance of this whole question is still further emphasized by the fact that the earlier methods of analysis failed to show the full amount of sulfur present in plants, which therefore actually remove far more sulfur from the soil than was formerly supposed. In fact, Hart and Peterson of the Wisconsin Station point out that the amount of sulfur trioxid represented in average crops of cereals, grains and straws is about two-thirds as great as the required amount of phosphoric acid. Mixed hay contains as much of the one as of the other. In alfalfa the sulfur trioxid exceeds the phosphoric acid, whereas certain cruciferous crops such as the cabbage and turnip may remove two or three times as much of the former as of the latter. It has also been shown that considerable losses of sulfur may occur in the drainage waters, and that fields which have received little or no manure may have lost in from fifty to sixty years forty per cent. of their sulfur.

In the use of nitrogen a large number of factors must be considered. For example, if a fertilizer is to be used in the warm, moist climate of the South, and

FERTILIZERS, CROPS AND SOILS.

117

for crops having a long period of growth, it may contain relatively more nitrogen from organic sources than if it is used in the northern and colder sections of the United States where the climatic conditions are less favorable to rapid humification, ammonification and nitrification.

Crops having a short period of growth such as early garden truck of various kinds, grains, and especially grass, must receive a relatively large part of their nitrogen in forms which the plant can utilize without serious delay. Organic nitrogen is rendered more quickly available on light and open soils if favorable conditions of moisture are maintained than on soils of a heavier character. This explains why Julius Kuhn of Halle, Germany, recommends the use of bone meal on light, rather than on clayey, soils. If, on the other hand, extreme drought prevails, nitrates or ammonium salts may act more favorably on a light soil than organic forms, yet under such conditions the plant itself cannot make much growth and hence this factor becomes less important than would at first seem to be the case.

Organic nitrogen, from whatever source, is more readily available on soils where suitable rotations have been practised than on those left for long intervals as pastures or as unmanured grass fields. This is by virtue of the greater bacterial activity in the former case. It has been shown in the course of my experiments in Rhode Island that the efficiency of dried blood may be lessened one-half if the soil is quite acid. The value of ground roasted leather under such circumstances was only one-fifteenth as great as it was found to be in a soil containing a suitable amount of lime in the form of the hydrate or carbonate.

It is not usually recognized that the long continued use of certain organic nitrogenous fertilizers may tend gradually to create soil acidity in the same manner as the plowing under of certain green crops. Not only are organic acids produced therefrom in the natural processes of decay, but the nitrogenous matter, in consequence of its ultimate nitrification, yields nitric acid which unites with certain bases which are either taken up by the plant or may be lost in part by subsequent leaching.

There are compact clayey soils already difficult to till on which the long continued use of nitrate of soda may have an ill effect on account of the deflocculating action of the residual sodium carbonate formed in the soil as a result of the utilization of the nitric acid by the plant. On the other hand, there are sandy loams, silty loams, and even clayey loams, and clays on which the use of nitrate of soda may be continued in some cases for long intervals with excellent results, provided they are greatly lacking in basic substances and especially if they are highly acid at the outset. If again soils of this physical character are already neutral or alkaline, it may be necessary to use nitrate of soda with great care or to employ it only in association with other nitrogenous fertilizers.

Still another complicating factor is the ease with which nitrate of soda is lost by drainage if soils are very porous and open. The use of nitrate of soda is rendered still further complex on account of the fact that certain plants, as for example, barley and millet, are but little if at all benefited by soda, whereas, on the other hand, if a shortage of potash develops, the soda may be taken up and utilized to such advantage by certain other crops that they may be doubled in consequence of the presence of the soda. In the course of the writer's experiments in Rhode Island it was found that an application of either common salt or sodium carbonate was capable of doubling the crop of mangel wurzels and of greatly increasing crops of radishes and turnips even when as much as 330 pounds of muriate of potash had already been applied per acre. The crop to be grown will therefore determine very largely in many cases whether nitrate of soda should preferably be used or not, for, as may be inferred, its presence in the case of certain crops serves as a sort of insurance against serious crop limitation if the supply of potash chances to fall short. On acid soils the continuous use of nitrate of soda for many years may correct their condition to such an extent as to render possible after a time the growth of plants which failed previously, due to their great sensitiveness to soil acidity or to certain toxic conditions often or usually associated with such acidity. Obviously it would not pay one in actual farm practice to wait for the correction of such an acid condition by this means,

and immediate liming is to be recommended in such cases. It is nevertheless true that the continued use of nitrate of soda on acid soil lessens somewhat their normal lime requirement.

If nitrate of soda is used on wet soils charged with ordinary vegetable matter or with barn-yard manure in the early stages of decay, it is subject to denitrification, in which case a considerable part of the nitrogen may be lost as nitrogen gas while at the same time a part is converted into what goes to make up the mass called humus. Even in comparatively open soils, charged with excessive amounts of stable manure, such as are often used in gardening operations, nitrates may during brief wet intervals be readily broken up and some of the nitrogen thus dissipated and lost.

Sulfate of ammonia is best adapted to such soils as are about neutral or only slightly acid and in which there is neither so much lime as to render possible the loss of ammonia nor so little as to delay nitrification. For soils which have been injured by the use of too much nitrate of soda, sulfate of ammonia is a true specific, since it gradually restores their condition. Acid phosphate is also useful in a similar way which would not be true, for example, of floats or basic slag meal.

On soils which are quite acid sulfate of ammonia may lack greatly in efficiency. In severe cases it may also prove positively injurious at the outset or after several repeated applications. Proportions of sulfate of ammonia and nitrate of soda may be employed which will leave the soil in its original condition, as concerns its chemical reaction, or they be made such as to affect it in the direction of acidity or alkalinity as desired.

Sulfate of ammonia is not so quick in its action in most cases as nitrate of soda, although recent investigations in England and elsewhere lead to the belief that the grasses and other plants, at least at certain stages of their growth, may make use of ammonia to a greater or less extent without its previous transformation into nitric acid.

One marked advantage of sulfate of ammonia and of soluble organic nitrogen, such as is now present to a certain extent in many ready mixed fertilizers prepared by up-to-date methods is that the nitrogen is less subject to loss by leaching than that in nitrate of soda. It is not only held mechanically but also chemically in the case of ammonia by its union with organic acids and by entering into combination with the complex silicates of the soil in the same manner as potash and lime. It is nevertheless subject to subsequent nitrification and gradual utilization by plants. It is for this reason that sulfate of ammonia possesses a distinct advantage on many of the lighter soils over nitrate of soda.

It has been stated previously that bone is better adapted to use on light than on heavy soils, and some of the best authorities in Europe recommend acid phosphate in preference to it, not only for quick maturing crops, but also on all heavy silt and clay loam soils. Acid phosphate, also, even aside from its quick action as a fertilizer, may improve such soils physically because of its causing many small particles to form a smaller number of larger ones or in other words because of its flocculating action. High authorities in Europe consider its action in this respect much superior to that of slaked lime or carbonate of lime. It appears therefore that there are several reasons why it is frequently more profitable to employ acid phosphate rather than floats even notwithstanding the higher phosphoric acid content and lower price of the latter per ton.

It has been shown in England by the Rothamsted experiments, and in Massachusetts by Brooks, and similarly elsewhere, that many of the members of the turnip and cabbage families are highly dependent upon ready available phosphoric acid, or at least upon acidulated or so-called superphosphate such as acid phosphate, and that they are not apparently able to derive the same benefit from bone and many of the other natural and artificial phosphates as certain other agricultural plants.

It appears that many plants are especially dependent upon generous supplies of readily assimilable phosphoric acid in the earlier stages of their development and that its application later fails to exert the same degree of benefit. This explains at once the great usefulness of even relatively small applications of acid phos-

phate such as are frequently used in certain parts of the South. It also throws light upon the fallacy of the unfortunate theory of the Bureau of Soils of the U. S. Department of Agriculture, based upon the fact that plants can feed from very dilute solutions, which is in effect that the soil solution is being continually renewed and that as practically all common minerals are represented in soils, hence fertilizers are not needed for plant food purposes. The fact is that the volume of moisture in the soil is often relatively small and slow in its movement and it is probably not true that this renewal of the soil solution is rapid enough to meet the need of the plant, nor can the plant by virtue of its added direct root action get phosphoric acid in all cases as rapidly as it is required. The promulgation of this idea in a popular Bulletin has been one of the great mistakes of the United States Department of Agriculture and had not the American farmer found it contrary to his experience and contrary to all other authorities of consequence in the world, it would doubtless have done much greater harm to the agricultural interests of the country.

Much is heard in these days of basic slag meal as a top-dressing for grass and grain, but if used as a fertilizer at all it should usually be employed in the same way as bone and lime. In other words it should be worked into the soil as thoroughly as possible, for the nearer one can come to bringing a particle in contact with each particle of soil, the better the result is likely to be. This material formerly contained a large excess of free lime in addition to that existing in various chemical combinations but in recent years sand or silica in some other form has been introduced in the fusion process, and this being of an acid character combines with the lime to such an extent that the amount of free lime now present rarely ranges higher than from two to six per cent. For this reason basic slag meal as now manufactured is relatively much less valuable as a soil corrective, where lime is needed, than was formerly the case. Its earlier popularity has also been injured by the fact that from certain English sources a product having a very low phosphoric acid content is said to be finding its way into the American market to the great disappointment of those who think they are getting a highly efficient product.

It is a significant fact that certain soils are so acid and so lacking in carbonate of lime that the soluble phosphates may pass very largely into combination with iron and alumina, and thus become less available to plants than when free to enter into combination with lime. Such soils need corrective treatment with lime before the great majority of agricultural plants can thrive to best advantage, and when so corrected the immediate efficiency of applications of acid phosphate as well as the after effects therefrom are greatly heightened.

In order to emphasize the fallacy of top-dressing grassland and grains with basic slag meal and bone meal, it is merely necessary to point out the fact that only an exceedingly small proportion of the phosphoric acid present in them is soluble in water. Furthermore, the rainfall is very irregular, and it often happens that a period of almost extreme drought, lasting for from ten days to two or more weeks ensues, follows the time when the spring top-dressings are applied. In such a case the relatively insoluble phosphates such as basic slag meal and bone can exert little or no effect, and even under usually favorable conditions they cannot be dissolved and carried into the soil with sufficient rapidity or ease to meet the requirements of the crop. It is but reasonable to suppose that those who apply phosphoric acid as a spring top-dressing do so because they think their land needs it immediately, and if such is the case, basic slag meal and bone will not fulfil the requirements. It may be said by some that it is not lost. This is indeed true, but the interest on the investment will certainly be lost for one year and much of it for several years, whereas if soluble superphosphates such as acid phosphate are used the phosphoric acid will be largely dissolved and carried into the soil by the first rain, where it will yield a handsome return on the investment in the immediate effect upon the crop, and any residue remaining unused will still perform good service to plants in future years.

The writer recalls an instance where, after the application of the spring top-dressing to a grass field only one-fourth inch of rain fell for nearly three weeks,

and yet because of employing acid phosphate and suitable quantities of other soluble plant foods, the crop was raised from a yield of half a ton to between three and one-half and four tons per acre.

It is an interesting fact that certain iron and aluminum phosphates are of little use as a fertilizer even on limed land. After roasting, however, they become very useful especially to grass, corn, millet, and many other crops though less so, for example for the cabbage and turnip. The efficiency of even the roasted product may be very small and may amount to almost nothing on a very acid unlimed soil, whereas liming raises its efficiency greatly from the outset and maintains it for many years after the last application of each, a fact abundantly shown in the course of the experiments in progress at the Agricultural Experiment Station of the Rhode Island State College from 1894 to the present time.

It has been found in the course of the reclamation of the acid peat soils of northern Germany that certain raw phosphates were relatively more efficient when used thereon than when used on ordinary upland soils. It has therefore been inferred, and doubtless with some degree of correctness, that floats may be rendered somewhat more efficient than otherwise, if they are introduced into the soil at the time of plowing in a green crop. Just how much gain in efficiency results in such cases needs to be more definitely established by actual experiment under well controlled conditions before too much weight is laid upon it. It may in fact turn out in a measure like the general statement about the ability of stable manure to increase the efficiency of floats when the two are mixed together in the stall; for the carefully conducted experiments of Hartwell and Pember in Rhode Island have shown that the intimate mixture of the two even for some months was without practical beneficial effect. It has also been pointed out by Hartwell and Pember that the experiments of Director Thorne of Ohio which are often cited in the agricultural press in support of such an idea were not conducted in a manner calculated to settle this particular point, and Director Thorne himself states that they were planned with other objects in view.

It is true, however, that plants do not act alike towards the more insoluble phosphates of the soil and their roots vary in their power to extract therefrom the phosphoric acid and other needed plant foods.

Recently Th. Pfeiffer and E. Blanck have studied the action of oats, lupines, and peas on monocalcium phosphate (represented by acid phosphate and similar superphosphates) and on other less available raw phosphates. It was found that the frequent charging of the soil with carbonic acid during the period of growth was of no particular aid to assimilation, excepting in the case of the more soluble phosphates nor did it lessen the difference in the ability of oats and legumes to utilize the raw phosphates. Certain raw phosphates also required much stronger acid to render them available. They conclude therefore that the solvent action of the roots of certain plants may be due largely to organic acids and not alone to the carbonic acid which they give off.

It is often stated without qualification, that lime should not be applied to land on which raw phosphate is used, yet if the soil is exceedingly acid and the crop to be grown is highly sensitive to acidity it must be obvious that the general condition of the soil must be corrected by liming before the plant can endure the conditions sufficiently well to make good use of phosphoric acid, no matter how assimilable it may be. On the other hand, there are crops which thrive so splendidly under any soil conditions or in the presence of the peculiar substances formed where such conditions exist that liming would make of such soil an unfavorable habitat and hence no matter how available the phosphate it could not be utilized to the best advantage.

One frequently reads statements in the agricultural press to the effect that the legumes are helped by liming, but this is a most unguarded statement. It may be correct regarding most soils as concerns peas, vetches and alfalfa but under usual conditions, it is often quite untrue of the seradella and of certain other legumes. Not infrequently also one hears that beans should be treated thus and so, yet as concerns liming, the ordinary string bean will nearly fail for need

FERTILIZERS, CROPS AND SOILS.

121

or liming, where the pole horticultural bean thrives moderately, and where the lima bean grows to perfection.

Certain flowering perennials will die to the last plant on exceedingly acid soil, whereas the *Silene orientalis* thrives thereon most luxuriantly.

Furthermore, under conditions where without liming practically every lettuce, spinach, beet, cress, and cantaloupe plant will die, common sorrel will make more than four times as much growth before liming as afterward.

Another idea which seems to be somewhat current is that timothy and clover will not thrive on acid soil yet it may be seriously questioned if they will not thrive better on a soil which is still capable of distinctly reddening blue litmus paper and of yielding a somewhat dark extract with ammonia water than on one limed to such an extent that these reactions are no longer possible.

When one realizes that *Silene orientalis* grows to perfection on soil which has been made continually more acid by nearly twenty annual applications of sulfate of ammonia, and that even at the outset neither lettuce nor beets would thrive, it will be seen that the conditions best adapted to the different plants are widely variable. The matter is still further complicated by the fact that certain plants which will endure acidity, or the conditions which accompany it, are also very tolerant of conditions approaching the other extreme. Again some plants which are highly tolerant of alkaline conditions can still thrive fairly well under quite acid conditions. In other words certain plants have no critical point at which they are affected by slight variations in soil reaction. It is true on the other hand that a given plant may not be seriously affected by a considerable degree of acidity or alkalinity until a certain critical point is closely approached when a very slight change is followed by serious consequences. Thus it will be seen why in the one case a very small application of lime will accomplish wonderful results, whereas with another plant much more lime is needed. This fact is well illustrated by the cereals and beets, for on a soil which requires a given application of lime in order to make beets thrive satisfactorily, much less will be needed for barley, still less for wheat, and less again for oats, whereas Indian corn and rye may not require it at all.

Another point in reference to liming deserves special comment, and this may apply to Indian corn, rye, or other plants that stand on the border line between those not helped by liming and those that are. For example, let it be assumed that one has to deal with a condition that is ideal for the growth of Indian corn, and that ample available nitrogen is at hand. In such a case liming might lessen the yield of corn by creating a soil reaction not ideally suited to it. If, however, on a soil having an identical chemical reaction there were a dearth of available nitrogen, liming might promote nitrification to such an extent as to greatly increase the crop, and this beneficial action would be likely to then counterbalance the tendency to lessen the yield in consequence of the direct effect of the lime upon the soil reaction, or upon the toxic substances accompanying it. If there were at the same time a lack of phosphoric acid, the possible action of the lime in making the soil phosphorus available to the plants would also increase the indirect benefit and thus still further outweigh the direct tendency to injury. If it chanced that the lime also improved the physical condition of the soil, there would then be a third and additional indirect benefit to aid as an opposing force in outweighing the slight tendency to direct injury. With these points in mind, it is easy to understand the reason for some of the conflicting testimony in regard to the effect of lime upon Indian corn and other plants which thrive best on soils where the vetch, alfalfa, beets, lettuce and spinach either fail or partially fail, because of lack of lime.

It has become a common saying that onions thrive best after onions, and in this connection some observations which have been made at the Experiment Station in Rhode Island are of special interest. A tract of about two acres of land had been in grass for several years. During the interval, annual applications of nitrate of soda were made in order to rapidly exhaust the other elements, so that the whole field might be brought into as uniform a condition as possible. The area was laid out in plots containing two-fifteenth acres each with an inner

plot of one-tenth acre. The plots were then tested as to their uniformity by growing Indian corn on all of them for a season without manure. The next year duplicate strips of the plants to be experimented with later were planted across all of the plots. This latter precautionary test was suggested by the fact that certain plants which had been grown on plots fertilized earlier with different phosphates, showed only moderate or slight differences in yields, whereas other plants exhibited enormous differences. It was therefore evident that land shown by Indian corn to be satisfactorily uniform might vary greatly in uniformity as concerns the production of some other crop.

Each of the sixteen plots was then devoted for two years to a different crop. Care was also taken to avoid fertilizers which would be expected to leave toxic residues behind in the soil, and the plots were fertilized exactly alike. The third year of the experiment onions were planted on all of the plots, which were again fertilized in the manner just described. It was soon observed that the growth of the young onion plants following the mangel wurzel, Swedish turnip, cabbage and buckwheat, were all much smaller than any of the others, and when they had reached a height of from one and a half to two and a half inches, a heavy frost occurred. It was noted that the larger onions were nevertheless uninjured but that those following the crops just mentioned were all injured at the tips to a greater or less extent. The differences noted at an early stage became more accentuated as the season advanced, and the greatest difference of all appeared as the ripening stage progressed. On most of the plots the onions developed normally and ripened as they should, but on the plots referred to, and to a less degree on some of the others, the onions failed to develop bottoms, the tops remained green, and at the end of the season they had failed to ripen, so that finally the tops had to be cut off with a knife in order to separate the two parts of the onion.

The final yields ranged from 12 bushels to 412 bushels of first quality onions per acre, the largest yield being that following redtop. The crop following two years of timothy was much smaller than that following two years of redtop. Similarly, the crop after two years of oats was much better than after two years of rye. Millet, which has such a bad reputation for exhausting land, proved to be a very good crop to precede onions. The fifth poorest yield in the lot was the crop following potatoes, and the others ranged between these extremes. It was found that onions succeeded better after onions than following certain of the plants, but yet the yields were greatly inferior to those following a considerable number of other crops.

The foregoing results suggest that the old idea that onions will do better after onions than after any other crop, probably arose from the fact that the onion crop is usually more heavily manured than the ordinary farm crops, and that, in consequence, a greater residue of plant food usually remains in the soil. In this way a poor soil might become so enriched after a few years that it would give much better crops even of onions than other fields which in the meantime had received other crops, but parsimonious treatment.

In 1911 it was observed at the Rhode Island Station that oats grew far more luxuriantly following potatoes than following mangel wurzels and similarly that Indian corn was far better following carrots than following the Swedish turnip. Experiments have been begun in Rhode Island for the purpose of ascertaining the cause for all of these various differences, but it is still too early to speak positively concerning the matter.

From what has preceded it is evident that the greatest returns from fertilizers are only possible when the system of farming is planned with due regard to the soil, the crops and the order of crop succession. On the other hand, the best results from crop rotation require an equally careful study of the question of proper fertilization, having due regard to the previous crops. It is furthermore evident that soil conditions are sometimes met with where the use of acidic fertilizers will prove beneficial, whereas under other conditions and for other crops, the reverse is particularly true. The corn crop on light soil having a poor sod must be fertilized differently from that on a good sod and on a heavier soil.

FERTILIZERS, CROPS AND SOILS.

123

Similarly, the newly seeded grass field, particularly if much clover is present, must receive different fertilization from old grass fields if maximum net profits are sought. It is possible to so fertilize certain fields that when they are seeded to timothy, redtop, and clover, practically nothing but redtop will thrive, or such land may in a single season be made to again produce the most magnificent timothy and clover. For lawns on such a soil a single kind of fescue, or solely Rhode Island bent, should be sown, or else the soil should be so limed and fertilized that the other grasses may also thrive.

It is in fact the purpose of the Agricultural Service Bureau of the American Agricultural Chemical Co. to study all of these features, and, by the examination of soils where desirable, to show how the returns from fertilizers may be increased regardless of whether it be by liming, by proper crop rotation fertilization, or by other methods of soil treatment or general agricultural procedure. Our service to the public is gratuitous; it is freely given, and your questions and difficulties will at all times be given careful consideration. Permit me in closing to express my admiration of the progressive spirit of so many farmers of New Jersey and my pleasure at meeting with you again, and finally I beg to say that in my new relation to the agricultural interests of the country, I am glad to welcome you to the vastly greater constituency to whom I trust I may be able to render useful service in the future.

Secretary Dye—Mr. Chairman, I think we have had a series of lectures of very superior excellence and importance on this great subject of soil improvement and fertilizers, and the interest here manifested has been deep, but when we come to read them in the report I know that we will have greater benefit still, so that I move you now that a standing vote of thanks be tendered to these three gentlemen who have addressed us this morning. Motion carried.

Chairman Cox—If there is no further business to come before the Board, the meeting will now stand adjourned until 2:00 P. M. this day.

SECOND DAY—FIFTH SESSION.

The Board was called to order by President Frelinghuysen at two o'clock P. M.

President Frelinghuysen—The first business before the Board will be the report of the Auditing Committee. Is the Auditing Committee ready to report?

Mr. Darnell for the Auditing Committee makes the following report:

To the State Board of Agriculture:

We, the members of the Auditing Committee, make the following report:

We find, upon examining the books of A. J. Rider, treasurer, that he has received from the hands of the Comptroller, \$9,671.42. We also find that he has

paid bills by checks for the same amount, and report that his books and accounts are correct.

J. HARVEY DARNELL,
GEORGE E. DeCAMP,
WILLIAM GLEESON,
Committee.

January 8, 1913.

The report was received and filed.

President Frelinghuysen then resigned the Chair to Senator Gaunt.

Senator Gaunt—The first number on the programme for this afternoon is the reading of the address of our President, and it gives me great pleasure at this time to announce that the President will now deliver his annual address to the members of the State Board. (Applause.)

The President's Address.

As President of the State Board of Agriculture, I take great pleasure in greeting the delegates from the various County Boards at this annual session.

I feel that we have cause for self congratulation at the splendid results achieved in agriculture during the past year, a year of progress and prosperity, as is shown by the Secretary's report of a million and one half dollars increase in value of farm products.

Once more the people of this great country have registered their solemn will, and have again chosen a chief executive to preside over their interests for the four years to come.

Our State has been peculiarly honored by having her Governor chosen the President-Elect of this great country. I think I can speak for the farmers of the State in extending to him our best wishes for a successful administration, coupled with the hope that his administration may be productive of great good to our country.

We are proud of the fact that he comes from a State active in agricultural industry. Our earnest wish is that with other problems he will have to meet and solve, that he will not forget the necessity of considering the promotion of agriculture vital to the very life of our nation.

It has been characteristic of the American people (and to this has been largely due their progress) that they can after exciting and unsettling months of a political campaign, return to their pursuits as temperately as though no great public excitement had affected them.

We meet again today, representatives of one of the chief industries in the State to confer together and study conditions, and looking to the future with renewed confidence, in the hope that our efforts to increase the productiveness of the farms, and improve the conditions of the farmers, will meet with the reward we desire, greater prosperity for all the people of New Jersey.

History records that no nation on the face of this globe has ever continued to exist that did not recognize and attend to the cultivation of the soil as one of its chief industries.

The principle, therefore, of this State Board has been the widening and deepening of the channels of education to the American farmers, as well as those of foreign birth, by providing the ablest and most capable specialists to thus inform them of the latest and most practical methods of farming, knowledge born of experience and research.

THE PRESIDENT'S ADDRESS.

125

Well, what have we done? The Institute is the greatest institution we have. We have held a greater number this year. The Poultry Department of the Experiment Station alone has held 80 institutes.

Under the direction of the Executive Committee, Prof. Lewis of the Station has made a special poultry census. It is the first correct census we have ever obtained, as our previous figures ignored towns and cities.

Prof. Lewis has reported a gratifying increase over our estimates of production of two millions of dollars. He found about 14,000 chickens in New Brunswick. That's something to crow about! He also states the average per hen in New Jersey is 100 eggs per year, while the average is only 80 in the United States. Farmers take off your hat to the New Jersey hen!

Mr. Alvah Agee, formerly of the Pennsylvania Agricultural College, has been employed as Conductor of our farmers' institutes. This has been arranged through the temporary employment by the State Board of Agriculture co-operating with the Experiment Station at New Brunswick. However, in order that Prof. Agee may have a title commensurate with his reputation as a specialist in institute work, your Executive Committee believes that the Legislature should be requested to create an office, and designate him as Director of the Farmers' Institutes, and empowering the Executive Committee to appoint him as such.

The Agricultural Experiment Station during the past year has established a new course known as "A Short Course in Home Economics," for women, which in short, means that teachers in the public schools are to be taught how to teach the baking of bread, trimming hats, decorating the home, and other useful information, which will be of benefit to the women and children who will eventually take up their lives on the farms. There are at the present time 19 students in this department.

The Legislature appropriated last year \$10,000 in order that individual and agricultural associations throughout the State might make an exhibit at the Land and Irrigation Show which was held in the 71st Regiment Armory in New York City in November last. The New Jersey Exhibit was a credit to the State. It occupied a prominent position in the centre of the building, and was beautifully and tastefully arranged.

Over the entrance of the Exhibit were the words electrically illuminated, "New Jersey—The Garden State."

Exhibitors from this State won the silver cup for the best sweet potatoes, silver cup for the best ears of corn, silver cup for the best brown eggs, 2nd, 3rd and 4th prizes for the best exhibit of apples, 2nd prize for the best exhibit of sweet potatoes, and 2nd prize for the best exhibit of white eggs (Rhode Island carrying away the first prize).

In addition to this, there were numerous honorable mentions. Great credit is due to Mr. Elmer Bradshaw, Secretary of the Commission, for his splendid efforts in soliciting exhibits in South Jersey, and general control of the work, and to Prof. M. A. Blake, the horticulturist of the Experiment Station, and Mr. Charles Van Nuis, for their indefatigable efforts in arranging the exhibit, and attending to the stupendous details in shipping and packing the fruits and vegetables. The appropriation was not sufficient in itself to carry out all the plans of the Exposition Committee, but certain public-spirited citizens came forward and contributed from their private purse the necessary amount in order that New Jersey's exhibit might be more complete. We feel very grateful to Dr. H. B. McAlpin, of Morris Plains, and Messrs. M. Hartley Dodge, of New York, and H. A. Haskell, of Red Bank, N. J., who made these contributions.

THE COMMISSION ON TUBERCULOSIS IN ANIMALS.

By reason of my position as President of the State Board of Agriculture, I am also President of the Commission on Tuberculosis in Animals. Inspector Charles McNabb of the Commission will later make a full and complete report of the work of the Commission.

I have only a few words to say on this subject. The great problems that have

confronted us heretofore are still present, but in a much less degree. There are two or three reasons why this work is absolutely essential to the welfare of the State. The first reason is an economic one.

New Jersey is in part a milk producing State, and as long as farmers buy cows, it is imperative that the farmers be protected by laws against the infection of diseased cows from other States. The second is a humane reason. We know that tuberculosis in cattle in advanced stages is communicable from the cow to the human being, and we must consider the lives of the children of more importance than the lives of cows. I, therefore, maintain the theory advanced at a previous session of this Board, that the continuance of this work is absolutely essential.

What has been accomplished by the Commission on Tuberculosis in Animals in the year 1912?

In the report of last year only a small portion of it was mine, as I had been at the helm but four months; necessarily, I could only tell something of what I hoped or expected to do. Standing then upon the threshold of the work, my report was largely of the future. Today, after a year of studious application to my official duties, I feel justified in speaking with a knowledge born of experience, the best of all teachers. Therefore, my first year of service has seen sundry changes in policies established; all of which have passed the frictional stage, and are working successfully.

Since my last report, the State has been redistricted and five inspectors instead of four are on duty. A more careful watch is being kept all along the border line for incoming cattle, as well as being ready at all times to attend to applications for testing, appraising and slaughtering cattle that may react in our native herds.

The amendment of our law also occurred within this year, whereby the appraisalment of native cattle has been raised from \$40 to \$50 and I would recommend a still higher appraisalment at the present worth of dairy animals. The ten dollar raise alone has worked wonders in bringing the owners of dairy animals to the front, requesting that their herds be tested, without so great a fear or dread as far as the money question is concerned. The policy of the Commission has been in the handling of native cattle condemned, because of tuberculosis, to meet the farmer at least half way. In view of the extremely high initial cost of dairy cattle, it has seemed wise to at least attempt to meet the farmer with a price which would be of material assistance to him in replacing the condemned animal. The Commission does not lose sight of the fact that a cow badly infected with tuberculosis is not of especial value. But on the other hand, they desire to encourage a spirit of co-operation on the part of the owner, which will insure a prompt report on his part of any suspicious animal that may be in his herd. They also wish him to feel that in so doing, he is not only benefiting himself, but assisting in the work of the eradication of the great white plague.

Each of our inspectors is required to make a weekly report on blanks made for that purpose, so that nothing can be neglected. At the end of each month a full report is made up and a copy of same is mailed to members of the Commission and the Inspectors. Therefore, each Inspector knows what the other is doing throughout the month. We have won every battle fought where the law was being violated or disobeyed, with the exception of a case now pending at Frenchtown.

New Jersey, by reason of its location, must continue to be a milk producing State. The production of milk has decreased in the last year. The number of cows have decreased also. Other dairy States have the same experience. New York has decreased 100,000, Massachusetts 10,000. At the present time, the high price of cattle, and the cost of their maintenance, is a deterrent to the conservative farmer anxious to make money in every department of his farm. There are four causes for this. The first is the low price of milk; the second the high price of cows, and third, the high cost of feed; fourth, difficulty in securing efficient help in the dairy.

The reason for the high price of cows is largely due to the spread of the infectious disease of tuberculosis. Good cows are scarce. How are we to remedy

THE PRESIDENT'S ADDRESS.

127

this condition? It is a most important problem. Experience teaches only one way, and that is to keep the cattle under healthy conditions and breed and raise your own stock; as it is proven that there is a minimum percentage of tuberculosis among native home raised cattle. The only way the farmer can be induced to raise his heifers at the present time is to have some incentive to do so. The scarcity of production in milk may bring about a recognition of this by the State authorities and relief offered in some form of subsidy. Then, too, the farmer must receive better prices for milk produced under cleanly conditions. Some method might be established through co-operative exchanges such as potato growers have. Then the problem of the high cost of feed. This problem can only be worked out by careful management and growing of more protein crops. Fourth problem: to keep the help by making the farm attractive to them. These may be utopian ideas, and I may be indulging in idealistic opinion; but the question is one that is most worthy of discussion, as it is one of the most important problems before us today. We are on the doorstep of the best milk market in the world. Within one hundred miles of any section of New Jersey, there are 10,000,000 people consuming over 5 million quarts of milk daily. New Jersey produces over 1 million quarts of this milk daily.

New Jersey has a large area of uncultivated land. Some of it is not suited for grazing lands, but there are thousands of acres in New Jersey of unused grazing lands that should be brought into use, not only for dairy purposes, but in order to raise meat for market. A milk famine would cause much suffering. It is not a remote possibility; the problem is a serious one and should be the subject of much thought, not only by our experts at the Experiment Station, but also by this organization.

EDUCATION.

The State Board of Agriculture is supposed to execute the agricultural laws. It is also an educational institution to this extent, that through its agency the Farmers' Institutes are managed. It is closely allied and co-operates with the Experiment Station in the short courses, and the spreading of knowledge and enlightenment in scientific agriculture. The extension work is in addition to the protective feature of the department at New Brunswick, plant pathology, entomology, poultry, bee industry, and several others.

New Jersey farmers have always been interested in the cause of education. Their attitude has been a patriotic one. Permit me to take a portion of my time in discoursing on this subject. A recent investigation by a Senate Committee found that the standards of the rural schools needed strengthening. The Commission are working along this line. One improvement is the public instruction, introduction of agricultural courses in rural schools.

You practical men realize that this will reach further and beyond the Institutes and Experiment Stations, and what practical use it will be to the farmer.

Its beginning is with the child at the time when such instruction will leave its imprint. To teach agriculture properly the teacher must know something about it. Last year the Executive Committee was approached by the State Board of Education, who requested them to use part of the moneys allowed them by the Legislature, establishing at the Agricultural Experiment Station a short summer course in agriculture for school teachers.

The Executive Committee, recognizing how practical and beneficial this would be to the young school teachers of the State who were in rural schools, readily approved the plan, believing it a splendid idea to have these young girls go to the Experiment Station and broaden their knowledge of agriculture, and with these ideas absorbed, go back to their schools and transmit the learning thus acquired to their students; but the Comptroller and Attorney General vetoed the plan, and, therefore, it could not be put into operation.

Your President requests that a resolution be adopted by this State Board urging the Legislature to enact a law and appropriate the necessary money therefor, in

order that this course at the State College may become available to the teachers in the rural schools.

Mr. Kendall, Commissioner of Public Instruction, has labored energetically and with much wisdom in creating a practical plan to install the teaching of elementary agriculture in the public schools. I quote in part from his pamphlet of instructions which he sent out, when he established this course:

"Because of the growing interest in country life, attention has been directed to the possibilities of the country school as a means of getting new industrial and social needs.

"The conviction is increasing that wherever practicable, schools should relate part of their work to the dominant activity or pursuit of the community.

"There is more or less well defined feeling that the rural school has too long neglected to promote interest in country life.

"All this is particularly true of New Jersey, in view of its unique position in the heart of the most populous region of the country, with great cities at its borders and a large urban population within its borders.

"The study of agriculture is not compulsory in the schools of the State. This plan is suggested for these schools that elect to adopt it, and it is not intended to displace work of a similar nature already successfully carried on."

The subjects to be taught are:

1. Course in general experimental and observation work of a simple character.
2. Alfalfa. Cowpeas and soy bean growing.
3. Corn growing.
4. Market gardening (tomatoes, lettuce, radishes, onions, peas and other vegetables).
5. White potato growing.
6. Sweet Potato growing.
7. Tomato growing.
8. Poultry raising.

The problem of education by the State is a great one, and is a solemn duty imposed upon the State by the Constitution. With our County population increasing, caused by those who come from the cities and seek homes in the country, and by thousands of aliens coming to our foreign shores who are taking up the land, the expenditure of large sums of money to carry out the provision of the Constitution that the State shall educate, is absolutely necessary.

Our normal schools are overcrowded and insufficient to provide suitable teachers. The two normal schools have about 700 pupils and graduated this year about 333 young teachers. There were 1727 new teachers hired during the year. There are about 500,000 pupils in the public schools. This takes a corps of 13,000 teachers.

Some people say we are spending too much money. How to get enough money to meet the needs, I know is the constant concern of the State Board of Education. It is absolutely necessary to spend this money, and I venture to say that while a large portion of it may be expended freely, it is not spent extravagantly.

Our schools are among the best in the land. We must spend money to keep them up to a high standard. The increased cost of living has much to do with the expense of maintaining them. Then, too, there is the provision of special teachers for subnormal, defective, backward and weak-minded children.

New Jersey maintains a great Education Institution, educating one-half million children. It costs 21 cents a day to educate each child. Compare this cost with the charges in private schools and the cost is not alarming when we consider that the instruction afforded in the public schools is as good as in the private schools.

A great problem confronting us is the competition of other States for our teachers. They take them away from us by the hundreds every year.

At the present time the pay of many of the school teachers is insufficient, in the rural schools particularly. We find in some of the districts a reluctance toward paying teachers a fair wage and in some a resentfulness toward increasing their pay to keep them.

THE PRESIDENT'S ADDRESS.

129

The number of teachers in the State receiving less than \$300, 41; the number receiving from \$300 to \$390 inclusive, 330; between \$400 and \$499, inclusive, 1124; so that of the 12,652 teachers in the State, about 1500 receive a salary of less than \$500.

Let me illustrate:

There are two girls—sisters in a family—and it is necessary for them to work. They have had a training at the Normal School. They must support themselves. One elects to be a school teacher—the other selects housework—a servant in a house.

The servant goes into a private house. She received about \$18 per month, or \$216 per year, board and lodging, amounting to \$192 or \$16 per month; washing amounting to \$4 per month or \$48 per year. Clothes worth \$50 or \$60 a year are given her. Out of this salary of \$506 she saves a large portion. The girl who selects teaching goes to a rural school and for ten months' work gets \$300. (You say she doesn't have such long hours. Yes. But she can take no other employment.) Out of her salary she must board herself for \$16 per month, or \$192 a year; clothe herself—\$100 total \$292. How much does she save?

There is a wider field of employment for women today in other vocations than teaching. At the noon hour in New York you see thousands of women on the streets, probably the lowest is receiving \$50 per month or more.

I have thirty women working in my office and the lowest gets \$50 per month, and some get as high as \$150 per month. All of this creates a competition and effects the teaching profession. When we consider that the pay of many of our teachers is less than these—yes, even less than a servant in your house—we realize how insufficiently they are paid. We ought to pay all public school teachers liberally. To do otherwise is to dishonor ourselves. When we consider the amount of education necessary, and the intelligence demanded, to teach in our school system, the comparison of the wages proves unequal. The question of a minimum salary for school teachers will come before the present Legislature. I ask your support of this measure.

LONG LIVE THE SCHOOL TEACHERS.

I am in favor of the greatest economy, but the greatest economy sometimes is not to be niggardly when it affects not only our homes but the future welfare and happiness of our children. Nor should we ask these young women and young men who teach in our schools to work for a less sum than can provide them a decent living. The policy that offers less than a decent living to beginners in the profession of teaching is a mistaken policy. I quote from a recent editorial in a New York paper dealing with this subject. It is well known that men and women of high devotion will not hesitate at financial sacrifices. It may be true that people born to teach will teach, though they starve for it, but a community that complacently expects such sacrifices stands in its own light.

The public schools of America cannot flourish in an atmosphere of parsimony. Americans should realize that the public schools of this country are our most unique possession. They form the spinal substance of the national life. If we lead the world in working and thinking power, it is because of our schools. The right education of a child is the making of an efficient citizen. The republic cannot succeed unless its citizens are efficient. The country that has the most efficient citizens is the most efficient country in the world. The most efficient country is the country that not only creates and accumulates the greatest store of material wealth, but also the greatest store of intellectual and moral wealth. Such is the United States today with all its faults and failures. It leads the civilization of these times. It cannot continue to do so without the most generous and most liberal nature of its school system. The work of education should be committed to the very best men and women that we have. We should pay them well. If we do this the investment will pay the greatest dividends to the home and farm.

PARCELS POST.

At our last meeting a resolution was passed urging our representatives in Congress to support the bill providing for a parcels post. The bill is now a law which became operative on the first day of January this year. Next to the rural free delivery, and the pure food law, it is one of the most important pieces of legislation that has been enacted in the interest of the farmer. Whether the law is as perfect as it might be, time and experience only will tell.

It brings the consumer in direct touch with the producer. Take for instance the question of the housewife in a village or town from which a rural route maintains. She can make the most practical use of it. Suppose she is buying eggs, butter, chickens, etc. For a comparatively small charge, she can buy directly from the farm, and use this method of transportation at about one-half the price that the express companies now charge, and have the goods delivered with much greater facility.

One of the Congressmen instrumental in passing it has said of the Act:

"A word or two to the farmers and shippers who wish to make New York and Philadelphia their markets. They should take the most up-to-date methods for packing purposes. As an illustration, paper box manufacturers have already, in expectation of the parcels post, worked out containers that will carry eggs, butter, chickens, and other farm products without danger of injury or loss. These containers, I understand, can be very cheaply manufactured, and the shipper should examine their availability, both to save themselves the trouble and difficulty of packing, and the possibility of injury to the shipment.

It is going to take some time for farmers and consumers to learn the art of dealing together. However easy the conditions are made for farm products, they usually sell in the city markets at about twice what they bring on the farm, and usually this difference in price ought to provide the farmer power and the farm sufficient motive for profit to get together very soon. By the time they have learned the extortionate rates, the low rate of 11 pounds will have been removed.

What is the function of a parcels post? Obviously, it is to move direct from producer to consumer as the first means instead of the third or fourth, all products sufficiently standardized to permit the consumer to safely buy direct. In order to do this, the rate should be as low as the cost of service permitted in the first place, and the weight limit as high as the retail weight of such products ordinarily runs in individual consumption.

Other countries have a weight limit of more than 100 pounds. Belgium, the paragon in this matter, is proposing to raise its weight limit from 132 pounds to 220 pounds. Probably no greater blunder has ever been committed in the serving of the people than that committed by the Senate conferees who chose in the closing hours of the last session of Congress, to make a five cent rate on 300 miles instead of three cents, four cents on 150 miles instead of two cents, and three cents on fifty miles instead of one cent, the lower rates provided in the House bills.

The whole subject is now up to the Postmaster General. If the rates are too high, if the weight limit is prohibitive, if the classifications are identical, blame the Postmaster General. Not as a man, of course, but as an institution to which Congress has given the power and invitation to construe a satisfactory transportation system for producers and consumers, and upon which it has imposed the responsibility to make all these things right.

The conditions are such that he can initiate a system that will take the place of the express companies, and extend their service to their village and farms at rates one-half those that have been charged, effectively supplying direct from producer to consumer transportation.

Of course, the farmers and consumers should have wisdom enough to get together. In England, the farmer advertises in the London papers his prices for the goods. Farmers within shipping distance of New York under present rate must take some means to acquaint the consumer with his supplies and prices. Until credit relations develop between them, the farmer can take on the shipment on

THE PRESIDENT'S ADDRESS.

131

a C. O. D. basis under regulations soon to be provided at a trifling charge. He will smooth out the difficulties, but a great victory has been achieved not only for the farmer as a producer, but also as a consumer. Inasmuch as it brings the buyer in the cities in touch with him, and it brings him in touch as a buyer with the cities' wares and markets.

INLAND WATERWAYS.

In connection with transportation, Inland Waterways was a subject which was discussed at our last meeting. With the completion of the Panama Canal, our attention is called to other projects of water transportation. A coast canal is contemplated across New Jersey, a projected inland waterway, that will open up from Raritan Bay to Norfolk a safe inland channel for the navigation of ships of deep draught.

New Jersey on April 29th, 1911, passed a law committing the State to the expenditure of \$500,000 for the purchase of the right of way. A companion resolution provides for a ship canal commission. This Commission is actively at work, and it is our earnest hope that when the survey for the canal is completed that the Federal Government will build this canal, which undoubtedly will be of immense benefit to the farming interests of the State.

GOOD ROADS.

New Jersey was the pioneer in this country in the building of good roads. For many years we had the proud distinction of having the best roads in America. This is not so today, for we cannot keep them repaired.

At our last meeting autoists of other States were taxed. The Legislature since that time passed a bill that has practically permitted 20,000 automobilists to ride over our roads without paying a cent. Who pays the bill? We do.

We should refer today to the "bad roads" of New Jersey, not the "good roads."

The Road Commission and the Commission of Motor Vehicles are doing everything in their power to bring about improvement of conditions. I wish in this connection to commend the humane law which made possible the employment of convicts on the roads relieving the State of the expense of labor and improving the condition of these poor unfortunates who are the wards of the State, by giving them this outdoor healthful exercise, and occupation. Let us hope that this charitable reform which has been undertaken by the Commissioner of Roads will renew the character of these men, and teach them a lesson that will make useful citizens of men who are unfortunate, probably too often by the lack of the opportunity afforded others.

The road situation is appalling. Many roads are worn out, others are wearing out. Almost every county is taxed to the limit for their repair. The State hasn't the money to increase the appropriations to the counties.

The Legislature at the demand of automobilists themselves have cut off thousands of dollars revenue, which for six years past greatly relieved the taxpayers, and helped keep the road system up. The members of the State Board are already familiar with my humble sentiments in reference to this policy. There are going to be more automobiles. One concern which manufactures a cheap touring car will turn out 200,000 cars this year.

Our roads are called upon to sustain trucks weighing 3 or 4 tons and carrying 3 to 5 tons' burden besides. Every county must rebuild its bridges to make them safe, and unless relief is afforded, this expense must be borne by the taxpayers. Some bridges have broken down under the excessive weight of auto trucks, and life has been lost. The taxpayers cannot and should not meet this burden. Sufficient revenue must be raised from those benefited who use the roads. All pleasure driven vehicles should be taxed, resident and non-resident. The heavy auto trucks must pay a toll license commensurate with their tonnage, and additional for extra tonnage carrying capacity. This revenue should be sufficient to pay for

80 per cent. of the repairs of roads per annum. Demand from your representatives an answer to this important question, and insist upon their answer.

Automobilists will oppose increased taxation. If your representatives do not vote to lighten your load of taxation, let him secure his votes from the automobilists. He probably doesn't care for the taxpayers' vote. Get busy! Let us hope that our Legislature will see this in a just light.

GRADE CROSSINGS.

I think we should take some action here in reference to grade crossings. In speaking on this subject, I cannot do better than quote from a recent article I read on the subject. A few weeks ago three people were killed, and eight seriously injured near Perth Amboy, N. J., at a grade crossing of the Jersey Central Railroad. That crossing with six deaths marked against it in the last ten years, had no gates to guard it, and only a bell to ring, which the roar of the trains and the rattle of automobiles might drown, and did drown.

These people in New Jersey were killed by the laws, or lack of laws, which permitted that grade crossing to exist. Other people have been killed, and other people will be killed in New Jersey by the lack of a law to abolish these grade crossings.

Many of you are familiar with the accident which happened to my manager at a similar meeting at my place, scarcely a year ago. That crossing as well as many other crossings are a menace to life. Every day the people of this State pay the penalty by reason of this lack of laws. No people are more subject to the hazard of these dangerous grade crossings than the farmer. The reason why this law was not passed last year was because of the opposition of the present State administration of New Jersey. The Pierce Grade Crossing Bill requiring every railroad in the State to remove one dangerous grade crossing every year for each thirty miles of track operated was introduced and passed by both houses of the New Jersey Legislature early in the present year. Governor Wilson, of New Jersey, vetoed that grade crossing measure, believing the act too drastic. There yet remains two months in which Governor Wilson can exercise his powerful influence to have a fair life-saving and grade crossing bill drafted and enacted into a law. The people of the country who are looking forward with confidence and expectation to the enactment and execution of many righteous laws for the people under the coming national administration, will feel an additional reassurance, if Governor Wilson will press to fulfillment this necessary statute of protection and safety for the people of his own State, his fellow man.

RECOMMENDATIONS.

At our last meeting a Committee was appointed to consider the consolidation of the various departments of agriculture now managed by separate boards into one Department of Agriculture, with suitable office at Trenton, and a commission of agriculture. We are awaiting a report of this Commission. Undoubtedly they will have intelligent suggestions to make to us. That this is a reform much to be desired no one can question. The work of the agricultural department should be carried on by special officials who are appointed by representatives of the farmers, and be paid for it. This law should be revised by men of experience, by friends of agriculture and not by its enemies, or those who have any selfish ambitions. We cannot report much progress in this direction, but let us hope that the problem which is still before us, sooner or later, will find solution.

Reclamation in the splendid work carried on by the Agricultural Experiment Station in the southern part of the State, which now has a great area of undeveloped land. There comes before us the question of having sub-experiment stations in the southern and northwestern part of the State. That two sub-stations in southern Jersey are absolutely necessary, and one in northern Jersey, say Sussex County, is necessary, is not met with any denial.

THE PRESIDENT'S ADDRESS.

133

One of the managers of the institute for the feeble-minded has informed me that he should like to have an opportunity of making available a certain class of feeble-minded men in his institution for the clearing up of land in southern Jersey. I have referred him to the Director of the Agricultural Experiment Station, feeling that possibly some scheme might be formulated where this idle labor, now a charge on the State, could be utilized. The setting aside by the Legislature of 100,000 acres of land for development is an important one, and one that requires the closest attention by this Board and the Agricultural Experiment Station, making for the increase of our productive areas and the development and progress of the State.

FEDERAL AID FOR FARMERS.

Recently in Washington there was held a conference between President Taft, Secretary Knox, twenty-one governors, and Ambassador Herrick, of France, to consider a plan to extend financial aid to farmers, the object being to increase the products of the land. There are two plans, the Herrick plan is a rural credit plan to encourage the farmers and form rural credit associations. This scheme does not contemplate that the nation or the States go into the business of lending money to farmers.

Congressman E. R. Bathrick, of Ohio, proposes that the Federal government should go into the business of lending money to farmers, not on second mortgages, but on the unencumbered land of the farmers to be mortgaged to the Government as security. The Government would charge the farmer interest at the rate of $4\frac{1}{2}$ per cent. and would issue 4 per cent. bonds for the purpose of obtaining money to be loaned to the farmers.

It is estimated that the farmers of the country have been paying not less than 7 per cent. interest on the average and that the aggregate interest paid on farm loans in the last 25 years was equal to the total increase of the value of farms in that period.

France and Germany have, like the United States, taught the farmers how to farm but they also set up the machinery by which the farmers could borrow easily and cheaply the money they needed to put in operation the things they were taught.

Ambassador Herrick estimates that two million a year can be saved by the farmers of this country by the introduction of such credit. Average rate farm loan United States $8\frac{1}{2}$ per cent. Average rate in Europe $4\frac{1}{2}$ per cent. A reduction of 4 per cent. interest paid by one farmer on the six billions of borrowed capital would mean a yearly saving of 240 million. A further material increase in the price of foodstuffs would be a serious hardship to a vast number of people and would imperil the economic advantage of the country. The only sure remedy for reducing prices on products of the farms is a very material increase in the augmentation of production.

Ambassador Herrick, who was formerly Governor, says:

"There is no more important factor in the social and economic progress of the country than the wise development of its agricultural resources. The social importance of successful agriculture primarily is due to the fact that farm life produces a virile citizenship; it is conducive to independent thinking and well-considered action. The stability of our national life and the maintenance of our position as a great force for good among the nations of the world depend upon our ability constantly to improve the quality of our citizenship. If this country is to play the part that it should in the progress of the world, it is essential for us to encourage that sort of life, and that kind of industrial development that provides the proper environment for a higher order of manhood and womanhood.

"The pressure of population in the cities of this country is making the struggle for existence by a large proportion of the people severe and uncertain, and the consequence is a deterioration in industrial efficiency and a deadening of civic pride and responsibility. The overcrowding in our cities is producing a large class of people whose low moral and intellectual standards unfit them for citizen-

ship. It is, therefore, becoming more and more important that the trend of population be turned from the cities to the country.

"The economic importance of agriculture is best indicated by the fact that 35.6 per cent. of all the industrial workers of the United States are engaged in farming, which is more than three times the number of those employed in commerce, the next most important industrial division, as measured by the number of those who make it their vocation. The increasing prices of foodstuffs make it plain that the number of those now engaged in agriculture is altogether too small, unless their efficiency can be materially increased."

I suggest that New Jersey enact a law providing for co-operative farmers' banks arranging for advances to farmers on their crops to be harvested, loans to be a lien on the farms. I suggest (and I am frank to say, when Senator Brice proposed this law, I opposed it) that the State set aside, if possible, \$200,000 per year to loan on unencumbered farms on 30 per cent. of their value at a low rate of interest, say 4 per cent. Banks now paying the State 2 per cent. interest for idle funds will probably oppose such a move. They are asking 5 per cent. and 6 per cent. and are receiving large deposits from the State. However, such a law would bring about increased development of land, particularly in South Jersey, and would increase the productiveness of the State. This subject should be at least discussed at this meeting.

Active efforts are now being made to encourage immigrants to find homes in the country instead of in the cities. It is said that 65 per cent. of all those arriving at our ports are of the farming class in their own country. This statement is sufficient to show the social and economic importance of turning the tide of immigration to the soil, to work in which the majority of immigrants have had experience; for those who are engaged in work in which they are most efficient make the best social material, and do the most in promoting the material advantage of the country. It is much easier to induce the farmer immigrants to continue as farmers here if they are approached before they determine definitely upon a place of residence and upon an occupation, and before they become enamored of the excitement of urban life.

And now in closing, while we have cause for gratification at the splendid results achieved during the past year, I feel that we ought to expect more progress in the future. Together with the State Board of Agriculture, all the other allied organizations, the Grange, the Horticultural Society, Cranberry Growers, Beekeeping Association, and other Societies, these are operating hand in hand with the Experiment Station, which is headed by one of the best agriculturalists in the country, supported by a faculty of virile and scientific men, working energetically for the State. This co-operation, this complete understanding, I venture to say, does not exist in any other State. It is bound, therefore, to work wonderful results for the welfare of New Jersey in the future.

Paul may plant and Apollus may water, but God alone can give the increase.

Turning, therefore, to a supreme being, we ask His approval of our endeavors of the past and His guidance and blessing on our future efforts.

Prof. Rider—Mr. President, on account of the numerous valuable suggestions in this address of our President, I move you, sir, that the several propositions in the address be referred to a special committee to report upon. The motion was carried.

Senator Gaunt—Who shall appoint the Committee?

Prof. Rider—The Chair.

Senator Gaunt—I will appoint upon the Committee Mr. E. R. Collins, Chairman, J. T. Allison, R. E. Haines.

INSECTS INJURIOUS TO WHITE POTATOES. 135

That committee will get the report and go over it carefully and be prepared to make their recommendations and report at some future session of the Board. Some time tomorrow.

President Frelinghuysen then resumed the Chair.

President Frelinghuysen—The next subject on the programme is one that I am sure you will all be interested in, an address by Dr. Thomas J. Headlee, State Entomologist, on Insects Injurious to Potatoes.

Some Insects Injurious to White Potatoes in New Jersey.

BY THOMAS J. HEADLEE, PH. D., STATE ENTOMOLOGIST.

When we realize that the white potato crop contributes annually eight or nine million dollars to New Jersey agriculture it seems that a few minutes may be profitably spent in considering the problem of controlling the insects that annually reduce the crop as a whole and every year destroy practically the entire crop of some growers. We will limit our consideration, however, to the recognition marks of the more important species and their work and to the latest methods for their prevention and control.

For purposes of discussion, the white potato insect pests may be grouped under two heads—those that attack the potato plants below the surface of the soil, and those that attack it above the ground.

INSECT ATTACK BELOW THE SURFACE.

Cut worms, wire worms and white grubs are known to damage the potato plant in the ground.

Although the cut worm is a very serious pest of the sweet potato, it only rarely does much damage to the white potato. When potatoes are planted on cut-worm infested sod or weed lands a considerable amount of harm may be experienced the first year. The worms which pass from egg to adult moth in one year's time are from one-half to two-thirds grown when the potato plants appear above ground. Under such conditions the plump, dirty-colored worms may cut many of the plants off. It is probable that early fall plowing would so expose the over-wintering larvæ that most of them would perish, or that late summer plowing would prevent the deposition of eggs by the parent moths. If such measures as these have been impracticable or neglected, the cut worms can be destroyed by sowing rows of poisoned bran three or four feet apart all over the infested area. Enough of the Paris green should be mixed with the bran to change its shade; but hardly enough to make it look greenish. This mixture should then be distributed with a drill or seeder. The poisoned bran must not be placed in the soil; but upon the surface. The writer has never seen this tried for cut worms on white potatoes; but has seen it very effectively used against the same insects on sweet potatoes. The total absence of green food is likely to be found necessary to the successful use of the dry poisoned bran. When infested areas are small, the ordinary green bait or poisoned bran mash may be employed.

Wire worms and white grubs occasionally damage potatoes that are planted on badly infested sod land within two years after the breaking, and during the past year white grubs have occasioned much complaint. The white grub pest is like that produced by almost every other injurious insect. Under favorable conditions it so increases in numbers as to become very destructive, and each such increase

is sure to be followed by a marked decrease. Last year was one of the periods of great abundance, and it is possible that this year, and next even, may show the same characteristic; but sooner or later the grubs will disappear.

The wire worm is easily recognized by its hard, smooth, shiny, rather dark brown surface and its three pairs of legs near the front end. White grubs are to be distinguished by their white color, their constantly curved bodies with the rather enlarged rear end, their brown heads and their three pairs of large, awkward legs. The habit these grubs have of accumulating in grass lands and the fact that damage done by them usually occurs in crops that follow sod within two years indicate that potatoes should not be planted on badly infested sod land, and that the use of clover as the only grass in the rotation should become more general while white grubs are abundant. No insecticides used against either the wire worm or white grub have given promising results.

INSECT ATTACK ABOVE GROUND.

The stalk is infested with the potato stalk borer, the stalk borer, and the foliage is consumed by the Colorado potato beetle, the three-lined leaf beetle, flea beetles and blister beetles.

The potato stalk borer is the larva of a beetle and is locally common and sometimes injurious. It may be recognized by the fact that it bores out the inside of the stalk, and does this work in the form of a dirty white or yellowish legless grub. The beetles winter over in the stalk, and the raking and burning of the stalks of an infested field will bring relief.

The stalk borer is the larva of a moth. It bores out the inside of the potato stalk, and may be recognized by the presence of three pairs of legs, and by the fact that while the front and rear ends of the "worms" are similar in color and striping, there is a section in the middle totally unlike the rest of the body in color. This creature normally feeds on weeds, particularly the rag weed; but when abundant may devote its attention to potato, corn, dahlia and other cultivated plants. Its work on potatoes may be prevented by keeping down the weeds and grass, particularly along the fences.

The Colorado potato beetle is an oval, yellowish creature furnished with ten black stripes running lengthwise its back. Its grubs are plump, dark red slugs with black dots along each side. Both adult beetles and grubs consume the foliage of the potato plant. If the leaves are thoroughly dusted with Paris green or lead arsenate or sprayed with the latter whenever the bugs appear the plants will be adequately protected.

When Paris green is to be used alone as a dust, an experienced man should make the application, because too much may seriously burn the plants. It is perhaps safer to mix the green with wheat flour or land plaster, at the rate of 1 to 15, and in order to avoid the use of too large an amount of powdered arsenate of lead it is probably well to dilute it with equal quantities of finely ground sulphur. The arsenate of lead spray should be made up at the rate of from three to five pounds to fifty gallons of water. The latter strength will kill the slugs and the adults if the numbers be small; but when the numbers are so large as to threaten quick stripping of the vines the greater strength is advisable. In some instances the adult beetles will emerge from winter quarters before the plants are above the ground, and will eat them off as fast as they appear. Such cases are to be met by destroying or poisoning late volunteer potatoes, keeping down weeds, especially solanaceous ones, and by planting some early seed through and about the field as a trap. When the beetles begin to attack these early plants they should be covered with a strong poisonous mixture such as arsenate of lead at the rate of five pounds to fifty gallons of water, or dusted with the one to fifteen mixture of Paris green and flour of land plaster.

Locally the "old-fashioned potato beetle" or three-lined leaf beetle is common. The adult is about half an inch long, of a pale yellow color with three black stripes down its back. Its grubs, which also consume the foliage, may be distinguished by the mass of excrement with which they cover their backs. The

INSECTS INJURIOUS TO WHITE POTATOES. 137

measures of control recommended for the Colorado potato beetle will prove efficient for this species.

The flea beetle is perhaps just now the worst insect pest the New Jersey white potato grower has to meet, because it not only consumes the foliage—the food-making organs of the plant—but appears also to spread blight. This creature is easily recognized by its small size, dark color, and especially its ability to hop like a flea. The adult beetle attacks the leaves in spots and consumes the skin and the filling beneath the skin, leaving the skin on the other side untouched. Such a leaf, when held up to the light, shows many irregularly round window-like spots. Rarely the larvæ attack the tubers, scarring them and still more rarely penetrating them. Keeping the plants thoroughly covered with Bordeaux mixture while the beetles are present gives adequate protection; but the poison treatments which serve to control the potato beetles do not seem to be effective.

Rarely the long, narrow and sprawly gray or dark colored blister beetles make their appearance in the potato fields. They range from a strong half an inch to an inch in length, and run and fly very rapidly when disturbed. The adult beetle is alone responsible for the damage. When in small numbers the ordinary arsenical treatments are sufficient; but when in very large numbers, the foliage may be consumed before the horde obtains enough poison to destroy it. In such cases, the grower must resort to mechanical measures such as "driving." Driving consists essentially of laying a windrow of straw or dry grass and weeds along one side of the infested field, then sending a line of people through the field from the opposite side, driving beetles before them into the straw, and promptly burning up both windrow and blister beetles. In dealing with large fields it might be necessary to employ a series of windrows.

PRACTICAL SUGGESTIONS.

To fight the insect enemies of his crop efficiently, the white potato grower must become thoroughly acquainted with the normally injurious species and know what to do for each of them. He must include in his crop plans a plan of protecting his plants against their six-legged foes.

Usually it will prove possible to lay out a method of procedure, which will serve to protect his crop from both insect and fungous injury. The writer of this paper will be glad to take up in greater detail with those who are interested the matter of a schedule of treatment to protect the crop from its parasites.

During the address of Dr. Headlee, Mr. Dye, the Secretary, took the Chair.

Chairman Dye—Does any member wish to ask any question of the Doctor? If they do, now is the time.

Mr. Reed—Did you say anything there about the control of the wire worm? Can you say anything further about that?

Dr. Headlee—It is the nature of the wire worm to accumulate in grass lands. The parent beetles are known as "click beetles" or "jumping jacks," and lay their eggs during the summer in grass lands. About three years are required for the creature to pass from the egg through the wire worm stage to the adult. It is possible,

therefore, that any susceptible crop which follows grass within two years may be seriously injured. There is no satisfactory method by means of which injury can be avoided under these conditions. If you would avoid injury by the wire worm, you must not plant crops especially subject to damage on land that has borne infested sod within two years of the time of planting. Infested sod land should be planted to some crop composed of a very large number of plants per square foot, for the reason that the attack of the wire worm will be divided among so many plants that comparatively little injury will follow. In sections where wire worm injury is common, clover should be used as the only grass in the rotation, for while wire worms accumulate readily in timothy and other similar grasses they are comparatively scarce in clover sod. Of course, large numbers of the creatures can be destroyed by winter plowing; but badly infested land cannot ordinarily be freed by this means.

(President Frelinghuysen resumes the Chair.)

President Frelinghuysen—Are there any further questions you desire to ask of the Professor?

A Member—I would like to ask whether Pyrox on potatoes will prevent blight?

Dr. Headlee—I have not used Pyrox on potatoes for blight; but knowing that it is a combination of an arsenical and Bordeaux I should be inclined to think that it would control both blight and the flea beetle. In connection with the control of blight the prevention of the work of the flea beetle is of great importance, for the reason that the attacks of the beetle appear to spread the blight.

A Member—My experience is in using Pyrox in a small way, it is perfectly practical; that is, that it will control the blight and will control the effects of the flea beetle, but in using it on a large scale the cost is prohibitive. You have to spend considerable time putting it on and I have come to the conclusion that if you have a small batch of potatoes, half an acre or so, you might use it, but raising potatoes on a large scale, it is prohibitive on account of expense.

President Frelinghuysen—Are there any other questions?

A Member—They say it only costs sixteen cents a pound, while arsenic and lead would cost in the neighborhood of twenty-two

DISCUSSION.

139

cents. I don't know where it would be any more expensive. I was told by a man that through a part of his patch where he put it on he had five hundred and twenty-eight baskets on one acre. On the others where he did not put it on he did not have anywhere near as much, they did not do anywhere near as good, and he said that if you got it on just before the beetles came it would kill them and later on put it on again; he advised spraying about every three weeks with Pyrox and that is all they used.

A Member—The experience has been that you have to use from six to ten pounds per acre in an application of Pyrox and it costs about thirteen cents a pound. If you apply it every three weeks you can see where the expense comes in. We cannot use it around Freehold, where they raise from twenty to thirty acres of potatoes in one field.

Prof. Headlee—Will you tell us what you do use?

A Member—I have not used it myself. I say we looked that up very carefully with the intention of using it this coming season, but we dropped it on account of the expense.

Dr. Headlee—Of course, practically the same results should come from the use of a mixture of Paris green and home-made Bordeaux as from Pyrox.

A rising vote of thanks was given Dr. Headlee.

President Frelinghuysen—Dr. Cook, who will this evening give us a stereopticon lecture on diseases of potatoes, he having been in the West and found several new diseases of potatoes, has suggested that it would be good for New Jersey, as a protective feature, to form a Potato Growers' Association. I wish you gentlemen who are interested in growing potatoes would discuss this subject with Dr. Cook in order that at a future session of this Board this can be discussed and some action taken if you wish.

It gives me great pleasure now to introduce to you a gentleman who has visited New Jersey before, eight or ten years ago. The gentleman who is about to address you came to Trenton and delivered an address on dairying. We welcome him to New Jersey again, and he will now speak to us upon Potato Production from Experience. The largest crop at least expense. Dr. George M. Twitchell, of Monmouth, Maine. (Applause.)

Potato Production from Experience.

BY DR. GEORGE M. TWITCHELL.

There are some few essentials in potato growing which, we are learning, apply in New Jersey as well as in Maine, and, assuming that the conditions here are the same as there, I am going to talk with you for a little while as I would at home, and I ask of you if what I say is not applicable in your individual cases, that you will let it pass. If you want to take it, you can.

I want first of all to emphasize the right selection of land. There is some land where it is utterly useless to expect to grow a profitable crop, and it does not pay to grow potatoes unless you can grow a profitable crop. This growing of potatoes simply because our fathers grew them is a bad policy. We had better be doing something else. We must be looking for the returns, no matter what we produce or plant.

Fortunately, potatoes are adapted to a great variety of soils, but there are some soils to which they are not adapted, and it is for us to find what they are, and, having selected the field, we surely want to lay out our work with reference to the minimum cost of labor. That means a long furrow. It makes a mighty sight of difference whether your furrows are ten or forty rods long in carrying on profitable work, because everything must be done by horse-power. The day is past for us to grow potatoes by hand. We cannot afford to. The day is past for us to grow one or two acres of potatoes. We are compelled to do it in quantity in order to realize.

Another lesson enters here. We want to lay our furrows better than we have been laying them in the past. We are not careful enough. We are not plowing as deep as we ought to. I was glad to have a gentleman tell me to-day that he wanted to plow fifteen inches. When you get down there you are going to get a crop. Why? Because you are going to open up available plant food that you otherwise do not have and also going to find moisture. It takes a mighty sight of moisture to make an acre of potatoes, and if you can hold the moisture there for the season it is going to help you out when the drought comes, as it surely will. The deeper and the better you can plow, the better the crops.

I want to come back to the long, straight furrow, simply because the turning of the furrow at the right angle and turning it uniformly, has a great deal to do with results. It has to do with something else. I was standing one day, way down on the Eastern shore, in the State of Maine, by the side of an old friend, a little Scotchman, who, fifty-six years before, had taken his farm out of the wilderness. There were the furrows straight as an arrow sixty rods long. I turned to him, and said: "You are a fussy old man." He said: "Why?" "Look at your furrows, how straight they are." He looked at me for an instant, and stepping around in front of me, looking up in my face, said: "It is just as easy to lay a straight furrow as a crooked one, and means a mighty sight more to the man." The man who lays a straight furrow will be more likely to walk a straight path than he who zigzags.

There is the lesson, and it is an important one. The selection of land, and its preparation, is of vital importance, because it is the maximum crop we are reaching after, and the profit lies in the last bushel. There is where the cream is. So we want a long, straight furrow, want it laid correctly, especially at the right angle, and then we want to prepare that land thoroughly.

Farmers very often say, "How many times do you harrow a piece of land?" I would harrow it until it was right, if I harrowed all summer. There is no rule you can lay down. Harrow your land, harrow it until it is all worked into shape and ready.

You cannot grow a peck of potatoes in a two-quart hill. We have been trying to do that in Maine. We want a deep furrow, a thoroughly worked furrow, the land in light, friable shape so that the rootlets will not be obliged to search for food, and will not have to go very far to get it, but be picking it up all along the way, will not have to go through hard soil to get it.

Then comes the question of seed. Whether you use whole or cut, I would

POTATO PRODUCTION FROM EXPERIENCE. 141

always use good seed. I like to plant a potato that weighs about five ounces cut into four or five pieces. The time is coming when we are going to pay more attention to the question of shape—when the market will not accept Cobblers like this, with very deep eyes, and we will be weeding them out with the culls and growing those with shallow eyes. We want to get a uniform size, but we want the eyes set as evenly as possible over the surface of the potato, and then put one or two on each piece planted.

If you are planting whole seed, then, of course, use the size just below the merchantable potato, about the size of a hen's egg or a little larger. We want to be very careful how we select that seed. How do you select your seed? Well, I am glad to know that you come down to Maine, the fountainhead, and buy it.

But I want to say to you, friends, that it is a ruinous policy. I am a Maine man, and I am proud of my State and what we are doing, but I want to say that I should like to see the time when the farmers everywhere will feel conscious of their ability to do things themselves. There is no such thing as seed deterioration. It is the man that deteriorates, not the seed. It is seed neglect, friends, which is causing the trouble. It is wonderful what we can do with potatoes, as it is with everything else. All we want is to get a vision of a real man and what he is capable of doing, a potato man, yes, of a potato man, what he is capable of doing and the consciousness that things are in his hands to control.

I have a friend who was not satisfied with his Green Mountains and he said, "I am going to establish a type."

He went through his field at digging time. When he found a hill that was exceptionally large in stalk and abundant in leaf, well preserved, he dug that hill, and if it contained seven or more merchantable potatoes and only three or four small ones, he selected from those hills the type he wanted. And lo, in three years, here he had established a type.

Then he said: "I have accomplished that much, now I am going to grow a resistant potato." And so, guarding his crop, feeding it and spraying it carefully during the season, he followed the same rule; he selected his seed from the best, the most healthy, the most vigorous, the most rugged plants at digging time. In three years' time he has established a type which has been acknowledged all over our State as being vastly superior in resistant powers, resistant to bugs and resistant to blight. Not immune, but resistant to a much larger degree. In six years' time he has been able to do that.

We talk about seed running out. Here are a couple of Early Rose that have been grown on one farm forty-three years. Come and look them over and see if there is any sign of deterioration in those potatoes. They weighed, when I left home, a little better than eight ounces apiece. They have shrunk some because they have been in a warm room, but look over those potatoes after we get through and I should be glad to talk with you about them.

I am not here to give you a finished lecture; I am here to talk with you about this problem, hoping that I may encourage some one, stirring if I can some others, arousing a little more enthusiasm; but, above all, I want to kindle that desire and that determination on the part of individuals to go out and solve the problem for themselves. That and that alone is going to give us the quality of men upon the farm which the president indicated in his address this afternoon.

Then we need to know more about this question of fertilizer. We are using in our State as a rule, about a ton, of 4-6-10 or 5-8-7. Doubtless we are wasting an immense amount of money. Why? Because we do not know what our land wants. We are not feeding it intelligently, as we should.

Every man should be carrying on a series of experiments. A friend of mine within the past week said,—he is one of our most successful potato growers and one of the largest—"I have cut out nitrate of soda in my fertilizer in its first application." He is using tankage and dried blood with his acid phosphate and potash. He has cut out the nitrate of soda, because, he says, "I find that I have lost it; that before the plant can get in condition where it has thrown down its tap root, sent up a stalk, developed a leaf, and is ready for the nitrate of soda, the nitrate of soda is gone, and so I have changed. I have used in the hill and

broadcast, a fertilizer that carries about two to two and a half per cent. of nitrogen getting it from the dried blood and tankage, and then when that potato has broken the ground and the leaves have started, I will apply my nitrate of soda, I want them a fertilizer that carries four or five per cent. of nitrogen and six or seven per cent. of phosphoric acid and seven of potash. This I apply broadcast, and then the next day run my hiller over them and just draw it around the hill."

I am not going to say that is the practice for you. I do not say but that the 5-8-7 is the proper fertilizer, or the 4-6-10. But I do say that none of us know, unless we have experimented carefully, what is best. This kind of experimentation is necessary for every farmer to get the maximum profit from his crop.

We have been troubled in our State with getting abnormals. Have you ever had that trouble in New Jersey? By these I mean potatoes over size. The market does not want them. I have been told by some here that it does not make any difference whether a potato weighs eight ounces or sixteen, they will take them just as quick. They are not going to, gentlemen. The time is coming when you have got to have uniform stock. You want to minimize the number of the overgrown.

How are you going to do it? The Aroostok County growers say that they have settled the question by reducing the space between the rows from thirty-six to thirty-two inches and the space in the rows from fourteen to nine inches; I am not giving that to you as the rule, but something which you want to test out for yourselves. It makes a big difference whether you get sixty or eighty per cent. merchantable potatoes. One insures profit; the other comes too close to loss.

The best time to spray is before the potato bugs begin to work. By the way, I don't know as the President will agree with me, but I want to say that the potato bug and the blight spore have been the two best friends that the Maine potato growers every had. Do you believe it? If it had not been for the potato bug and the blight spores, we never would have raised the crop of potatoes we have raised this year. Why? We would not have had the incentive. You never knew a man to do anything unless there was an incentive. These friends have taught us the value of the crop and how best to preserve it. A man never does any more nor any better than he is obliged to.

A man's best friend is adversity. It forces him to do things.

The potato bug is a good friend, but you want to be very sure that you are there to take care of him in season, and the best time to spray is before he begins his work. I like to spray when the vines are about four to six inches high. That is considered by some to be too early. They are spraying when they are about six inches. We cannot plant our potatoes until the last of May or the first of June, and the first spraying is about July 4th to 8th and the second ten to twelve days later. I would spray the second time just as the little slugs hatched, when they can hardly be seen. Use Bordeaux mixture with the insecticide, so that we would be sure to take care of the flea beetle. I would not wait for the slugs to get half grown. If you will spray when you can see those little black specks at the heart or crown of the potato, before you can distinguish their shape, it takes but a very small amount of insecticide to destroy them. If you wait thirty-six hours you will have to use twice as much. If you wait forty-eight to sixty hours, it is almost impossible to kill them.

Whatever insecticide you use I would combine with the Bordeaux mixture and then spray and spray frequently. How many times shall I spray? Spray as often as necessary. It is the crop you want, and the only way to get it is to conserve its best growth and development. You cannot get that crop unless you are able to protect to the end. A potato is eighty per cent. water and one or two per cent mineral matter and the rest is starch, and we want sixteen to eighteen per cent of that element, the source of which is not fully known, but we believe it to be the elaboration of the sap in the leaf of the potato.

If that is true, then surely we want to safeguard those leaves, every one of them. The more vigorous the growth, the larger the leaves, the heavier the

POTATO PRODUCTION FROM EXPERIENCE. 143

yield and the better the quality of potato. The market is calling for sixteen or more per cent. starch.

A prominent Chicago house has within the past two or three weeks placed a contract for fifty carloads of potatoes in Idaho, every potato to be wrapped in paper and packed in boxes as they are packing apples. That means uniform size.

Some will say "Oh, well, that is fancy." Yes, it may be, but I do not care what the fancy is so long as the man is ready to pay for it. That is all we want to know. If he wanted every one of them gilded we would gild them, wouldn't we, if he would pay for it?

There is a condition that is coming in the market shortly. The best restaurant keepers in the City of Boston are paying sixteen to twenty cents a bushel more for their potatoes, but they insist upon their being graded. They want a potato from five to seven ounces, of blocky shape, and they will only take the large ones, twelve ounces or more, at a lower price and use them for other purposes.

They are studying economy in their business, and so should we now in ours.

If we can eliminate in any degree those abnormals by narrowing the space between the rows and narrowing the space in the hills, and by studying the question of feeding, then surely it becomes not only our privilege, but our duty.

We cannot emphasize too much the necessity of our putting more starch into our potatoes, and of thinking more of the culture than we have in the past.

I know when we narrow the rows and reduce the size of the hills, there will come increased labor on the man to maintain his yield. You should increase seed from twelve to eighteen bushels per acre, and this increase should yield proportionately. It is going to call for a closer study of the question of fertilization, but I submit, friends, that being the condition of the market, is what is coming. We must prepare for it.

You may not feel it to-day in your markets here, but I have no question that the time is not far distant when we will find that we must guarantee the quality of our potatoes. The time is coming very rapidly, I believe, when the man who can go to the market and say, "I will guarantee you sixteen or more per cent. of starch," will find he will get price proportioned to the value.

I have here some figures of production on a five-acre lot, which will serve as a hint. It was light soil, free from stone. It was old pasture land, and the turf broke readily as we turned it, so the cost of cultivation was not great:

Plowing five acres, cost	\$ 15.00
Harrowing	6.50
55 bushels seed	24.00
Fertilizer	105.00
Cutting and cartage	8.00
Cultivating	6.00
Bordeaux mixture	8.50
Bug Death	18.00
Paris green .....	.20

I will say, I was testing Bug Death, to see what I could do with it as an insecticide, and not being able to get my supply regulated, I ran out of that and I started in on Paris green and went over one acre, and not being satisfied with the results, we waited until the next day. The Paris green did not have a good effect; it burned the leaves, whether it was because of its unevenness or its difference in strength, I do not know.

Spraying, four times,	10.00
Digging by hand and loading on train, one-half mile from the field	86.00
Rent of land	25.00

Making the cost\$312.00

Cost per bushel, 20 3-4 cents.

Of course, those figures simply approximate so much, depending upon the location, nature of the soil, shipping facilities and other items.

The next year we dug five acres with machine at a saving of forty-two dollars over hand labor.

This first crop was wanted for seed by one of our old seed concerns, and being a half-mile from the farm houses, half way to the station, I put it in a barn, a cool, comfortable place, and it remained there for ten days. Then I found that the rats had commenced to work, and put the potatoes on a car and shipped them, five hundred bushels, but in the ten days they had shrunk ten per cent. The lesson is that potatoes want to be taken care of just as soon as dug out of the ground, leaving them only long enough to dry. They shrink very rapidly, and if it is simply water that shrinks out, it is worth just as much per pound to the grower as starch if he takes it to the market.

What are some of the lessons that we want to emphasize? I think the first is to increase the yield. The average yield of the State of Maine is 262 bushels. The average yield in this State is, I think, not far from 110 bushels, yet there are men in this audience who are raising as many potatoes to the acre as almost any man in Maine. The contest this year for the Bowker prizes brought out this fact, that out of a hundred and thirty who entered, thirty-two remained in to the finish; of those thirty-two, eighteen raised more than three hundred bushels; eleven raised more than four hundred, and four raised more than five hundred. The gentleman who raised this potato (indicating a Green Mountain before him) raised 546 bushels to the acre. The second sized potato was a Belle of Vermont, grown by a man in that State, and the yield was about fifteen bushels less.

If there is any one lesson to enforce upon the platform before an agricultural audience, it is this, that no man knows the limit of production from the animal or the acre. Mr. Fields' cow holds the record of 29,000 pounds of milk, beating her mother about two thousand pounds. Some may say this is the limit; yet I believe if we asked Mr. Fields, he would say, "I believe that she will do better next year." Why? Because of the great fact that we do not appreciate, that the possibilities of an acre of soil or an animal are not to be comprehended by man. It is the man with a large appreciation who can succeed. If your measure is a hundred bushels, you never will grow 150. If your measure is a thousand bushels, you will come pretty near meeting it some time. Oh, I like to emphasize the fact that it is the man all the while, no matter what the work. We must do work which will call up the inherent qualities, the kind which will develop, the kind which will awaken to the important consciousness that man is co-operating with the greatest force of the universe, and that this will be with him in his work on the field. We want the man who has the conscious dignity of manhood and is seeking to raise to the highest level. You know, the Good Book says that "the people without a vision perish." It is true, and that has been one of the causes in the past why we have not succeeded better, one of the reasons why agriculture has not been more harmonious, why so many boys get out from the home on the farm and go to the towns and cities, not to find success in a great many cases, but to find disappointment. They have gone there because they have not seen at home the evidence of this vision, or because it has not been opened up to them. We want a vision of an acre producing the utmost and then we want to go to work and make that vision a reality. We want a vision which will bring a larger conception of the productiveness of the soil, by lifting, lifting, lifting, not only the standard of production, but the quality of men day by day. Here is the supreme reason why yield must be increased, quality made uniform, yes, improved uniformity established, and markets opened.

Gentlemen, it is a comparatively easy thing to produce a hundred bushels of shelled corn to the acre. It is an easy thing to produce five hundred bushels of potatoes to the acre.

The difficult problem comes when we attempt to market the same to the best advantage, and here, strange as it may seem, farmers have stood as units in the market contending against each other. We have been preaching co-operation for years in the State of Maine, and have yet to see the first permanent results.

POTATO PRODUCTION FROM EXPERIENCE. 145

Somehow the American farmer seems to stand with a chip on his shoulder. He calls it personal liberty, the right to do as he pleases. That chip has got to come off. It has had to come off in every other line of business. It has had to come off because men found that by coming together and uniting together, and working together they could obtain results otherwise impossible. When we as workers on the land come to feel that we shall find benefit in disposal of our products, and after that we will realize what its importance is. Some men have their individual markets where they are getting all that can be obtained. But the great mass must ever be dependent upon the greater market, and in order to control those there must be a coming together of the producers. This, and this alone, is going to give us the best returns from our work.

In this imperfect and very crude manner, I have gone through the story of what I would do in growing potatoes, what the Maine men are doing in growing potatoes, how some of them are succeeding. I have not given you my own experience alone, I have been speaking out of a broad acquaintance with my own State, and you know we grow about thirty-six million bushels of potatoes yearly.

It is only a few years in our Institute work since we urged growing potatoes. We were met at once by the remark all over the rest of the State, "It is no use for you to urge it, we cannot grow potatoes. They can grow them in Aroostook County. We cannot grow them here." It took years and years to break up that sentiment and get the counties outside to produce more potatoes. To-day those counties outside produce more potatoes than are produced in that county, and they are finding they can produce as many per acre and of as choice quality as can be grown in that wonderful county in our State.

If there is any farmer here who has the feeling he cannot do it, I want to say the one thing for him to do is to go home and try honestly, faithfully, intelligently.

Speaking in Massachusetts one day upon the low cost of pork production, having carried on some experiments for several years, I thought by the impression of this audience, that they were not taking much stock in what I said. I stopped and asked, "Do any of you believe what I am saying?" And three men spoke up at once and said, "No." I said: "Did you every try it?" "No," they had not.

Before we condemn, let us try. Before we say a thing is impossible, let us experiment. Before we assume that we know it all, let us get down to some of the simple principles and find that we know but very little.

The man who starts out this Spring to grow potatoes and makes a success, is the man who will select his seed as he should, will fertilize or seek to fertilize to secure the maximum result with the minimum loss of food material, will spray thoroughly throughout the season, will keep down the weeds, because you cannot afford to pay good money for high cost fertilizer with which to grow weeds, and observe every detail. The man who will do that and guard his crop, and then dig and put them on the market at the right time will succeed.

If you prepare your land thoroughly, if you protect them from the bugs, if you feed the right kind of food, so as to keep them growing rapidly, and dig eighty days after planting, you will get upon the average, about 125 bushels per acre, leave them fifteen to twenty days longer and you will get 250, fifteen to twenty days longer and you may get 275. So long as you can keep the vines green and the leaves in good healthy condition you will be making tubers. Market price must determine how long it will pay to let them grow.

That is a question for you, not for us of Maine. We do not plant until about the twenty-fifth of May and dig the first of September or the middle of the month.

Here is one of the mathematical propositions to be determined by the individual. Here is where the man comes in, and somehow we reach the man everywhere, no matter which way you turn.

This is a simple story I have told you. I know there is something in it because I know of men who are making a success in my own State by following these steps, and I know of men who have told me since I have been in New Jer-

say what they are doing on their own farms. Don't go away and say, "That's a fairy tale." Don't go away saying, "There is nothing in it." I want, if I can this afternoon to shake the mental powers just a little, I want to disturb the kaleidoscope of your brains so that when you go out from here and take up your work to-morrow you will see it from a slightly different viewpoint and feel a little deeper that determination to find success.

President Frelinghuysen—We have listened, I am sure, with a great deal of pleasure to this interesting address, are there any questions you would like to ask?

A Member—I would like to ask the speaker about how deep he plants potatoes?

Dr. Twitchell—Four inches. We have tried deeper planting. I think that is the general rule. Some work was done within the past two or three years at our State farm in hilling, medium, high and even culture, and they found the best results from medium ridging. We want three to four inches of soil worked well beneath the seed and four inches of equally well worked soil on top.

Mr. Randolph—Have you told us anything about the treatment of the seed?

Dr. Twitchell—No, I have not. I am glad you raised that question. There are two or three things suggested and I will try to touch on one where I had a little experience. I have been growing seed on a small scale for several years, for one of our seedsmen, shipping it from the field.

I have no seed to sell, so I can talk to you. I put in the cellar in 1910 what I wanted for the next year, and shipped the rest. When I came to plant in 1911, I fell short and asked them to send me some from the seed house, a couple of bushels of those grown by me. When it arrived I had used up my seed and cut the other and put it in the ground without waiting, and I got a lesson. I wonder if you ever got the same. Less than sixty per cent. of that seed came. The rest of the seed all came. The only difference was that one had been kept in the cellar and the other in a potato storehouse and taken out of that storehouse and shipped direct to me. I want you to know that I travelled over that little piece of potatoes more than I did on any other piece of land, all the summer trying to find what was the cause, and I finally settled down to this, that the reason for that seed not starting was that it was too cold when I cut and planted. I have since found others who have had the

same experience and they find relief by bringing the potatoes out of the cellar and spreading on the ground four or five days before planting, so that they will warm up.

Since I have been here I have met those who have had the same trouble and naturally charged it to poor seed. If you are buying seed that comes from a storehouse where the temperature stands at about forty or below, not cooled artificially, but simply closed in in the fall, and the temperature brought down and then kept uniform for the winter, the seed is not in condition to be planted. It should be spread out on the grass for several days and allowed to warm up. That will save you from a possible loss, and the seedsman his reputation.

A Member—Will you demonstrate to us how you cut such a potato as this (indicating a potato on the table)?

Dr. Twitchell—I like to have my seed pretty uniform, the eyes at equal distances as possible. I want as large a piece as would easily go through the planter.

A Member—Would you discard the seed end?

Dr. Twitchell—Why? Well, our grandfathers did it? A man said he did not build a post and rail fence because his father never did. Now, our grandfathers used to cut off the seed end. No one can say why. I never saw any one who could give a reason for it, only that they used to do it. No, I would plant the whole potato if small enough, or cut the whole of it to get blocky pieces with one or two eyes.

A Member—Do you pay more attention to the size of the piece than you do to the eyes of the potato?

Dr. Twitchell—Yes. I would want blocky pieces. The size of the piece insures life until it has thrown down a tap root and also shoots out to catch the air. After the potatoes are out of the ground and begin to develop their leaves then the leaves and the roots begin to search for food.

A Member—How were those potatoes grown where he got seventy per cent., uniformity of size?

Dr. Twitchell—He planted the rows thirty-two inches apart and the seed nine inches apart, and got seventy-seven per cent., between four ounces and twelve ounces.

A Member—How much fertilizer did he use on that?

Mr. Twitchell—One ton.

A Member—We have a hard job keeping our seed potatoes from growing, they will shoot out and lose vitality. How can we keep them in better shape?

Dr. Twitchell—The only thing to do is to keep the temperature down.

A Member—In cutting your seed, do you prefer to cut them and plant them immediately?

Dr. Twitchell—Our growers usually cut it the day before we plant.

A Member—Would you cut it two weeks in advance?

Dr. Twitchell—I would not want to cut it too long in advance, because evaporation takes place and that makes loss in vitality. If you can keep the seed covered up, say on a lawn or a cool place, of course, you can prevent that evaporation.

A Member—How would you get the extra starch which you recommend?

Dr. Twitchell—That is the elusive element. We get the extra starch by protecting the vines and increasing the leaf growth. If starch be formed by the elaboration of the sap in the leaf then of course it is dependent upon the size, character and quality of the leaves, and in this way they are protected. That is why I would not use Paris green as an insecticide, because I never have seen it used where you did not get some of its burning effect. Take a magnifying glass, you will find those little yellow specks upon the leaf. These close up the pores of the leaf. I would rather use arsenate of lead with my Bordeaux mixture if I was going to use arsenic. We want the most rapid growth from the fifth to eighth week and this can come only by protection.

Some of the larger growers in my own State have been putting no fertilizer at all into the drill; others the whole and both grew good crops. That is why I suggest that a man must be a law unto himself. It is a matter of experiment, but I think we are coming gradually to the belief that the distribution of the fertili-

DISCUSSION.

149

zer through the ground, is better than its concentration, and when you are growing potatoes, I firmly believe it would pay any man to put one-third of his fertilizer upon the surface after they broke the ground and bury about the hill at once.

A viva voce vote of thanks was given Dr. Twitchell.

President Frelinghuysen—Now, are there any resolutions to be offered?

Mr. Gleason—I offer a resolution, as follows:

As New Jersey has never yet had a comprehensive exhibit of farm products from the several Counties of the State, and believing that such an exhibit would be of much value in an educational way,

THEREFORE, BE IT RESOLVED, That the Executive Committee of this Board be and are hereby requested to arrange for a comprehensive exhibit of the products of our farms from all the Counties of this State in connection with the next annual meeting, at such place and time as may be by them thought most desirable, and that they invite the State Horticultural Society and the State Grange to co-operate in this movement.

President Frelinghuysen—The resolution will be referred to the Committee on Resolutions.

Are there any other resolutions? If not, I would like to call your attention to the exceedingly interesting programme for to-night, beginning at 7:30, "Lessons from the New York Land Show," by Professor Blake, and "Diseases Affecting Potatoes," by Dr. Cook.

Possibly some of you may wish to discuss with Dr. Cook the question of a Potato Growers' Association, and that he will be glad to do after the address.

If there is no other business, the meeting will stand adjourned until 7:30 o'clock this evening.

SECOND DAY—SIXTH SESSION.

The meeting was called to order by Vice-President Cox at 7:30 P. M.

Chairman Cox—The first matter on the programme this evening is an address: "Lessons from the New York Land Show." This subject will be presented by our own Professor Blake, who

superintended the Exhibit made by the State of New Jersey at the Land and Irrigation Exposition. Mr. Blake will now address you. (Applause.)

Lessons from the New York Land Show.

BY PROF. BLAKE.

Mr. President and Members of the State Board of Agriculture, Ladies and Gentlemen: As we are to discuss an exhibit, it would seem proper to consider for a moment the objects of exhibits, or, perhaps more specifically, the objects of agricultural exhibits, and we must say that the principal object in agricultural exhibits is their educational value. That is their only reason for existing. If an agricultural exhibit has no educational value, it should never be shown. It has no place, whether it is a State exhibit, a County exhibit or a State Board of Agriculture Institute exhibit.

And to me, that is a very important point; it is a thing that should not be lost sight of where any agricultural exhibit is held.

Aside from the educational value of that agricultural exhibit, it should, in a way, be an advertisement of the crops that represent any particular County, or any particular State, before the people of other Counties or of other States, regardless of the value which it may have in showing proper selection, freedom from disease, trueness to shape and other qualities.

A State exhibit involves certain questions and matters and principles that do not come up with a small County exhibit, or where an exhibit is held within a State. When a State exhibit is held, it should represent larger things than the County exhibit or the small exhibit. If it is an agricultural exhibit from a State, representing a State, it should certainly try to represent the important crops for which that State is noted, and when we consider those matters in connection with New Jersey, we have to consider, the cranberry crop, the flower production, the sweet potato production, white potatoes, fruits, vegetables celery and a number of similar crops.

Most all State exhibits are also held under limited conditions when they are held in competition with other State exhibits especially, and in large exhibits held in large cities, exhibits of that kind are expensive from the standpoint of space. In this building here you have plenty of room for your exhibits. But most of our large State exhibit expositions, the space is exceedingly expensive. Sometimes two or three dollars per square foot, and only a limited amount of space can be purchased for any one State.

That means then that we must select a few exhibits and have those united in such a manner that they will be representative of the State and make it worth while to exhibit in the small space allotted.

I think perhaps few of us realize how expensive it is to get up an exhibit and hold it in a city like New York. The original cost of space is great, to say nothing of the expense of working and carrying on such an exhibit.

When we plan to carry out a State agricultural exhibit we have a certain space designed and allotted, and the first thing that must be considered is how that space is going to be distributed between the different crops. We will say we have a space forty by fifty-five feet, which was the amount of space secured for the New York Land Show. That is a comparatively small amount of space. If we should call on one County to supply an Exhibit for that space and it responded liberally, we would have more material than we could put on that space.

You will see the problem at once. We have at least a half dozen important crops or industries that should be displayed. It means then that the quality of the material displayed must be high, because the quality necessarily must be small. It means also that every part of that exhibit should be as well grouped as possible. You are possibly competing with other States who are also making effort to bring to the front their agricultural products.

In a State display also, there should be a unity of design. The whole exhibit should represent something, and when the matter of the State exhibit was taken

LESSONS FROM THE NEW YORK LAND SHOW. 151

up we considered an idea to be followed out in connection with the exhibit.

As you all know, New Jersey is known more or less, within its confines at least, as the Garden State. It seems to us that no better idea could be followed out in connection with our exhibit than to typify as far as possible the Garden State. And with this idea in mind, the exhibit was planned and designed upon that basis.

I want to call another matter to your attention. In connection with all exhibits of this kind, the question comes up; "Are you going to show live plants, live fruits, live vegetables? Or, are you going to show, canned vegetables, or canned goods or preserved materials?" And this fact is too often lost sight of. The thing that we are most interested in from the standpoint of our agricultural exhibits, is to see those materials in their living condition, as far as possible, or in their growing condition. Suppose, for instance, that I should bring in a bunch of bananas, and put them on display here. How much attention would that bunch of bananas receive from the public? Very little. But, if I should bring in a plant here, with a bunch of bananas growing on it, it would attract a great deal more attention. The same thing is true with a package of preserved peaches or preserved apples. Suppose, for instance, that I bring in a jar here of peaches or apples that are pickled in a certain solution to keep their form. Compare the amount of attention that would receive with an actual basket of fresh peaches on exhibition. That is a thing that I want to emphasize, and as far as possible in every exhibit of this kind we should try to get as near the fresh condition in the display of our fruits and vegetables, and when you are in competition with other States, a thing like that will count wonderfully.

You can often display a considerable amount of fruit in a solution to preserve it. But that takes a good deal more care and ability. But stage fruit that is past its season, in a fresh condition, and that will bring the attention. And that is a thing that we tried to carry out in connection with the State Exhibit at the Land Show.

There is another matter too, that should not be forgotten in an exhibit of this kind. No matter what the quality of the products of any State, the displaying of those products will count for a great deal. No matter what the quality of your vegetables, if you bring them in and put them together in a heap on the table, they will attract very little attention. They must be arranged to show off their quality.

The question of whether you will display in a commercial package, or whether you will display them on plates has to be considered. But, the principal idea is not to stick to the old method. Try to develop something new every time. Show that you not only know how to grow the products, but you know how to arrange them in neat and new ways, to show them to the best advantage. That is another thought.

I said that we first worked out a design to represent a single idea. This idea was that New Jersey represents a Garden State. The idea was to arrange this exhibit if possible, as a garden. Mr. William A. Manda of South Orange assisted us materially in working out the details of this plan. Briefly, the space was outlined, with a private hedge, with boxwood at intervals. Many of our gardens in connection with our country homes and estates are outlined with a privet hedge. There are certainly many miles of privet hedge in New Jersey. Besides, this hedge would be a living hedge. Unfortunately the air conditions in the Armory were such that it was impossible to keep this fresh for many days, and we had to renew it with cedars.

The space was divided up into plots; the front part of the exhibit, by the front entrance representing floriculture, the cranberries representing fruits, apples representing fruits on this side, sweet potatoes, vegetables, white potatoes and also some fruits.

As we went back toward the rear of the exhibit we had our poultry at one side, also a dairy exhibit, representing a dairy, an exhibit of corn, the figures representing the grains; and at the front of this whole here we wanted something of especial value, and we had two large maps of New Jersey, one showing the topography of the State, that is the hills and the streams and lakes and

the coast line, and another map designed as a crop map, beside it, showing the value according to the 1910 census of the various farm crops in the State according to the Counties.

We tried to do the same thing with fruits and flowers, but we could not complete the map in time, because we could not secure the statistics from Washington. But that map will be completed.

In front of those two maps we also had a soil map with about thirty-six samples of soil from as many portions of the State, with a list showing the crops best adapted.

These three portions of the exhibit in themselves would be worthy of an exhibit at a World's Fair anywhere. The amount of information there would keep one interested for a long time, if they were interested in the topography and the crops and the soil conditions of the State.

In taking up this work, after having our design, the question was to get material for them. In carrying out the garden idea also, it would not be possible to have anything very high there, as it would cut off the view from any portion of the exhibit.

I want to bring out one other point in connection with an exhibit of this kind. I think that possibly some people in the State wondered why we did not put up a more general call for materials of all kinds, why we did not use such materials as pumpkins and squashes and that type of vegetables. I called your attention to the fact, in the first place, that space was expensive. In carrying out the details also, it was a question of getting a certain amount of material from a certain space, and that should be of the highest quality.

That also brings up the question that if we should call on a considerable number of people in the State and they had responded, you might get a lot of material that could not be used. One of the States last year at the Land Show did that very thing. They had several carloads of material that they could not show. Now, those people who went to work and got that material together, were certainly very much disappointed. We did not want anything like that to occur, so that we worked out our plan, figured out the amount of material we wanted and then tried to get it.

The first crop that we tried to secure was the potatoes.

I also called attention to the fact a few moments ago that we tried to work in new ideas, to show that we did not have to follow the same thing that had been carried out before. We thought that we had a new idea here as to eggs, using green sawdust separating the eggs so that the different designs would show up prominently.

Our figures of grains on the rear wall of the exhibit could be seen from the very entrance of the exhibit and they attracted a great deal of attention. I was asked a good many times where we got such grain as that to make up those figures, such tall grain as that. Why, it could not have grown in New Jersey.

In calculating our potato exhibit, we felt at first that this would be one of the easiest of our problems, that it would not be a difficult matter to get a large exhibit together. But it turned out to be the case that it was one of the hardest. You have all heard it said that a presidential election causes a great disturbance all over the country. But I did not realize that such a thing would have the influence that it did the past year. It seemed to have an influence under ground as well as above.

I am afraid that some of the growers in the State felt that we did not know very much about picking out potatoes for exhibition. That our ideas, perhaps, did not agree with the ideas of the growers. But the exhibition of potatoes is a different matter from growing them. And one thing that I want to call your attention to here tonight is that in exhibiting potatoes we need to give just as much care to the selection of the type, the uniformity, the freedom from scabs and cuts and blemishes, as the fruit grower does to his apples or to peaches. We have a few specimen here sent in in the same box. The three upper potatoes compare very well in uniformity, smoothness and all around quality. We have two potatoes here at the bottom however, that are off type. In the same box

LESSONS' FROM THE NEW YORK LAND SHOW. 153

that would not make the most uniform representative sample of that variety. The selection of potatoes, whether sweet potatoes or white potatoes, or carrots or any root crop for exhibition is a great deal more difficult problem than the average grower thinks and much more difficult than the fruit grower has in selecting his apples. The potato crop is grown under ground. The potato may be injured by worms or it may be injured by the digger and it has a great many troubles which may cause blemishes, while if the fruit grower thoroughly 'sprays, and sees that the fruit has plenty of air, he has it above the ground where he has a better chance of keeping watch on it and seeing how it is growing and he is better able to select it. It is a much larger problem to select a good potato or sweet potato exhibit.

Now, if we were displaying peaches or apples, the fruit grower certainly would not display a specimen of that size on the same plate with a specimen of that size if he expected to get any premium for it. We have to do the same thing in selecting potatoes and sweet potatoes, and carrots and other vegetables. The fruit grower who expected to make a fine exhibition, perhaps to win a premium against close competition, would not have a specimen of fruit that has a single scab spot on it. We must have the same thing with potatoes, if we are going to have a high grade exhibit. When it comes to uniformity in exhibiting potatoes, or sweet potatoes or vegetables, we need to use just as much care in selecting each specimen as a man would in exhibiting a crate of peaches to make a good high grade commercial exhibit.

I would say too that we do not want to make the mistake of displaying great immense specimen. That is the tendency, but if you are going to exhibit,—if you will go to any exhibit of any kind where close judging is followed, the great overgrown specimen are not considered for a minute. I was criticised for not taking the largest specimen possible and taking them over to New York. I was told that Colorado potatoes would be so much larger that we would be out of sight. But, as a matter of fact, a prize was offered for the fifty largest potatoes over there, and I saw a question in the press a number of times, what was the object of offering such a prize? Certainly, it is all right to display immense specimens as a matter of interest, but for a matter of education of the people in the State who are going to eat the vegetables, we should represent the best market type, show that we can grow them uniform in size and color and smoothness and quality.

Onions and other exhibits. We had to give just as much attention to the selection of onions for exhibit, according to size and freedom from blemishes and other qualities as we did for our fruit.

The exhibit of vegetables put up by New England last year is of interest in connection with the discussion of exhibits. This display of vegetables was put up in a standard box used in that section, holding one bushel. Notice the uniformity in the potatoes, in the onions, in the cucumbers, in everything, in the celery, in the peas, everything displayed in those packages. That is the sort of an exhibit that really has a meaning.

This shows sweet potatoes. Sweet potatoes are decidedly variable as to shape and size, even in the same field, yet in getting up an exhibition we should have them absolutely uniform, if possible. Select a good shape and see that it is uniform. In one package that we had sent in to select from to get up a half bushel, I picked those three potatoes. It is impossible you see to find any two there that would hardly compare as to uniformity. This one would be very much better. If we were able to get a good many boxes like that. And that is what we should work for, uniformity and of a good smooth shape.

I want to say that our County fairs and other exhibits should receive more attention from the farmer. I found in trying to get this State exhibit together that those men who had had experience on fairs, were the men that could give us the best help. They were the men who turned in the potatoes and vegetables in the best and most carefully selected condition, and when it comes to the State making a showing anywhere, those are the men who can do the work, and if those exhibits are properly arranged and properly carried out, prizes are properly offered, they should be the means of much good throughout the State. It

should encourage the growers to select properly. That should be the object of State exhibits.

This will give you a little idea of the way our sweet potatoes were staged, in boxes; the photograph, of course showing them much larger than they really were, or perhaps that will give you the impression. The question would come up whether hampers would not have been the best package to display the sweet potato in, the commercial package of the State. In connection with our garden idea that would not work out very well. In comparison also to the hamper the sweet potato would make a much better display in that sort of a package. That is the reason the commercial package was not used in this case. Oftentimes the commercial package, when there is a large amount of fruit on display, does not show up to the best advantage. If it is, of course, a commercial competing display, there is no question the commercial package has to be used.

In connection with our egg display, as you all know, a New Jersey exhibitor won the silver cup for the best dozen brown eggs. We also received honorable mention for the best dozen brown eggs, for the best dozen white eggs also.

You all know that we also won the sweet potato cup, and it is well for us to consider that a few men really did the work. That if it was not for the efforts of a few men it is very doubtful if we would have had any such display. In getting up an exhibit of this kind we found that was true in regard to a good many crops. We need more men in the State that would support exhibits of this kind. We need more men who have had some experience, who would be able to assist in an exhibit of this kind.

You also know with what success we exhibited corn at the New York Land Show. I want to call attention in this connection to another matter. In a State exhibit of this kind, perhaps there is a feeling among some that whoever is put in charge is perhaps not altogether the responsible man for the work. There seemed to be a feeling in some cases of a lack of confidence in the carrying on of the work. Now, I want to impress one idea upon you and that is, that anyone who has charge of an exhibit of this kind representing the State, must accept the responsibility, and if the exhibition is not a success, the superintendent is the man who is to receive the kick. That is not so much the criticism that might come from within the State as it is, for instance that our crops were fine, but such remarks as "New Jersey had fine crops, but they were wretchedly displayed." That matter came up in connection with our corn exhibits. One man sent in some corn for display, and it was very badly mixed on the ear. I did not display that sample of corn. This gentleman came to us and asked why we would not display his corn. I told him that the corn was not up to the standard for exhibition. He insisted that it was good corn. The States everywhere had twenty-five or thirty entries of corn there of the highest standard, and you put one sample in there that is mixed, poorly selected, and someone would make the remark, "Yes, New Jersey had good corn there but they had some poor corn there too. How did it happen that such a sample was allowed to be staged?" That point must be kept in mind.

I even requested one of my own friends to send corn to that show and when it was received in New York it was not good enough to go with the specimen that had been brought out from some of the other Counties of the State. We could not stage that corn. I believe that is the only way to get an exhibit that everybody will recognize as fine all the way through as regards selection and the way it is staged, and proper experience at our County fairs in such matters, and in all exhibits will insure us a higher grade of selection. I know that some perhaps are discouraged because they did not receive prizes. Perhaps some mistakes have been made on the part of the judges. But you should not be discouraged. If the different ones will work together it is very likely that those things can be corrected.

We need to look to an exhibit of this kind when we may be called on to show what the State can do and that we will be prepared not only to grow the products but to know how to display them so that we will receive proper attention.

I think those are points that we should not overlook.

At the close of our Land Show in New York, and I think without boasting at all, that we can say that we had crops there that cannot be obtained in any other State, that we can get an exhibit together that will astonish people in every State anywhere near us. That is amply illustrated by our exhibit of apples, by our exhibit of corn, by our exhibit of sweet potatoes, eggs, cranberries and other crops; and I should mention the matter of the cranberry bog before closing, that growing lot of berries attracted more attention from the people of New York, was advertised on the outside of the building more than any other part of our exhibit, simply because it represented growing and living material.

And that thing should be kept in mind, no matter what we display at outside places.

We also had peaches exhibited there, Elberta Peaches, grown in the State. No other crop of that fruit was displayed by any other State or represented in that condition.

We have a great deal to congratulate ourselves for, but let us take considerable interest in the exhibitions. I always commend a man who will bring fruit or vegetable to a Farmers' Institute, no matter how poor it is. He has got the right spirit. It will be compared by his neighbors. Some good will certainly come of it. I should look at it in that light, and we will be prepared at any time to show that we can properly represent what we are able to grow. I thank you. (Applause.)

Secretary Dye—Mr. Chairman, I move you that a vote of thanks be tendered to Professor Blake, not only for this interesting résumé of what was done in New York, but for his services there in setting up and keeping charge of that exhibit which was such a credit to the State. I move a vote of thanks.

(This motion was duly seconded, and, on a vote, carried.)

Chairman Cox—Professor Blake, you will please accept the thanks of the State Board of Agriculture for your interesting address and for your work on our behalf.

I now have the pleasure to present to you Dr. Mel. T. Cook, our State Plant Pathologist, who will talk to you with the aid of picture slides on "Diseases Affecting Potatoes." Dr. Cook. (Applause.)

Diseases Affecting Potatoes.

BY DR. MEL. T. COOK.

It is wise for us to consider some of the disadvantages under which we work,—to consider some of the dangers that threaten our growing interests in this State. And for fear that some of you who are not engaged in the growing of crops may come to the conclusion that the life of the farmer is one of ease, that it is a pathway of roses, it is wise for you to see some of the enemies which he has to combat.

We are coming more and more to appreciate that plants suffer from diseases, that those diseases are very similar to the diseases of animals, and that while some of them are curable, a great many of them are preventable in a measure, and that it is possible to control them, to reduce them, and thereby to increase our crop.

The history of agriculture throughout the world, as well as in this country, indicates certain crops are usually grown in a locality for a limited time and then give way to other crops. Some crops are grown in a certain locality or even on the same land for a great many years, while others cannot be maintained with profit for more than a very few years. The explanations are many; sometimes it is due to changed soil conditions; sometimes it is due to insects, but by far the most important reason is the increase in plant diseases.

Now, at the present time a great many of our people in this State are engaged in growing potatoes. We look upon it as a very good industry, and up to the present time we are having a minimum of troubles, a minimum of diseases, and yet we do have a great many of the diseases of the potatoes here, and these diseases are increasing. My conversation with people here to-day indicates that the diseases are on the increase, and people are coming to appreciate that something must be done if we are to preserve this industry in the State.

Last week I attended a meeting of the American Association for the Advancement of Science at Cleveland, Ohio, and at that meeting we had about a hundred or a hundred and fifty pathologists from various parts of the country, and on our programme we had a number of papers on diseases of potatoes. Those papers came from various parts of the United States, and as I listened to them I came to the conclusion that we people in New Jersey were really blessed, that we did not have as many troubles here as they were having in some other places. Why, do you know, in some of the great potato growing districts of the West they are to-day unable to produce more than about one-tenth as many potatoes as they were a few years ago. That means that some other part of the country must grow potatoes. And it means that we people here in New Jersey should use the very best methods of growing potatoes in order to keep this industry.

Now, to-night I shall show you some pictures of very common diseases of potatoes, and then follow by showing you pictures of some diseases that occur in other localities. Possibly they occur here also, but if they do, they are not so severe as they are in other places.

After I had listened to the papers at Cleveland, I called upon some of the writers and borrowed their lantern slides so that I could bring them here to-night and show you some of the troubles they are laboring against and some things we will be compelled to labor against unless our potato growers in this State use greater precautions in the future than they have in the past.

Usually the first disease to appear on the growing crop is a leaf spot known as the "early blight." It causes small spots, small brown spots, which unite, frequently uniting, forming irregular blotches. Upon close examination these brown spots show black, concentric circles which are characteristic of this disease and by which it can be distinguished from other leaf spots.

Now, a disease of that kind which destroys that much of the leaf must necessarily reduce the crop, because the foliage of the plant is the part which is largely responsible for the crop. The work of the plant is always done in the leaves. It is here in the leaves that the starch is manufactured, and it is then transferred from the leaves to the tubers under ground, and so, if a part of the foliage is destroyed, the plant is unable to do its maximum amount of work, and the result is that the crop is reduced that much.

This disease is due to a fungus, a minute plant, so very small that it is necessary to use a microscope in order to see it. This fungous grows in the tissues of the plant, using the tissues of the plant as a soil, in exactly the same way as the potato itself uses the ground. Such a plant grows from spores which correspond to the seeds of the higher plants. This spore germinates in the moisture on the leaf, producing an extremely delicate thread-like structure which grows into the tissues of the leaf, eventually coming to the surface to produce a new crop of fruit or spores.

Very frequently in this latitude especially along the seaboard, we have what is known as tip burn. It is a trouble that is not due to an organism, but directly to climatic conditions. When you have extremely hot, dry weather and heavy dews at night, you will find this trouble. The heavy dew collects on the

DISEASES AFFECTING POTATOES.

157

margins of the leaves, and the heat of the sun scalds them. It is usually accompanied by the disease to which we have just considered, the early blight. In fact, this disease makes the conditions most favorable for the early blight, so that when we have this tip burn we are almost sure to have the early blight at some time.

The early blight is also accelerated by an insect known as the flea beetle. I do not care to discuss insects to-night, they have been considered this afternoon, but I simply wish to call your attention to this flea beetle. It is very small, and as it travels from one part of the plant to another, it carries the fungus along with it, and as it eats the leaf, it incidentally drops a few fungous spores and thus spreads the disease from one part of the plant to another and from plant to plant. Therefore, the insect makes the disease much worse than it otherwise would be.

The next disease is known as the late blight. It is a northern disease, especially common in the northern states where they grow potatoes extensively. It also occurs in the northern part of New Jersey. It has been reported to our office several times this year from the northern part, especially the mountainous districts. It also extends to the Southern part of the United States, but in the South always follows mountain ranges.

This disease comes suddenly. It causes the plants to wilt down and to become blackened and destroys them in the course of a very few hours. When this disease is prevalent you can expect but very little if any crop whatever. The disease is carried to us by the seed. It does not carry over in the soil. The organism which causes it is quite different from the organism which causes the early blight. It also produces spores which give rise to numerous minute free swimming bodies called zoospores. In moist, rather cool weather, this disease spreads very rapidly. The tubers which are infected in the field will frequently rot in storage. It is a brownish rot which may affect the entire tuber.

All discolorations inside of the potato do not indicate this disease. These discolorations from the various rots are more or less different, so that frequently by the appearance of the cut potato we can tell the disease from which the plant is suffering.

This disease, known as the black leg, is a bacterial disease, and is especially prevalent in the northern states. It is always brought to us in the seed. It occurs in tubers and in very severe cases causes a rot. Of course, in mild forms it does not cause a rot, and the growers may plant potatoes without suspecting anything wrong, and then grow weak plants. The leaves stand up straight instead of spreading out, and a blackish rot starts at the surface of the ground. This rotting runs up the plant. There is another rot disease of the stem which runs down the plant. It does not hold over in the soil.

The southern wilt, so far as I know, does not occur to any extent in this State. In general appearance it is very similar to the preceding, and may be mistaken for it. It is a southern disease especially severe throughout the southern states, and very rarely coming this far North.

The next disease, one which gave a great deal of trouble last year, is known as the stem rot or stem blight, or, when it occurs in the bins, as dry rot. It causes a wilting of the plant, and upon examination you will find that the plant is black and rotten at the surface of the ground. As the disease progresses the plant falls and the rot tends to go downward. The tubers, in severe cases, show cankers on the surface, and sometimes a dry rotting. But in cases less severe we cannot see the disease from the outside, but find it when we cut the tuber, appearing as a black streak just under the peeling. These streaks are very black in color and do not extend to the centre of the potato, as in the case of the rot caused by the late blight. We find them in the end which is attached to the plant, starting at that point and gradually working throughout.

This disease, as I say, has been especially prevalent throughout the State last year and caused a considerable loss. I was in some fields where I believe that the loss must have been fully ten per cent. A great deal of this could have been

avoided if the growers had made careful examination of their potatoes when they were cutting them for planting.

There is another rot somewhat similar to this one, but it is not nearly so widely distributed. I do not know that it occurs in this State, but it caused a great deal of trouble in certain Western States in 1912.

You are all familiar with the potato scab.

It is one of the most severe diseases in the State and a disease that is very easily prevented. A great many people, however, object to doing the work necessary to prevent this disease. The tubers should be treated with formalin, using one pint of formalin (or formaldehyde) in thirty gallons of water, and soaking the potatoes for two hours. If you object to using this treatment, you can use a gas treatment, using twenty three ounces of permanganate of potash and three pints of formalin, mixing the two together in a shallow vessel of some kind and exposing the potatoes to the gas produced by the mixture of these two chemicals in a tight room. Of course the treatment must be in a room that is absolutely tight, and the amount that I have given will disinfect a room of about one thousand cubic feet. In doing this it is necessary to have the potatoes in bags and on racks, so as to give the gas a chance to spread among them. It is not nearly so satisfactory as the treatment of dipping the potatoes in a mixture of formalin and water but where the growers handle large quantities it has some advantages. This disease will also attack beets and turnips, and many other root crops. When the disease is once in your soil it is necessary to use a rotation of crops from three to five years in order to get rid of it.

Last week, while we were in Cleveland, Ohio, we had a very startling experience, in finding that instead of having one scab disease in this country, we had two scab diseases; that is, we have at least two scab diseases in North America, so much alike that most of us, even those who have been making a study of the disease of plants, felt that we may have made many mistakes in the past and failed to separate the two.

The other scab disease to which I refer is common in Europe, and has been introduced into Canada and it is believed that it has spread throughout the entire Dominion, and probably occurs in the United States, although it has not as yet been reported, probably because none of us have been able to recognize it. I will frankly admit that up until last Friday I do not believe I could have distinguished one of these scab diseases from the other; but last Friday we had an opportunity to examine a lot of potatoes affected with this other form of scab, which is sometimes referred to as powdery scab, and I believe I could recognize it now without much trouble.

It is in several respects much more severe than the old fashioned scab, because there is no known treatment. The formalin treatment will not do, and there is no treatment that we know of that is successful other than the long rotation of crops. I hope we will be able to satisfy ourselves this summer as to whether we do or do not have this disease in New Jersey, and I hope we will find out that we do not have it.

The Rhizoctonia or scurf disease is very widely distributed but one which may be unfamiliar to most of you. It occurs in this State and several specimens have been sent to us this year. Many potatoes brought here for display are affected with this disease which our growers failed to recognize. When in a mild form the diseased potatoes show small blackened spots which can be easily removed by rubbing. These black spots are small masses of the fungus by which the disease is carried from year to year. Plants from these tubers will be attacked by the fungus and cannot produce a maximum crop, even under the best conditions.

The leaf roll is one of the troubles which they have further West and which may possibly be due to this same organism. You will notice the leaves are rolling upward. I wish to call your attention to the direction in which the leaves roll because I will show you another form in a few minutes in which the disease acts in an entirely different way. There are other things that may cause this trouble, but, nevertheless, it is reasonably certain that the organism to which I have just referred will cause the leaves to roll upward when the attack

DISEASES AFFECTING POTATOES.

159

is rather severe. This rolling of the leaves is sometimes attributed to the weather when, in fact, it is due to this fungus.

In severe cases the crop is practically worthless; the tubers are small and have a tendency to cluster next to the main stem of the plant. In some cases these small tubers are produced above ground.

The curly leaf is another disease which may be due to the same cause, although we are by no means sure. This disease differs from the preceding in that the leaves are crinkled, and roll downward instead of upward. For the reason that the one form rolls the leaf up and the other rolls the leaf down, many of our people are inclined to believe that they are two distinct diseases due to causes which are unknown. This is a question which will have to be decided by future study. I do not know whether we are troubled with this form of disease in this State or not, and yet last Spring we received potato plants from three or four different sources in the State which appeared to be affected in this way. The growers who reported this disease said that almost the entire field was affected.

What does that mean to you? Why, it means that you must have good seed. One of the biggest things in growing potatoes is to have good seed, and how many of you know when you are buying seed, that you are getting a good product? In fact, I doubt if any of you are using seed absolutely clean. Of course, that is not your fault.

The "streak" disease, which causes a peculiar streaking of the foliage, was unknown until the past season, when it appeared in Maine and Wisconsin, and has been the cause of some rather severe losses.

The "mosaic" disease is becoming more and more common and threatens to become severe at any time.

I wish to call your attention to two or three other diseases which are of very little importance to us, although we may meet with them at any time. The nematode or gall disease of the potato is due to a very small worm, so small that it is impossible to see it without the microscope. It is known as the eel worm and causes knots or nodules over the entire surface of the tuber.

While we may expect this disease to occur here at any time, I do not look upon it as a disease which we need to fear to any very great extent, because the organism is likely to be killed out by the winter weather of this climate.

The European wart disease is one concerning which we have had a great many inquiries, and which you have all read more or less about. I wrote some few articles for the papers of the State last Spring, and sent a warning to every Grange in the State asking that the people take precaution against the introduction of this disease. At that time we were receiving great quantities of potatoes from Europe, and on account of the high price of seed potatoes in this country, it was a great temptation to our people to use the European tubers for seed. Now, in the first place, the European tubers would not produce a good crop, even if they were healthy, and every person who used European seed was in danger of getting seed with this disease.

Since then the United States Congress has passed a law which permits the Secretary of Agriculture to quarantine against plant diseases, and at the present time we have a quarantine established against potatoes from any country whatsoever where this disease is known to exist. The disease has gotten as far as Newfoundland, and the potato industry of that island is practically wiped out. The disease has been introduced into this country twice, but fortunately the diseased potatoes were found and it was wiped out. It is a surprise to those of us who have been watching the disease that it was not introduced last year.

There have been some reports in the papers that it was introduced into New Jersey, but I do not believe it is true. However, if any of you know of any fields affected with this disease, I wish you would report the case to us. It is the most severe disease of potatoes known, and I really believe that if the disease should get a foothold in this country that you would probably have to buy potatoes wrapped in tissue paper as you are now buying oranges.

The picture on the screen represents an entire hill of potatoes in which there are ten tubers, and of those ten, every one is affected with the disease. A great

many people have insisted that it was wrong for us to quarantine against this disease coming in from Europe. I think the man who says the quarantine is wrong ought to be allowed to have the disease on his own place, but he ought to have a stone wall all around it and he should be kept inside. (Applause.)

The plant I show you in this picture is not a potato plant, as you will all recognize, and the disease on it is of very little importance here, and yet it sometimes occurs, and sometimes it occurs on the potatoes in sufficient quantity to cause some loss. It is the Dodder.

I wish now to call your attention to spraying.

I have given you the treatment of potatoes with formalin; formalin, as I stated, would prevent the scab, this old-fashioned scab with which you are familiar. It will also prevent the scurf, and the black leg.

The foliage diseases must be treated with Bordeaux or some preparation similar to ordinary Bordeaux, such as Pyrox. Although I have never used Pyrox, a great many people tell me it is satisfactory. You can add arsenate of lead or Paris green to the Bordeaux. Bordeaux is good for the potatoes, whether they have a disease or not.

Spraying should be begun when the plants are about four inches high. Here are shown the results of spraying and not spraying [Lantern slide] in the localities where the leaf blight is severe. Those plants have been killed off by the late blight, a disease which is common throughout the northern potato growing states, and is also common in Northern New Jersey, especially in the mountainous districts. Several cases of this have been reported this year from Sussex County.

This shows also the result of spraying. You will notice that these plants have very little foliage, nothing much except stem, and here is a fairly good crop, and over there not quite so good.

This picture shows the effects of spraying; it prevents early blight and late blight, and prevents Paris green injury. A great many of our people are using the dry Paris green. Dry Paris green will of course kill the bugs, but it also burns the foliage, and wherever the Paris green burns the foliage there you have a point for infection with early blight, and I am sometimes inclined to believe that people do almost as much harm with it as they do good. I suppose this is not strictly true, but, nevertheless, the using of Paris green does encourage the early blight. Bordeaux also reduces flea beetle and stimulates the assimilation of the plant.

Now, then, in addition to giving a treatment with the formalin and to spraying, what else can we do to keep up the potato industry in this State?

If we are to control a great many of these diseases we must do so by study and seed selection. But how will we select the seed? What process shall we go through? You cannot simply depend upon selecting the seed in the bin or after it is shipped to you. The selection must be made on the growing plant. The potatoes must be inspected in the fields and when the growing plants show the leaf roll or the leaf curl or some of these diseases which can be carried in the seed, that field of potatoes should be condemned.

Of course, most of you cannot go up to Maine or New York to examine a field of potatoes from which you are going to buy your seed. But there is another way that we believe we can get at this problem. It has already been commenced in some five or six States and I hope New Jersey will not be the last to take it up. That is the organizing of a Potato Growers' Association. Some five or six States have already formed such an organization and as soon as some more join in the formation of organizations of this kind it is planned to form a national association. This national association with these various State associations working together can control the character of the seed potatoes.

Now, as I said a few minutes ago, I hope New Jersey will not be the last to take up this work, and so I am going to ask you people here, those of you who are interested in growing potatoes, to meet me here tomorrow at twelve o'clock at the close of the morning session that we may appoint a committee to take

INTRODUCTION OF RESOLUTIONS.

161

steps towards organizing a New Jersey Potato Growers' Association, that we can have some assurance of getting better seed in the future than we have in the past.

This is one of the most important movements at the present time, so that I will ask all of you who are interested in this to join me tomorrow, and we will see what can be done in this direction.

I thank you. (Applause.)

Chairman Cox—Is there any further business this evening? If not, the meeting will stand adjourned.

THIRD DAY—SEVENTH SESSION.

The meeting was called to order by Vice-President Cox, and opened with prayer by Rev. W. M. Curry of Trenton.

Chairman Cox—Now for the introduction of New Business. Are there any resolutions to be presented? Or any other New Business to come before the Board this morning? The introduction of resolutions will be in order.

Secretary Dye—Perhaps this would be as good a time as any to say to the members of the Board, that our efficient helper here, Mr. Elmer Lock, has been working in the interest of our State Board and this meeting, as far as possible, and he has made a draft upon the churches and upon the Interstate Fair and brought influence on all to get this nice equipment for this room. He has secured help from the German Lutheran Church, the Second Presbyterian Church and the Lawrenceville Presbyterian Church, all of whom have loaned their tables for the exhibits, and we have got them here, and Mr. Weseman has loaned tables and chairs and carpets for this platform from the State House, and we have had an arrangement with the Basket Ball Club by which we have taken these seats, which they have borrowed from the Interstate Fair Association and turned them over for our use while we are here. So that we have had an interchange of good feeling and helpfulness all along the line and that is what we like to have, as stated last night, between all, the Granges and the State Board and the Horticultural Society and the Experiment Station have all worked together. Now, Mr. President, I move you the following resolution:

We hereby wish to extend a vote of thanks to the German Lutheran and Second Presbyterian Churches of Trenton and Lawrenceville Presbyterian Church of Lawrenceville, for the loan of tables and trusses.

Also to Mr. John W. Weseman, Custodian of the State House and Mr. Silas R. Morse, Curator of the New Jersey State Museum, for their many courtesies extended to this Board at their exhibit at the Armory.

We also wish to extend our thanks to the Interstate Fair Association, and Mr. Adam Exton and Mr. Kendrick Hill, owners of the Trenton Basket Ball team, for their generosity in lending to this Board the use of tables and chairs.

The resolution was unanimously adopted.

Mr. Kille—Mr. President, there has been a communication referred to the Committee on Credentials from the Farm Bureau Association of Sussex County, as follows:

*To the New Jersey State Board of Agriculture:
Gentlemen—*

The Farm Bureau Association of Sussex County respectfully asks recognition as an Agricultural Society of this State, with the right of naming a delegate to your body.

THOMAS E. INSLEE,
G. W. VAN HORN,
of Advisory Committee.

Trenton, N. J., Jan. 9, 1913.

The committee recommended that the request be granted.

On motion the recommendation of the committee was adopted.

Chairman Cox—The motion is carried. Will the person named as delegate present his credentials to the Credential Committee and report his name to the Secretary to be entered on the roll?

Mr. Van Horn—There has not been any delegate regularly elected this year. Next year they will have a delegate here.

Mr. Kille—Mr Chairman, I would like to report for the Credentials Committee, that we have examined the credentials of all the delegates present and we have them all in, and everything is O. K. The delegates entitled to their expenditures should get their bills in to the committee as early as possible.

The report of the committee was accepted..

Chairman Cox—In the absence of Dr. Twitchell, whose address is first on the programme this morning, I will call upon the Secretary to make the report of the Tuberculosis Commission, out of the regular order. If there is no objection, the Secretary will proceed with that report.

Report of Commission on Tuberculosis in Animals.

READ BY SECRETARY DYE.

Although Bovine Tuberculosis is more or less prevalent throughout the entire country, there never was a time when the efforts to control and eradicate it were so general as now, nor a time when, in New Jersey at least, these efforts have met with such a good degree of success.

The same is true concerning the discussion of the relation of bovine tuberculosis to human health through the milk and meat supply, and the various legislative acts, municipal, State, and national, to control in some way this entire business.

While it is generally accepted that tuberculosis may be transmitted from the bovine animal to the human, through tubercular milk, especially to young children, the line between danger and immunity is not so definitely marked as to prevent unfounded fear on the one hand, and on the other hand prevent the destruction of valuable dairy animals and the waste of meat that is entirely safe for human food. This broad margin of uncertainty affords ample room for expression of views, both pro and con, and there is a wide divergence of opinion.

Here are those of the **ultra reformers** who would test with tuberculin all dairy animals and slaughter all those giving the accepted reaction forthwith, and without any compensation to the owner of the stock for the loss he sustains. Then there are many who take the more conservative view—they would test only suspicious animals and slaughter any that might react, allowing remuneration according to the value of the animal destroyed. Then, there is the Bang method, which is advocated by some. By this course many valuable animals would be saved from premature destruction, and their progeny added to the rapidly decreasing number of dairy animals. This system practised always in connection with the sterilization of the milk would seem to be the most economical one.

The law under which this Commission works and by which it was constituted, requires a rigid tuberculin test of all animals entering this State from others, and the destruction of all reactors without compensation to the owner or importer.

The same requirement for testing applies to all home herds whose owners request an examination, but allows compensation for animals condemned, according to their market value, within a definite limit.

The Commission believing the law was enacted to be enforced, have carried out its provisions to the letter without fear or favor, notwithstanding the various devices resorted to by unscrupulous importers and dealers, and the adverse criticisms and obstructions of some others who have endeavored to impugn the work of our inspectors and bring the law into disrepute.

The district inspectors have been vigilant in their respective fields. All imported animals have been carefully scrutinized. Herds purporting to have been properly tested before entering the State have been held up and suspicious animals removed. Five cars of imported cattle have been returned to the original shipping point because their test records did not meet the requirements of the New Jersey law. The tests made by veterinarians throughout the State, whether of imported or native cows, are carefully examined, and if irregular work or records are found, the attention of the practitioner making such test is called thereto, and correct work required.

In the disposition of slightly diseased animals for human food, all such animals have been slaughtered under Government or municipal inspection, so that no carcass is passed off for food without such inspection. Notwithstanding this care there are some insistent, persistent, if not consistent, objectors to the use of such meat for human food. To meet in some way such objectors, we have requested Dr. Melvin of the U. S. Bureau of Animal Industry to treat this question at this meeting, and Dr. B. T. Woodward will represent the United States Bureau on that question. One thing is evident, that if all domestic animals responding to the tuberculin test, or that are but slightly diseased are to be consigned to the fertilizer and soap factories, the price of meat would still further advance and the high cost of living be made still higher.

A law which requires all monies received by any Department to be paid into the State Treasury makes a heavy inroad upon the appropriation to the Commission, as the money paid veterinarians for testing cows, amounting to \$3,913.50, is returned to the State treasury.

The money received for hides and carcasses of condemned animals sold, amounting to \$6,811.92 is also paid into the State.

These items for the year amount to \$10,725.42. With this sum taken from the appropriation, the Commission had not money enough to meet the demands made upon it. If the same requirements occur for the current year, it is evident that an increase in the appropriation will be necessary.

As dairy animals are very much higher than a few years ago, the Werts' amendment to the law passed last winter is an encouragement to cattle owners desiring inspection, in that it increases the maximum amount of appraisement from \$40 to \$50 for a No. 1 animal condemned.

The following tables show in a concise form the divisions of the work and the totals under each head. A careful perusal should convince any fair-minded citizen that this work is an important one to the people of this State, that it is being thoroughly well done and that it justifies the expenditure of the sum appropriated by the State.

The tables or records follow:

NUMBER OF IMPORTED CATTLE TESTED BEFORE ENTERING STATE.

1st District	Dr. Wm. H. Lowe, Inspector,.....	6,820	
2nd District	Dr. W. Gray, Inspector,.....	1,264	
3rd District	Dr. J. J. Pardue, Inspector,.....	134	
4th District	H. B. Richman, Inspector,.....	187	
5th District	Dr. H. H. Bair, Inspector,.....	1,566	
Total,			9,971

NUMBER OF CATTLE IMPORTED AND TESTED AFTER ENTERING STATE.

1st District	Dr. Wm. H. Lowe, Inspector,.....	2,404	..
2nd District	Dr. W. Gray, Inspector,.....	940	
3rd District	Dr. J. J. Pardue, Inspector,.....	351	
4th District	H. B. Richman, Inspector,.....	1,910	
5th District	Dr. H. H. Bair, Inspector,.....	509	
Total			6,114

NUMBER OF IMPORTED REACTING CATTLE SLAUGHTERED.

1st District	Dr. Wm. H. Lowe, Inspector,.....	161	
2nd District	Dr. W. Gray, Inspector,.....	25	
3rd District	Dr. J. J. Pardue, Inspector,.....	16	
4th District	H. B. Richman, Inspector,.....	46	
5th District	Dr. H. H. Bair, Inspector,.....	37	
Total			285

APPRAISEMENTS OF NATIVE CATTLE SLAUGHTERED.

1st District	Dr. Wm. H. Lowe, Inspector,.....	219	head	\$ 7,746.50
2nd District	Dr. W. Gray, Inspector,.....	351	"	12,436.00
3rd District	Dr. J. J. Pardue, Inspector,.....	144	"	5,394.00
4th District	H. B. Richman, Inspector,.....	101	"	3,057.00
5th District	Dr. H. H. Bair, Inspector,.....	136	"	4,877.00
Total		951	"	\$33,510.50

COMMISSION ON TUBERCULOSIS.

165

AMOUNT RECEIVED FROM MEAT AND HIDES SOLD—SLAUGHTERED UNDER INSPECTION.

1st District	Dr. Wm. H. Lowe, Inspector,.....	\$2,830.00
2nd District	Dr. W. Gray, Inspector,.....	1,510.00
3rd District	Dr. J. J. Pardue, Inspector,.....	1,349.00
4th District	H. B. Richman, Inspector,.....	992.70
5th District	Dr. H. H. Bair, Inspector,.....	1,291.42
Total		\$7,973.12

AMOUNT RECEIVED FROM SHIPPERS OF IMPORTED CATTLE FOR TESTING.

1st District	Dr. Wm. H. Lowe, Inspector,.....	\$2,157.50
2nd District	Dr. W. Gray, Inspector,.....	572.00
3rd District	Dr. J. J. Pardue, Inspector,.....	167.00
4th District	H. B. Richman, Inspector,.....	1,098.00
5th District	Dr. H. H. Bair, Inspector,.....	301.00
Total		\$4,295.50

REMARKS:

Our charts of incoming cattle tested out of this State preshipment, show 347 head condemned and slaughtered in their respective States. Number of reactors on imported cattle tested after arrival, 285 head, all slaughtered. 5 cars of dairy animals were refused entry on account of test charts not being made according to Chap. 202, Laws 1911, and returned to their original State at owners' expense.

DOMESTIC CATTLE.

Number of herds tuberculin tested	159
Number of animals in above herds.....	3,469
Number of reactors in above herd.....	710
Number of herds physically examined.....	230
Number of animals in above herds.....	3,260
Number condemned on physical examination.....	190

We have a complete stable record of each herd whether physically examined or tuberculin tested.

The report was received.

Mr. Denise—Mr. President, may I offer a resolution which has just come to my attention within the last few minutes?

Chairman Cox—I will be glad to receive it.

Mr. Denise—I move you, sir, that this Board appoint a committee of two to represent the New Jersey State Board of Agriculture to appear at Washington before the Committee of Congress, which will hold hearings on the tariff.

I will say that we appointed a committee some fifteen or twenty years ago, and I think we ought to have a committee sent from this Board down there again. I think the agricultural interests of the State should be represented there.

Chairman Cox—Do you want that resolution to be referred to the Committee on Resolutions or to have it come before the Board now?

Mr. Denise—Right away. I think the men who are interested in that matter are here, and it should be brought before them. I believe they are ready to act on it now.

Chairman Cox—There is a motion made by Mr. Denise that this State Board of Agriculture appoint a committee of two to meet with the Committee of Ways and Means at Washington, in reference to matters touching upon the tariff legislation as it affects the farmer. Is that motion supported? The motion was seconded.

Chairman Cox—Are there any remarks to be made upon this question? It is now before the Board for discussion.

Secretary Dye—I think Mr. Denise is right. We have depended upon the National Grange to attend to this for us for many years. Way back when Mr. McKinley was Chairman of the Committee on Ways and Means Mr. Denise and myself were sent down to represent this Board and we were the only Board of Agriculture in the United States represented at that meeting, although all were invited. And we did some effective work down there at that time.

Chairman Cox—Is there any further discussion?

Mr. Ford—I approve of that motion. I think this Board should be represented down there before that Committee. The agricultural interests of New Jersey are very important and the agriculturalists get very little benefit by the tariff legislation, simply because they do not ask for it. They are not represented in our national Legislature, and it is perfectly right and proper that we should be represented. We will then have a committee to look after our own interests.

Mr. Cook—I agree with the idea, Mr. Chairman. I think it is our duty to appoint a committee to make our needs and wants known to the national government.

Chairman Cox—Is there any further discussion of the motion. If not, we will proceed to a vote upon it.

The motion was carried unanimously.

Mr. Denise—I want to make a motion that the Executive Committee appoint that committee, but, as the mover of that resolution, I do not wish to be on that committee, because I do not feel myself able to go. I think that the meetings will begin on the twentieth of this month. The motion was carried.

Secretary Dye—Mr. Chairman, here is another resolution which has been presented:

Whereas, the soils of New Jersey, as well as the soils of other States in the East, are as a rule deficient in lime;

Whereas, this deficiency of lime in our cultivated soils prevents the raising of larger crops;

Whereas, the more general and frequent application of lime would add to the prosperity of our agricultural industries, and;

Whereas, the existing high freight rates on lime, and particularly ground limestone, discourage the purchase and use of agricultural lime;

Therefore, be it resolved, that the State Board of Agriculture and allied agricultural organizations express themselves strongly in favor of reduced freight rates on lime, and, be it further,

Resolved, that the representatives of these organizations be instructed to use their utmost endeavors to secure reduced freight rates on all forms of agricultural lime.

Chairman Cox—If there is no objection, that resolution will be referred to the Committee on Resolutions.

We had present with us yesterday, Dr. Twitchell of the State of Maine, who gave us a very interesting talk on the subject of potatoes. Now, in addition to potatoes, up in the State of Maine, they make milk, and I am sure that, in listening to Dr. Twitchell, you will think he knows something about milk, as well as potatoes. Dr. Twitchell will talk this morning on "The Business Side of the Milk Pail."

The Business Side of the Milk Pail.

BY DR. G. M. TWITCHELL.

It is not as a milk producer that I would discuss this problem to-day, but side-step enough to catch the viewpoint of the manufacturer, and therefrom study the situation.

Serious and complex problems face the agricultural worker and threaten increase to-morrow. For thirty years my life has been devoted to a study of, and to some extent, experiments in, agriculture, and I am forced to the conviction that the time has come to break from long established lines of thinking and unite to find a solution of the many problems confronting us. The sucking power of the towns and cities, always a menace to our civilization, is rapidly strengthening.

The number of farms in active operation is decreasing, the rural population falling off, and our herds being depleted. This is the record all over the country. Over against these hard facts we may set increases in value of farm products per acre and animal, as well as total for the State, the result of greater skill, the use of improved machinery and the assistance rendered by the allies of the farmer, the scientist. It is with the first proposition we have to do. Is it possible to check the outgo of young blood, sufficiently, to insure a steady increase in number of farms? Is there any way by which stock husbandry may be strengthened for the good of the State? Can we so organize the forces as to again increase rural population? These are the propositions we must face, and assist in solving.

In these days of specialized effort by which production has been so wonderfully increased, there has come a letting go of certain fundamentals. There never has been, cannot, and will not be a live, positive, agricultural sentiment distinct from some line of stock husbandry. On this foundation the industry rests. Lacking this we drift towards tenant farming and the destruction of that individuality necessary to uphold and promote American citizenship.

The security and stability of our cities must ever depend upon the stream of fresh blood from the country. The city left to itself, dies with the third generation.

Because of all this, the question becomes a vital problem to the business man. What is to be the character and conception of the young men and women flocking down from the hillsides and farms to the centres? As years pass and conditions become more congested this question assumes increasing importance. Can we find the solution of the difficulty confronting the friend of the farm?

In the business world today, the one great dominating purpose is to minimize cost of production. The demands of the public, the severe criticisms against increase of cost to the consumer, the possible output through improved machinery, and the exactions of labor interests, unite to force the most critical study of the problem of cost. If a fraction of a mill can be saved in the finished product a large outlay, to compass this, is legitimate. A railroad in my State spent hundreds of thousands of dollars recently, in building around a hill to save a bad grade, sacrificing several miles of road-bed, that the hauling capacity of an engine, between terminal points, might be increased, and one or two seconds saved in passenger traffic. The savings in ten years will fully compensate for the outlay. Agriculture has been looked upon as an occupation, not a business, and the farmer as a laborer, not a manufacturer, yet, by every law of business, he is, in the most pronounced sense, a manufacturer. This admitted, the next question is, does he stand in the same relation to his manufactured goods as the shoeman or railroad official? Once the farm was looked to simply for the food of support. Then, as wants increased, a surplus in some form or forms, was sought, to supply home demands. Gradually conditions became more critical, wider areas centralized in the local market, per cent of profit per animal or acre was reduced, and cost of production increased. Did the average farmer enter this contest from the standpoint of the manufacturer? Experience has taught that he did not, but accepted what came to him as all that could be obtained, while inwardly rebelling at the small returns. Manufacturers long ago realized the necessity for practical co-operation, the removal of competition and the establishment of harmonious relations. The farmers, with here and there an exception, have refused to accept this policy as bearing upon them, and other interests have been prompt to foster the spirit of personal liberty, the result being that the producer of the food of support for the nation stands, in the market, as an individual, face to face with corporate interests closely allied, and because of this feels that he is powerless to protect himself. So long as the middleman stands to demand fifty to seventy cents out of every dollar paid by the consumer, so long will there be an insurmountable barrier in the way of increased production. Let that class of economists now preaching the gospel of conservation, through increase per acre or animal, lend assistance towards insuring the producer sixty-five cents out of the consumer's dollar, instead of

BUSINESS SIDE OF THE MILK PAIL.

169

thirty-five, and the increase would be forthcoming. Given the incentive, results would be certain. History does not record an advance along any line, without a conscious incentive, and it is useless to urge, and expect, an increase of interest or activity in any department of farm life and work without this dominating factor being recognized as the impelling force.

On eastern farms, surrounded by growing markets, the best form of stock husbandry is doubtless that of milk production, fresh milk being a product in daily demand by every family, one sure to lose value rapidly. From a purely business standpoint three factors enter here—the cow, the feed and the man. For sake of the object lesson, let us take this marvelous piece of intelligent mechanism—the cow—and consider her as a machine.

You would not for a moment think of sawing boards with a shingle saw or make shoes in a blacksmith shop, yet men still insist on fighting natural law in the animal world, by attempting to force milk without thought of the inherited purposes of the machine, or the individuality of the animal. I have a St. Bernard dog, large, powerful, yet he never sees a cow, a hen or a bird, but, let a stranger approach, and he is there to protect. My neighbor owns a spaniel and it is busy all day hunting for tracks, driving birds into the air, or chasing hens. Why is this so? Simply because each is dominated by the law of its being, fixed by long generations of breeding and intensified by environment. Value in either depends upon its intelligently following the higher line of its development. Supposing you cross the St. Bernard and spaniel, to combine the best qualities of both, will you succeed? Or still worse, suppose you allow your choice spaniel to mate with a street cur on the plea that a pup is a pup, would you expect improvement?

Value in a cow depends primarily upon what she represents in her ancestry, and secondly upon the environment of the generations. Wanting a milk-making machine we must look to those breeds wherein the organs of maternity have been most carefully stimulated by breeding and the nervous system, wherein milk production centers, most critically protected. A cow is not a cow simply because she has horns and gives milk. A cow is not a cow simply because she has behind her generations of registered ancestors or her name is in the herd book. The factor we term individuality must be reckoned with, if large production is desired. We must never lose sight of the tenacity with which the law of reversion holds and the necessity for the man at the helm to make clear his purpose, always along the upper line. We are learning to-day that possible profit in dairying comes only through the building up of a herd along specific lines, never from the yearly gathering together of individual animals with no knowledge of previous environment. If the right business side of the milk pail is found it must be through the intelligence of the cow. We cannot force milk, except for a brief period, it must come by invitation. Formerly, 4,000 to 5,000 lbs. of milk annually covered the cost of production and gave a small profit, but, in the changes already indicated, and the larger life lived by the average farmer we must look for a material increase yearly per head. More than this it is necessary that we get away from herd averages and measure critically individual production. Too many star boarders still burden the milk producer. Where men rely on purchased stock this burden becomes heavy. Careful breeding and weeding alone can reduce the per cent. The scales and daily weighing of the product of each cow, as well as frequent testing for fat content, becomes a necessity.

1st, to meet the exacting demands of boards of health, and
2d, to eliminate unprofitable animals. No man can afford to continue in milk production unless he can find a profit from every cow on the farm.

Once we figured cost of keep to cover hay, grain and pasturage, and too many, content with small profits, saw their farms losing in productiveness, their buildings gradually going into decay, and their bank account not increasing. The business side of the milk pail forces items not formerly considered.

Ten per cent of the value of the herd should certainly be set one side yearly to provide for the deterioration of stock. The losses to the dairyman from death and accidents, abortion, and failure to breed, constitute a yearly total surprisingly large.

Ten per cent more surely should be put one side to provide against deterioration of buildings, utensils, carts and necessary repairs. Every item connected with the maintenance of a dairy becomes a charge against the product as legitimate as the hay and grain. Business farming forces the consideration of all these problems as well as feed and care, and when one approaches the subject from this standpoint, important lessons present themselves.

The business side of the milk pail makes necessary a study of all items entering into the cost of production, and if they total an amount far beyond present estimates, they force a consideration of the subject of price to be realized necessary to-day to compensate the producer. Subject to modifications, the following figures indicate cost yearly, upon a basis of twenty cows:

Buildings, \$2,500, 10 per cent depreciation yearly.....	\$250.00
20 Cows, \$2,000, 10 per cent depreciation yearly.....	200.00
(deaths, accidents, failure to breed, abortion, etc.)	
Labor, 1 man and board	500.00
Insurance, \$2,000, yearly cost	10.00
Taxes	80.00
Implements, wagons, etc., \$1,000. 10 per cent depreciation..	100.00
Bull and keep	100.00
Hay, grain, silage and pasturage	1,200.00
Incidentals, 10 per cent	240.00
Interest on Buildings, Implements and stock, 5 per cent.....	265.00
Total	\$2,945.00

CR.

15 Calves yearly, at birth.....	\$100.00
Dressing, \$20 per cow	400.00
(assuming that liquids and solids are carefully protected and applied)	
	\$500.00
Yearly cost per cow	\$122.25

This is no record in actual milk production, but taken as a basis for discussion. Increase or reduce the items to harmonize with the fact in your own experience, and the lesson still remains that by every consideration of justice these items of maintenance, and very likely others, are as much a part of the yearly expense of conducting the business as the feed or care. If the manufacturer did not figure the salary account, or that of maintenance of property, depreciation of machinery, etc., etc., he would fail. In my home city they make shoes and one of the larger manufacturers said to me recently that if he could be sure of a net profit of two cents per pair, he would stock the factory to the limit. Is agriculture an exception to all laws of good business? If so, it is our first duty to discover its law and apply with the same impartiality as in the industrial world, if under the same general conditions, the same system holds. Looking for a revival and a regeneration agriculturally this question assumes great importance. A critical appreciation of cost will promote action to insure price.

In a comparative dairy test in Wisconsin to determine the value of different dairy breeds and grades for milk and butter, five hundred animals being included, it was found that 160 lbs. of butter fat or 4,000 lbs. of milk were necessary to cover the cost of feed, leaving all other items out of the account. One cow giving 21,000 lbs. of milk paid a profit of \$154.00, while another giving but 5,000, was kept at a loss of \$6.00. In Ohio, under a test covering several years, it cost \$134.00 to keep a cow. In Connecticut, the outcome of a five-year critical test, was an average cost of \$164.00. This total covers all the items of maintenance of herd and farm as well as feed. The present price paid by contractors is, to some extent, determined by the oft-repeated statement of cost of keeping a cow put forth by farmers, and some speakers, which covers only hay, grain and roughage. In my State fifty dollars is usually given as the cost

per cow, the dressing being accepted as an offset for all labor. In Massachusetts it would be \$60, indicating that the maintenance items, outside of feed, are not considered, and contractors have been prompt to seize upon these statements and make price accordingly. When criticism is made against charges to consumer, it is found that the items of wear and tear, shrinkage, depreciation, taxes, interest, labor, etc., etc., are all figured at the maximum.

This indicates that business principles enter only when the milk passes into the hands of the contractor.

Is this just? Is the producer true to himself, his family, or his calling, who fails to protect himself? Are you not entitled to the market price at your door for your hay, grain, silage and roots? Should you maintain implements, harnesses, or support teams, solely for the benefit of the contractor?

Is there any reason why you should build and maintain buildings out of your hard labor while selling milk at present prices? There's not one of these items but is a legitimate charge against the dairy, that being the principal cash business of the farm. There is no product of the farm so high in food value, sold at so low a price as milk.

The growing of hay, grain and silage is separate and distinct from their conversion into milk, and you are entitled to the market price at your door for each. Under what laws should you give the contractor, or consumer, the benefit of the board of your hired man? Second only to the question of cost of maintenance, is that of cost of production. Accepting these figures as a basis, if your cows give 4,000 lbs.—2,000 quarts—the cost is, approximately, 6½ cents per quart. If 5,000 lbs.—2,500 quarts—4 4-5 cents. 6,000 lbs.—3,000 quarts—4 1-4 cents. 7,000 lbs.—3,500 quarts—3 1-2 cents, and 8,000 lbs.—4,000 quarts—3 1-20 cents per quart.

Some lessons suggested by these figures are:

1st. To know the production of every cow and weed out the boarders.

2nd. To study individuals more carefully, and open the way for each to do its best. It is impossible today, for any one to give a fixed ration, because we have learned that each animal is a unit by herself, to be studied and fed in harmony with her powers of digestion and assimilation, and, getting still deeper, her fancies and desires for food. Today the wise milk maker is daily changing rations with individual cows, as indicated by the animal.

3rd. Remembering that the bull is one-half the herd, a close study of his blood lines, and records of his ancestors on both sides, is obligatory on him who seeks improvement, and with that a sharp study of the individual.

Pronounced dairy type is required in the male, back of the shoulders, while from that point forward there must be unmistakable evidence of intensified masculinity. In the close breeding of the present to insure heavy production, especially of fat content, care is demanded to avoid males carrying the stamp of femininity in the face and head. The measure of the man will ever be the measure of the herd and as volume is lifted there is necessary clearer insight into those organs and functions of the brain and body which are at the heart of milk production.

I have a friend in Maine who is making cream, and keeping forty or fifty cows. He started twelve or fourteen years ago with one cow, and has been growing all the while, increasing the yearly product of his animals, keeping no cow which does not pay him a good profit. I asked him, what was his rule in feeding. "My rule," he said, "is to study every cow every day, and it is seldom that I feed a cow the same two days in succession. There are nine kinds of grain in the grain room and I am all the while watching the cows. I change the amount and kinds of ration in accordance with what it seems to me is the wants of the individual cow." How little we appreciate the science of feeding. Thirteen years ago on the platform in this city it was my pleasure to discuss the question of structure of the dairy cow with special reference to purpose. It is a familiar story, yet as I go about and see the cows in the pastures and tie-ups, the conviction is forced that we have not yet been awakened to the fact of the necessity for a still closer study of those questions of individuality.

One of the most important problems we have to consider is that of intensified maternity. We have been building up this cow for generations which has lately completed a record of thirty thousand pounds of milk. She never was created for that purpose. She was created merely to give milk for the life of her calf, until it was old enough to take care of itself. But some man had a conception of something more and began to build upon this, and to enter into sympathy with that animal. Through her physical structure he began to shape things in accordance with his desire, and through her brain to enter into companionship and lead up to a larger production, until we see the wonderful results which are coming in these later days.

I went into a barn not a great while ago and as I stood there, I heard a sound as of a mother singing to her babe, a crooning sort of song. Opening the door into the tieup, there was a woman milking, and, as she saw me, she said, "You wait in the barn a few moments, I will see you." I stepped back and closed the door and waited. When she came out she apologized for being so abrupt, but said, "I never want a stranger to come into the tieup when I am milking. It affects the cows." Certainly it does. I knew it. I said: "I noticed you were singing?" "Yes," she said, "I always sing when I am milking, because I can get more milk." And then I remembered what John Gould said years and years ago. "Always sing to your cows when you are milking, but," he added, and it was a wise word of caution, "be careful you don't sing Old Hundred to a Hallelujah cow." (Laughter.)

This last summer I stood in a tieup of a friend of mine, a dairyman who is getting a large production from his cows. They came up the lane and swung into the yard for it was milking time. As I stood there, my eye happened to be attracted to one cow in particular. She lifted her head as she came into the yard and turned her face until she saw the owner, and at that instant the milk started. I said, "That cow will leak her milk." "No," he says, "never, but it is time to milk, and I milk that cow."

There is a law here which cannot be explained, yet it is for us to appreciate it if we care to reach the highest production. It is the bond of sympathy which must exist between the dairyman and his cow. Why is it that some cows as you sit down by their side, will turn around and lick your arm? Did you ever see that with the milking machine? Why do they do it? I have had that experience, and wondered what the relationship was. This we know, that the cow that does that is the one that will give you the last ounce possible. There is a sympathetic relation somewhere which we do not appreciate, and it is involved in this question of motherhood, which is so vast that we have only time to touch upon it. It is important today, friends, that we appreciate this problem, give it more attention and take a deeper interest in these mysteries in order that we may still further advance the limit, because the limit of production with the cow has never yet been reached. It may be thirty, it may be fifty thousand pounds of milk in a year, but of this we may be certain, that limit will be always the limit of the man. There is always an undiscovered country before us in all our agricultural work, and that is what makes it so inviting.

The one supreme lesson for the farm producer to accept is the necessity for co-operative work in the disposal of all products. This is an age of organization and the generic principle at the heart of a trust cannot be called in question. If agriculture is a business and the farmer a manufacturer, the laws governing in the business world must hold here. Business today rests upon the power of united, organized effort. Turn in whatever direction we may and the farmer faces such a combination. Single handed and alone he is powerless to compete successfully, united no force can stay his progress.

We are at fault that we have not pressed the stern realities upon the business men. The farmer can live independent of town and city. The merchant, manufacturer, professional man, and laborer would die within six months of starvation, were it not for the workers on the land. Let this fact sink in that it may stir to profounder effort for mastery. Agriculture is the only productive industry. Our giant manufactories thrive only as, through skill, raw products

BUSINESS SIDE OF THE MILK PAIL.

173

are converted into finer forms. Commerce lives only as it transports food products from shore to shore. Trade is made possible only as goods change ownership.

Agriculture and agriculture alone produces, yet with all the marvelous records of the past we stand at the threshold of a new year, conscious that the limit per acre or animal has never been reached and that before us is an undiscovered country rich, fertile, inviting patient research and promising sure returns. I see no way for milk producers to obtain a fair price for their products except through organization. They stand to enforce the lessons and insist upon recognition.

The question is not what shall the contractor pay for his milk but shall the producer receive enough to cover actual cost of production based upon good business principles. No farmer can afford today, to make milk for four cents per quart. There's nothing in the business save a bare subsistence. We who stand upon the outside and are interested in other lines of agricultural development, owe it to the industry to aid in building sentiment which will insure a living price for milk, and give fresh impetus to a business vital to the future of the farm.

If we could call back the energies of youth and reconstruct a new agriculture, larger, richer, more extensive, there must be a coming together to insure a just return for honest labor and a steady increase of desired products from the farm. In studying the business side of the milk pail a few simple propositions demand attention. The consumer has the right to insist upon pure, clean milk, and the farmers are as anxious to deliver the same as he who receives, but tell me why you should make and sell a four to five per cent. milk upon a three and one-half per cent. basis? It is fat content which taxes animal and owner most heavily. Supply what the markets demands, and let it be just what it purports to be. When buyers pay for quality and a premium is put upon a minimum bacteria count the product will be forthcoming. In Maine, if a producer fails to standardize his milk, somebody else gets the profit of any excess of fat. Somehow it doesn't reach the consumer.

It is well also to establish the fact that the responsibility of the producer ceases when he delivers his milk at the shipping point, and for its condition twenty-four to thirty-six hours later he cannot justly be held. Assuming all responsibilities which rightfully attach let every man be prompt to demand and insistent in defending his rights at home and in the market, for in no other way can justice be done.

There's a responsibility on our shoulders far away and beyond personal gain. Here is the great underlying industry of the world. Through its development in America there has come a standard of life, a conception of manhood, a faith in institutions and laws, and a love of country not equalled on other shores. A goodly heritage is ours, not to be abused or neglected, but enriched, made stronger in every way and passed on to other generations to bless and strengthen for grander effort. If there is loss in any direction it is your duty, your privilege and mine, to search, find and remove the cause. Doing less we are unmindful of our duty to our God, our country or our fellowmen. It is not enough that we toil for the food of support, necessary as that is. Life goes deeper and reaches beyond this level. There is the making of the man which is the supreme call of the hour, the lifting of the life to that level where the greater issues claim our attention. Shame on us if we consent to be overburdened that others may fatten from our toil. We need a fresh awakening to the larger opportunities, a new enthusiasm borne of control over our products, a stronger determination to make farm life, rural life, home life, rich, sweet, helpful, inspiring, so that those who grow to manhood and womanhood within the circle, no matter how far they may wander, will ever turn with longing to the old hearthstone and come back to the old home, feeling that it is the dearest spot on all the earth. Somehow, friends, business and sentiment, divorced too much in the past, are to be reunited and in finding the business side of the milk pail and the financial success hovering there, find also that we have thrown an anchor to windward which will hold the boys to the

farm and, in the years to come, the agricultural sentiment of the State will come to its own and prosperity will crown our every effort.

If we believe in the farm home and home farm, if we have faith in that life in the open with the forces of God hovering all about us, if we cherish the hope that some day a new agriculture will come forth to insure what today we fail to compass, let us strike hands by honest efforts to hasten the hour when the cry of the soil will be heard by the boys as a challenge to noble endeavor and a promise of substantial returns.

I said yesterday, in speaking upon the potato question, what I want to repeat to-day, when I made that reference to the passage from the Good Book, which declares that the people without a vision perish. It is to my mind the supreme demand of the hour that we catch a broader vision of the real purpose and importance of the work we have to do. We have no right, it seems to me, to give our whole time and attention to the financial problems which confront us and think only of efforts for improvement that we may realize better returns for our work, necessary as those things are. There is something more important and higher, above all this to which we want to give our attention. The desire of every man is for more light, the need of the times is more light, the cry comes from everywhere for light, light, more light, and to solve this problem demands the best that there is in you and the whole of it. All of it and the best of it. That is the message I want to leave with you today as I go back home to my State, you who are workers upon the farm, you whose heads are gray, and you standing in the sunlight of the morn and looking to the future, I want to send you back home, determined, henceforth, to give the best there is in you, and the whole of it as you work to accomplish all these things.

Why, work is our greatest boon. We complain sometimes of the hardship of the farm, but do not realize what we would be without it. It is in that work that we find true companionship and fellowship of the farm, and it is in the work to produce the best that we will find interest and love for the farm. Work, work, work, for by that means only will you solve this problem, solve every problem, all the other problems of life, and in the end there will be a man conscious of his divine inheritance.

"You can climb to the top of the loftiest hill
If you work;
You can make of yourself whatsoever you will
If you work;
A faith you must have rooted deep in your soul,
A purpose unshaken, a firm self-control,
Strive on without ceasing, you'll reach the goal,
If you work."

A vote of thanks was tendered to Dr. Twitchell for his address.

A Member—I should like to ask the Doctor whether he has been raising dairy cattle such as he has described?

Dr. Twitchell—Only to a small extent. As I said at the beginning, I want to stand in the right position before you. I have been a student of the problems for many years, with profound appreciation of a dairy cow and with contact with dairymen all the time as I have been going over New England.

A Member—You did describe the dairy cow completely.

DISCUSSION.

175

Dr. Twitchell—That is the picture that is in my mind. It has been there a good many years and it has been my desire that I could have her, but I have not been so situated that I could.

A Member—If you will come down to Burlington County you will find a hundred farmers down there who know a dairy cow when they see her, and they know that they can buy the best-looking cow possessing all the points you describe, and yet get fooled part of the time. I have been raising Jersey cattle twelve years, and secured the best sires I could get, sent them to mates that cost seventy-five hundred dollars and took a great deal of pride in that, but I was unfortunate with them this last year. Now all my twelve years' labor amounts to nothing in undertaking to raise a Jersey dairy cow of the high type.

Now, I wish to refer to the tuberculous cattle where they are brought here in our own cattle from other States without inspecting them, and they are sent out in the State of New Jersey. In New Jersey we have a peculiar way of sending cattle from barnyard to barnyard at public sale. There is a public sale tomorrow at Columbus. We have them every two weeks, and the people bring their cattle from all over the county to be sold, and you have got to be a pretty good judge if you don't get stuck there, and get some tuberculosis, and there is good, bad and indifferent sold all through the country, and I know we have plenty of farmers who have been trying to breed their best dairy cows and who are good judges of cows, but it is a very difficult matter to get good cows, good dairy cows.

A Member—If it is in order I would like to ask the gentleman if he knows of any place in the country where the dairymen have united and secured a more profitable price for their product? There is no use talking about the cost of production. The dealers won't pay you any more than they are compelled to pay you. Do you know anywhere in this country where the farmers have compelled them to pay the producers a profitable price? And do you know by what means that was accomplished? And if you do not know where it has really been done, have you any scheme in your mind whereby it can be done?

Dr. Twitchell—I am a Yankee. Did you ever know a time when the dealers ever paid you any more than they were obliged to?

The Member—I don't recollect any such time.

Dr. Twitchell—No, I don't either. It has always been the condition. The question which the gentleman asks is a great problem. I don't know of any section in the country where the farmers are getting a fair price for their milk or dairy product in proportion to its food value, but I know this, that through local breeders' associations in Maine, and through our cow testing associations, our farmers are realizing as they never did before, for their product. We have in our State a large number of testing associations and they are doing a wonderful work in helping the farmers to a realization of how to breed, how to feed, how to take care of their cows, how to produce most, and how to increase the product of the farm, and they have also had a decided influence upon the market. You know we as a State are a sweet cream State. There is where we are making what we could not otherwise make or could not make in handling the milk product.

But, gentlemen, the history of progress agriculturally for the past twenty years has been a history of organization, so far as it has been successful. The fruit sections of the West, the fruit sections of the South, the truck farmers of Delaware and Virginia, have found success only through organization for the handling of their product themselves, and through organization I believe, and in no other way, are we to find the solution of this question. The dealers will pay you no more than they are obliged to pay. Organize, organize, organize for self-protection or you will be forced to the wall.

Chairman Cox—If there are no other questions, we will pass on to the next subject on the programme, which is an address on "The Tuberculin Test and the Use of Slightly Affected Tubercular Animals for Human Food," by Dr. B. T. Woodward, of the Bureau of Animal Industry, Washington, D. C. I now have the pleasure of introducing to you Dr. Woodward.

Tuberculin Test and the Use of Slightly Affected Tubercular Animals for Human Food.

BY DR. B. T. WOODWARD, QUARANTINE DIVISION, U. S. BUREAU OF ANIMAL INDUSTRY,
WASHINGTON, D. C.

The subject assigned to me for presentation and discussion at the fortieth annual meeting of the New Jersey State Board of Agriculture, divides itself into two large sections. In treating the first of these, the tuberculin test, it seems that it should be considered in the broadest sense possible, and I therefore will

consider the tuberculin test to imply prevention and eradication of tuberculosis among cattle, as a test is in itself but a single agent for the accomplishment of these ends.

In order that we may obtain the full value of the necessity for the campaigns which are being conducted for the eradication of bovine tuberculosis it is essential that we have a firm foundation knowledge of the fundamental facts connected with the disease itself. Tuberculosis is one of the oldest recognized diseases, as the writings of Hippocrates in 500 B. C. mentioned this disease as killing the greatest number of people in his age. In the middle ages it was classified with the diseases of immorality and stringent legislation was passed, in fact, far more stringent than will ever be or need be enforced in the present age.

The cause of tuberculosis was in those ages unknown, but it is now recognized as a communicable disease caused by one kind of germ, the tubercle bacillus. This definition may be rendered more complete by adding the statement that tuberculosis is a preventable and controllable disease. In the intelligent prevention of a communicable disease a thorough acquaintance with the causative agent is an essential weapon. This knowledge the world did not possess until the discovery of the germ of the disease in the year 1882 by the German investigator, Dr. Robert Koch, who proved by experiments, that the disease is produced by certain germs which he named "tubercle bacilli," and without which the disease cannot be produced. The germ itself is invisible to the unaided human eye, but is visible by the magnifying powers of the microscope. The usual type of this organism is a minute, slender rod, so small that six to ten thousand of them laid end to end would only make a line one inch long. Their length is approximately five times as great as their width. With the accession of this knowledge investigation gained a great impetus and the disease was found to be far more widely spread than had ever previously been assumed. It is now known to exist in varying degrees over the entire civilized world, but from our standpoint, it is especially prevalent among cattle in the old dairy sections.

Tuberculosis is found most often affecting human beings and cattle, but there is no kind of animal that cannot be infected. Hogs are quite susceptible; chickens are also frequently tuberculous in certain sections of the country. Horses, sheep and goats rarely contract the disease.

Illustrative of the importance of tuberculosis to the animal husbandry of the United States, I will quote the following figures regarding the disease as its appearance was determined in the meat inspection work of the U. S. Bureau of Animal Industry, during the year ending June 30, 1912. Among the cattle slaughtered the carcasses of 35,273 were found to be so extensively affected with tuberculosis that they were condemned as being unfit for food and converted into fertilizer. The losses among swine from the same cause were 42,267 carcasses. The aggregate losses in this meat from tuberculosis represent at least \$2,000,000. It is estimated that probably 60 per cent. of the food animals slaughtered in the United States are subjected to federal inspection, and with these figures it is evident that the loss should be at least \$4,000,000. Added to this, the figures presented at the International Congress on Tuberculosis, which was held in Washington, showed a depreciation in the value of living, meat producing animals of \$8,000,000, and in the production of milk, of \$10,000,000. Taking all these items into account the total annual loss caused by tuberculosis among farm animals in the United States is estimated at not less than \$23,000,000. Even in this great sum allowance has not been made for the impairment of breeding qualities and inheritance of weakened constitutions.

An important question is how do the tubercle bacilli obtain access and produce the disease in the animal bodies which causes these enormous losses. Probably the most frequent manner of the entrance of the organisms is by being swallowed or ingested. Milk is recognized as one of the most dangerous of the foods which convey the germs of tuberculosis. Illustrative of this it appears that in the year 1895, when it was customary to feed swine in this

country almost exclusively upon a grain ration, the results of post-mortem examination in the federal abattoirs showed .0004 per cent, of tuberculosis. In the following years with the establishment of creameries throughout the country, the feeding of separator skimmed milk to hogs gained favor and in 1908 the percentage of tuberculosis among swine slaughtered at the abattoirs was found to have increased to 2.05 per cent. It is also frequently illustrated by the infection of calves in those herds where separator skimmed milk is used for feeding purposes. The disease has been known to make its appearance in young stock thus fed, in herds which previously had never been infected with tuberculosis.

The inhalation or the breathing in of contaminated atmospheric air is probably next in importance, while the infection through wounds, sores or copulation is quite rare, as is also the infection of the calf before its birth.

When the germs have entered the body there is an immediate and involuntary effort upon the part of the animal to destroy the organisms, and it has been found that under normal conditions tuberculosis is transmitted only after prolonged exposure to the contagion or after repeated infection with the virus. It is a principle, which may be applied to all communicable diseases, which prevents the entire animal kingdom from being exterminated. In other words, there is a certain individual resistance which we frequently term a strong constitution. If the tubercle bacilli, entering in large numbers or receiving reinforcements by new invasions, take a stand upon favorable ground, they repel the antagonistic forces in the blood and finding warm, moist tissue, full of nourishment, they rapidly reproduce themselves. This growth, with the production of a toxin or poison, causes the irritation of tissue and soon a tiny, inflamed area can be seen with the microscope. It grows until it is distinguishable by the unaided eye, as a tubercle or nodule. As it becomes larger decay sets in and the center becomes filled with a soft, cheesy mass which may finally become encapsulated with fibrous tissue and becomes hard due to the depositing in it of lime salts. This represents a picture of a single tubercle, but generally they are multiple in their appearance and increase in size, not only by their own growth but by the fusing or blending together of a number of tubercles until there result the formation of great tuberculous masses. These are of a yellow or grayish yellow color and when cut with a knife, their interiors present the characteristics of pus or cheese, or of semi-stone. It is these lesions for which we look in making post-mortem examinations and although we find that they occur with greatest frequency in the lymphatic glands of the lungs and the lungs themselves, they may and do occur in the tissue of any part of the body.

Considering the small start which may result in the well-developed case of tuberculosis, it shows that the disease is insidious. The insidiousness makes the losses resulting from it more difficult for the cattle owners to appreciate than if the disease were rapid in its action, causing the sudden death of their stock as in outbreaks of anthrax. Tuberculosis may develop in the bovine body during a considerable period of time and the lesions become generally scattered throughout the carcass though the animal still retains its flesh and a general appearance of health. When the symptoms of the disease appear they are frequently not characteristic. The most important of these suggestive of tuberculosis is unthriftiness, as indicated by a rough coat and a harsh, thick skin which has lost its suppleness. With the unthriftiness there is noted a gradual loss of flesh in spite of the amount of feed consumed. This wasting away progresses until after a time the animals are reduced almost to skin and bones. Coughing is a symptom present when the disease affects the lungs or other respiratory organs. Enlarged lymphatic glands which are in the region of the throat may cause difficulty in breathing. The glands known as supra-mammary, which are located just above the udder, in the region of the escutcheon may also appear as enlarged. Affecting the udder no changes are at first noticeable but as the tuberculous lesions progress they may be detected as hard, non-sensitive lumps in various parts of the udder. These are more readily felt after the completion of milking.

TUBERCULIN TEST, ETC.

179

It was early known that the fight against tuberculosis among cattle would be of long duration on account of the hidden manner in which the disease attacks its victims and progresses within them. For eight years after the discovery of the germ of tuberculosis it was not possible to take full advantage of this knowledge and apply it in the eradication of the disease, as many cases could not be detected by their symptoms or ordinary microscopic examination. In 1890 Dr. Koch made another discovery, viz.: that a substance which he named tuberculin could be used as a diagnostic agent for the detection of tuberculosis in cattle which did not show visible lesions of the disease. Tuberculin as used for the diagnosis of tuberculosis is an absolutely sterile extract of the product of the growth of tubercle bacilli in artificial culture media or beef broth. Being sterile it is impossible for its injection to cause tuberculosis. The injection of tuberculin into a healthy cow has no other effect than would be obtained in the injection of a similar amount of sterilized water.

A brief remark upon the preparation of tuberculin may be of interest. The germs are placed in the specially prepared beef broth which nourishes them. The flasks containing the broth and the germs are placed in an incubator which maintains them at approximately body heat or at a temperature most favorable to the multiplication and growth of the organisms. After several weeks of this growth, during which the bouillon has become saturated with the products of the germ, the living germs are destroyed by a very high degree of heat and the dead bodies are filtered out. The fluid is then evaporated by heat to a definite proportion and consistency, preserved with carbolic acid and prepared for dispensing. During the year 1912 the Bureau of Animal Industry distributed 329,771 doses of tuberculin for the official use of its inspectors and of State officers in applying the tuberculin test to cattle. In addition to this amount a number of States maintain their own laboratories for the manufacture and distribution of tuberculin and it is also prepared by various commercial firms. The tuberculin test is not an infallible agent for the diagnosis of tuberculosis, but when properly applied by skilled veterinarians or other specially trained persons it is accurate in its results to 97 or 98 per cent. During the past five years 1906 cattle which reacted to the tuberculin test applied under the supervision of the Quarantine Division of the Bureau of Animal Industry, working in Virginia, Maryland and the District of Columbia, were slaughtered and the reactions to tuberculin were confirmed in 97.85 per cent. of the cases. Investigations in localities where the tuberculin test was reported as not having been accurate in its findings have shown that the tests were carelessly applied or were applied by farmers who were not specially trained in its use and in the clinical diagnosis of diseases of animals, or that post-mortem examinations were not efficiently made. This was illustrated by one State in which 22.5 per cent. of so-called tuberculin reactors were stated to have failed to show lesions of the disease.

The interpretation of the results of a tuberculin test cannot be made solely upon a reading of temperatures and the following of hard and fast rules concerning the temperatures recorded, but there must be taken into consideration the physical condition of each animal tested and the conditions under which she is being maintained. There are a number of conditions which influence the results of tuberculin tests, but their combined strength is not sufficient to cause at any time more than three per cent. of error and this could probably be largely reduced by more careful and thorough examination of the tissues of the slaughtered animals.

With the tuberculin test as a foundation, very satisfactory progress can be made in the control and suppression of tuberculosis by observing proper methods in the disposition of reactors which may be found. In the District of Columbia, where the tuberculin testing of all cattle is compulsory, and where the reactors are controlled by slaughter and the premises promptly and thoroughly disinfected, the percentage of tuberculosis has in two years been reduced from 18.87 per cent. to 1.29 per cent. and the centers of infection or infected premises reduced from 18.35 per cent. to 3.61 per cent. During the past year, in the

States of Virginia and Maryland, where the work of the Bureau in applying the tuberculin test is solely upon the voluntary requests of cattle owners and in which an effort is made to co-operate with them in their honest endeavors to eradicate the disease from their herds, it was found that among the new cattle tested 18 per cent. were tuberculosis, but in the annual retesting of herds, only three per cent. of tuberculosis cattle were found.

In every case successful results depend upon the prompt removal of all known tuberculous cattle from the herd and a disinfection of the premises occupied by them. Infected premises, while they do not propagate the tubercle bacilli, harbor them, so that healthy cattle may be contaminated and it is therefore evident that the simple removal of the diseased animals is not sufficient to obtain the best results.

The removal of the tuberculin reactors is accomplished in every case by one of the two following basic methods, or their modifications. First, slaughter of every tuberculous animal. Second, absolute and perpetual quarantine of every tuberculous animal. The slaughter method was that adopted by the early investigators and was radical in that no extenuating circumstances were allowed to interfere with the immediate slaughter of every tuberculous animal and the destruction of the entire carcass by burial or fire. Such action was largely responsible for the early prejudice and antagonism to the work of eradicating bovine tuberculosis, which unfortunately developed in the minds of cattle owners, traces of which, be it regretted to say, still linger in spite of the enlightenment of education and the changes which progress has taught. The investigations of science showed that under special quarantine conditions certain tuberculous animals might, by postponing the day of their slaughter, be of temporary financial profit to their owners, and further, that the destruction of all carcasses was a great, avoidable economic loss which cattle owners and through them the public should not be called upon to sustain. We, therefore, find at the present day that the slaughter of tuberculous cattle is associated with a veterinary post-mortem examination to determine the extent and character of the tuberculous lesions in each carcass, according to which the inspector passes his judgment upon the use of the meat for food or its condemnation.

The U. S. Bureau of Animal Industry, under authority of the Act of Congress approved June 30, 1906, usually known as the Meat Inspection law, has issued regulations governing federal meat inspection throughout the entire United States. These regulations are modifications of those issued under authority of early Congressional acts and were promulgated only after a searching investigation of the most recent work and decisions of the world's highest authorities, both at home and abroad, in regard to public health and the utilization of meat and its products. The fundamental purpose of the meat inspection law and these regulations seems best expressed by a quotation from their introduction, as follows: "For the purpose of preventing the use in interstate or foreign commerce of meat and meat food products which are unsound, unhealthful, unwholesome or otherwise unfit for human food." The scope of the protection granted by these regulations was widened by the adoption of their principles, by legislative action of States and municipalities covering local meat supplies. There is, however, a large volume of meat which is consumed by the public without having received any inspection whatever. This represents the animals slaughtered on the farms and in small local slaughter houses. The application of the principles of protection concerning the use of the meat of cattle or swine when these animals are affected with tuberculosis is clearly shown by the official declaration of principles which has been issued for the guidance of inspectors in passing on carcasses affected with tuberculosis.

PRINCIPLE A.—The fundamental thought is that meat should not be used for food if it contains tubercle bacilli, if there is a reasonable possibility that it may contain tubercle bacilli, or if it is impregnated with toxic substances of tuberculosis or associated septic infections.

PRINCIPLE B.—On the other hand, if the lesions are localized and not numerous, if there is no evidence of distribution of tubercle bacilli through the blood, or by other means, to the muscles or to parts that may be eaten with the mus-

TUBERCULIN TEST, ETC.

181

cies, and if the animal is well nourished and in good condition, there is no proof, or even reason to suspect that the flesh is unwholesome.

That the establishment of these principles is possible requires the presupposition that the meat of every animal affected with one of the various stages of tuberculosis is not necessarily infected with organisms of the disease. From the just published American translation of the last edition of Hutyra and Marek's textbook on the diseases of animals, which is probably the leading veterinary publication of its kind today, it appears that the muscles or flesh of animals contain tubercle bacilli only in rare cases. Infectiveness of compressed muscle juice is apparently greatest in advanced generalized tuberculosis with softened or suppurating lesions of the disease or with evidence of a recent invasion of numerous tubercle bacilli into the systematic circulation of the blood. Muscle juice of badly infected cattle has been proven infectious in only exceptional cases by intraperitoneal or subcutaneous injection, while attempts to produce tuberculosis through feeding experiments with muscle juice have almost universally yielded negative results. Tubercle bacilli, when they enter the blood current, remain there for a comparative short period of time and may then be demonstrated by a microscope, but their occurrence in the blood is quite rare. This should be contrasted with the relative frequency of the appearance of oftentimes large numbers of tubercle bacilli in the milk, which is generally consumed without the destructive action of heat to the germs. We should further consider that under natural conditions the normal animal or person, as previously stated, succumbs to tuberculosis only after repeated infection with the virus or prolonged exposure to the contagion. Based upon these facts is the following rule for the guidance of inspectors: The carcass of a well-nourished animal, if tuberculous lesions are limited to a single or several parts or organs of the body, without evidence of recent invasion of tubercle bacilli into the systematic circulation, shall be passed for human food after the parts containing the localized lesions are removed and condemned. The presence of a single tubercle in an organ such as the liver or in the lymph gland which drains an organ is sufficient to cause the condemnation of that entire organ. It is also a rule that when any meat has been contaminated by tuberculous material through contact with the floor or a soiled knife, or otherwise, that it shall be condemned. The observance of the principles and regulations which I have brought to your attention guarantees to you that any meat which bears the stamp "U. S. Inspected and Passed" is a safe article of food.

The great economic value of the application of the knowledge which permits us to utilize wholesome meat of animals affected with localized or restricted tuberculosis may be illustrated by statistics which show that of 1906 cattle which reacted to the tuberculin test applied by the Bureau of Animal Industry, about four-fifths of the carcasses were sold and used for food while the remaining one-fifth were a total loss with the exception of their hide and slight fertilizer value. Consider the saving in money which this represents to the owners of tuberculous cattle and the volume of wholesome meat which is made available for food as compared with the useless loss entailed by the radical attitude and methods of those who were earlier engaged in cattle tuberculosis eradication work which earlier course would have eliminated the food value and reduced to a negligible amount the financial return realized from the aforementioned 1906 cattle. In the fiscal year 1912 post-mortem examinations in abattoirs under federal meat inspection condemned 35,273 carcasses of cattle and 42,267 carcasses of swine, while 51,576 parts or organs of cattle and 314,581 parts or organs of swine were removed and condemned, leaving the healthful meat of this enormous number of animals available for food.

In summarizing and concluding this section of my discussion, it should be thoroughly understood that the U. S. Bureau of Animal Industry does not pass diseased meat for food but in all cases of every character whatsoever, only the sound and wholesome meat of an animal showing localized lesions is passed after removing and condemning the affected parts which most frequently consist of lymphatic glands or an organ.

To return to the elimination of the tuberculous animal from the herd and to work upon the second basic principle, viz.: absolute quarantine, it has been

found by investigators that as the disease is very rarely inherited, and as some animals may be able to prevent the rapid growth of tuberculous lesions within their bodies for a period of time, that such cattle might be safely maintained for the purpose of obtaining their offspring. This practice of quarantining is known as the Bang method and with modifications to suit special conditions, has proved to be of great value in combating tuberculosis of cattle with least financial losses to their owners. The method is not practicable in the handling of grade herds of cattle or those animals which are not especially valuable on account of their unusual producing qualities. As a rule the Bang method is only applied in this country in the case of pure-bred cattle where it is desired to perpetuate the family strain and the milk or beef producing capacity of individuals. The reacting animal is placed in a separate building, with separate attendants and permitted access only to separate pasturage. The calf of the tuberculous cow is removed from the mother immediately after its birth and upon some farms is thoroughly washed with a disinfecting fluid. This calf is then reared upon the milk of known healthy cows or the milk of its tuberculous mother is pasteurized or sterilized to destroy the tubercle bacilli which may be present and is then used for calf feeding. This tuberculous cow may be safely maintained in quarantine for breeding only so long as she fails to exhibit any visible evidence of tuberculosis, but it is recognized that with the appearance of these visible evidences of diseases subsequent offsprings would inherit weakened constitutions and would not be desirable representatives of the breed. In no case should an animal which has once reacted typically to the tuberculin test be permitted to return to the healthy herd, no matter what its physical appearance may be. Therefore, the animal once placed in quarantine under the Bang method must remain under that quarantine until slaughtered.

The use of tuberculous bulls which do not show lesions of the genital organs or visible evidence of the disease may be permitted under quarantine restrictions.

In this talk I have not attempted to cover all the phases of the subject, but to present the principal features, allowing you the opportunity to ask any questions regarding the details, during the discussion which is now opened for you.

THIRD DAY—EIGHTH SESSION.

The meeting was called to order by Vice-President Cox.

Chairman Cox—The first matter that we will take up will be "Some Comments on the Recent Emigrant National Protection Conference," by Mr. Theodore Brown, Delegate of the State Board of Agriculture to that conference. I now present to you Mr. Brown, a member of the State Board of Agriculture. (Applause.)

Mr. Brown—Mr. President, Ladies and Gentlemen, I want briefly to state a few of the recommendations of the National Emigration Conference that was held in Washington, in November, 1911, and the second meeting in Chicago, November 14, 15, 1912, both meetings of which I had the honor to attend as delegate from the New Jersey State Board of Agriculture.

The condition that was reported there from every State in the Union was a shortage of farm laborers, without excepting any State, and most of the States reported a shortage of farmers. Nearly every city reported a congestion of laborers, and it should be the result of this immigration conference to arrive

at some plan whereby the emigrants coming into this country, who ordinarily pile up in the cities more than they should, shall be distributed by means of the understanding and organization of the federal Government co-operating with the government of the several States.

One of the plans that seemed feasible is that when an emigrant lands who has been on the farm in the old country and he is admitted by the proper officers, that the federal government should step up to him and say, "Where do you want to go?" "What business do you want to engage in?" And hand him over to some officer of the State government who shall see that he gets to his destination and shall not be taken advantage of by people of his own tongue and kept where he will not be of an advantage.

The question of safeguarding the emigrants, not only the aliens but people who wished to move from one part of the United States to another to better their condition, is something worthy of the attention of all thinking people.

One of the means by which this may be established is by a system of State Free Employment Bureaus which shall have charge not only of the emigrants and the people, but shall have power to license private employment agencies, and the regulation of them.

The best system that we have at the present time is in the State of Kansas where the superintendent of the State Free Employment Bureau has power to license private agencies, and also has the power to revoke its license for cause. That is much more effective than any other system.

Also the question of distributing the transient labor that comes into any locality for a certain season is a very important one.

Last June the State Superintendent of Free Labor Bureau in Kansas advertised for sixty thousand men for the wheat harvest. He got them without any great confusion. They stayed in Kansas for the wheat harvest and then gradually worked north with the harvest, but because there was no system, no public system, no co-operation in transportation, they left North Dakota, Northern Minnesota, Northern Wisconsin, four weeks before the farmers were done with them. Left the grain in the shock.

Now, it should be the aim of this organization to devise some plan whereby those people could be kept where the work is until it is completed and then shipped to some other part of the country where they are needed. We could apply that locally to our own State. When they are needed in the strawberry section, later in the early tomato section, later in the cranberry section, still later in the corn section to take care of the corn.

In the State of New Jersey probably we would need only two State Free Employment Bureaus, one in the vicinity of Camden and another in the vicinity of Jersey City.

Another proposition that claimed the attention of the conference was the regulation of real estate agencies. I think that most of you have found out that at the present time there needs to be some control by the State over real estate agencies, that they do not rob and misrepresent to prospective settlers and prospective buyers the nature of the land.

I won't take your time further, but I want you to think over these things and be ready to recommend some of these matters to your Board. (Applause.)

Chairman Cox—If there is no objection, the report of the delegate, Mr. Brown, will be received and filed with the other reports, for printing.

Time is going by and we shall have to hurry on with our programme, and we will now take up the address, "The Scientific Feeding of Dairy Cattle Simplified," by Prof. H. R. Van Norman, of the Pennsylvania State Agricultural College.

The Scientific Feeding of Dairy Cattle Simplified.

BY PROF. H. E. VAN NORMAN.

I have become very firmly convinced of this thought; that we have had a period of ten to fifteen years of science in agriculture, we have learned that a whole lot of things are so and why. We have been trying to learn the truth. For instance, we have learned the relation between the bacteria and the keeping of milk, we have learned the relation of "bugology" and the destruction of fruits, the chemistry of spraying, the chemistry of feeds and the chemistry of fertilizers; I believe the next ten years will have to be a period in which the science of business is applied to farming.

There are lots of men who can grow a good crop who cannot run a successful business. A whole lot of the trouble on our farms today is not because we cannot grow good crops, but because we do not use common horse sense in the application of business principles.

BUSINESS PRINCIPLES.

1. The first step to insure profit is to know accurately the cost of production.
2. Assured a fair margin on each dollar spent, the more money spent the greater profit.
3. Many farmers are so intent on saving ten cents that they overlook the fact that the wise expenditure of a dollar may bring back the dollar and a clean profit of twenty cents or more.
4. Profit is limited not by the dollars but by the number of dollars spent so as to each return a profit.
5. Organization of work means, eliminate lost motion and increase the amount done without hurrying.
6. Co-operation and combination are not necessarily unjust, but are the natural order of development in business.
7. The larger the volume of any one product produced, the less the selling cost, the more uniform the article and the surer the market. This is the reason the dairy farmer with fifteen pounds of butter per week received twenty-five cents per pound while the creamery with five hundred pounds per day gets thirty-five cents.

Is it horse sense for the farmer to feed a cow fifty dollars' worth of feed and be satisfied with forty dollars' worth of milk, then sit around the corner grocery and complain that the Government does not run its business right? That is what we are doing on hundreds of farms.

We are doing it for two reasons; in the first place, because we do not use business methods in the buying of goods, in the second place, we do not use common business sense in taking advantage of what science has already taught us which may be applied to our business.

In the short time that I will have, I will try to give you a three weeks' course in feeding, boiled down into one hour. It is a pretty difficult undertaking, and I can only hope to hit the high points, and to arouse the curiosity of a few of you, and if it is aroused to the point where you will write to the Pennsylvania State College for a copy of their Bulletin No. 114, I shall feel that it has been well worth while.

When it comes to the feeding of cows, I am firmly of the opinion that it requires in addition to the science that we have, at least fifty per cent., of common sense, and I shall hope that every one of you have at least, that measure of it in fitting what I have to say into practice, because, remember, I have to leave a whole lot unsaid which in a longer dissertation I would present to you.

When we come to study the feed problem, the first thought is that an insufficient supply of food limits production. If you have a cow which has the ability

to make forty pounds of milk a day, and you only give her the material to make thirty of, very few cows will make more than thirty pounds. The first few weeks that is she is fresh she may do it, because nature has endowed her with the power to draw off of her body that which she has stored up, so that you may fool yourself and the cow for a short time by feeding her an insufficient supply of food the first three or four weeks. After this if nature will rest in the assurance that the calf can take care of itself, and the cow simply quits giving milk if you do not give her the food to take care of herself and to make milk of.

I want to emphasize that by saying, that the first use the cow makes of food is to maintain herself.

The next use she makes of the food is for the production of milk.

If she eats more than she needs for those two purposes, she will store it up on her body as gain in weight, and then when she freshens the next time, or at any time when she has insufficient food supply, she will draw on this stored up supply.

So our problem is to furnish the cow with what she requires.

But we cannot measure foods in terms of pounds. Science has been for a number of years groping around to find an accurate way of measuring feeds. The old terms chemists gave us of carbohydrates, protein and fat, has served a very useful purpose, but now, if it is possible, I am going to ask you to lay all that you know about carbohydrates and fat and protein on the shelf for an hour and forget it absolutely, and try and think of what I am saying, and see if we can get a little different point of view.

The old system measures dairy feeds in terms of what they are. Dr. Armsby, with the Calorimeter, at the Pennsylvania State College, and some of our German scientists have shown us, that it is a more accurate measure of the value of different feeds if we measure them in terms of what they will do. Dr. Armsby has given us then the energy value of feeds. Energy is power to do work. Just remember that little definition, energy is power to do work.

When we put coal under the boiler and burn it we create heat which converts the water in the boiler into steam, we run the steam over into the engine and set the engine in motion to haul the engine and the train of cars. You and I perhaps have seen a hundred box cars pulled by one engine. The energy, the power to pull that train came from that seemingly dead coal that went under the boiler. We can measure the power in that coal by measuring the heat that it will give when it is burned.

In the same way we can put corn under the boiler, and, if we had men enough and fed it in fast enough, we could put straw under the boiler and get the power to do the work.

And in the same way that we can measure the power of the coal, we can measure the power of the corn or the hay or the straw.

So these feeds contain power to do work, and that power can be measured by the heat that they give out when we burn them or by the heat that they will give off while they are being digested. There is the man chopping wood out of doors. He eats a lot of fat salt pork and thrives on it. While the fellow who is doing head work in the office cannot digest it as well. He don't need the heat or power. It is because the one is out of doors and the heat of digestion of the food is worked off.

So then we can measure the value of our foods for the purpose of balancing our rations in terms of energy. And energy is the power to do work.

But all of the energy of food is not available for useful work. There are some losses just as in the case of coal. We lose in the heat that goes out in the room, around the boiler, we lose in the gas that goes up the chimney, and we lose in the power that goes out in the form of soot and in other ways. Just so in feeding our cows we have loss. There are four of those losses. If you will let this line represent a hundred units of energy, and Dr. Armsby has given those units the name of a therm, a unit of measure of energy, just as the pound is the unit of weight. If that is a hundred units of energy in cows, a part of the energy is lost, in the feces, a part of the energy is lost in the

urine, a part of it is lost in the form of gas and a part of it is used up in the labor of chewing, swallowing, digestion and expelling from the body the waste products, which we speak of as the labor of digestion.

The reason why the energy value method is more accurate than the old method of measuring the value of food is because we have deducted these four losses, where in the old method we took out only the loss in feces and said the rest is digestible, but did not take into account these other three losses.

This remainder we speak of as the net energy of the food that the cow can use to support herself, to put on gain in weight, to repair the body, and to produce milk. The draft horse uses it to pull a load, the running horse uses it to run, and we use it in the case of our own bodies for our own work. Brain work requires energy, hand work requires energy, and the net energy is the part that is useful after taking out the four losses.

Corn has forty-one per cent. of the total amount of energy in it, net. In other words, more than half of the energy in corn is lost in those four losses. I was told by a railroad man once that if an engineer on an engine got from six to ten per cent., of all the energy in the coal exerted on the drawbar of the engine, he was doing fairly good work, and when he got fifteen per cent., he was doing exceedingly good work.

In the case of corn we have forty-one per cent. of the total energy going into the animal available for useful work.

For contrast, supposing we took timothy hay—we have the same four losses, but larger, there is only fifteen per cent., of all the energy going into the animal that is useful, *i. e.*, net and the rest is lost.

In the case of wheat straw we have only six per cent. Now, there is not a farmer that ever fed a cow who does not know that wheat straw is not equal to corn meal. This is simply an explanation of why that is so, and how much it is so.

So much then, for the terms in which we will study our foods.

Is there any question about it? Is that clear?

A Member—Why is it that you only get six per cent. of energy?

Mr. Van Norman—Because a part of the food which goes in is used up in the feces, part in the digestion, part of it goes out in the urine and part of it goes out in the form of gas and the rest of it is used in the labor required in the masticating, digestion, working it up and throwing it out.

A Member—There is a great waste then in all of those foods in those processes?

Prof. Van Norman—There is a waste in all of those processes with all foods, but there is a difference in different feeds, corn is most efficient that has been yet analyzed, and wheat straw is the least efficient of those that have been treated. Practically all the common foods we have come somewhere in between those two. The more crude fibre there is in a feed, the less the net energy.

I had a letter on my desk yesterday asking for the net energy in a certain mixed feed. We cannot tell that, because we have

got to know what the feed is made of and know the composition of it, and those fellows who make up mixed foods do not tell us those things. But we cannot expect to have more or the same net energy in a food madeup of oat hulls and various things of that kind than we can have in the same number of pounds of oats or corn meal, which has so much less crude fibre content. The more waste products and crude fibre we have, the less net energy there is left for our work, and that is a thing that most of our feeders forget when they are comparing the price of feed.

Mr. Cook—Is it not necessary to have considerable crude fibre in your food?

Prof. Van Norman—No, sir, I don't think it is necessary to have more than most of our common feeds contain. They have enough.

Mr. Cook—Can you feed a cow on concentrated foods without crude fibre and without some roughage?

Prof. Van Norman—The concentrated foods have some crude fibre in, but not enough perhaps, although it is not necessary to have much roughage. Experiments have shown that a cow has a wonderful adaptability and if the grains are cheap and the roughage is high priced and they have to get along without it, a cow can go right on doing good work without it, but she is built with a large stomach and she is better to have a considerable amount of roughage. When fed only rich food she will find the roughage herself if she can get out to find it.

Now to the next point. We can measure all of our common foods in terms of energy, but that is not sufficient. A cow can be fed a sufficient amount of energy producing foods and yet not do her best work, because she must have protein.

A hundred pounds of milk contains at least three to three and a half pounds of protein. And we must be sure that the protein is in the food, or the lack of it limits production.

So that we have those two facts, insufficient food limits production; insufficient protein limits production.

The problem then of the farmer is how to be sure that each cow is getting enough net energy, and that a part of that energy comes from protein, and that enough of it comes from protein to be sure that the cow has sufficient to produce all the milk that she has the ability to produce.

Protein furnishes energy, it is true, but we might liken the protein of the food to the mortar in a wall. You take ten foot of brick wall, ten feet high and ten feet long and one foot thick, and we will have a hundred cubic feet of wall, but part of that wall is made up of mud, or mortar, as we say. If we ran out of mortar when we got almost through the wall, we cannot put a brick in the place of mortar, but if we run out of brick, we could fill up with mud that little hole that we have left. In the same way, if we run out of protein, that limits production. If we give a little more protein than we need to the cow, the cow simply uses it in place of something else, and a little excess of protein does no harm, except as protein is expensive, it may not be quite as cheap to give an excess. But, the big problem is be sure that we get enough to meet the cow's needs, because if we have not got enough the cow is unlike a hen—the hen will lay a soft shell egg if you don't give her lime enough—but

the cow won't give imperfect milk. If you do not give her all she needs, to make a perfect milk, she just simply quits producing.

Now, the question is, how shall we be sure that the cow has what she needs? We have some standards which have been worked out; namely, a thousand pound cow requires one-half pound of digestible protein a day to maintain herself; she requires six therms of energy per day to maintain herself, if she weighs a thousand pounds. If she is producing twenty pounds of four per cent. milk, she will require another pound of protein and she will require another six therms of energy, or a total of one and a half and twelve.

But, supposing that same cow is producing forty pounds of four per cent. milk; then we do not have to double the amount of protein and energy. We only have to add one more pound of protein, because that is all she needs to produce the additional twenty pounds of milk; and we add another six therms of energy. So then she requires two and a half pounds of protein and eighteen therms of energy to maintain herself and produce forty pounds of milk.

A whole lot of dairymen have not learned that lesson yet. If a cow has the ability to produce forty pounds of milk a day and you are only giving her two pounds of protein and fifteen therms of energy, she cannot make forty pounds of milk out of it very long. If she does, she is taking it off of her body and she will grow thin. On the other hand if she eats this much and does not produce forty pounds of milk, then she will be storing it up on her body. The test of the dairy cow is her ability to convert the food that she can eat into milk. Some cows can eat more than they can use; others could use more than they can eat.

How can you be sure that you have supplied the needs of each cow?

Well, you can sit down and figure out each cow's needs by herself. But can you guarantee to me that the corn which grew on your fields this year has the same composition as that which grew last year? Can you guarantee to me that the composition of your hay is the same as the average given in the feeding tables. If you could do that it would be well. But you cannot do it. Therefore, my contention is, as a practical business proposition, it is not worth while for us to stop and quarrel over whether we fed 2.4 pounds of protein or 2.5; nor whether we have fed seventeen or eighteen therms of net energy. But, if you will understand the principle on which foods must be put together, and supplement the knowledge with the little figuring that it is necessary to do, then add to it your own observation as to whether the food is agreeing with your cows or not, you can do very much better feeding than thousands of dairymen are now doing. I was confronted with the problem of how to answer the hundreds of letters which are coming into our college on this feed question, with the high cost of feed, with the high cost of labor, with the complaint of insufficient price the dairyman is up against it, and he is groping for help, and out of the necessity of answering his questions I have worked out and suggest to you the following plan of figuring, in order that you may furnish the cow what she needs, and do it with the least figuring and at the lowest cost.

There are three parts to our problem. 1st. What does the cow require? 2nd. How shall we be sure we have supplied her with it. 3d. How can it be done cheapest? A man needs to get a clear conception of all these parts of the story, where he is trying to go, how to get there, and what it costs.

Our first problem is to furnish the cow the protein and the energy she needs, Are there any questions up to this point?

Mr. Van Fleet—I would like to ask Mr. Van Norman if he said that in wheat straw there is six per cent. of net energy?

Mr. Van Norman—I said six per cent. of the total energy in wheat straw is net.

Mr. Van Fleet—Yes. Now, for instance, corn stalks, what energy would they take?

Mr. Van Norman—You have not quite caught what I said; of the total energy going into the cow six per cent. is net. Our tables are made up in terms of the amount of net energy in a hundred pounds of the food; which is really a different proposition. A hundred pounds of corn stalks will have about twenty-six therms of net energy, but that twenty-six therms of net energy may be only five per cent. of what went into the cow. If there are any school directors here I would like to say to them that the greatest need in our schools today in addition to the other things we hear the need of, is that the children shall be taught the figuring of percentages. I spend nearly half of my time in some of the college classes trying to teach them how to figure percentages. They want to think like the small boy whose father said, "Johnny, how much are three knives and two knives?" "Oh, I don't know. If they were apples I could do it." Most people can think percentage in dollars and cents, but they cannot think percentages in pounds of milk or in therms of energy.

My suggestion for common feeding practice is that we shall make up a mixture of grains and feed that mixture in proportion to the milk yield, say one pound to each three pounds of milk. I believe that is a safe rule. It is not the only rule, but it is a safe rule, because if the cow is only giving three pounds of milk she would get only one pound of grain mixture, and she can eat enough roughage to take care of herself. On the other hand, if she has the ability to produce sixty pounds of milk she could eat twenty pounds of grain, and lots of cows producing that much milk have been fed that amount or more of grain, and gone right on the next year and done the same thing over again, without having been hurt. That is my test of a fool-proof rule, that we can run it to both extremes and still be within reason. It is about as near fool proof as you can get it.

But I also think when a cow goes over thirty pounds of milk a day, it is safer to drop back to one pound of grain mixture to each four of milk unless you are sure enough of your own judgment to make your own rule.

How are the grain mixtures to be made? The character of a grain mixture depends on the roughage available.

All the roughage we ordinarily have may be divided into three groups or classes. Any one group will be near enough alike in composition for all practical purposes, provided we classify our roughage in this way:

In the first group we will put timothy hay silage, and corn stover;

In the third group we put alfalfa and clover;

And in group two we have a mixture of any one or more from groups one and three; provided it includes about six or more pounds of clover or alfalfa hay.

Every farmer can decide which of those three groups his available roughage belongs to. If he has to feed his cow timothy hay and silage it is in group one, if he is feeding silage and corn stalks, group one, if he is feeding all three, he is in group one; but, if he is feeding silage and clover hay, then he is in group two.

That simply enables us to determine in what proportion we shall mix our grains, and so I give you this arbitrary rule without going into it very far unless some question is asked.

If you have roughage all in group one, make up a mixture so that for every one pound of protein you have four and a half therms of energy.

For group two make up your grain mixture so that for every one pound of protein you will have five and a half therms of energy, and

If your roughage is in group three, make up your grain mixture so that you will have somewhere from seven to eight therms of energy and it won't hurt, even if you have nine.

My contention is that while those rules are not absolute, the following of

them in practice is so far ahead of the common practice of hundreds of dairy-men that they will get very much better results. I have several instances to confirm this opinion.

One of many is that a man who was up at our Farmers' Week, a year ago and he went home. In five weeks he saved in his feed bill the whole cost of his week at the College, and got more milk. And now four or five of his neighbors are following the same practice.

My next point is that this plan, if you once get it in your head, is so much easier to work than the old, that there are a whole lot of folks who will use it who never will touch the old method of figuring.

So much for the relation of protein to energy and the grain mixture.

Let us take up the making of the mixtures themselves. If you have any questions, don't hesitate to ask them.

A Member—How do you determine the amount of energy in the different foods?

Mr. Van Norman—We have bulletins in which that has been worked out for the commoner foods, but, unfortunately, not for some of the newer ones. The mixed by-product feeds we do not know very much about, but the old standard feeds have all been worked out.

By way of example I am going to put on the board this mixture; supposing we take three hundred pounds of corn meal; that will contain twenty pounds of protein and it also will contain 264 therms of energy.

One hundred pounds of cotton seed meal will have thirty-five pounds of protein and eighty-four therms of energy.

This is digestible protein.

Then we will take three hundred pounds of distiller's dried grains, which will have sixty-six pounds of protein and 237 therms of energy.

One hundred pounds of gluten feed which will give us twenty pounds of protein and seventy-nine therms of energy. That is a total of 141 pounds of protein and 664 therms of energy.

Suppose we started out now to make a mixture that shall have one of protein to each five of net energy, which is a good mixture to feed with timothy hay, stover and silage; so that our 141 will divide into 664, about four and a half times; have we got too much or too little protein? Too much protein, because we have four and a half times four and as much energy as protein, and we want five times; that means we must have either more protein or less energy.

That brings me to the next suggestion; these tables that I have put in this bulletin (No. 114 Penn. Ex. Station, State College, Pa.), show the amount of protein in even hundreds of pounds, so that we do not have to stop to figure out how much there would be, and I suggest in making grain mixtures we use multiples of one hundred pounds of the several feeds, and this table will show you the protein in one hundred, two hundred, three hundred pounds of corn meal, so you don't have to stop to figure it, you just turn right to the table and pick it out.

Now, instead of rubbing this mixture all out and starting over again, we will just add a hundred pounds of corn meal, which will contain seven pounds of protein and 89 therms of energy; that makes our total 148 pounds of protein and 753 therms of energy or practically fifteen to seventy-five, five times. In other words, that is near enough for all practical purposes. Mathematics is an exact science, but feeding a dairy cow is not. It is not worth while spending a whole lot of time to make the mathematics come out exact; this is near enough for all practical purposes and we have a one to five grain mixture.

Now, if you want a one to six grain mixture, we can add another hundred pounds of corn meal, add it right down below. That will give us the right protein to energy grain mixture which if we will feed the cow twice a day in proportion to milk yield, and all the roughage she will eat up twice a day you

can be reasonably sure she has received enough protein and energy to do almost her best work. Her largest production depends as much on the judgment of the man as on the feed.

Now, if you will weigh the milk of each cow, if only one day a week, and then mark on her stall the amount of grain which she should have, the farm-hand can go along with the feed car and weigh to each cow the amount she ought to have in accordance with your instructions. You will save feed and make more milk, and the extra time it takes to weigh that feed will be paid for many times over by the extra milk and saving in grain.

Now, that is business, and that is what we need in our cow feeding, more business methods. I am very firmly convinced that the man who is so "sot" in his way that he is going to keep on doing the way he always has done, is going out of the dairy business inside of ten years, is going to be forced out of it, while the man who has got enough adaptability to learn new ways and learn the business methods from the other fellow has something to hope for in the dairy business. He is going to make more money than in the past. And it is all in these business propositions.

If you want a one to four and a half mixture, we leave out part of the corn meal.

You will say, is that the best mixture, or the only one? No. You can put those four feeds together in a half dozen different amounts and get the same ratio of protein to energy.

How shall we determine then how we shall put them together?

My suggestion is that we use at least four kinds of feed. Three will do. Some men are getting first class success with only two, but I am trying to make a fool-proof rule that you can pass out and let the other fellow follow pretty blindly. So I say at least three and better four.

Let the first feed one be the one which furnishes energy cheapest, usually a low protein feed, such as corn meal, add to this the cheapest source of protein, which in this case is cotton seed meal; then put something with it that is light, because the corn meal is heavy and the cotton seed meal is heavy; such as distillers' dried grains; then put in the most economical protein you can get, and at last winter's prices this has been gluten feed with us. So there we have variety, we have palatability, we have something that is not too constipating or laxative, and we have something that is economical. We could stop there, but if you do not have silage, I would put a little oil meal in, even though it is very expensive source of protein. When you have silage then it would be better without the oil meal, except in the case of some special animal.

So then make up a grain mixture, put together three or four, and there is no short cut to decide which or how much, you have got to guess at it and try it. You have just got to guess what you think will make the right amount and figure it out.

If the time was a little longer I would be glad to have your guess and figure it out for you, but I will pass out some leaflets a little later, and more complete explanations can be got by addressing the Pennsylvania State College for Bulletin Number 114.

So much then for the method of furnishing the cow what she needs. This will do it. Why it will do it I have not the time to tell you. You will have to take that on faith until you can prove that I am wrong. This will furnish the ordinary cow giving twenty pounds of milk a day or any other quantity, what she needs, when you feed her in proportion to the milk she gives and give her all the roughage she will eat up clean.

The next question is, what are the cheapest sources of these feeds? And here I want to emphasize the thought that the price per ton is not the measure of economy. But the price per therm of energy and the price per pound of protein. Let us take two or three of the common feeds for illustration.

A Member—I would like to know how about wet brewers' grain?

Mr. Van Norman—What about them?

The Member—Whether they have got as much protein as the others, the dried?

Mr. Van Norman—Your feeding table will tell you that. I don't remember the composition, but when we add forty or fifty pounds of water to a given amount of feed, there cannot be as many pounds to the mixture as there was without the water. Wet brewers' grains are a good food when they are kept absolutely fresh, but being wet they spoil very quickly.

Supposing we take corn, or corn meal; it has seven pounds of protein in a hundred and it has eighty-eight therms of net energy. Now, what is corn meal worth here?

A Member—Twenty-six dollars?

Mr. Van Norman—That would be \$1.30 a hundred; then for \$1.30 we have bought seven pounds of protein; and that divided down gives $18\frac{1}{2}$ cents for one pound of protein, or, in other words, 100 pounds of protein will cost \$18.50 plus.

Again for that \$1.30 we bought 88 therms of energy and that is about one and a half cents for a therm of energy, or \$1.50 for a hundred therms in corn meal at \$26.00 a ton.

Now, is anybody feeding bran around here?

A Member—Yes.

Dr. Van Norman—What is it worth here?

A Member—Twenty-five dollars.

Mr. Van Norman—All right. It contains ten pounds of protein and forty-eight therms of energy. Bran has so much crude fibre in it that a large amount of it is not digested. So we pay about \$1.25 for ten pounds or about thirteen cents a pound or \$12.50 a hundred for the protein in bran, and we get forty-eight therms of energy for the \$1.25, and in the same way we find one therm of energy cost us 2.70 cents or a hundred will cost us \$2.70. Now, I want to take just one more. Do you feed any cotton seed meal?

A Member—Yes.

Dr. Van Norman—A hundred pounds of cotton seed meal has in it thirty-five pounds of protein and eighty-four therms of energy, what is it worth?

A Member—Thirty-four dollars.

Dr. Van Norman—That would be \$1.70 a hundred pounds, our protein would cost about \$4.98 per hundred, and about \$2.00 for a hundred therms of energy. The point is here, which is the cheapest feed to feed, corn meal? Corn meal is the cheapest source of energy we have, even at \$26.00 a ton.

So we use that as the basis for our mixture. Then, we cannot use it for protein, because there is not enough of it and it costs too much. A lot of us buy bran thinking we are buying a protein feed. But a hundred pounds of protein in bran costs us \$13.00, and we cannot afford to buy it for the energy because it costs us \$2.70 per therms of energy or a whole lot more than the corn (\$1.50 per 100 therm of energy) does, so that any way you figure bran, it is too expensive for anything except as a medicine. If you have a sick cow or a calf which needs mineral matter or a cow which wants something light and slightly laxative, bran is all right, but you cannot afford to feed bran as a business proposition to make milk to sell at present prices.

Cotton seed meal, which costs \$34.00 down here furnishes protein at about one-third less than the bran because we have more than three times the amount of protein per 100 pounds, and it furnishes energy cheaper than the bran does. If you will go down through the list of feeds, you will find that the four that I picked out at the prices which have prevailed the last winter are about the best considering everything.

Now, we must have health; therefore, we cannot confine ourselves to one thing. We must have something the cow will eat. There is no use to have it theoretically right if she won't eat it. We must not feed her something that will put her system all out of order. All of those things must be put in together and this makes a pretty fair steady rule to work by.

Now, if you have worked thus far and secured a mixture and fed it to the cow, then you have a theory that something else would be better, try it, and watch the scales, and watch the cow and see whether your theory is right. Professors are accused of having all the theory. But the professors have a theory that the farmers have more theory to the square inch and know more things which are not so than all the professors put together. Fortunately for both we don't have time to prove this statement. Now then the test of all this is in the results on the farm. If you cannot make these things get you the results, do something else. A whole lot of our Pennsylvania farmers have been able to take this plan and sit down and figure it as they could not figure the older methods, and they all want to. I believe that the first step in the salvation of the farmer is to get him figuring on his own problems. I believe the function of the college professor is simply to help him to do that, not to do his work for him. When the farmer comes to me I try to show him how to figure how to answer his own questions. That is what I have tried to do for you. I have not tried to tell you whether you shall feed bran or cotton seed meal or whether you shall feed silage or something else. In this brief talk I have simply tried to show you how to answer your own questions. I know from frequent experience and drill with this method of figuring, that any farmer who can divide, multiply and add, and not let the decimal point throw him off the track—that is the hardest part of the whole thing—can figure out a grain mixture and do it very easily. After he once gets the general plan in mind he will go on easily. The hardest part is to get started. That is what our extension departments are doing all over this country; they are helping a whole lot of farmers to get started. We know a whole lot of things that they don't put into practice. The main thing is to get it into practice.

I believe my time is about up, but if there any questions I should like to answer them.

Mr. Cook—If you feed for beef do the cattle want the same kind of energy that they do if you feed for milk?

Mr. Van Norman—They want the same kind of energy, yes, but you want something else besides energy and you want it in different proportions. First of all the cow requires a half pound of protein and six therms of energy to maintain herself; that is one to twelve; when we give her one pound of protein to six therms of energy to make milk, that is, one to six and when we add the two of them together, then we have about one and a half to eighteen, and when we want beef we require about one to about nine.

A Member—How much cotton seed meal can we put in?

Mr. Van Norman—My suggestion is as a beginning not over one-third of the mixture and never so much as to give any one cow over four pounds. When you have a cow eating a large amount of grain and a mixture of one-third cotton seed meal would give her over four pounds, I would cut down the proportion and use gluten feed or oil meal or something else.

I have not time to figure it out now, but if you will write a postal card to the Pennsylvania State College we will send you the Bulletin 114 and if you get stuck, write to Professor Minkler and he will try to solve the problem for you.

A Member—What is the objection to so much cotton seed meal?

Mr. Van Norman—The objection is that in the hands of the inexperienced feeder sometimes it does harm and I am giving a rule for general application. If you are feeding cows and know enough about it of course you could feed more of it, sometimes they are feeding six to eight pounds of it, but I would not dare advise that to a fellow to go home and feed blindly.

Mr. Camp—How much protein is there in peanut meal?

Mr. Van Norman—I don't recall.

Mr. Camp—How would that compare with cotton seed meal?

Mr. Van Norman—My recollection is it has fully as much protein as cotton seed meal. I know that the Canadians where they have it, use it, and if you can get it easily, it may be a very desirable source of protein.

A Member—Don't you have to make some allowance for the calf in the cow before it is born?

Mr. Van Norman—Figuring roughly I have not made any allowance for it, except that when fed all the roughage she will eat in addition to the grain, she will have enough to take care of the calf. The calf itself at birth weighs sixty to a hundred pounds and it is something like sixty to seventy per cent. water; therefore, the actual amount of energy stored up in the body of that calf is comparatively small and it is stored up over a long period of nine months, therefore the amount required from one day's ration is not sufficient to become a factor in a crude method of figuring like this.

A Member—I would like to know whether mineral matter is not necessary for the growing calf?

Mr. Van Norman—We do not know as much about the influence of the mineral matter as we ought to know. They are being studied and will be studied further, and we will probably know a good deal more about them in the near future.

A Member—Will phosphate, pure ground rock, do better for that?

Mr. Van Norman—That I do not know. We have not enough experience to prove whether the animal can use it added to the feed or whether it must come in the form the plant takes it from the soil.

A Member—What effect would vegetables, cow beets have?

Mr. Van Norman—Root crops and the things that add succulence to the ration give the cow greater appetite. Roots contain ninety pounds of water to a hundred pounds of root, therefore the food property is lower than other feeds. They make the other food taste good and the cow will eat more of it.

A Member—The professor suggests four varieties of feeds, is there any feed which will give you the bulk in the place of distillers' dried grains that you would recommend or you would suggest?

Mr. Van Norman—Well, the bulky foods are bran, distillers' dried grains, about the only ones that I recall, and oats, but oats at these last two years' prices have been too high. If it is necessary that you feed the heavier grain mixtures you must go light on

bulky feeds. Mixing the grain with silage will usually get the same result. There are a whole lot of those things that the judgment of the feeder will bring out.

A Member—Does dried brewers' grain compare in any way favorable with distillers' grains?

Mr. Van Norman—You can use them in the same way; but they have to be used in a little different proportion, because they are different in composition.

A Member—I have seen statements where two cows were fed a given feed of grain and with one the production largely exceeded that of the other, and yet there was very little gain in weight. What did the cow with the small production do with all the food she ate?

Mr. Van Norman—Do you want my personal opinion?

The Member—Yes. I expect that is all I can get.

Mr. Van Norman—My personal opinion is there was a screw loose somewhere and that we did not get all the facts. This question has not been worked down as closely as I want it for my own information, but the work so far done at Missouri Experiment Station and at our own is, that when we get these seeming differences, we have left out of consideration some factors which if taken into account would explain it. Echles' work suggests that cows do not have the differences in efficiency as consumers of food that some people believe them to have. We forget to count the roughage sometimes and do not take into account the composition of the roughage and such things.

I will just add in closing, I have two leaflets here, not enough for everybody, but those who are feeding cows can get them from the platform at the end of the session. I will leave them here with the chairman, there are two of them and you may have one of each as far as they last, and then if you will write to the Pennsylvania State College Experiment Station for Bulletin No. 114 you can get that. (Applause.)

Chairman Cox—We are further highly honored this afternoon in having present with us, the President of the State Agricultural College. I am pleased to present to you now, Dr. Demarest, President of the Agricultural College of New Jersey, and you will hear what he has to say. Dr. Demarest. (Applause.)

AGRICULTURAL COLLEGE AND NEW JERSEY. 197

Agricultural College and the State of New Jersey.

BY DR. W. H. S. DEMAREST.

Mr. President, Ladies and Gentlemen: I am afraid I have not very much of interest to say to you. I am not an expert on any of these particular questions as to which you are looking for information and direction; and yet, perhaps it is just as well that once in a while we should remind ourselves of the principles and movements that lie back of the particular questions with which we are dealing.

This subject that has been given to me, The Agricultural College and the State of New Jersey, suggests a connection which not very many years ago would have been thought quite remarkable, very strange. The agricultural college is an institution which people of a hundred years ago hardly had in their minds at all. Fifty years ago, you know, the first agricultural colleges were founded; in 1856 the one in the State of Michigan, and after 1862, that is, after the Land Grant Act of the United States, those in the other States. And yet, you may be interested, as I have been interested, that a man who was graduated from our own college, Rutgers College in New Jersey, in the latter part of the eighteenth century, made an address in the early part of the nineteenth century, just about a hundred years ago, which is printed under date of 1819, under this title: "Considerations on the Necessity of Establishing an Agricultural College" for the training of young men for the profession of farming. Just about a hundred years ago, then, a graduate of this very college in New Jersey, spoke of the profession of farming, and insisted that an agricultural college was necessary to train men for it.

Then in 1862, as I said, the Land Grant Act was passed. Ordinarily through all the years preceding, an agricultural population would have said, "What have we to do with a college, except as we have boys who want to become ministers or lawyers or physicians?" What would the college have said as to the agricultural population? We only expect the boys to come who are going to be lawyers or ministers or physicians, or who are going to lead a leisure, literary life." The idea of giving them anything specific along the line leading to the particular work of farming, would not have occurred to them at all. Now, see the change! The change has come in these fifty years since the Land Grant Act. More than that, it has come in a large way only in the twenty-five years since the passing of the Experiment Station Act in 1887.

Rutgers College, originally Queen's College, was founded in 1766.

Our own Land Grant College, the Agricultural College of New Jersey, was founded in connection with it just after the United States Act, in 1863 or 1864. The colleges in the middle west States and in the far west States were in general, of course, founded a little later, but they grew far more rapidly than those on the Atlantic seaboard. We know of the rapid rise and the tremendous progress of the great State universities of the Middle and Western States which ordinarily include in their organization a State College of Agriculture and of Mechanical Arts.

In these days at least there is a recognition of and a respect for farming as a scientific vocation. Agricultural education has obtained its academic standing in our colleges, and has equal dignity with the other studies which have ruled through all the years. I believe also that the agricultural population has come to understand that behind its concrete problems there is a science that needs to be taught, a book learning, and laboratory work, as well as a common experience on the farm, with which men need to be familiar and out of which they need to learn how to fulfill their life vocation at its best.

That is my first thought in brief, simply of the advance in the relation of agriculture and the college, each respecting the other, each serving the other.

The second thought is this. There has been perhaps a little misconception as to these agricultural colleges. You whom I address have to do in particular with agriculture, of course, and to you our college is literally an agricultural college. But I want to remind you that after all the title is a misnomer. The agricultural college title got into the legislation by mistake somewhere. The college is for the benefit of both agriculture and the mechanical arts; it is a college expected to teach the sciences related to both these fields, not excluding all such subjects as chemistry and physics and English and the modern languages. The act even says in direct terms "not excepting the classical languages." The agricultural college is not a college simply for the teaching of agriculture. It is a college for the teaching of the wide fields of learning in which young men and all men are interested. That is one misconception which I want to have removed. When you speak of the agricultural college, you speak of the college at New Brunswick, but Rutgers College at New Brunswick is a great deal bigger thing than simply an institution for agricultural education.

A second misconception sometimes is this, that the agricultural college is founded for the giving of agricultural information and instruction only in a more or less informal, perhaps inconsequent and incomplete way. The agricultural college was founded rather to maintain a regular, definite and complete order of education; it was not expected to lower the value or standard of a college degree.

More than that, the agricultural college was not founded with the idea of teaching the prospective farmer only agricultural subjects. It was founded to teach him these, but with them the other subjects which tend to make a man well rounded and cultured, a fine citizen of the State by which he was trained.

The agricultural college was founded, however, to definitely teach agriculture, to be in so far a vocational school. And as time has gone on we mark the widening conception of the thing. No longer does the agricultural college feel that it can confine itself to the teaching of men who can come to college for four years to go through a full training, general and vocational, to a college degree. It realizes the larger responsibility laid upon it; it realizes the call upon it from the people of the State to do something more than this: consequently, what we call the Short Courses have been established, running for three months in the winter to give a brief and in a certain sense adequate instruction to those who can come only for such length of time.

More than that, the college must widen its service into what we call extension work. It must give out its touch and its influence to the near neighborhood and to the limits of the State in which it is established.

And one thing more, I think that it is for the agricultural college to maintain a summer session, corresponding to the winter session, in order that during the summer instruction may be given to those who are unable to take a full college course or those who have taken a full college course, those who want particular subjects or advanced training, those who cannot attend in winter, teachers, perhaps.

One more point as I close. I want to say that New Jersey in my judgment, has a value in its agricultural college which almost all of the other States lack in theirs—an old academic, well-established foundation with noble traditions and cultural standards. The agricultural college of the State of New Jersey has a peculiar value for the State indeed, through the personalities that have been a part of its life through the years past, the names still with power throughout the State, such names as George H. Cook, Edward B. Voorhees, John B. Smith, the last of these deceased, since this Board held its meeting a year ago. These are but three names representing the large group of those who have had great power in scientific and agricultural education in this State.

What is the State's financial relation to the College? It is the State's responsibility to stand behind the college in a liberal way. The Land Grant Act of 1862 assumed that the State would undertake its share corresponding to the share of the United States in maintaining such institutions. The State of New Jersey has given substantial support, and is now giving increasing

support. It is yet giving, however, what we might call inadequate support, as compared with the great opportunity which lies before the State and before the college. We need to have a large vision; we need to undertake and promote in a large way the fulfillment of that vision. Our vision is of a great college property and a great college equipment, of a great body of college students and a great agricultural achievement, of a great increase in the values of the State of New Jersey out of the work done at this college. It is for you, the members of this Board, to play your part in realizing this large, and reasonable and inspiring vision.

Chairman Cox—The next matter on the programme is an address, "The Organization of Agricultural Extension Work," which is an important and interesting subject and this matter will be presented to you by Prof. Alva Agee of Pennsylvania, who has come into our State to be a benefit to the farmers and farmers' boys in our State. I now present to you Mr. Agee. (Applause.)

The Organization of Agricultural Extension Work.

BY PROF. ALVA AGEE.

I shall speak briefly because it is becoming in me to say little until something has been done. Some fraternal organizations devote a period in their meetings to a consideration of the good of the order, and what I have to say comes under that head.

During the last thirty years a valuable science that relates to our business of agriculture has been developed. Within these thirty years our experiment stations have been established and our scientists have been at work, and a dependable body of knowledge has come into existence. We can go to the field, to the orchard and to the barn with a consciousness that we know things that are everlastingly so. A large amount of money has been expended, and yet it is fair statement that three-fourths of the people in the United States have no conscious connection with the scientists who are enlarging our body of knowledge. Within the last few years it has come about that our national Congress and our State Legislatures are willing to try to bridge the gap between the scientists and the practical worker, and now "for the good of the order" I am asking you to consider the danger that confronts us, interested as we are in a better agriculture.

The stations have depended largely upon the printed bulletin, and most of us are not willing to thresh out of the printed bulletin all that we need for our guidance. We want to use the eye in gaining our knowledge. We want demonstration. Money is going to be expended in publicity at a liberal rate in the next few years, and to my mind the friendliness of legislators to demonstration in agriculture can lead to greater danger to our science than the unfriendliness of thirty or twenty years ago.

The question before you and me this afternoon is how can we get all the farmers in New Jersey into touch with the best working knowledge of good science without making big mistakes in the expenditure of the money that is available. The New Jersey Experiment Station has been engaged in extension work for years. It is now engaged in it. But the problem before us is to lead all those who have agricultural problems to connect up with the knowledge that they need most, and to do this work without foolish waste.

President Demarest has given us this afternoon a true conception of the New Jersey College of Agriculture and Experiment Station as a public service institution. The granting of money to the New Brunswick institution by the Nation and the State has placed upon the agricultural college and the experiment station the burden of rendering service to every man who has an unsolved problem and comes to it for assistance. The young man of school age who

comes to New Brunswick for training in agriculture may seem to have the first claim upon teachers, but any other man in the State, regardless of age, who has an unsolved problem and wants help, has a right to turn to that public service institution with the thought that his needs will receive the best attention of the institution. The day has come when the people of the commonwealth should turn naturally to their college and station with the same confidence that the boy of eighteen, trained to enter college, will come for an agricultural course.

You men are representative men of this State. How do you propose to assist your public service institution in connecting up whatever of helpfulness it may have with the men who need help in your localities?

I believe that the people of New Jersey are going to turn to us through correspondence in a greater degree than they are doing today, and yet the correspondence today is heavy. They are going to learn to turn to us more and more for training in the short courses, and in the four years' courses in the college. All this is good, but we shall not have effective touch with the agriculture of the State until every county has in it some one trained in science who is a representative of the college and station, and who is working with the thought that service to others is the finest thing in this world. This representative of the station and college will be ready to assist any man just so far as his ability goes, and I am hoping that within the next two or three years such a man will be placed in every one of our counties.

I am not looking for the man that is a walking encyclopædia. He would make me so uncomfortable when I would be in his company. I do not want someone who is capable of advising every one on every possible point. But we do have men so trained that they can come to bear the same relation to land-owners that a physician comes to bear to the people of the community. It is possible for a man trained in agricultural science to give advice to a dairyman along the line of my friend Van Norman's talk this afternoon, that will make a direct saving to that man in the maintenance of his cows. It is possible for him to give sound advice to some man who is considering the planting of an orchard and to urge him to get into touch with his experiment station and learn the varieties for that soil so that disappointment and financial loss may not be his lot later on. It is possible for that man to co-operate in the growing of legumes new to the region. It is possible to him to indicate to the farmers of a section the best source of lime and limestone; the place where they can get their materials most cheaply. He can advise about materials for the home mixing of fertilizers and can render good service to poultrymen. He should not be expected to do much talking in the first year of his residence, nor to demonstrate his full value in one or two years, but should be permitted to grow in a position of usefulness.

There are many other things that we have in mind.

Our extension work should render service to the boys of the State through some assistance and counsel to principals of schools, Y. M. C. A. organizations and others in the conduct of contests that may turn those young people to rural life, and help them to know that country life is the best for most young people.

We may be serviceable to such organizations as the Grange and Farmers' Clubs by sending some of the men in our Extension Department to meet with them and to keep them in touch with the results of research.

One could outline a great field of endeavor and then come short in performance. My only desire this afternoon is to convince you that your public service institution at New Brunswick takes no account of the age of the student, but is ready to help any man who has a problem, to help him on his farm, wherever he may be, to the extent of his ability. I urge that it is your duty to join hands with us in getting into touch with those who need help, and if we can render them service, we need not ask anything finer to come into our lives. (Applause.)

MEMBERS NOMINATED.

201

Chairman Cox—I think the Nomination Committee is ready to report now. Is the Nominating Committee ready to report? Mr. Lozier, Chairman.

The following members were nominated for office for the year 1913:

President, Hon. Joseph S. Frelinghuysen; Vice-President, John T. Cox; Treasurer, A. J. Rider.

Executive Committee—George E. DeCamp, Theodore Brown, J. Harvey Darnell for the term of one year.

The officers nominated were elected by the Secretary, who cast the ballot.

Chairman Cox—I therefore declare those gentlemen elected as officers of the Board for the ensuing year, and I take pleasure, gentlemen, in presenting to you the President-elect, Hon. Joseph S. Frelinghuysen, who will express to you the thanks of all the officers elected in one address. (Applause.)

President Frelinghuysen—Mr. Chairman and members of the State Board of Agriculture, I thank you exceedingly for this vote of confidence in electing me President for another year.

There is considerable work in this office and I had hoped that this year you would have seen fit to have followed that principle of rotation in office and selected someone else.

However, one of the statements of Professor Agee, that service to the public is the finest thing in the world, expresses my sentiments. And for the sake of the farmers and the dairymen's interests also, I accept the nomination and will do my best in the future, as I have tried to do in the past.

I want to thank you also for electing Vice-President Cox, Treasurer Rider and Secretary Dye. I don't know whether it is my inability or theirs, but we have gotten along splendidly during the past year, and I want to say for them that the interests of the farmers could be in no abler hands than theirs, and that you have been very wise today in electing them for another year. (Applause.)

(President Frelinghuysen takes the Chair.)

President Frelinghuysen—What is the next business?

Secretary Dye—There is a lot of business that ought to be attended to if the Board would like to have it brought up now. There is the report of the Resolutions Committee.

President Frelinghuysen—Is the Committee on Resolutions ready to report?

Mr. Somers—Mr. President, the Resolutions Committee reports the following resolution and moves its adoption :

As New Jersey has never yet had a comprehensive exhibit of farm products from the several counties of the State, and, believing that such an exhibit would be of much value in an educational way,

Therefore, be it resolved, That the Executive Committee of this Board be and they are hereby requested to arrange for a comprehensive exhibit of the products of our farms from all the counties of this State, in connection with the next annual meeting, at such place and time as may be by them thought most desirable, and that they invite the State Horticultural Society and the State Grange to co-operate in this movement.

The motion was adopted.

President Frelinghuysen—Are there any further resolutions?

Mr. Somers—Mr. President, the Committee on Resolutions report favorably the following resolution, and move its adoption :

WHEREAS, The soils of New Jersey, as well as the soils of other States in the East, are as a rule deficient in lime;

WHEREAS, This deficiency of lime in our cultivated soils prevents the raising of larger crops;

WHEREAS, The more general and frequent application of lime would add to the prosperity of our agricultural industries, and,

WHEREAS, The existing high freight rates on lime, and particularly ground limestone, discourage the purchase and use of agricultural lime;

Therefore, be it resolved, That the State Board of Agriculture and allied agricultural organizations express themselves strongly in favor of reduced freight rates on lime, and, be it further,

Resolved, That the representatives of these organizations be instructed to use their utmost endeavors to secure reduced freight rates on all forms of agricultural lime.

The resolution was adopted.

Mr. Brown—Mr. President, I offer the following resolution and request that it be referred to the Committee on Resolutions :

Believing that it is unreasonable and unjust to allow motor vehicles from other States privileges that are denied to those within the State;

Be it resolved, That the New Jersey State Board of Agriculture demand the enactment of a law taxing all motor vehicles owned in other States and used in this State, the same license fee as those owned in New Jersey, and to be in every way subject to the same regulations.

RESOLUTIONS OFFERED.

203

President Frelinghuysen—That will be referred to the Committee on Resolutions. Are there any other resolutions?

Mr. Pancoast—Mr. President, I offer the following resolution:

WHEREAS, The public transportation of children to school has greatly increased the taxes, without compensating benefit, since in most cases the parents themselves are well able to provide such transportation, and when able should have enough interest in their children's welfare to do so,

WHEREAS, It is believed it was never the intention of the Legislature to give the privileges now granted, but that they are given under an unforeseen, if not a strained construction of the law;

Resolved, That the State Board of Agriculture requests the Legislature to authorize the Township Committee of each Township to limit free transportation to such pupils as really require it.

President Frelinghuysen—The resolution will be referred to the Committee on Resolutions. Are there any other resolutions?

Mr. Pancoast—Mr. President, I offer the following resolution:

WHEREAS, The medical inspection more than once a year of the pupils of rural schools as now required, is of little if any benefit and, therefore, entails useless expense;

Resolver, That the State Board of Agriculture demands that this whole matter be left to the discretion of the several Township Boards of Education.

Resolved, That we assert that whatever may be true of larger cities that our rural communities yet possess the ability and judgment to wisely govern themselves in their local affairs, and that we strongly deprecate and object to the tendency of State officials to dictate to such communities concerning these matters.

President Frelinghuysen—This resolution will also be referred to the Committee on Resolutions.

Mr. Somers—Mr. President, if it is in order, the committee now approves and moves the adoption of this resolution:

Believing that it is unreasonable and unjust to allow motor vehicles from other States privileges that are denied to those within the State;

Be it resolved, That the New Jersey State Board of Agriculture demand the enactment of a law taxing all motor vehicles owned in other States and used in this State, the same license fee as those owned in New Jersey and to be in every way subject to the same regulations.

The resolution was adopted.

President Frelinghuysen—Are there any other resolutions?

Mr. Somers—The committee refer the following resolution back to the Board for its action here:

WHEREAS, The public transportation of children to school has greatly increased taxes, without compensating benefit, since in most cases the parents themselves are well able to provide such transportation, and when able should have enough interest in their children's welfare to do so; and,

WHEREAS, It is believed it was never the intention of the Legislature to give the privileges now granted, but that they are given under an unforeseen if not a strained construction of the law;

Resolved, That the State Board of Agriculture requests the Legislature to authorize the Township Committee of each Township to limit free transportation to such pupils as really require it.

Prof. Rider—Mr. President, I move you that the resolution be laid on the table. The motion was carried.

President Frelinghuysen—Are there any further resolutions?

Mr. Somers—Mr. President, the Committee on Resolutions respectfully returns the following resolution without report, for such action as the Board may wish to take:

WHEREAS, The medical inspection more than once a year of the pupils of rural schools as now required, is of little if any benefit, and herefore entails useless expense;

Resolved, That the State Board of Agriculture demands that this whole matter be left to the discretion of the several Township Boards of Education.

Resolved, That we assert that whatever may be true of large cities, that our rural communities yet possess the ability and judgment to wisely govern themselves in their local affairs, and that we strongly deprecate and object to the tendency of State officials to dictate to such communities concerning these matters.

President Frelinghuysen—The resolution is before the Board, what is your pleasure?

Mr. Rider—I move that it be laid on the table. The motion was carried.

President Frelinghuysen—Are there any other resolutions? Or committee reports?

Mr. Kille—Mr. President, the Credentials Committee recommends that a delegate be granted to the Somerset County Holstein Friesian Association.

President Frelinghuysen—You have heard the report of the Chairman of the Committee, what action will you take on it?

A Member—I move its adoption. The motion was carried.

President Frelinghuysen—Are there any other resolutions? Is there any other business?

RESOLUTIONS SUGGESTED.

205

Secretary Dye—Gentlemen, let me call your attention to the session this evening. We are to have a trip over Canada, from ocean to ocean, which will show you your competitors up there, the vast country that they are utilizing, not in opposition to you perhaps. Two hundred thousand of our farmers have gone over there the past year. We want to see what sort of a country they have gone to, what they are doing. I have heard a little of this lecture, not much and so have invited Mr. Armstrong to come down here and talk to us, and I am sure you will all be highly pleased with the lecture tonight. Bring your friends and have the school pupils come and let us have a good time looking at the pictures and hearing what he has to say.

Tomorrow morning let us all be here in time. Don't forget and forsake the last session. You are to have two important addresses tomorrow. Let us have a full attendance to the close.

President Frelinghuysen—It has been suggested to the Chair that during this session, before adjournment, it might be a good plan to introduce a resolution asking your representatives in the Legislature to introduce a bill calling for an investigation into the price of gasolene. There are very few farmers, progressive farmers in the State today, who are not using gasolene, and the increase in price of over one hundred per cent., and the anticipation probably of a still further increase, shows that there is something radically wrong either with the supply or the demand, either that the supply is decreasing and the demand increasing or else there is some juggling of the market. Every farmer uses more or less gasolene and it is quite an item, and it may be a good plan to ascertain whether the oil companies in this State are juggling the price and raising it. At least it won't hurt to make an inquiry. It also relates to the farmers' pleasure; because a great many of them are driving automobiles, and if you do drive automobiles, the question of the cost of the fuel, gasolene, is a very important one.

Another thing has been called to my attention and that is contained in these resolutions which have been passed, requesting the Legislature to frame certain requirements and calling upon your representatives to enact those requirements, that is all very well, but unless your representatives have somebody behind them pushing and helping and doing everything in their power in their communities, and with the Legislature and their representatives, the individual legislator will be helpless and alone at Trenton. Now, as

delegates to this State Board of Agriculture, your duty does not end with your mission here to Trenton, but your duty goes on, the same as the duty of the officers of this Association or Board, every day and month in the year, and you should do everything in your power to uphold the hands and strengthen your representatives in the furthering of those policies. And I now request you to do that and help and to render assistance in making successful the measures that you have recommended at this annual meeting.

Mr. Reed—Mr. President, it seems to me that is a good suggestion of yours regarding the investigation of the advance in the price of gasoline and I wonder whether that matter might not have a good effect on the oil monopolies?

President Frelinghuysen—Probably some of the delegates will formulate a resolution and present it to the meeting tomorrow. I should like to speak on it, but I cannot be here tomorrow, but I would give it my earnest support in every way.

A Member—I should like to ask a question? Has this Board got a Legislative Committee?

President—The Executive Committee have always worked together as a Legislative Committee. If there are any volunteers or anyone wants to have a legislative committee, I am sure the Executive Committee would like to have any assistance they can get from any auxiliary committee whatever.

A Member—I would then suggest that the delegates act as an auxiliary committee, then we can get all around the counties and the State.

Another Member—I second that suggestion, Mr. President, I think it is a good idea.

President Frelinghuysen—The suggestion has been made that the delegates of the State Board of Agriculture act as an auxiliary committee to the Executive Committee in the matter of legislation, and under the power vested in me as President, I now appoint them as such.

Is there any other business? If not, this meeting will stand adjourned until 8 o'clock P. M. sharp tonight.

COMMITTEE ON CREDENTIALS.

207

THIRD DAY—NINTH SESSION.

The meeting was called to order by Vice-President Cox.

Chairman Cox—The meeting will be in order.

On behalf of the Committee on Credentials I want to say that the delegates who have not already filed their expense account with them should take pains to file them tonight with the Credentials Committee, here directly on my right, so that their expense accounts may be properly checked and presented to the Treasurer of the Board for payment.

On behalf of the State Board of Agriculture I want to say that we are intensely gratified at the size of this audience which we have here present with us tonight. This is an unusual occurrence indeed for us to have an attendance of this kind in a meeting of this character. We know that you have been very much interested in looking over the exhibits that have been placed before you here, but I realize the fact that we have a large audience here tonight, and that the speaker of the evening may be heard through all parts of the hall it will be necessary for those present, to keep perfectly quiet during the lecture.

Before we proceed with this lecture, Mr. Dye, the Secretary of the State Board of Agriculture has just a word to say. Mr. Dye. (Applause.)

Mr. Dye—I want to say that these trophies that you see here on the left were won at the New York Land Show by the farmers of New Jersey; some of you might wonder where they came from.

I want to say further, that a meeting of this character, covering four days and three nights, with entertaining and instructive lectures, does not come together in a day nor of itself. It takes considerable planning, we must first know what we want and then we go casting about the country to find the speaker to cover the subject. Sometimes I begin this work immediately at the close of an annual meeting, as for example, this meeting, I have in mind now, writing if my life is spared, before another week passes, a gentleman I hope to have at the next annual meeting.

So we bring all this together in mosaic form, as it were, and fitted to a programme, and give you an annual feast. One of the last selections this year was to find a speaker for this evening. We usually have an illustrated lecture. We have been holding it at

the State Normal School, but it was decided to have all the lectures here this year. I was at the New York Land Show and saw some moving pictures and other pictures there, and among them some from Canada showing the scenes up North, showing what we farmers have to contend with up there in the way of competition. And I was pleased with the pictures as well as the exhibit, and so I found a gentleman from that Northland who was willing to come down here and talk to you tonight. Mr. Cox will introduce that gentleman to you.

Mr. L. O. Armstrong, of the Department of Natural Resources, Montreal, Quebec, was introduced and gave an extremely interesting illustrated talk.

A vote of thanks was extended to Mr. Armstrong and the Board adjourned till January 10th, 9:30 o'clock A. M.

FOURTH DAY—TENTH SESSION.

The meeting was called to order by Senator Gaunt.

Senator Gaunt—The hour has already passed for the calling of the State Board to order.

This meeting of the Board was opened by Prayer by Rev. George H. Ingram, Pastor of the Westminster Presbyterian Church of Trenton.

Senator Gaunt—Is there any Unfinished Business to bring before the Board this morning?

Mr. Darnell—Mr. Chairman, I have a resolution which I offer, as follows:

WHEREAS, Gasolene is an article that is used by the farmers increasingly, and, WHEREAS, During the past year the price of this product has doubled, thereby increasing the cost to the farmer,

Be it resolved, That our representatives in the Legislature introduce a resolution investigating this subject and ascertain from the corporations of this State and other States whether the cost is due to natural or unnatural causes and whether any relief can be obtained by legislation.

The resolution was adopted.

Senator Gaunt—Is there any other Unfinished Business?

REPORT OF COMMITTEE ON EXHIBITS. 209

Mr. Darnell—The Committee on Exhibits is ready to report.

Report of Committee on Exhibits.

Your Committee on Exhibits feeling that some record should be made in our report of this the fortieth meeting of the State Board of Agriculture, take this opportunity to report on its first collection of exhibits, and feel highly gratified with the result, and wish to thank heartily every one who has been connected with the work of assembling and especially those who have so generously contributed of their products and exhibits.

Our Boys' Corn Clubs are deserving of our hearty support and I hope the members of this organization will lend them all the help possible toward the end for which they are striving. Many of them have reached a standard now, which it would puzzle their fathers to excel. We wish to call special attention to the excellent educational exhibits from our Experiment Station, and the great benefit that can be derived from them if closely studied. Then we have the very complete Forestry Exhibit, also the Road Department, showing the very excellent work done by that department.

No less in interest is the Weather Bureau, with the workings of which we hope to become more familiar as time goes on.

Of particular interest may be mentioned the unique display of the State Department of Weights and Measures.

We should congratulate the department that so many bogus measures have been confiscated and are now out of use.

We wish to extend our thanks to the merchants who have put up the splendid exhibits of material for the farm.

The exhibit of corn, including the prize winning ears from the recent Land Show, with that of fruit, vegetables and cereals has been very gratifying to your committee who had it in charge.

Respectfully submitted,
J. HARVEY DARNELL,
Chairman.

The report was adopted.

Senator Gaunt—Is there any other unfinished business?

Mr. Jones—I move you, Mr. Chairman, that a vote of thanks be extended by this Board to

Colonel Reeding, Maj. Pedrick, the officer in charge at the Armory; Capt. Bernard Rogers, and Herbert J. Hill, for the courteous treatment we have received from them.

The motion was carried.

Senator Gaunt—Is there any other business to come before the Board?

Secretary Dye—Mr. Chairman, I hope the delegates of the Board who are here will remember the appointment yesterday by the President, that all the members of the Board of Directors are members

of the Legislative Committee and are to co-operate with the Executive Committee in securing such legislation as the farmers think they need.

That is a very important matter. The Legislature is to convene next week, and we should be on hand with our recommendations for the several things that should be attended to, both in connection with our Board and in connection with the Farmers' Institutes in general, and I am quite sure that it will need the co-operation and the advice of all sections of the State to secure it.

Then again, friends, our county Boards, some of them are languishing yet, and there is an effort to have them revived, and in the counties where such a movement will be put forward, I hope the directors in those counties will take up that work and see that Boards are organized and made efficient in their various departments, as they ought to be. Some of them exist only in name.

Then there is this great big resolution covering the proposed meeting for next year, and I am sure when the Executive Committee have time to take that up and consider it in detail they will submit some plans for next year's exhibits and the character of the meeting in all its details. You will remember the resolution required the Executive Committee to confer with the State Horticultural Society and the State Grange and have their co-operation in the creation of an exhibit here which will set forth the products of New Jersey from the counties throughout the State. We have never had such an exhibit made in the State heretofore, and it will be a very extensive and educational affair, more than this is here, to see every county from the North to the South with an exhibit which represents fairly the products of each county and show what New Jersey is doing and can do. It will show the other States too what a variety of soil we have and what a variety of products we have in this State. So let us not fail, every one of us, to do our share in this line, all pull together, and then I am sure we will secure a result that will not be excelled by any other State.

Senator Gaunt—Are there any other remarks?

Mr. Busby—I would like to ask a question in reference to this produce that is here. What is to be done with it after the meeting, that which does not go back home, of the produce that is here?

Prof. Rider—I don't know whether they want any instructions about it, but I would move that the gentleman in charge of the

exhibits be authorized to give those which are not taken home to the Children's Home Society.

Mr. Busby—That is a motion I would like to offer.

Prof. Rider—I will second the motion then.

Senator Gaunt—I want to say, before putting this motion, in conversation with Mr. Lock, the gentleman who has been assisting us here, he told me that is what he had planned to do with all of the products that could be consumed from this exhibit, that was not taken home. He had expected to send them there.

Mr. Busby—That institution was the one I had in mind.

Senator Gaunt—I think we can leave it with Mr. Lock in his judgment. The motion was unanimously carried.

Secretary Dye—Is Mr. Seabrook here?

Mr. Seabrook—Yes, sir.

Secretary Dye—I wish we might have a little talk on that irrigation system?

Mr. Seabrook—I have nothing I can tell you about it.

Prof. Rider—The brother has some information and maybe he might stand up here and let us fire some questions at him. I would like to know something about the cost of the overhead irrigation.

Senator Gaunt—We should be very glad to have Mr. Seabrook answer questions.

Mr. Seabrook—Mr. Chairman, I suppose I was the pioneer on irrigation in the State of New Jersey.

One day a party drove in there, and his first expression was, "You are ahead of the Almighty." I said, "No, not yet." "Well," he said, "I think you are for you can have it raining when you want it." "Well," I said, "in the first place, he gave someone wisdom to manufacture such a thing."

Now, in irrigation the great cost is your water supply, that is first. On my farm we have a never-failing stream, and that is a consideration in the cost of irrigation. Your water supply. If you have to drill big wells your expense will be more and it is owing to the line that you put in for your cost.

Now, on my farm, it was mine but it is not now. We put in twenty-five acres and the cost as near as I can figure on it, was about five thousand dollars, and probably last year it paid from three to five hundred per cent., different in crops that we grew, that is, garden crops. Our main crops have been lettuce, spinach, onions, radishes and beets, and you can grow two or three crops the season where you irrigate and if you had to depend on the climate you would not grow more than one, and possibly two.

Now, if you have any questions to ask.

Secretary Dye—That five thousand dollars you speak of, you don't mean that for the whole twenty-five acres?

Mr. Seabrook—The whole twenty-five acres, yes, cost about five thousand dollars.

Prof. Rider—How much do you have to elevate the water?

Mr. Seabrook—We have our pipes overhead.

Prof. Rider—From the stream, how much do you have to elevate it?

Mr. Seabrook—Not very much. We pump direct from the stream, that is, have a channel that leads from the stream up to the swamp and have a well eight feet deep and put a pump in it.

Prof. Rider—Then when you irrigate you send it out in a spray?

Mr. Seabrook—We send it out in a spray, yes, sir.

Prof. Rider—Overhead?

Mr. Seabrook—Overhead, we have the overhead system, yes. The pipes are seven feet above the ground, and the lines are fifty feet apart, and the extensions are about twenty feet the pipes rest on, so that your horses can go underneath the pipes, and there is a union turned on the pipe and you can turn on the water and that throws the water twenty-five feet, and the other throws it twenty-five feet, so as to meet, and the nozzles are four feet apart on the pipe and as the water comes out it sends a stream and it spreads out in drops like a gentle rain.

A Member—What is the motive power of the pump and what kind of a nozzle do you use for spraying?

Mr. Seabrook—We have an eight-horse power engine.

The Member—Gasolene or steam?

Mr. Seabrook—Gasolene, and the nozzle is a little brass nozzle with a hole bored in the pipe with a drill.

A Member—The regular Vermoral nozzle of the spraying machine?

Mr. Seabrook—The regular spraying nozzle. The pump that we have will pump three hundred and forty gallons of water per minute, and you can irrigate about seven acres a day and in ten hours the water is equal to one inch of rainfall.

A Member—Do you have that running all the time?

Mr. Seabrook—We run it mostly in the day time, very seldom nights.

A Member—I mean to irrigate a given piece of land, does it run all day, do you keep it running all day?

Mr. Seabrook—On one piece of land?

The Member—Yes?

Mr. Seabrook—No, we generally run from two to five hours on one piece of land.

A Member—Does it make any difference whether it is morning or afternoon or evening?

Mr. Seabrook—Not a bit, excepting on your lettuce, if your lettuce is heading and it is a very hot sun, it is best to irrigate that probably in the morning or late afternoon, or in the evening.

A Member—For other crops it does not make so much difference?

Mr. Seabrook—It does not make any difference. Are there any more questions? I can answer questions better than I can talk.

Prof. Rider—I did not catch what kind of nozzle you had?

Mr. Seabrook—Merely a brass nozzle, and we have a drill that drills the hole in the pipe and that fastens in.

Prof. Rider—A regular Bordeaux nozzle, such as is used for spraying Bordeaux?

Mr. Seabrook—A little coarser than the Bordeaux nozzle. The stream will be as large as a lead pencil when it is largest.

Prof. Rider—You can increase the size of the hole.

Mr. Seabrook—Yes, we can increase the size of the hole.

Prof. Rider—It throws it according to the size of your nozzle?

Mr. Seabrook—Yes, sir.

Secretary Dye—How far can you throw the spray from pipe to pipe?

Mr. Seabrook—Twenty-five feet.

Secretary Dye—You have considerable force?

Mr. Seabrook—We want about forty to sixty pound pressure.

A Member—You have a spray or a heavy stream, how do you regulate that?

Mr. Seabrook—We have a spray, you see one pipe is under here, and you throw the water and you have a union and you can regulate those things, one throws off the water one place here and it will probably go forty feet high and the other way it would not go but ten; but they most always meet.

The Member—You have your nozzles so arranged?

Mr. Seabrook—We have a union, you can turn them and have your spray up or spray down.

A Member—How many pounds pressure do you use?

Mr. Seabrook—Forty to sixty pounds.

Mr. Rider—What size pipe do you use?

Mr. Seabrook—That is owing to the length or fall; our longest sections start in with a two-inch and reduce down to three-quarter inch; they have a five-inch main, underground, from the pump.

Prof. Rider—You run a five-inch main to the pump?

Mr. Seabrook—Yes.

IRRIGATION.

215

Prof. Rider—I thought you were starting your irrigation directly from the pump.

Mr. Seabrook—Well, you have got to have a main to carry this water to the different sections.

Mr. Rider—That would be a five-inch main first?

Mr. Seabrook—Yes, that is underneath the ground and every fifty feet we have a standpipe, a two-inch standpipe.

A Member—You said you have your pipe up seven feet from the ground, do you turn the nozzle up or down, the spray nozzle?

Mr. Seabrook—You turn them out in any position you want. It is owing to the position you want them.

The Member—Where is your union?

Mr. Seabrook—The union is at the end of the line. The union turns the whole length of pipe. We have some pipe there that is only six feet in length.

We had one piece of ground that we set out in lettuce early in the spring and had a fine crop of lettuce, one carload sold for eleven hundred dollars. That lettuce was taken off by the first of June and we had sown in beets for the canning factory down there; we get eight dollars a ton for them down there, tops and all, and on those four acres we had 103 tons of beets, the tops were so immense that they objected to carting so many tops and we mowed them off. And after that crop was taken off, we set the piece out in lettuce again, and this fall we had a far bigger crop than we had in the spring. Such a crop of lettuce I have never before seen grown. There were three crops from one piece of ground there by irrigation where it would have been impossible to get two under the conditions of the weather last year or last spring.

Secretary Dye—I had the pleasure of visiting Mr. Seabrook's place last year and I can testify to what he is saying.

A Member—What did the last crop of lettuce sell for approximately?

Mr. Seabrook—It netted us nearly a thousand dollars an acre. It did not sell as high as it did in the spring, but there was so much more of it that it made up the difference.

Senator Gaunt—Are there any other questions to ask Mr. Seabrook? The time has about arrived when Dr. Kendall is to speak to us. We will therefore, take up the programme. The next number on the programme is an address by the Commissioner of Education of this State, Dr. Kendall. Dr. Kendall is not a stranger to many of us, we have had the pleasure of co-operating with him and in our feeble way we have suggested some things to him in the State Board and State Grange, and I want to say before Dr. Kendall is introduced, that he has always been very anxious, very earnest, very desirous, of getting the sentiments and suggestions from the representatives of the rural communities. He believes, as we do, that it is time for us to get back and get hold of those who are not so conveniently situated for educational purposes. And I think it is very commendable that he is here before this State Board of Agriculture. Our only regret is that he was not on the programme yesterday, when he could have addressed the representative farmers from every county in the State. It gives me great pleasure at this time to introduce to the members of the State Board of Agriculture, Dr. C. N. Kendall, the Commissioner of Education of New Jersey. (Applause.)

Rural School Problems.

BY DOCTOR KENDALL.

I see that I am placed on this programme to discuss the problems of the rural schools.

Outsiders may feel that the only problems in education are those connected with rural schools. This is not true. There are, of course, many problems, which I shall attempt to discuss later, in connection with the country schools, but I want to assure you, gentlemen, that there are as many problems, and just as serious ones, connected with the administration and the betterment of city schools, as well. Speaking frankly, the whole educational situation bristles with unsolved problems.

I feel that much of the work of the Department of Education here in Trenton, is primarily with the betterment and help of the rural or the country schools. In some respects this is the most interesting part of our work.

All the early days of my school life I went to a one room country school, and my first experience in teaching was in a one room country school. I therefore feel that I have the sort of sympathy that one in my position ought to have in regard to the rural school. I had the experience which some of you may have had—those of you who have taught school. I taught school and boarded around. If there were six children in the family, I boarded with that family six times as long as in the family in which there was but one child.

I want to crave your indulgence to speak of one thing in that experience of boarding around. I looked out for my boarding place, naturally, and I would ask the boy to ask his mother—bear in mind, not his father, but his mother—if I could board at his house the next week. The boy would come back with one of two answers; one was this: "Yes, Ma says you can board

at our house next week." Or, it would be this: "Ma says that she don't want you to board at our house next week, because we ain't butchered yet." And if they had not butchered, you may make up your mind that I did not go. (Laughter).

Confidentially, I wonder that I did not die of dyspepsia in those days of '76—not 1776—in Central New York.

I feel, gentlemen, to be serious, that there is a good outlook in this State for the development and improvement of the rural or the country school. I say this because of the generally increased interest in rural life. The country or the rural school is going to come to its own sooner or later, and the sooner the better. A friend of mine, a State Superintendent of Schools in the West, travelled over this State in an automobile last summer, and said to me, "You have the best roads in New Jersey in the United States." We ought also to have the best rural schools in the United States. The country school should respond to the needs of rural life. I believe that in the future we are going to have more people interested in rural or country life. People are going to see the advantage of country life in comparison with living in the slums and the tenement districts of our great cities.

Now, the schools, alone, cannot bring this condition of affairs about, but I believe that the schools can help. How can they help? By instilling into the minds of the girls and boys, the older girls and boys, some idea of the advantages of rural life.

Now, we are not going to get this simply by talking about it. One way of getting it is by having a course of study in the consolidated rural school and in the rural high school that will be allied or connected with rural life. I refer to courses in agriculture, to courses in animal husbandry, including poultry raising, courses in gardening, courses in English—we must remember that books will remain a large part of the work of the schools, city or country; courses in hygiene or healthful living; courses in geography, which should include the geography of the neighborhood, and courses in domestic science for girls. All of this work should be connected with the needs of that particular community.

In our schools we have been educating the children too much away from an interest in country life. Much of that traditional course of study must remain, of course, but we ought to have for girls and boys who are upwards of twelve years of age, in the highest grades of the grammar schools and in the high schools, such a course for girls as well as for boys as will keep them in touch and in sympathy with country life, to the end that those girls and boys may be influenced to stay in the country and not drift to the city. Too many of them now drift to the cities.

I hasten to say that it would be unfortunate for the cities if no country girl or boy drifted to them, because you and I know, being country people, how much the cities have gained by the influx of country girls and boys. We admit it, you and I.

Here is an illustration that I like to use. In the schools of Canada there has been a great development of rural education. In no state in the United States, gentlemen, has so much been done for the development of the rural school as in Canada. Now, what has been done there? I will tell you one thing that has been done. Reliable statistics seem to show that they have increased the production of corn in Canada five bushels an acre by means of the work done in the schools.

I am not prepared to vouch for the accuracy of this statement. If the same thing could be done in New Jersey by means of schools—I don't know whether it can or not—I just throw it out as a suggestion—it would increase annually the net value of corn to the State upwards of nine hundred thousand dollars. New Jersey is not one of the great corn growing states. I do not know whether it is possible to do that by means of education or not, but I believe that education can do something.

Now, gentlemen, what are the problems of the rural schools?

First, there is—and I am not going to state them strictly in the order of their importance—the school building, or the school plant. I feel, I don't know what you think about it, that we need in this State to pay greater attention to the appearance of some of our school premises. The country school should be the most beautiful place in the entire township.

It does not cost much to do that. It often does not cost any money to do it. What is the school, gentlemen? The school is the secondary home of the children. It should be an attractive place to look at. And what do I mean by that? I mean neat and tidy grounds, not littered with rubbish. I mean a place where the children can play. Of course, the little children must have a playground. I mean, too, a flower bed and some shrubs, and if possible to have trees let us have them.

No school board yet, in city or country, ever bought a school site that is too large. And many school boards have bought school sites that are too small. One of the most encouraging things I have seen in New Jersey was down in the southern part of the State, where the school board has recently acquired a site of fifteen or twenty acres in the outskirts of the town for high school premises.

There should be room enough for a school garden in connection with the school.

The school house should be neat and tidy and attractive; that does not cost anything. I have been in country schools the appearance of which indicated that the building had not been swept out in a fortnight.

The school seats should fit the children. I tell you, gentlemen, it is wrong to have children in schools with their legs dangling in the air. Ask any physician what that means.

Now, there is another thing I want to speak about, and I want to speak very frankly about it. It is the condition of the outhouses. Some of the outbuildings are in an exceedingly bad condition. I say this because I ought to say it, not because it is a pleasant thing to say. On some school premises in New Jersey the outbuildings are far from creditable to the State or to the districts. There is not much use in teaching morals in the schools and teaching immorality on the school grounds. Here again there is little or no expense. Just a little care, that is all. Don't turn this matter over to the school teacher. The question of the moral health of our girls and boys is involved here, and I want to say that I am willing, as Commissioner of Education, to withdraw the approval of any high school in this State where the toilets are not kept in a twentieth century condition. (Applause). I don't care how much Latin is taught, or how much history is taught, so long as the immorality is taught on the school premises. I don't know that I would have said this today had not the Inspector of High Schools come into my office yesterday after visiting a certain county in this State, and said to me, "I want you to go with me to that county to see what the toilet conditions are." He said, "It is hard to realize the little attention that is paid to those things."

Now, who is going to look after this? Well, I will tell you, gentlemen, who ought to look after it. The school board ought to look after it. It is up to them; they ought not turn the matter over entirely to school teachers. The woman school teacher has her part to perform. The school board member has his part to perform.

I want to make, in the second place, a plea for the consolidated school. My first point, bear in mind, is the school house and school premises. But, before I leave the school house, let me say this: The State Board of Education has promulgated a building code. Now, gentlemen, I have heard that in some parts of the State it is thought that that building code demands too much. If it does, you ought to let the State Board of Education know about it. If you think it is putting too great a tax upon the rural community,

let them know about it.

In this State we need a larger number of consolidated schools.

Now, what are the advantages of the consolidated school? In the first place, by means of it we can have a graded school. And a graded school, gentlemen, is likely to be a better school than an ungraded school. When I went to school in New York State as a boy, to come back to that once more, the teacher had about sixty children. It was an ungraded school. I have in mind a boy—I could call him by name—who grew up to be an illiterate, because the teacher did not have time to teach him. She could give him only a few minutes each day for his reading. The boy to-day is an illiterate in the State of New York.

Now, the State of New York at that time was not a poor state, it was not poverty stricken. The State of New York, however, failed in its business of education, so far as that particular boy was concerned. I mean exactly what I say. The State of New York was doing what? Why, the State of New York was in the great business of education, just as New Jersey is in the great business of education. It is a great business, isn't it?

Wherever the teacher has too many children to teach, some of them are liable to be untaught. And I want to say to you, gentlemen, in this State there are nearly four hundred schools where the teacher has more than fifty children to teach. I want to repeat that; I want it to sink in. That number is too large. Under those circumstances, gentlemen, some children are likely to be neglected. No teacher can properly teach sixty children. We should make up our minds to that fact.

We need the consolidated school, where the school is graded, where there can be a good supply of books and apparatus, where the school building is adapted to the needs of the children, and where there is a diversified course to study, with a course in agriculture. Not much can be done in teaching agriculture in the one room country school. We can do a little something there, but we cannot do much. It can best be done in either the high school or the consolidated school. And there is another advantage about the consolidated school—and what is that? Namely, that the consolidated graded school with an attractive building and surroundings and a diversified course of study, is more attractive for the strong teacher. And that brings me to the next point, namely, the school teacher.

Now, whatever we may say about schools, you know and I know that the great factor in the school is the teacher. This has been said so many times that some of you, I suppose, are getting tired of it, but the fact remains that whatever our school buildings may be, or our courses of study may be, the efficiency of the school is determined by the character of the school teacher.

Now, what about the school teacher? I am talking to you frankly. It is a fact that too many school teachers do not want to teach in a one room country school. They do not like the isolation of it. It is a fact that the cities, the large towns—I am just telling you the facts as they are, not because I endorse them—that the cities and large towns recruit their teaching staff somewhat from the country school. The tendency to drift into the cities seems to be the tendency of human nature.

Now, the consolidated school will help to keep strong teachers in the country, and we need all the help there that we can get. Some teachers find it difficult to get acceptable boarding places in the rural districts—not all teachers, but some of them—and this is a serious matter. I am beginning to feel that a city bred person, a person brought up in the city, does not always make the best teacher for the rural school. Sometimes they have not the right point of view. I am not saying this is true universally. I wish that we could devise some plan of inducing a large number of well qualified, well educated country girls to teach in the rural schools.

We need in this State two things: first, we need additional facilities for

the training of teachers, and I hope that the next General Assembly which convenes next week will vote to establish additional normal schools in this State, one of which should be in South Jersey.

It is going to cost something to do this. For whom is it to be done? For the teachers? No; it is to be done for the children of New Jersey. We need a larger number of trained teachers. All other things being equal, the trained teacher is more efficient in the school room than an untrained teacher. We are importing too many teachers from outside the State. We ought to train more of them in the State.

I said there were two things the State needs in regard to teachers. What is the other? The other is additional facilities for teachers to study during the summer.

Now, the Cape May Summer School, down at the southern end of the State, is doing in my judgment a good work for the teachers of this State; that should be encouraged.

We need, however, three or four additional summer schools, some of them, two or three, up in the northern part of the State. Why do we need these? So that the teachers in service, the teachers who are already teaching in your schools and in the city schools, too, may have an opportunity right at home of getting additional scholarship and additional skill in teaching. Those schools should be of six weeks' duration, beginning the first of July or thereabouts.

These are the two needs about the training of teachers. Now, there is another thing about this that I hesitate to speak about, because I think people do not like to hear about it, but I must speak about it. And what is that? That is the question of the salary of teachers. Just before I came down here this morning, gentlemen, I looked at our reports, and I found that in this State there are nearly four hundred teachers, chiefly in the rural schools, who are getting less than four hundred dollars a year. That is just a little more than a dollar a day, three hundred and sixty-five days in the year. The cost of living about which we have heard so much, bears down upon teachers as well as upon other people. To be sure, we can get somebody into a school to teach school for three hundred and fifty dollars a year, provided she can pass the examination—but some of them have great difficulty in that. But the teacher who is getting such a meagre wage as three hundred and fifty or three hundred and seventy-five dollars a year, is liable to be one who keeps school rather than teaches school. And, gentlemen, there is a great difference between teaching school and keeping school. And who is it that suffers where the school is merely kept rather than taught? I will tell you who suffers. The children of the State. And the greatest asset of this State lies in the children of the State.

And I want to say another thing, gentlemen, and that is that in 1913 the number of things—I would like to have you think about this—the number of things that a young woman can do, who wants employment, has very greatly increased. Every office building in Camden, in Trenton, in Newark, is filled with young women doing clerical work, and most of them getting more money than the teachers of the State in the rural districts receive. It did not used to be so. I remember, and so do some of you, the time when a girl who wanted employment had only three or four occupations open to her. What were they? Sewing, millinery and teaching school. There are a score of occupations now open to women, so that the schools must of necessity pay better salaries if you are going to get the right kind of teachers.

Now, that costs something. I know that. But I would not be doing my duty to the children of the State—they are the ones I am thinking about, not the teachers—unless I called attention particularly to the fact that we cannot get efficient service in our schools, the service that we ought to get, when we pay teachers very small salaries.

Now, I realize that a few teachers who are excellent teachers, get very

RURAL SCHOOL PROBLEMS.

221

small pay. But sometimes the efficiency of the teacher is measured by the wage she receives.

Gentlemen, these are some of the problems which confront the rural school:

First, the building or plant;

Secondly, the necessity of the consolidated school;

Third, the course of study;

Fourth, the teacher.

And there is one other thing—yes, two other things, that I want to mention.

One is the question of school attendance. I want to say that we need in this State a better degree of public sentiment concerning the attendance of children at school. The teacher cannot teach the children unless the children are there. Unfortunately too often it is true, that many children are in school not more than three-quarters of the time, some of them not more than half the time; and that hampers the work of the teacher, and it hampers the work or the progress of the children who are there all the time. I would like to state, gentlemen, that one of the greatest wastes, one of the greatest sources of waste, lies in poor attendance. In some rural counties in this State, or in some rural districts, the attendance is not more than sixty per cent.—forty per cent. waste.

Now, some poor attendance is caused by sickness, stormy weather and bad roads, particularly with young children. But there is much of this poor attendance that could be avoided. And some people talk about the inefficiency of the schools! Well, they cannot do some of the things they should do, because the children are not there.

And one other thing; we need more and better supervision, more help for the teachers in the school rooms. The supervising principals of the State are in the main doing good work. The teachers in service need constructive, sympathetic, helpful supervision.

In conclusion, gentlemen, I have a vision that in the future we shall have a country school of the sort that I have attempted to describe: that we may have a house on the school premises or grounds, in which the teacher or teachers may live; a small farm in connection therewith, which may be used by the pupils for demonstration purposes, the products of which may be used by the teacher under proper restrictions or regulation. I have a feeling that sometime we shall have in the high school a teacher of agriculture and another for domestic science for the girls, who will be employed the year round, or for the year of twelve months, teaching school the greater part of the year and living in the community the remaining part of the year.

These are some of the problems that confront the rural schools. I would like to say, and say it, gentlemen, with all frankness, that the Commissioner of Education, and everybody connected with our Department here at Trenton, will welcome suggestions and criticisms and help from any one of you, or from any body of you, at any time. We are working, you and we, with one great purpose, and that purpose is the betterment of the schools of the State, which means the betterment of the children of the State. (Applause.)

Senator Gaunt—I am quite sure that we all of us have been very glad to hear Dr. Kendall. While we know that he is laboring under disadvantages, yet I am certain that he would be delighted to answer any questions that you here, who are representing the rural districts, would like to ask him.

We are very glad this morning to have these school children who are here, with us, and their teachers. (Applause.) It is

gratifying to the members of the State Board of Agriculture that the teachers of the schools of Trenton have brought their charges in here this morning. And I want to say to you that I am quite sure that you will be interested, because Professor Moore is going to tell these children something about the Weather Bureau, and perhaps he may promise you that we will have plenty of skating this winter. I don't know, he has not told me that.

The next speaker is one with whom we are more or less acquainted. One who has been in the capacity that he is now in for more than twenty years. The head of the Weather Bureau at Washington. A practical farmer, I am informed that Professor Moore has a farm of two or three hundred acres outside of Washington, where he is doing real agricultural work. I believe that you will be intensely interested this morning in his address.

Some one has intimated that Professor Moore would be a very good representative of the agricultural interests at Washington in the new President's cabinet. (Applause.) He is a modest man, I am sure, but as I gauge the sentiment of the farmers' organizations throughout the United States, they do not believe that our Governor, the President-elect, would make any mistake in that selection. (Applause.)

It was my privilege to be at the last session of the National Grange in Spokane, and that department was highly commended, because of its efficient service. Perhaps for the benefit of you who do not know it, it would be well to say that the Weather Bureau is the ranking department in the Department of Agriculture. In the absence of the Secretary, Professor Moore has been the acting Secretary of Agriculture on many occasions. It is a great deal of pleasure that I have in presenting him to you this morning, he will address you on the subject as it is outlined on the programme. (Applause.)

The United States Weather Bureau—What it Means to the Farmer.

BY PROF. WILLIS L. MOORE.

Mr. President, Women and Men, I think possibly that it is appropriate that the man who is supposed to control the winds, should come in at the end of the programme.

I shall endeavor to arouse the attention, if I can, of these school children first, and if I get them, I know I shall have the older ones here at the front.

You little fellows; look up there now, through that glass, at the light coming in; and, if the sun were shining brightly and you could look way out in the

universe, you would say everything is bathed in light,—the whole world, the whole solar system; everything is beautifully illuminated. No, nothing of the kind. If, children, you would ascend in a balloon only three or four miles, the blue tint of that heavenly vault would rapidly change to a gray, and then to a brown; if you could go upward to a distance of only twenty or thirty miles, there would be no oxygen there for you to breathe. There would be no atmosphere sufficiently dense to transmit my voice. You could not hear me speaking, if you were up there thirty miles away.

Furthermore, there would be nothing to catch the rays that come from the sun, to intercept it and change it from etheric vibrations; change it into molecular activity. In other words, there would be nothing up there to catch the energy of the sun and transmute it into light. There would be nothing to check the energy of the sun and change it into heat or electricity.

If you were up there just a little distance of fifty miles, the rays of the sun would pass you and you would be entirely unconscious of them. You would be entirely unfamiliar with the subtle power, the beauty, all that is contained in that wonderful ray of light, which only becomes sensitive light and heat and other forms of energy as it comes farther down and meets something to obstruct it,—something to get in the way of it and change its forms of energy.

So then you catch the thought that I wish to put in your mind. It is not taught in any of your physical geographies, or your text-books. I think it ought to be. That you are living down here in a little thin skin of light, illuminated air, warmed and heated sufficiently to generate vegetable and animal life. The whole outer space is universally cold and inky black with darkness. Think of that.

Well, you say, how is it I see the sun? Well, I will tell you. You look up at the sky on a clear night, without any clouds. You see each star, like a brilliant diamond set in the shadow of a black inky wall. You see the stars, but you do not see the space between, for it is black between them, isn't it? Well, that black space between the star is exactly like the space between the star and you, except for the little thin skin of heated light air that is next to the surface of the earth. Just catch that thought, and you will gain one new idea.

Now, as we look at those wonderful manifestations of the effect of rainfall and temperature and the mineral matters of the soil as they are brought together; and this wonderful alchemy of the Creator transmuted into these beautiful products that we see here, you do not stop to think that if you took that great ear of corn and the stalk upon which it grew and burn it,—what does burn-ign mean? It means that you are rapidly rotting it. The same process as rotting, only that takes fifty years. You rot it by a rapid rot, by a decomposition, in a minute or two. Now, if you take that great stalk of corn, ear and all, and burn it in a crucible, the ashes will become perfectly white. What have you? You have only one-twentieth of the original weight of the great stalk and the ear and the foliage. What has become of the other nineteen-twentieths? You say the fire has destroyed them? Now, right there, let me tell you, and let me emphasize it, that you can destroy nothing—neither matter nor force. You have only changed the form of that corn and foliage, just as has been changed the form of that ray that comes from blackness and cold into light and heat. You have changed the form of that corn and foliage into its original elements. The nineteen-twentieths that have disappeared have gone back to this wonderful air whence they came. Only the one-twentieth is the mineral part which was dissolved in the soil water and which the plant slowly took up in the process of its growth.

Now, another thought. I am trying to give you a little better idea of the wonders of this atmosphere in which we live—a few elementary ideas that you can take away and keep with you. These wonderful products, the corn, the fruit, the cereals, the flowers; there is little in them that is mineral. Reduced to their elementary forms, they go back to the invisible. Then if we should analyze that little one-twentieth,—the mineral part, and reduce it down to its ultimate atom, we are amazed at the thought that this atom may not be

matter at all, but only energy. Then, if you just substitute spirit for energy, and you can say that everything in this room that you see and everything that is tangible and has shape, reduced to its ultimate end, is not matter at all, but is only the materialization of a thought; the materialization of a thought of the great Creator. God simply thinking, that is all; these expressions of matter only the thoughts of the Divine Creator.

Nothing lives, nothing lasts, except the spirit of the corn of the flower, of the man. Everything goes back to the unseen so far as our mortal senses are concerned, and all these things that we see go back to this wonderful air; this wonderful atmosphere.

I shall not take your time to describe to you all of its wonderful functions, but just a thought or two in regard to it.

Why, there are no hundred men who could lift the air in this room if you were to condense the air, to liquefy it. It weighs 1.3 ounces per cubic foot. If you were to take from this atmosphere the little minute dust motes that it contains, we could not illuminate this room.

Now, I am going back a little farther; all through the atmosphere there are millions of little dust motes. In the laboratory we count them, and we count in a cubic centimeter, which is about one-third inch as high as five or ten million dust motes in that little space. You say, "How do you count them, you cannot see them?" No, we never do see them, but we count them easier than I could count the people in this room. It is too long and too intricate a process to describe it to you. Suffice it to say that we do count them. Now, I wish you to catch the thought as one function of that unseen atom,—you cannot see them any more than you can see your own spirit, any more than you can see this undefiled air; that little minute dust mote, several millions to the cubic centimeter, performs many functions in the economy of nature. In every drop of rain there are probably a million at least and perhaps several million of those little minute atoms. We don't know what they are, probably broken up forms of gases. They form what in physics we call the free surfaces upon which condensation begins. A little minute speck of water is condensed on one of those little dust motes. Then it coalesces with another one, and finally if a million or so join together, you have the rain drops that fall to the earth. There could be no rainfall, there could be snow fall, if it were not for those little minute atoms of dust in the air. When the air become saturated the inside of this building would drip with water, just like outside. There would be no rainfall.

Again, it is these little minute atoms that catch the rays of light, and, as I told you a little while ago, scatter it, and illuminate the lower atmosphere.

Think of the wonderful function of that little minute atom. Think again that God never made anything except for a purpose, a wonderful purpose. Think that design—intelligence—is back of everything. We may not be able to see the reason always, but it is only our ignorance. When we analyze the wonderfully mysterious ways in which God moves, His wonders to perform, we find that even this little minute atom of dust has its function in giving to us illumination, giving to us the downpour of the rain and the falling of the snows.

Now, I will pull out my watch. I have suffered when people have talked weather to me.

I wish now to give you a little idea of the atmospheric seas or eddies or storms that operate in this lower atmosphere. You must bear in mind that a storm does not extend upward over five or six miles. Six miles usually is the topmost limit. You have seen a placidly flowing stream, and where a rock projected out into the brook, you have seen little eddies form all around that rock, and those little eddies would go drifting down with the current. You have seen a little hole in that eddy and how that little hole was carried down with the drift of the current. Now, there was something there that you did not see, but which you probably will see the next time you see one of

these little whirling holes. If you look carefully, right adjacent to it, you will see a bubbling up of the water, because where the little hole is there the water is spirally being carried down to the bottom of the stream; where there is the bubbling up, there is the same form of motion carrying the water spirally from the bottom upward. That is what we see, two little whirling eddies in the water, one carrying the water upward and the other carrying it downward.

Now then, I am bringing you to the thought I wish to give to your minds; our storms are only whirling eddies or just such same effects in the atmosphere, and only in the lower six miles of our atmosphere. But, instead of being only one, two or three inches in diameter as in a running stream, the great vortex in the atmosphere is two or three hundred miles if it is in the tropics; it is one to two thousand miles in diameter if it is in the middle latitudes, coming across our mountains from the West eastward.

The cyclone that carries the air upward spirally is only an enlargement of the little whirl that you see taking up the straws on the street and carrying them upward. In the one that carries them upward, the atmosphere is brought in spirally around the base, and flowing in around the base it is then carried upward near the centre. The centre may be a hundred miles in diameter. The whole whirling system may be, as said, between a few hundred to two thousand miles in diameter. Now, in this atmospheric eddy, in which the air is drawn upward, near the centre, we get what we call a low-pressure area or rain storm. The barometer is low. Humid air is light, not heavy, as most people think. Now, when the air is carried upward it cools to a certain degree, cooling by expansion as it rises and that causes condensation, which produces rain or snow.

Now, there is the anti-cyclone. In it the air comes down from above. There is where the barometer is always high. It is the cold wave.

So then if I have left another picture in your mind it is—that storms and cold waves are only eddies in the atmosphere, cyclonic or anti-cyclonic, working upward if they produce rain or snow and working downward if they produce clear and fair weather.

The weather service gathers observations from two hundred places in the United States twice every day. And it compiles and plots them, each observation in its proper geographic position. It measures the pressure of the air, it locates the space where the pressure is the lowest, it locates the space where the pressure is the highest, and it puts in arrows indicating which way the wind blows, and always we find that gravity acting upon the air causes it to flow from the place where the barometer is high towards the place where the pressure is low; in other words, where the air is being carried upward by the spiral motion of the eddy. We find a clear, fair weather condition where the barometer is high and a warm, moist condition where the barometer is low. One is a downward moving eddy and the other is an upward moving eddy.

We see what distance those two forms of eddies have travelled during the past twenty-four hours. We go back for two or three days, and we watch the beginning of these whirls of air; we watch their movement and direction, and for the next two or three days we forecast where they will go and what they will produce. It is empirical reasoning. The observations are scientifically made, the deductions are empirically made. Anything that is predicted upon human judgment must be subject to a considerable element of error. The result is that the weather forecast fails, on the average, one time in ten. It does not fail any oftener. The forecast may be accurate for thirty days in succession and on the thirty-first day if there comes rain on a fair weather forecast—well, the first thirty forecasts no one ever sees or hears about. They seem to pay no attention to these at all. You would not think they knew what the weather forecast was. But let the thirty-first forecast fail, and everybody knows it. (Laughter and applause.)

Then within the next few minutes the storm centres are located, the cold wave centres are located and the telegraph then begins to carry out the fore-

casts; and, do you know this, the rural telephone today reaches over five million farmhouses with the weather forecast every morning before ten or eleven o'clock. On the lakes or seaboard, there the storm warnings are displaced, in the day by flags, and through the medium of lights at night.

The forecaster this morning, if there is a storm imminent anywhere along the coast, simply touches a button as it were, and within the next thirty or forty minutes all of the lights are lighted along that seaboard, or the flags flown if it is day time, and everybody who is interested in marine property is notified.

When a cold wave is imminent, and it first shows on the Rocky Mountain slope,—the great stock interests receive the first warning, next come the tobacco interests in Tennessee and Kentucky, and later on the sugar interests in Louisiana and Texas, and the great fruit and vegetable growing regions south of the Delaware,—all by a system of telegraph in which we have often sent out ten thousand telegrams within a space of an hour or two.

You say, how can you do that? We will telegraph to one hundred distributing centres, and they immediately begin sending telegrams. We have a thorough system of distribution, all planned beforehand.

We will just take the great freeze that has in the past few days caused such an enormous loss of property in California. Two days before that cold came into those fruitful valleys of California and the other Rocky Mountain States near the coast, the weather forecaster,—what did he see? He saw, overlying Arizona and New Mexico, a low pressure; one of those inwardly moving cyclones, or vortices. He saw overlying the Canadian Northwest, just touching Montana, the beginning of one of those downward moving eddies of air. He knew the one in the south would suck or draw to itself the heavier air at the north.

Then the great fruit interests were all notified by wire. From reports that I have received, it is apparent that the forewarning of the coming of that cold in the fruit regions in California, saved more than double the cost of the United States weather service for the next two years. (Applause.) And still they must have suffered a great loss. They utilized everything that they had of a practical nature to maintain the right temperature. Many of these appliances have been invented by observers of the Weather Bureau; some have not. But growers lighted fires in their orchards and maintained temperatures probably ten or fifteen degrees above those in orchards not thus heated. They used anywhere from fifty or more stoves per acre.

Now, in the great fruit regions of the Yakima Valley, the Hood River, the Grand Junction, there are wonderful fruit valleys. In the first years of their attempts to grow fruit they found the loss by frost was so great that the industry was not profitable. Then came the Government service to tell them a day or two before that the frost is coming.

Now then, our relation in regard to the great floods. You saw accounts here of the great flood in Pittsburgh. Now, that flood in Pittsburgh is occasioned by the rainfall on the water sheds of the Alleghany and the Monongahela. We have on those water sheds about twenty little telegraphic reporting stations. They measure the rainfall. They are small stations; they do not report to Washington; they only go to Pittsburgh. There are about twenty such stations on those two water sheds. They are precipitous sheds. From the reports received the Pittsburgh forecaster knows the depth of the water on those two water sheds, and he knows the area of the water sheds, and he knows by empirical study just what the gauge reading will be, and he knows what height of water will be occasioned at Pittsburgh sixteen, twenty-four or thirty-six hours after any given amount of water falls on those water sheds, and he tells the great industries down that wonderful valley: "*Tomorrow, at such an hour, your water will stand so much on the gauge, and will go right through your shop; get ready for it.*" The result is that we give them warning of the coming flood and every industry gets ready and the loss is cut down.

We serve the transportation interests, and the marine interests, and it is

seldom that we allow a storm to come to any of our coasts that is dangerous to shipping without forewarning it in advance.

We forecast the coming weather, the general character, for a week in advance, with a high degree of accuracy. And we do that by making a chart of the entire Northern Hemisphere. Our Government is the only government that does that. We make a weather chart giving the weather entirely around the northern hemisphere, our Government paying the cost of cabling and telegraphing and getting many observations by the courtesy and co-operation of foreign governments, and when we have calculated the pressure of the air lying clear around the northern hemisphere we are able to see the low pressure, and the high pressure eddies,—study the rainstorms and the snowstorms, and are able to see the weather entirely around the world. (Applause.)

I will say a word in regard to the proposed new crop reporting system. If the same machinery that is used by the Weather Bureau in the collecting of weather reports were utilized for the purpose of gathering telegraphic reports of the crops from the growing fields and these telegraphic reports were collected at station centres and partly digested before being forwarded to Washington, it would be possible for the Central Office of the Weather Bureau at Washington to issue a complete weather-crop report once each week, which would not be over two hours old at the time it was published. This is a matter that will come up for future consideration.

A vote of thanks was extended to Professor Moore.

Senator Gaunt—I want to say that at the last session of the National Grange we went on record in favor of having the crop reporting service placed back where it used to be, with the Weather Bureau. I do not believe we made any mistake. Did we, Professor Moore?

Prof. Moore— No, I think not.

Senator Gaunt—We think that the crop reporting service should be in the hands of the department that is looking after the weather and the rainfall, etc., and the winds, instead of in the census bureau where our old friend Uncle Joe has placed it. We believe that it would be more beneficial in the weather department, to the farmer, than where it is now. (Applause.)

Right on this line I want to say that I have not thought of it, but we should have had an expression of the farmers of this State in reference to this matter endorsing the proposition that has been advocated, I think by many of those who have had the interest of the farmer at heart other than the interest of the speculator, that the weather department be placed in charge of collecting the crop reports instead of having it where it is done at present.

Secretary Dye—I move, Mr. Chairman, that it is the sense of the

New Jersey State Board of Agriculture, that we believe increased efficiency would be secured by having the crop reporting referred to the Weather Bureau rather than to the Statistical Bureau.

This motion was carried.

Senator Gaunt—I am informed by the Secretary that the programme has come to an end and that the session is now about to come to a close, and I want to say before closing that the officers of the Board feel—I am not an officer and it seems to me when they want to get away they throw things back on me—we certainly have been very grateful for the attendance that has been had here, and that we claim there is a greater interest in this State Board of Agricultural meeting than there ever has been in any former meeting. The State Board will now stand adjourned.

REPORT OF THE STATE ENTOMOLOGIST. 229

Report of the State Entomologist

BY THOMAS J. HEADLEE, PH.D.

During the past year through the death of Dr. John Bernhardt Smith our State has lost the services of one of the foremost of American Entomologists, and New Jersey must feel this loss with especial keenness, for the economic entomology of our State is really the work of Dr. Smith. Step by step he brought the production and handling of nursery stock from a chaotic condition where the distribution of infected and infested stock was disregarded and unchecked to a point where nurserymen and fruit growers realize the necessity of great care in the production and distribution of stock, and where the matter is controlled by State law and carefully looked after. When the bee-keepers of the State manifested a desire to bring foul brood under control, Dr. Smith joined hands with them and obtained an excellent bee-disease law, under which the work of control is now going forward as rapidly as the funds will permit.

Following the death of Dr. Smith, Mr. Harry B. Weiss was appointed Acting State Entomologist and until October 1st, 1912, was in full charge of the work of insect and bee-disease control.

Following the resignation of Mr. C. S. Sharp, Mr. E. G. Carr was duly appointed bee inspector and has rendered highly satisfactory service to date.

INSECT CONTROL.

The work of insect control has consisted of the inspection and certification of nurseries, the investigation and granting of certificates to dealers in nursery stock, the examination of nursery stock imported from abroad and from Gypsy or Brown-tail moth infested portions of New England, and the examination of occasional shipments from other States. The inspection of nurseries began August 1st and was practically completed by October 31st, this period including necessary re-inspections. In accordance with the practice of controlling the activities of the dealer in nursery stock, all persons jobbing stock from satisfactory sources have been granted certificates. The following nurserymen and dealers in nursery stock were granted certificates:

LIST OF CERTIFICATES FOR 1912.

- | | |
|-----|---|
| No. | 1. Henry A. Dreer, Inc., Riverton (general). |
| " | 2. Bobbink & Atkins, Rutherford (general). |
| " | 3. Elizabeth Nursery Co., Elizabeth (general). |
| " | 4. F. and F. Nurseries, Springfield (general). |
| " | 5. A. A. Watts, formerly Ball Nursery, Westfield (general). |
| " | 6. K. M. van Gelderen, Long Branch (general). |
| " | 7. George A. Steele, Eatontown (general). |
| " | 8. T. E. Steele, Palmyra (general). |
| " | 9. Chas. W. Schneider, Little Silver (general). |
| " | 10. John Ryan, Basking Ridge (general). |
| " | 11. Willard H. Rogers, Mount Holly (general). |
| " | 12. Julius Roehrs Co., Rutherford (general). |
| " | 13. Alvah H. Reynolds, Madison (general). |
| " | 14. George H. Peterson, Fair Lawn (general). |
| " | 15. John Moore, Little Silver (general). |
| " | 16. Charles Momm, Irvington (general). |
| " | 17. John McCleary, Sewell (general). |
| " | 18. Wm. Rose, Red Bank (general). |
| " | 19. James Ambacher, West End (general). |
| " | 20. J. D. Brown, Allenhurst (general). |
| " | 21. James Clinton, Morris Plains (general). |
| " | 22. W. G. Eisele, West End (general). |
| " | 23. W. H. Forristel, Plainfield (general). |
| " | 24. Victor J. Humbrecht, W. Windsor Township (general). |

- No. 25. Amon Heights Nurseries, Inc., Merchantville (general).
- " 26. F. E. Beugelaar, Rutherford (general).
- " 27. Frank Breck, Vineland (private).
- " 28. Michael N. Borgo, Vineland (general).
- " 29. Mrs. N. P. Creely, Burlington (strawberry).
- " 30. John Casazza, Vineland (general).
- " 31. Peter Henderson & Co., Jersey City Heights (general).
- " 32. W. A. Manda, Inc., South Orange (general).
- " 33. Vineland Grape Juice Co., Vineland (grape).
- " 34. George Macaltioner, Woodstown (ornamental).
- " 35. Wm. L. Ewing, Fishing Creek (blackberry).
- " 36. K. E. de Waal Malefyt, Ridgewood (general).
- " 37. Red Towers Nurseries, Hackensack (general).
- " 38. K. Herman Stoye, Eatontown (general).
- " 39. Mrs. E. P. McColgan, Red Bank (general).
- " 40. Arthur J. Collins, Moorestown (general).
- " 41. J. M. Ralston, Allenhurst (general).
- " 42. M. O'Hagan, Asbury Park (general).
- " 43. Wm. O'Hagan, Asbury Park (general).
- " 44. Mrs. W. S. Hertzog, Morris Plains (general).
- " 45. Carlman Ribsam, Trenton (general).
- " 46. North Jersey Nurseries, Millburn (general).
- " 47. Joseph Sbortoli, Vineland (dealer).
- " 48. S. T. Hillman, West Cape May (dealer).
- " 49. Hartung Bros., Jersey City (dealer).
- " 50. J. F. Noll & Co., Inc., Newark (dealer).
- " 51. Alfred J. Kull, Far Hills (dealer).
- " 52. Jos. J. Black, Son & Co., Hightstown (general).
- " 53. Charles Black, Hightstown (general).
- " 54. Wm. Henry Maule, Hightstown (dealer).
- " 55. H. Weezwnaar, Bergen Nurseries, Teaneck (dealer).
- " 56. Benjamin Connell, Merchantville (dealer).
- " 57. Bassett & Weller, Hammonton (general).
- " 58. R. D. Cole, Bridgeton (general).
- " 59. George W. Bassett, Hammonton (general).
- " 60. C. B. Horner & Son, Mount Holly (general).
- " 61. J. T. Garrison & Sons, Bridgeton (strawberry).
- " 62. Ellsworth Pedrick, Bridgeton (strawberry).
- " 63. Hiram T. Jones, Elizabeth (general).
- " 64. I. D. Cole & Co., Rutherford (dealer).
- " 65. S. T. Pullen, English (peach).
- " 66. Charles A. Baird, Freehold (general).
- " 67. George A. Shultz, Jamesburg (peach).
- " 68. Chas. H. Totty, Madison (greenhouse).
- " 69. Samuel Brant, Madison (peach).
- " 70. Chas. A. Bennett, Robbinsville (general).
- " 71. Albert Nelson, Allentown (general).
- " 72. W. H. Polhemus, Robbinsville (strawberry).
- " 73. James L. Hall, Farmingdale (dealer).
- " 74. Dirk de Haas, Plainfield (dealer).
- " 75. Charles L. Stanley, Plainfield (dealer).
- " 76. Richard Evans, Jr., Wenonah (dealer).
- " 77. Henry E. Burr, East Orange (general).
- " 78. J. F. Randolph, East Rutherford (general).
- " 79. John Bennett, Atlantic Highlands (general).
- " 80. J. E. Kuhns, Cliffwood (strawberry).
- " 81. Wm. W. Lukens, Princeton (dealer).
- " 82. The Chas. C. Owens Co., Orange (dealer).
- " 83. Garfield Williamson, Ridgefield (general).

REPORT OF THE STATE ENTOMOLOGIST. 231

- No. 84. H. W. Shoemaker, Convent (general).
 " 85. J. T. Lovett, Little Silver (general).
 " 86. Frank Lenz, Irvington (general).
 " 87. Wm. Bryan, Elberon (dealer).
 " 88. J. W. Wooton, Jersey City (dealer).
 " 89. Edwin Allen & Son, New Brunswick (general).
 " 90. S. C. DeCou, Moorestown (general).
 " 91. Max Rumprecht, Fort Lee (general).
 " 92. Peter Henderson & Co., Jersey City (special).
 " 93. Bound Brook Nurseries, formerly Wadley Nursery Co., Bound Brook (general).
 " 94. T. C. Kevitt, Athenia (strawberry).
 " 95. James Apgar, Fairmount (peach).
 " 96. Willard Apgar, Fairmount (peach).
 " 97. Mrs. E. B. Conover, Fairmount (peach).
 " 98. Mansfield Eick, Bissel (peach).
 " 99. J. H. Lindsley, White House (peach).
 " 100. W. S. Perry, Delaware (general).
 " 101. J. C. Williams, Montclair (general).
 " 102. A. S. Wallace, Montclair (dealer).
 " 103. Stanton B. Cole, Bridgeton (general).
 " 104. John W. Henry, Lebanon (peach).
 " 105. Samuel H. Wilson, Lebanon (peach).
 " 106. W. S. Pullen & Co., Cranbury (peach).
 " 107. P. V. Drake & Co., Hopewell (peach).
 " 108. Francis Pettit, Hopewell (peach).
 " 109. Wilfred Everingham, Woodsville (peach).
 " 110. Charles Bird, Arlington (general).
 " 111. John Fleming, Califon (peach).
 " 112. J. Kaiser Davis, Chester (peach).
 " 113. Mathias Fleming, Califon (peach).
 " 114. Wm. H. Morgan, Westmont (dealer).
 " 115. Cicero Higgins, Ringoes (general).
 " 116. H. C. Steinhoff, West Norwood (general).
 " 117. Wm. C. Evans, Sewell (general).
 " 118. Hammonton Nursery Co., Hammonton (dealer).
 " 119. Jos. J. Ayars, Williamstown (dealer).
 " 120. S. C. C. Stephens, Tuckahoe (dealer).
 " 121. J. Monroe Mattison, Englewood (general).
 " 122. David V. Higgins, Ringoes (peach).
 " 123. James H. Vliet, Gladstone (peach).
 " 124. J. D. Lindsley, Mendham (general).
 " 125. Luther A. Apgar, High Bridge (peach).
 " 126. Wm. Tricker, Arlington (general).
 " 127. W. M. Howey, Sewell (dealer).

Much nursery stock of one sort or another has come to New Jersey from foreign countries and some from New England. During the past year the following stock was received:—

Belgium.....	4,384	cases—azaleas, bay trees, palms, boxwood, rhododendrons and greenhouse stock.
Brazil.....	57	“ greenhouse stock.
Canada.....	6	“ orchids.
Columbia.....	263	“ greenhouse stock.
Costa Rica.....	21	“ orchids.
Great Britain.....	335	“ roses, fruit stock and hydrangeas.
France.....	259	“ roses, fruit stock and miscellaneous ornamental shrubs.

Germany.....	384	"	roses, evergreens, hydrangeas, fruit and greenhouse stock.
Guatemala.....	21	"	greenhouse stock.
Holland.....	4,161	"	rhododendrons, roses, boxwood and azaleas.
Italy.....	6	"	greenhouse stock.
Japan.....	15	"	fruit and ornamental stock.
Mexico.....	2	"	greenhouse stock.
P. Islands.....	8	"	orchids.
Spain.....	10	"	greenhouse stock.
Venezuela.....	67	"	greenhouse stock.
New England.....	106	"	fruit and ornamental stock.
Total.....	10,045	"	of all sorts.

Of the 10,045 cases of nursery stock received from abroad and from New England in 1912, 6,727 came in during the spring and 3,318 during the fall. Six hundred and thirty-two cases of the spring importations were examined and 3,279 of the fall importations were gone over. The 14 cases of the fall importations which were not examined contained stock of a type entirely unlikely to carry either brown-tail or gypsy moth.

Previous to November 1, 1912, the inspecting force was physically not only unable to inspect this stock as it was unpacked, but was unable to inspect all of it at any time or in any fashion. That part of the stock which, in the judgment of the inspector was most dangerous, was inspected so far as time and strength would permit. In general, it may be said that such as was examined to October 23d was found clean and in satisfactory condition. In the Japan importations a small lot of cherry trees infested with Japan cherry scale was discovered and destroyed. A few cases of infested palms and bay trees were discovered.

Several reports of Brown tail and Gypsy moth infestation within the limits of New Jersey have appeared during the past year; but in every case the most careful investigation showed them to have been unfounded.

On October 23rd an egg mass of the Gypsy moth was found at New Durham in a shipment of azaleas from P. & L. Van Acker Freres of Loochristy Lez-Gand, Belgium. In view of the very serious nature of this insect and the apparent danger of it being introduced in this way, the Executive Committee of your Board ordered the careful examination of all imported stock liable to carry Gypsy or Brown-tail moths, at the time of unpacking, and authorized the employment of sufficient additional force. Acting on this authorization the State Entomologist employed two temporary inspectors to supplement the efforts of the regular inspection force, and sent the following order to the nurserymen of New Jersey.

NEW BRUNSWICK, N. J., November 2nd, 1912.

MY DEAR SIR:—

On October 21, 1912, in the course of inspecting some azaleas from Belgium at New Durham, N. J., an egg mass of the Gypsy moth was found in the shipment. This finding renders it certain that the importation of this terrible pest, which with the Brown-tail moth has induced Massachusetts alone to expend a million dollars a year for suppression, and the United States Government to spend annually three hundred thousand dollars more, is coming into our State on Belgium stock. Heretofore this office has made the practice of inspecting as it comes from the cases all stock other than herbaceous plants and palms from France, Germany, England, Ireland, Scotland and Japan, and in some instances Belgium stock.

In view of the danger from Belgium stock as shown by the New Durham inspection, the Executive Committee of the State Board of Agriculture has authorized me to employ sufficient inspectors for the purpose of examining all stock from France, Germany, England, Ireland, Scotland, Japan and Belgium and some of that coming from Holland.

REPORT OF THE STATE ENTOMOLOGIST. 233

In accordance with Section 11, Chapter 249, Laws of 1903, a copy of which is inclosed, I hereby direct you from the date of the receipt of this notice, to hold without unpacking every case of nursery stock imported from France, Germany, England, Ireland, Scotland, Japan and Belgium until such time as it is inspected under my direction, provided said cases contain stock other than herbaceous plants and palms.

It is my intention to employ enough inspectors to examine stock without delay. Notify me at once on receipt of such stock in order that an inspector may reach you promptly.

I am sure you do not want to be instrumental in bringing this pest into our State, and I trust that you will co-operate without fail.

Thanking you in advance for your co-operation, I am,

Very sincerely yours,
(Signed) THOMAS J. HEADLEE,
State Entomologist.

On November 8th a winter nest of the Brown-tail moth containing living caterpillars was found in a case of *Cypripedium* from Exeter, N. H. In view of this development a second order was sent out as follows:—

NEW BRUNSWICK, N. J., November 14, 1912.

DEAR SIR:—

On November 8th in the course of inspecting some stock from Exeter, N. H., which came in under a properly signed certificate, a nest of the Brown-tail moth containing living caterpillars was found. This finding renders it certain that we must provide against the introduction of this pest. It seems that the simplest way in which this can be done efficiently is to examine, at the time it is unpacked, every case or parcel of nursery stock coming into New Jersey from Maine, New Hampshire, Massachusetts, Connecticut and Rhode Island.

In accordance with Section 11, Chapter 249, Laws of 1903, a marked copy of which you received in my letter of November 2, 1912, I hereby direct you from the date of the receipt of this notice to hold without unpacking every case or parcel of nursery stock from the above described territory, until such time as it is inspected under my direction.

Notify me at once on receipt of such stock, in order that inspector may reach you without delay.

I am sure you do not want to be instrumental in bringing this pest into our State, and I trust that you will co-operate without fail.

Thanking you in advance for your co-operation, I am,

Very truly yours,
(Signed) THOMAS J. HEADLEE,
State Entomologist.

Practically the full time of four men for the months of November and December was required to examine the stock from Europe and from infested parts of New England liable to carry Gypsy and Brown-tail moths. From November 1st, all stock liable to carry Brown-tail or Gypsy moth infestation has been examined at the time of unpacking. In some instances, stock from Holland, which is exceptionally clean and on which the service of this State has never found these pests, has been unpacked before examination.

Occasional shipments from other States have been inspected. In one instance peach trees infested with San José Scale was found, in another apple tree infested with woolly aphids were discovered, and in still another Norway spruce infested with the spruce gall aphid were discovered. There is no doubt that we are getting some infested stock from other States and there is also no doubt that the knowledge that shipments are always likely to be examined greatly improves the grade of stock which we receive.

The past season has seen the enactment of a national inspection law known as "The Plant Quarantine Act of August 20th, 1912." The Federal Horticultural Board, which is charged with its enforcement, can regulate the importa-

tion of stock from abroad and the passage of stock from State to State, and is able under the authority of this law, with certain restrictions, to declare and enforce a quarantine against specific insects and diseases.

This Board has already promulgated rules and regulations of such a nature that the State inspector will get due notice of all importations destined for his particular State. It has declared a quarantine against the white pine blister rust, the potato wart, the Gypsy moth, the Brown-tail moth and the Mediterranean fruit fly. The quarantine against the first two species involves the forbidding of the importation of plants and products likely to carry these diseases from certain foreign countries where they are now prevalent. The quarantine against the Gypsy and Brown-tail moths involves the forbidding of the carrying of certain substances likely to be infested from certain parts of New England, except as these substances are examined and certified as clean by proper authority. The quarantine against the Mediterranean fruit fly involves the forbidding of the transportation of various plants and plant products likely to be infested by this insect from the territory of Hawaii into the United States.

If properly administered this law should prove a great boom to the horticultural interests of New Jersey and of the country at large.

BEE DISEASE CONTROL.

The inspection of apiaries and the treatment of foul brood has gone forward during the past summer as rapidly as our inspector, Mr. E. G. Carr, could cover the ground. Especial attention was given to those localities in which disease was known to exist, and most of the time was purposely spent with the less well-informed bee-keepers. Of course, inspections of all apiaries were made promptly on request. This policy was adopted, because we believed that the successful bee-keeper would take care of the infection and prevent it from becoming a center of distribution, while the less-informed apiarist was certain to permit the disease in his yard to become a distribution center.

Thus far the inspection has been largely confined to the northern half of the State, for in this section much foul brood has been known to exist.

No. of bee yards examined.....	378
No. of colonies examined.....	3,272
No. of colonies in box hives.....	355
No. of yards stocked with Italian bees.....	64
No. of yards stocked with black bees	47
No. of yards stocked with hybrid bees.....	264
No. of colonies with American foul brood.....	157
No. of colonies with European foul brood.....	391
Percentages of yards infested with foul brood.....	46

Inspections have been made in fifteen counties and infection found in every one. Both American and European foul brood have been found in Burlington, Essex, Bergen, Hunterdon, Middlesex, Morris, Passaic, Sussex, Somerset and Union Counties. American foul brood has been found in Warren, Hudson, and Salem Counties. European foul brood has been found in Ocean and Mercer Counties.

The statistics from this year of inspection show even more pointedly than those of last year the need of the work of control. With 46% of all yards infested it would seem that vigorous measures must be taken if the bee industry is to be worth while in New Jersey. The problem of control of bee disease is one of education and law enforcement. A simple manual of bee husbandry, including among other necessary things, a section on the recognition and treatment of bee diseases, should be in the hands of every New Jersey bee-keeper. When the inspector visits a bee yard, he not only examines it for disease, but discusses with the owner the recognition marks and the treatment of different diseases and the nature and value of different methods of bee management.

Having found a serious disease present the inspector makes the necessary

REPORT OF THE STATE ENTOMOLOGIST. 235

arrangements for treatment, and makes it a point to see that the disease disappears.

Once the intent and purpose of the act under which the bee inspector operates is understood by the bee-keeper, he offers no opposition, but is usually glad to have his apiary examined.

Leaving out of consideration the bees kept in towns and cities of which we have no record, the 10,484 colonies now on New Jersey farms yield about 14 pounds of honey and 1 pound of wax per colony. This amounts to \$22,900. Under good management and protected from foul brood these bees should produce an average of 50 pounds of honey per colony. This means an increase of \$22,100.

A simple manual of bee husbandry is now in process of preparation, and it is hoped that it will prove an important aid to better bee-keeping.

Report of Dr. Mel. T. Cook, State Plant Pathologist

ORGANIZATION.

The Department of Plant Pathology was organized in accordance with Chapter 54, Laws of 1911, a copy of which is appended to this report. The writer assumed the duties of the office of State Plant Pathologist and Plant Pathologist to the federal Agricultural Experiment Station, December 1st, 1911. Mr. Edgar L. Dickerson, formerly assistant Entomologist, was appointed assistant nursery inspector for the months of July and August. Mr. Carl A. Schwarze was appointed Assistant State Plant Pathologist, and assumed his duties September 1st.

NURSERY INSPECTION.

All the nurseries of the State have been inspected, some of them twice, and certificates issued as follows:—

NO.	NAME.	TOWN.	COUNTY.
1.	Henry A. Dreer, Inc.,	Riverton,	Burlington.
2.	Bobbink & Atkins,	Rutherford,	Bergen.
3.	Elizabeth Nursery Co.,	Elizabeth,	Union.
4.	American Nursery Co.,	Springfield,	Union.
5.	A. A. Watts,	Westfield,	Union.
6.	K. M. van Gelderen,	Long Branch,	Monmouth.
7.	George A. Steele,	Eatontown,	Monmouth.
8.	T. E. Stiele,	Palmyra,	Burlington.
9.	Chas. W. Schneider,	Little Silver,	Monmouth.
10.	John Ryan,	Basking Ridge,	Somerset.
11.	Willard H. Rogers,	Mount Holly,	Burlington.
12.	Julius Roelers Co.,	Rutherford,	Bergen.
13.	Alvah L. Reynolds,	Madison,	Morris.
14.	Geo. H. Peterson,	Fair Lawn,	Bergen.
15.	John Moore,	Little Silver,	Monmouth.
16.	Charles Momm,	Irvington,	Essex.
17.	John McCleary,	Sewell,	Gloucester.
18.	William Rose,	Red Bank,	Monmouth.
19.	Jas. Ambacher,	West End,	Monmouth.
20.	J. D. Brown,	Allenhurst,	Monmouth.
21.	James Clinton,	Morris Plains,	Morris.
22.	W. G. Eisele,	West End,	Monmouth.
23.	W. H. Forristel,	Plainfield,	Union.
24.	V. J. Humbrecht,	W. Windsor,	Mercer.
25.	Amon Heights Nursery Co.,	Merchantville,	Camden.
26.	F. E. Bengelaer,	Rutherford,	Bergen.
27.	Frank Breck,	Vineland,	Cumberland.
28.	Michael N. Borgo,	Vineland,	Cumberland.
29.	Mrs. N. P. Creely,	Burlington,	Burlington.
30.	John Casazza,	East Vineland,	Cumberland.
31.	Peter Henderson & Co.,	Jersey City,	Hudson.
32.	W. A. Manda, Inc.,	South Orange,	Essex.
33.	Vineland Grape Juice Co.,	Vineland,	Cumberland.
34.	Geo. Macaltione,	Woodstown,	Salem.
35.	Wm. L. Ewing,	Fishing Creek,	Cape May.
36.	K. E. de Waal Malefyt,	Ridgewood,	Bergen.
37.	J. J. Phelps,	Hackensack,	Bergen.
38.	K. Herman Stoye,	Eatontown,	Monmouth.
39.	Mrs. E. P. McColgan,	Red Bank,	Monmouth.
40.	J. M. Ralston,	Allenhurst,	Monmouth.
41.	Arthur J. Collins,	Moorestown,	Burlington.

REPORT OF PLANT PATHOLOGIST.

237

NO.	NAME.	TOWN.	COUNTY.
42.	M. O'Hagen,	Asbury Park,	Monmouth.
43.	Wm. O'Hagen,	Asbury Park,	Monmouth.
44.	Mrs. W. S. Hertzog,	Morris Plains,	Morris.
45.	Carlman Ribsam,	Trenton,	Mercer.
46.	North Jersey Nurseries	Milburn,	Essex.
52.	Jos. H. Black & Son Co.,	Hightstown,	Mercer.
53.	Charles Black,	Hightstown,	Mercer.
57.	Bassett & Weller,	Hammononton,	Atlantic.
58.	R. D. Cole,	Bridgeton,	Cumberland.
59.	Geo. W. Bassett,	Hammononton,	Atlantic.
60.	C. B. Horner & Sons,	Mount Holly,	Burlington.
61.	J. T. Garrison & Sons,	Woodruff,	Cumberland.
62.	Ellsworth Pedrick,	Woodruff,	Cumberland.
63.	Hiram T. Jones,	Elizabeth,	Union.
65.	S. T. Pullen,	Englishtown,	Monmouth.
66.	Chas. A. Baird,	Freehold,	Monmouth.
67.	George A. Shultz,	Jamesburg,	Middlesex.
68.	Chas. H. Totty,	Madison,	Morris.
69.	Samuel Brant,	Madison,	Morris.
70.	Chas. A. Bennett,	Newtown,	Mercer.
71.	Albert Nelson,	Allentown,	Monmouth.
72.	W. H. Polhemus,	Robbinsville,	Mercer.
77.	Henry E. Burr,	South Orange,	Essex.
78.	J. T. Randolph,	Rutherford,	Bergen.
79.	John Bennett,	Atlantic Highlands,	Monmouth.
80.	J. E. Kuhns,	Cliffwood,	Monmouth.
81.	Wm. W. Lukens,	Princeton,	Mercer.
82.	The Chas. C. Owens Co.,	Orange,	Essex.
83.	Garfield Williamson,	Ridgefield,	Bergen.
85.	J. T. Lovett,	Little Silver,	Monmouth.
89.	Edwin Allen & Son,	New Brunswick,	Middlesex.
90.	Samuel C. DeCou,	Fort Lee,	Bergen.
93.	Bound Brook Nursery,	Bound Brook,	Somerset.
94.	T. C. Kevitt,	Athenia,	Passaic.
95.	James Apgar,	Fairmount,	Hunterdon.
96.	Willard Apgar,	Fairmount,	Hunterdon.
97.	Mrs. E. B. Conover,	Fairmount,	Hunterdon.
98.	Mansfield Eick,	Bissell,	Hunterdon.
99.	J. H. Lindsley,	White House,	Hunterdon.
100.	W. S. Perry,	Vail,	Warren.
101.	J. C. Williams,	Montclair,	Essex.
103.	Stanton B. Cole,	Bridgeton,	Cumberland.
104.	John W. Henry,	Lebanon,	Hunterdon.
105.	Samuel H. Wilson,	Allerton,	Hunterdon.
106.	W. S. Pullen & Co.,	Cranbury,	Middlesex.
107.	P. V. Drake,	Hopewell,	Mercer.
108.	Francis Pettit,	Mt. Rose,	Mercer.
109.	Wilfred Everingham,	Woodsville,	Mercer.
110.	Charles Bird,	Arlington,	Hudson.
111.	John Fleming,	Parker,	Morris.
112.	J. Kaiser Davis,	Chester,	Morris.
113.	Mathias Fleming,	Parker,	Morris.
115.	Cicero Higgins,	Ringoes,	Hunterdon.
116.	H. C. Steinhoff,	West Norwood,	Bergen.
117.	Wm. C. Evans,	Sewell,	Gloucester.
121.	J. Monroe Mattison,	Englewood,	Bergen.
122.	David V. Higgins,	Ringoes,	Hunterdon.
123.	James H. Vliet,	Gladstone,	Somerset.
124.	J. D. Lindsley,	Mendham,	Morris.
125.	Luther A. Apgar,	High Bridge,	Hunterdon.
126.	Wm. Tricker,	Arlington,	Hudson.

Most of the nurseries which were handling pine trees were inspected in the spring or early summer by the writer to determine their freedom from blister rust (*Peridermium pini*) (Wild Kleb.) During July and August nearly all the nurseries were inspected by Mr. Dickerson, and a few also by the writer. The few remaining nurseries, which were devoted to the growing of strawberries, were inspected by Mr. H. B. Weiss of the Department of Entomology.

The nurserymen very generally expressed a willingness to co-operate with the Department in its work, some of them cancelling orders for European white pine stock, others voluntarily destroying white pine stock which they suspected, while several of them have sent diseased plants of various kinds and asked for advice.

The following diseases were the most common and most important found in the nurseries:—

Apple, pear and quince—Canker caused by fire blight (*bacillus annglovorus* (Burr) (DeToni) and black rot (*sphaeropsis malorum* pk.) which also caused a leaf spot. Rust, which also occurred on flowering crab. Crown gall on but very few trees.

Blackberries, dewberries and raspberries—Anthracnose (*gloeosporium venetum* Speg.) quite common but not severe. Double blossom (*fusarium rubi* winter) was quite common, especially on dewberries. Crown gall (*pseudomonas tumefaciens*, Smith and Townsend) was quite common on red raspberries.

Boxwood—A leaf and stem disease (*volutella boxi* Cda Berk.) on stock imported from Holland; destroyed by consignee.

Chestnut—Very little chestnut is handled by the New Jersey nurserymen, and every nursery handling such stock was found to be infected with the bark disease (*diaporthe parasitica* Murril.) All of the diseased stock, and in some cases the entire stock was destroyed.

Currants—Anthracnose (*pseudopeziza ribis* Kleb.) and cane blight (*nectria cinnabarina* (Tode) Fr.) were found in a few nurseries and some stock destroyed.

Hollyhocks—Rust (*puccinia malvacearum* Mont.)

Peach—Yellows and little peach are two diseases which are said to be distributed through the nursery, but are very difficult to detect in young trees. A number of trees which we suspected of being diseased were destroyed upon our recommendation. However, it appears to the writer that some method other than inspection must be devised for the control of these diseases. It also appears that the most feasible method will be to supply the nurserymen with bud wood from our own State orchards.

Other diseases of minor importance will be mentioned in this of plant diseases reported from various sources.

ORCHARD INSPECTION.

During the summer a number of orchards were also inspected upon the request of the owners, and advice given for the control of diseases.

INSPECTION OF IMPORTED STOCK.

The passage of a quarantine law by the last session of Congress and a subsequent quarantining of a considerable part of Europe for protection against the introduction of the wart disease of the potato and the blister rust of the white pine has been greatly to our advantage. It was impossible to inspect cargoes of potatoes in such a manner as to make the work efficient. Although the great bulk of such shipments was intended for food, it was impossible to prevent ignorant and irresponsible individuals from selling or using them for seed.

Therefore, the importation of potatoes from countries where the disease is known to exist was a continual menace to the potato-growing industry of the entire country.

The character of the blister rust of the white pine is such as to make its detection impossible until it has reached the eruptive stage. Since the imported

stock might not show the disease at the time of importation, it was possible for it to be distributed on the market and to develop the disease one, two or three years later. Therefore, the inspection for this disease was more or less uncertain. There is a considerable quantity of European pines in the New Jersey nurseries, which must be kept under observation until ready to put on the market.

The inspection of stock from other States is a problem to which we are giving considerable attention. There are a great many shipments to many points. The shipments to the nurserymen can usually be reached, but the small shipments to individuals are not so easily managed.

CHESTNUT BARK DISEASE.

The very destructive disease which threatens to destroy our chestnut timber has spread to practically every part of the State where there is any chestnut growth. The total loss to the country at large will no doubt, exceed \$25,000,000. During the year the writer attended two conferences for the consideration of this very important disease. One called by Governor Tener of Pennsylvania, met at Harrisburg, February 20th and 21st and was attended by more than 200 delegates and visitors, representing fourteen states, the District of Columbia and Canada. The reports of this conference have been published by the Commission for the Investigation and Control of the Chestnut Tree Blight Disease in Pennsylvania.

The second conference was called by Dr. Haven Metcalf of the U. S. Bureau of Plant Industry and held in Washington, D. C., August 29th and 30th for the purpose of considering the best methods of investigating the chestnut bark disease in accordance with a federal appropriation of \$80,000 for this purpose. One of the results of this conference was the subdividing of the investigation into ten heads, and the writer was appointed to supervise one of these lines of work. The federal authorities will appoint a man who will be stationed at New Brunswick to assist in this work.

PUBLICATIONS.

The character of certain diseases which are likely to be introduced into the State at any time and certain outbreaks which did occur made it necessary to issue the following series of press bulletins:—

- No. 1—Chestnut Bark Disease. (January.)
- No. 2—Canker or Wart Disease of the Potato. (January.)
- No. 3—Blister Rust of the White Pine. (April.)
- No. 4—Crown Gall and Hairy Root. (May.)
- No. 5—Peach Yellows, Little Peach and Peach Rosette. (July.)
- No. 6—Potato Failures. (August.)

These bulletins were sent to the men throughout the State and also to the local granges. In addition to these bulletins the writer also prepared a paper on "Diseases of Shade and Forest Trees" which was published by the Forest Park Reservation Commission of New Jersey in connection with a work by State Forester Alfred Gaskill on "The Planting and Care of Shade Trees."

It appears to the writer to be advisable to continue the publication of the press bulletins from time to time, treating the more important epidemics and a series of circulars treating the most common and most important diseases occurring in the State.

OUTBREAKS.

Several diseases have proved especially severe during the growing season of 1912, and the writer has frequently been called upon to visit localities of the State and make studies of the conditions. Among the most important of these outbreaks are the following:—

1. Leaf curl of the peach (*exococcus deformans* (Berk) Fuckel) was very severe in many parts of the State owing to the failure of the growers to give

a winter or early spring spraying with lime-sulphur solution. The disease was the primary cause for failure of the trees to set a crop in many places.

2. A stem rot of the potato (*fusarium oxysporum* Schl.) was prevalent in many localities and was the cause of considerable losses. A more careful selection of seed would have reduced this loss.

3. A leaf spot disease (*phyllosticta* sp.) of the Lima bean was the cause of heavy losses in the Jewish settlements in the vicinity of Vineland. It was almost entirely restricted to a territory which had just previously been swept by a severe wind storm and was no doubt due to numerous wounds affording a ready entrance for the fungus.

4. Probably the most severe outbreak, the one most nearly approaching an epidemic was the stem rot or yellow rot of the sweet potato which has been erroneously attributed to *nectria ipomoea* Hals. In some places this disease caused a loss of fully 50% of the crop.

In addition to these especially severe diseases more than 100 diseases reported many of which were the cause of considerable losses. In addition to the inspection work we are conducting special studies on as many of these diseases as the circumstances will permit.

Officers of the State Grange of New Jersey

P. of H. 1913

Master—G. W. F. GAUNT,.....Mullica Hill, Gloucester county
Overseer—JOHN M. WOOLMAN,.....Elmer, Salem county
Lecturer—DAVID H. AGANS,.....Three Bridges, Hunterdon county
Steward—FRANK O. WARE,.....Deerfield, Cumberland county
Assistant Steward—C. C. BASLEY,.....Farmingdale, Monmouth county
Chaplain—EVI VANDRUFF,.....Sussex, Sussex county
Treasurer—CHARLES COLLINS,Moorestown, Burlington county
Secretary—JOHN T. COX,.....Three Bridges, Hunterdon county
Gate Keeper—D. HOWARD JONES,.....Freehold, R. D., Monmouth county
Ceres—HESTER G. HILDRETH,.....Rio Grande, Cape May county
Pomona—ELIZA PERRINE,Cranbury, Middlesex county
Flora—LOUISA MAHIE,.....Westwood, Bergen county
Lady Assistant Steward—PHEBE HUTCHINSON,.....Robbinsville, Mercer county

Executive Committee—GEORGE W. F. GAUNT, Mullica Hill, Gloucester county;
 ALBERT HERITAGE, Mickleton, Gloucester county; A. G. VAN NEST, Neshanic Station, R. D. No. 1, Somerset county; H. M. LOVELAND, Cohansey, Salem county; A. W. FUND, Chatham, Essex county; JOHN T. COX, Three Bridges, Hunterdon county.

State Grange meets first Tuesday in December, 1913.

County Deputies

Atlantic—Henry Pfeiffer, Cologne, Atlantic county.
 Bergen—A. I. Ackerman, Ridgewood, R. D. No. 2, Bergen county.
 Burlington—Joseph Engle, Mount Holly, Burlington county.
 David L. Ballinger, Moorestown, Burlington county.
 Camden—John M. Garwood, Ashland, Camden county.
 Cape May—A. T. D. Howell, Dias Creek, Cape May county.
 Cumberland—Walton E. Davis, Shiloh, Cumberland county.
 Essex—A. W. Fund, Chatham, R. D., Essex county.
 Gloucester—Alvin L. Gaventa, Swedesboro, Gloucester county.
 I. B. Pancoast, Clayton, Gloucester county.
 Hunterdon—Joseph Bodine, Flemington, Hunterdon county.
 Frank V. D. Fisher, Stockton, R. D. No. 2, Hunterdon county.
 Mercer—C. Newton Hutchinson, Robbinsville, Mercer county.
 Middlesex—W. H. Havens, Cranbury, Middlesex county.
 Monmouth—D. Howard Jones, Freehold, Monmouth county.
 Morris—A. W. Fund, Chatham, R. D., Morris county.
 Ocean—D. Howard Jones, Freehold, Monmouth county.
 Passaic—David F. Duncan, Paterson, R. D. No. 1, Passaic county.
 Salem—Maxwell W. Buzby, Woodstown, Salem county.
 Somerset—H. W. Kline, New Brunswick, R. D. No. 6, Somerset county.

Sussex—E. W. Clark, Sussex, Sussex county.

Sanford J. Crawn, Newton, R. D., Sussex county.

Union—A. W. Fund, Chatham, R. D., Morris county.

Warren—James I. Cooke, Delaware, R. D. No. 2, Warren county.

Women's Work Committee—Mary R. Brown, Swedesboro; Sadie E. Collins, Moorestown; Eudora N. Rue, Windsor.

Pomona Granges, 1913

.. MASTERS AND SECRETARIES, WITH POST-OFFICE ADDRESS.

Burlington, No. 1. Master, Harry Dubell, Mount Holly, N. J.

Secretary, George L. Gillingham, Moorestown, N. J.

Meets fourth Tuesday in January, April, July and October.

Sussex, No. 2. Master, Thomas W. Dekay, New Milford, N. Y.

Secretary, Frank Stoll, Branchville, N. J.

Meets first Saturday in January and October, third Saturday in April and July.

Hunterdon, No. 3. Master, John V. Painter, Lebanon, R. D., N. J.

Secretary, Wm. Y. Holt, Flemington, N. J.

Meets second Friday in January, April, August and October.

Cumberland, No. 4. Master, N. E. Diamant, Cedarville, N. J.

Secretary, L. F. Glaspey, Shiloh, N. J.

Meets second Tuesday in January, April, July and August.

Mercer, No. 5. Master, Emerson Yard, Allentown, N. J.

Secretary, T. A. Bolmer, Rocky Hill, N. J.

Meets first Wednesday in March, June and September at Hightstown, Windsor and New Egypt; third Wednesday in November at Allentown.

Salem, No. 6. Master, John Moore, Elmer, N. J.

Secretary, Minnie C. Wilkinson, Woodstown, N. J.

Meets at call of Executive Committee.

Camden and Atlantic, No. 7. Master, Benjamin Barrett, Blue Anchor, N. J.

Secretary, Harry E. Horner, Merchantville, N. J.

Meets second Saturday in January, last Saturday in April, July and October at Haddonfield, Blackwood and Berlin.

Gloucester, No. 8. Master, Wm. B. Nichols, Franklinville, N. J.

Secretary, Elizabeth B Kirby, Mullica Hill, N. J.

Central District, No. 9. Master, August W. Fund, Chatham, R. D., N. J.

Secretary, E. Oscar DeCamp, Roseland, N. J.

Meets January 24th, April 24th and October 23d.

Warren, No. 10. Master, N. Warne, Broadway, N. J.

Secretary, J. H. Albertson, East Stroudsburg, Pa.

Meets third Saturday of January, May and November, second Saturday of September.

Bergen, No. 11. Master, E. M. Lyman, Park Ridge, N. J.

Secretary, L. Pikaart, Midland Park, N. J.

Meets February, April, October and December.

Monmouth, No. 12. Master, Henry W. Herbert, Englishtown, N. J.

Secretary, S. B. Wells, Marlboro, N. J.

Meets second Saturday in March, June, September and December.

Middlesex and Somerset, No. 13. Master, A. G. VanNest, Neshanic Station, R. D. No 2, N. J.

Secretary, H. W. Kline, New Brunswick, R. D. No. 6, N. J.

Meets third Thursday in January, April, August and October.

Cape May, No. 14. Master, Joseph Camp, Pierces, N. J.

Secretary, Eli Townsend, Stone Harbor, N. J.

SUBORDINATE GRANGES.

243

Subordinate Granges

- Pioneer, No. 1. Master, A. S. Reid, Plainsboro, Middlesex county.
 Secretary, J. E. Chamberlin, Cranbury Station, Middlesex county.
 Lecturer, W. H. Havens, Cranbury, Middlesex county.
 Meets second and fourth Tuesday evenings at Cranbury.
- Marl Ridge, No. 2. Master, William H. Davis, Cream Ridge, Monmouth county.
 Secretary, I. E. Harrison, Chesterfield, Monmouth county.
 Lecturer, Violet Tatum, New Egypt, Monmouth county.
 Meets third Friday at 2 P. M.
- Hammonton, No. 3. Master, Manley Austin, Hammonton, Atlantic county.
 Secretary, Helen Burgess, Hammonton, Atlantic county.
 Lecturer, Jennie Kind, Hammonton, Atlantic county.
 Meets first and third Fridays.
- Swedesboro, No. 5. Master, John Shoemaker, Swedesboro, Gloucester county.
 Secretary, Minnie Young, Swedesboro, Gloucester county.
 Lecturer, Theodore Brown, Swedesboro, Gloucester county.
 Meets every Wednesday evening in Black's Hall.
- Somerset, No. 7. Master, H. W. Kline, New Brunswick, R. D. No. 6, Somerset county.
 Secretary, Mrs. J. A. Thomson, Middlebush, Somerset county.
 Lecturer, Mrs. F. F. Fuess, New Brunswick, R. D. No. 6, Somerset county.
 Meets second and fourth Wednesday, Wyckoff's Hall, Middlebush county.
- Moorestown, No. 8. Master, Wilmer Collins, Merchantville, Burlington county.
 Secretary, Sadie E. Collins, Moorestown, Burlington county.
 Lecturer, Mariana L. Coles, Merchantville, Burlington county.
 Meets Thursday 2 P. M. from December 1st to April 1st, balance of year every other Thursday at 7:30 P. M.
- Woodstown, No. 9. Master, Robert G. Baynes, Woodstown, Salem county.
 Secretary, M. W. Buzby, Woodstown, Salem county.
 Lecturer, Annie Lippincott, Woodstown, Salem county.
 Meets every Wednesday evening in Peterson's Hall.
- Vineland, No. 11. Master, W. C. Parsons, Vineland, Cumberland county.
 Secretary, Mrs. M. E. Hendricks, South Vineland, Cumberland county.
 Lecturer, Mrs. J. A. Vanaman, Millville, Cumberland county.
 Meets Saturdays at 2:30 P. M., hall on Landis Avenue.
- Ringoes, No. 12. Master, E. H. Wilson, Ringoes, Hunterdon county.
 Secretary, J. S. Williamson, Ringoes, R. D. No. 2, Hunterdon county.
 Lecturer, Mrs. H. C. Sutphin, Ringoes, R. D. No. 1, Hunterdon county.
 Meets first and third Saturday evenings, other Saturday afternoons.
- Hopewell, No. 16. Master, George J. Schaible, Bridgeton, R. D. No. 2, Cumberland county.
 Secretary, Walton E. Davis, Shiloh, Cumberland county.
 Lecturer, Mrs. John R. Tomlinson, Shiloh, Cumberland county.
 Meets every Wednesday evening in Grange Hall.
- Cumberland, No. 18. Master, Samuel L. Watson, Greenwich, Cumberland county.
 Secretary, Morris Goodwin, Greenwich, Cumberland county.
 Lecturer, Anna T. Goodwin, Greenwich, Cumberland county.
- Fenwick, No. 20. Master, J. Hartley Brown, Hancock's Bridge, Salem county.
 Secretary, Anna E. Harris, Harmersville, Salem county.
 Lecturer, Maggie H. Brown, Hancock's Bridge, Salem county.
 Meets in Grange Hall, Harmersville, Thursday evenings.
- Mannington, No. 25. Master, Leon A. Crispin, Woodstown, Salem county.
 Secretary, Mrs. Lena D. Crispin, Woodstown, Salem county.
 Lecturer, Mrs. Asca Austin, Woodstown, Salem county.
 Meets in Grange Hall, Tuesday evenings.
- Harrisonville, No. 26. Master, C. E. Kirby, Mullica Hill, Gloucester county.
 Secretary, Elizabeth B. Kirby, Mullica Hill, Gloucester county.

- Lecturer, Ada Rouse, Harrisonville, Gloucester county.
Meets Tuesday evenings in Grange Hall.
- Elmer, No. 29. Master, Jacob Schwertly, Monroeville, Salem county.
Secretary, Mary W. Gaunt, Monroeville, Salem county.
Lecturer, Laura A. Evans, Elmer, Salem county.
Meets Wednesday evenings in Garrison's Hall.
- Bridgeport, No. 32. Master, Harvey McKeag, Swedesboro, Gloucester county.
Secretary, Willard B. Kille, Swedesboro, Gloucester county.
Lecturer, Mary R. Sweeney, Swedesboro, Gloucester county.
Meets every Tuesday evening.
- Cedarville, No. 34. Master, A. H. Westcott, Fairton, Cumberland county.
Secretary, M. B. Husted, Cedarville.
Lecturer, Miss Margaret F. Starkey, Fairton, Cumberland county.
Meets first and third Thursday evenings, Jerrel's Hall.
- Medford, No. 36. Master Eckard J. Ballinger, Medford, Burlington county.
Secretary, Anna R. B. Engle, Medford, Burlington county.
Lecturer, Mary H. Cowperthwaite, Medford, Burlington county.
Meets Thursday afternoon, I. O. O. F. Hall.
- Haddon, No. 38. Master, Wendle Beideman, Haddonfield, Camden county.
Secretary, Wesley R. Stafford, Marlton, R. D. No. 3, Camden county.
Lecturer, Amelia Bates, Haddonfield, Camden county
Meets Wednesday afternoons November to April, balance of year Saturday evenings.
- Mantua, No. 39. Master, Chalkly Lyons, Wenonah, Gloucester county.
Secretary, H. C. Viereck, Wenonah, Gloucester county.
Lecturer, Mrs. Maria T. Burt, Wenonah, Gloucester county.
Meets Monday evenings in Noblitt's Hall, Wenonah.
- Windsor, No. 40. Master, Harry C. Dey, Hightstown, R. D. No. 1, Mercer county.
Secretary, Mrs. Augusta Mount, Trenton, R. D. No. 2, Mercer county.
Lecturer, Mrs. Eudora Rue, Windsor, Mercer county.
Meets second and fourth Tuesday in Odd Fellow's Hall, Windsor.
- Hope, No. 43. Master, William French, Bridgeton, R. D. No. 2, Cumberland county.
Secretary, C Atkinson, Bridgeton, R. D. No. 2, Cumberland county.
Lecturer, Mary Uhland, Bridgeton, R. D. No. 4, Cumberland county.
Meets first and third Tuesdays in Grange Hall.
- Marlton, No. 45. Master, Henry J. Olt, Marlton, R. D. No. 2, Burlington county.
Secretary, Miss Ethel Bell, Marlton, R D No. 2, Burlington county.
Lecturer, Caroline S. E. Wills, Marlton, R. D. No. 2, Burlington county.
Meets December to March, Tuesday afternoons, balance of year Tuesday evenings in Endicott's Hall.
- Pemberton, No. 50. Master, Isaac W. Rogers, Pemberton, Burlington county.
Secretary, Frank M. Hargrove, Vincentown, Burlington county.
Lecturer, Mrs. A. Rosbach, Pemberton, Burlington county.
Meets first and third Friday evenings in Grange Hall.
- Mullica Hill, No. 51. Master, Russel Skinner, Glassboro, Gloucester county.
Secretary, Anna G. Tonkin, Mullica Hill, Gloucester county.
Lecturer, Elizabeth Kirby, Mullica Hill, Gloucester county.
Meets Tuesday evenings in Grange Hall.
- Deerfield, No. 52. Master, Emery Hetzell, Deerfield, Cumberland county.
Secretary, A. D. Ackley, Deerfield, Cumberland county.
Lecturer, Mrs. F. O. Ware, Deerfield, Cumberland county.
Meets Wednesday evenings in Brotherhood Hall, Deerfield.
- Centre Grove, No. 57. Master, William Taylor, Millville, Cumberland county.
Secretary, Anna M. Taylor, Millville, Cumberland county.
Lecturer, Evelyn Earle, Millville, Cumberland county.
Meets second and fourth Wednesday evenings in Centre Grove School House.
- Columbus, N. 58. Master, Benjamin R. Kirby, Columbus, Burlington county.
Secretary, Reba J. Sharp, Columbus, Burlington county.
Lecturer, Eliza B. Deacon, Columbus, Burlington county.
Meets every other Friday evening in Grange Hall.

SUBORDINATE GRANGES.

245

- Thorofare, No. 57. Master, E. E. Clement, Thorofare, Gloucester county.
 Secretary, Charles H. Budd, Thorofare, Gloucester county.
 Lecturer, Margaret Gibbs, Thorofare, Gloucester county.
 Meets Monday evenings at Thorofare.
- Courses Landing, No. 60. Master, Charles F. Hackett, Woodstown, R. D., Salem county.
 Secretary, Gertrude W. Freas, Sharptown, Salem county.
 Lecturer, Bertha Hackett, Woodstown, R. D., Salem county.
 Meets Tuesday evenings in K. of P. Hall, Sharptown, Salem county.
- Crosswicks, No. 61. Master, Frank Bowers, Yardville, Burlington county.
 Secretary, Howard M. Rogers, Crosswicks, Burlington county.
 Lecturer, Carrie Oldrey, Bordentown, Burlington county.
 Meets second and fourth Saturdays.
- Pennington, No. 64. Master, A. T. Blackwell, Harboursont, Mercer county.
 Secretary, S. T. Cox, Pennington, Mercer county.
 Lecturer, Mrs. Leo Drake, Glenmore, Mercer county.
 Meets second and fourth Saturday afternoons.
- Vincetown, No. 67. Master, Thomas M. Henry, Vincetown, Burlington county.
 Secretary, Mrs. F. Githens, Vincetown, Burlington county.
 Lecturer, Miss Harriet Mount, Vincetown, Burlington county.
 Meets every Saturday evening in Grange Hall at Vincetown.
- Ewing, No. 73. Master, John W. Hendrickson, Trenton R. D. No. 1, Mercer county.
 Secretary, Wm. H. Cadwallader, Trenton, R. D. No. 1, Mercer county.
 Lecturer, Mrs. Sanford J. Vernam, Trenton, R. D. No. 1, Mercer county.
 Meets first and third Tuesday evenings at Ewing Church House.
- Mercer, No. 77. Master, N. Stout Voorhees, Woodsville, Mercer county.
 Secretary, J. M. Dalrymple, Hopewell, Mercer county.
 Lecturer, Mrs. Charles L. Sullivan, Skillman, R. D., Mercer county.
 Meets second and fourth Saturday afternoons in Grange Hall at Hopewell.
- Wantage, No. 78. Master, W. W. Titsworth, Jr., Sussex, Sussex county.
 Secretary, Mrs. Evi Vandruuff, Sussex, Sussex county.
 Lecturer, S. M. Parcell, Sussex, Sussex county.
 Meets first and third Wednesday evenings in Grange Hall.
- Hamilton, No. 79. Master, Albert Grove, Trenton, R. D. No. 2, Mercer county.
 Secretary, R. E. Haines, Robbinsville, R. D. No. 3, Mercer county.
 Lecturer, Anna C. Hutchinson, Robbinsville, R. D. No. 3, Mercer county.
 Meets first Tuesday evening, third Tuesday afternoon from October to March, balance of year Tuesday evenings in Grange Hall.
- Friesburg, No. 81. Master, John D. Horner, Elmer, R. D. No. 3, Salem county.
 Secretary, Attie Loveland, Bridgeton, R. D. No. 8, Salem county.
 Lecturer, Kate Sigars, Deerfield, Salem county.
 Meets Tuesday evenings at Friesburg.
- Williamstown, No. 85. Master, William A. Wilson, Williamstown, Gloucester county.
 Secretary, Grace Ritchie, Williamstown, Gloucester.
 Lecturer, Edith V. Wilson, Williamstown, Gloucester county.
 Meets third and fourth Tuesday evenings May to October, balance of year every Tuesday evening.
- Locktown, No. 88. Master, Wm. H. Wagner, Flemington, R. D. No. 2, Hunterdon county.
 Secretary, Wm. B. Smith, Flemington, R. D. No. 2, Hunterdon county.
 Lecturer, Wm. Eick, Flemington, R. D. No. 2, Hunterdon county.
 Meets every Tuesday evening in Grange Hall, Locktown.
- Blackwood, No. 90. Master, H. I. Clements, Mount Ephraim, R. D. No. 1, Camden county.
 Secretary, Martin Schubert, Laurel Springs, R. D. No. 1, Camden county.
 Lecturer, Miss Florence Clements, Westville, R. D. No. 1, Camden county.
 Meets every Saturday evening in Grange Hall.

- Monmouth, No. 92.** Master, H. E. Taylor, Freehold, R. D. No. 2, Monmouth county.
 Secretary, J. L. Pittenger, Freehold, R. D. No. 2, Monmouth county.
 Lecturer, George Blatchley, Jr., Freehold, R. D. No. 2, Monmouth county.
 Meets first and third Wednesdays at Freehold.
- Hightstown, No. 96.** Master, Frank T. Norcross, Hightstown, Middlesex county.
 Secretary, Frank C. Danser, Cranbury, Middlesex county.
 Lecturer, Mrs. George Davison, Cranbury, Middlesex county.
 Meets December to April, Saturday afternoons, balance of year second and fourth Saturday evenings.
- Allentown, No. 98.** Master, J. Carroll Burtis, Allentown, Monmouth county.
 Secretary, Sarah G. Chamberlin, Robbinsville, Monmouth county.
 Lecturer, Ella Schooley, Allentown, Monmouth county.
 Meets first, third and fifth Saturday evenings in Grange Hall.
- Liberty, No. 99.** Master, G. C. McDowell, Wickatunk, Monmouth county.
 Secretary, S. B. Wells, Marlboro, Monmouth county.
 Lecturer, Kate Herbert Kelly, Wickatunk, Monmouth county.
 Meets second and fourth Wednesday in Grange Hall, Bradevelt.
- Sergeantsville, No. 101.** Master, E. C. Rockafellow, Stockton, R. D. No. 1, Hunterdon county.
 Secretary, F. V. D. Fisher, Stockton, R. D. No. 2, Hunterdon county.
 Lecturer, May F. Merrill, Sergeantsville, Hunterdon county.
 Meets every Saturday night in Grange Hall, Sergeantsville.
- Livingston, No. 104.** Master, Mrs. A. W. Fund, Chatham, Essex county.
 Secretary, A. W. Fund, Chatham, Essex county.
 Lecturer, Miss Lillian Collins, Chatham, Essex county
 Meets second and fourth Thursdays in Collins' Hall.
- Morris, No. 105.** Master, A. M. Webb, Hanover, Morris county.
 Secretary, A. L. Renimann, Jr., Hanover, Morris county.
 Lecturer, Mrs. Charles Young, Whippany, R. D., Morris county.
 Meets second and fourth Tuesday evenings in Hanover.
- Kingwood, No. 106.** Master, Jared N. Alpaugh, Frenchtown, R. D. No. 1, Hunterdon county.
 Secretary, Ellis B. Huffman, Frenchtown, R. D. No. 1, Hunterdon county.
 Lecturer, Emma K. Cline, Frenchtown, R. D. No. 1, Hunterdon county.
 Meets Saturday evenings in Grange Hall, Barbertown.
- Caldwell, No. 107.** Master, Austin E. Hedden, Verona, Essex county.
 Secretary, Mrs. A. E. Hedden, Verona, Essex county.
 Lecturer, R. C. Campbell, Caldwell, Essex county.
 Meets second and fourth Thursday evenings.
- Roseland, No. 108.** Master, Marcus W. DeCamp, Roseland, Essex county.
 Secretary, E. Oscar DeCamp, Roseland, Essex county.
 Lecturer, Rev. H. R. Blackwood, Roseland, Essex county.
 Meets second and fourth Tuesday evenings in Grange Hall at Roseland.
- Warren, No. 110.** Master, Frank Housel, Broadway, Warren county.
 Secretary, Miss Mae Oberly, Broadway, Warren county.
 Lecturer, H. J. Beers, Stewartville, R. D., Warren county.
 Meets first and third Tuesday evenings in Grange Hall at Broadway.
- Mickleton, No. 111.** Master, Henry Pool, Clarksboro, Gloucester county.
 Secretary, Walter Heritage, Swedesboro, Gloucester county.
 Lecturer, Lizzie L. Duell, Mickleton, Gloucester county.
 Meets every Thursday evening in Grange Hall at Mickleton.
- Hurffville, No. 115.** Master, Benj. F. James, Pitman, Gloucester county.
 Secretary, Walton H. Chew, Pitman, Box 105, Gloucester county.
 Lecturer, William M. Evans, Sewell, R. D. No. 1, Gloucester county.
 Meets Saturday evenings in Davenport's Hall, Hurffville.
- Rocksburg, No. 116.** Master, Van Young, Phillipsburg, R. D., Warren county.
 Secretary, Warren Herman, Phillipsburg, R. D., Warren county.
 Lecturer, Mrs. Amzie Miller, Phillipsburg, R. D., Warren county.
 Meets every two weeks.

SUBORDINATE GRANGES.

247

- Washington, No. 117. Master, Samuel T. Bowman, Washington, R. D., Warren county.
 Secretary, Mrs. Joseph Bodine, Box 45, Washington, R. D., Warren county.
 Lecturer, Melville L. Rush, Washington, R. D., Warren county.
 Meets first and third Thursdays at home of S. T. Bowman.
- Oak Grove, No. 119. Master, Howard Robinson, Pittstown, Hunterdon county.
 Secretary, Melissa Mathews, Pittstown, Hunterdon county.
 Lecturer, Maria Shephard, Pittstown, Hunterdon county.
 Meets Tuesday evenings in Grange Hall one mile from Pittstown.
- Spring Mills, No. 120. Master, Eli P. Burgstresser, Milford, Hunterdon county.
 Secretary, Mary E. Woolf, Milford, Hunterdon county.
 Lecturer, R. T. Crouse, Milford, Hunterdon county.
 Meets first and third Tuesday nights in Grange Hall, Spring Mills.
- Stewartsville, No. 121. Master, Howard L. Frey, Stewartsville, R. D., Warren county.
 Secretary, Mrs. Myrtle R. Frey, Stewartsville, R. D., Warren county.
 Lecturer, Mrs. Annie Carhart, Stewartsville, R. D., Warren county.
 Meets first and third Thursday evenings in I. O. O. F. Hall.
- Aura, No. 122. Master, Harmon D. Newkirk, Clayton, Gloucester county.
 Secretary, Harry C. Ivins, Aura, Gloucester county.
 Lecturer, Mrs. Harry Ivins, Aura, Gloucester county.
 Meets Wednesday evenings in Grange Hall at Aura.
- Cross Keys, No. 123. Master, George A. Thompson, Sewell, Gloucester county.
 Secretary, Jennie Scott, Sicklerville, Gloucester county.
 Lecturer, Stella M. Hurff, Cross Keys, Gloucester county.
 Meets Saturday evenings in Hurff's Hall.
- Grand View, No. 124. Master, Edward P. Nief, Flemington, R. D. No. 2, Hunterdon county.
 Secretary, Albert K. Ludy, Flemington, R. D. No. 2, Hunterdon county.
 Lecturer, Mrs. Augusta Higgins, Flemington, R. D. No. 2, Hunterdon county.
 Meets Saturday nights April to October, balance of year Wednesday nights.
- Riverside, No. 125. Master, Abram D. Schomp, Whitehouse Station, R. D., No. 2, Hunterdon county.
 Secretary, W. W. Foster, Three Bridges, Hunterdon county.
 Lecturer, John T. Cox, Three Bridges, Hunterdon county.
 Meets every Saturday evening.
- Delaware, No. 126. Master, I. S. Appleman, Columbia, Warren county.
 Secretary, J. H. Albertson, East Stroudsburg, Pa.
 Lecturer, Elizabeth Hartung, Delaware.
 Meets first and third Friday evenings.
- Iona, No. 127. Master, David F. Atkinson, Franklinville, Gloucester county.
 Secretary, Ella Hinchman, Newfield, Gloucester county.
 Lecturer, Mrs. Marion Holmes, Franklinville, Gloucester county.
 Meets every Saturday evening at Franklinville.
- Cape May, No. 128. Master, Alex. Schellinger, Dias Creek, Cape May county.
 Secretary, Edward W. Tuttle, Dias Creek, Cape May county.
 Lecturer, Jane Schellinger, Green Creek, Cape May county.
 Meets Tuesday evenings in I. O. M. Hall, Dias Creek.
- Bergen, No. 129. Master, August C. Ohle, Hackensack, R. D. No. 2, Bergen county.
 Secretary, Arthur Lozier, Ridgewood, R. D. No. 1, Bergen county.
 Lecturer, Mrs. Lillie Banta, Hackensack, R. D. No. 2, Bergen county.
 Meets first and third Wednesdays in Grange Hall, Spring Valley Road.
- Franklin, No. 130. Master, William J. Ellis, North Haledon, Bergen county.
 Secretary, Mrs. J. Vanderhoff, Wyckoff, Bergen county.
 Lecturer, A. R. Dougherty, Midland Park, R. D., Bergen county.
 Meets every Tuesday evening in hall at Wyckoff.

- Rancocas, No. 131. Master, Richard H. Hansell, Burlington, R. D. No. 1, Burlington county.
 Secretary, Mrs. Nancy M. Leeds, Rancocas, Burlington county.
 Lecturer, Mrs. L. Miller, Burlington, R. D. No. 1, Burlington county.
 Meets first and third Wednesday from April to December, balance of year every Wednesday at 2:30 P. M.
- Cold Spring, No. 132. Master, Frank E. Bate, Fishing Creek, Cape May county.
 Secretary, Jennie H. MacPherson, Erma, Cape May county.
 Lecturer, Minnie Bate, Fishing Creek, Cape May county.
 Meets Monday evenings in Grange Hall, Cold Spring.
- Hickory, No. 133. Master, Charles D. Tharp, Pattenburg, Hunterdon county.
 Secretary, A. B. McCrea, Pattenburg, Hunterdon county.
 Lecturer, Keturah Dougherty, Pattenburg, Hunterdon county.
 Meets Wednesday evenings in Hickory Grange Hall.
- Vernon Valley, No. 134. Master, T. B. Storms, McAfee, Sussex county.
 Secretary, Mrs. C. L. Giveans, Vernon, Sussex county.
 Lecturer, Miss Agnes Storms, McAfee, Sussex county.
 Meets first and third Tuesday evenings in Vernon.
- Ramsey, No. 135. Master, Alvin Winter, Allendale, R. D. No. 1, Bergen county.
 Secretary, Alice Young, Mahwah, Bergen county.
 Lecturer, Abram Gretchins, Ramsey, Bergen county.
 Meets Tuesday evenings in I. O. O. F. Hall, Ramsey.
- Lincoln, No. 136. Master, Thomas J. Post, Westwood, R. D. No. 1, Bergen county.
 Secretary, Mrs. Mary L. Ludwig, Westwood, R. D. No. 2, Bergen county.
 Lecturer, Mrs. P. J. Westervelt, Westwood, Bergen county.
 Meets second and fourth Wednesday evenings in I. O. O. F. Hall at Westwood.
- Mt. View, No. 137. Master, D. C. Howell, Sussex, R. D., Sussex county.
 Secretary, Mrs. Dolson Ayers, Beemersville, Sussex county.
 Lecturer, Miss Olive Howell, Sussex, R. D., Sussex county.
 Meets every other Saturday evening.
- Berlin, No. 138. Master, H. N. Gillon, Berlin, Camden county.
 Secretary, X. F. Ottiger, Berlin, Camden county.
 Lecturer, Anna M. Gillon, Berlin, Camden county.
 Meets every Tuesday evening in Grange Hall, Berlin.
- Upper Township, No. 139. Master, Walter L. Yerkes, Tuckahoe, Cape May county.
 Secretary, Z. A. Townsend, Tuckahoe, Cape May county.
 Lecturer, Mrs. Lillie M. Hand, Tuckahoe, Cape May county.
 Meets first and third Friday evenings October to March first Friday, balance the year in Mechanics' Hall at Tuckahoe.
- Montague, No. 140. Master, Henry J. Schneider, Port Jervis, N. Y., R. D. No. 1.
 Secretary, Harry E. Cortright, Port Jervis, N. Y., R. D. No. 1.
 Lecturer, Chas. R. Reinhardt, Port Jervis, N. Y., R. D. No. 1.
 Meets second and fourth Saturday nights at Millville, Sussex county.
- Pascack, No. 141. Master, John M. Myers, Westwood, R. D. No. 2, Bergen county.
 Secretary, Edward M. Lyman, Park Ridge, Bergen county.
 Lecturer, Mrs. I. E. Mabie, Westwood, Bergen county.
 Meets second and fourth Saturday evenings in Borough Hall, Woodcliff.
- Olive Branch, No. 142. Master, George F. Keller, Cliffwood, Monmouth county.
 Secretary, J. H. Douglass, Matawan, R. D. No. 1, Monmouth county.
 Lecturer, Mary E. Stemler, Matawan, R. D. No. 1, Monmouth county.
 Meets every Thursday evening October to April, balance of year every two weeks.
- Delaware Valley, No. 143. Master, Ira Stoll, Layton, Sussex county.
 Secretary, George E. Hursh, Layton, Sussex county.
 Lecturer, Frank Stoll, Layton, Sussex county.
 Meets first and third Saturday evenings in Grange Hall at Layton.

SUBORDINATE GRANGES.

249

- Saddle River, No. 144. Master, T. N. Woodruff, Saddle River, Bergen county.
 Secretary, J. Fred Koopman, Waldwick, Bergen county.
 Lecturer, Mrs. J. Fred. Koopman, Waldwick, Bergen county.
 Meets first and third Wednesday evenings.
- Wayne Township, No. 145. Master, Aaron Laanwe, Paterson, R. D. No. 1, Passaic county.
 Secretary, H. M. Berdan, Paterson, R. D. No. 1, Passaic.
 Lecturer, John Lobb, Paterson, R. D. No. 3, Passaic county.
 Meets first and third Thursdays in Grange Hall, Preakness.
- Egg Harbor, No. 146. Master, Henry Tapken, Egg Harbor, R. D., Atlantic City.
 Secretary, Mrs. Henry Tapken, Egg Harbor, R. D., Atlantic county.
 Lecturer, Carl F. Schirmer, Egg Harbor, R. D., Atlantic county.
 Meets first and third Saturdays in Krein's Hall.
- Wrightstown, No. 147. Master, Wm. A. Nelson, Wrightstown, Burlington county.
 Secretary, Rosha Thompson, Wrightstown, Burlington county.
 Lecturer, Mrs. Laura Rue, Wrightstown, Burlington county.
 Meets second and fourth Wednesday evenings in Mechanics' Hall.
- Stanton, No. 148. Master, James W. Lare, Flemington, R. D., Hunterdon county.
 Secretary, Johnson Gary, Lebanon R. D., Hunterdon county.
 Lecturer, Mrs. J. Rose Schomp, Stanton, Hunterdon county.
 Meets Thursday evenings in Grange Hall, Stanton Station.
- North Arlington, No. 149. Master, F. A. Koch, Stuyvesant Avenue, Arlington, Bergen county.
 Mrs. Effie G. M. Steup, North Arlington, Bergen county.
 Lecturer, Ceila Brandenburg, North Arlington, Bergen county.
 Meets second and fourth Saturdays.
- Burlington, No. 150. Master, Clarence H. Adams, Burlington, R. D., No. 1, Burlington county.
 Secretary, Hope E. Adams, 16 Federal Street, Burlington, Burlington county.
 Lecturer, Nellie Sutton, Burlington, R. D. No. 2, Burlington county.
 Meets every other Saturday evening from March to December, balance of year in afternoon.
- Milltown, No. 151. Master, George Redshaw, Jr., New Brunswick, No. 3, Middlesex county.
 Secretary, Frank H. Smith, Box 18, South River, Middlesex county.
 Lecturer, Miss Lillian Brandt, Milltown, Middlesex county.
 Meets second and fourth Wednesday evenings in Mechanics' Hall, Milltown.
- New Market, No. 152. Master, Everitt Marshall, Bound Brook, Somerset county.
 Secretary, W. B. Kurtz, Bound Brook, Somerset county.
 Lecturer, Mrs. J. M. Evans, New Market, Middlesex county.
 Meets second and fourth Thursday evenings.
- Raritan Valley, No. 153. Master, Jacob D. Quick, South Branch, Somerset county.
 Secretary, Mrs. C. S. Phillips, South Branch, Somerset county.
 Lecturer, A. G. Van Nest, Neshanic Station, R. D., Somerset county.
 Meets second and fourth Monday evenings in Grange Hall, South Branch.
- Union, No. 154. Master, Samuel Chambers, Leesburg, Cumberland county.
 Secretary, Estella L. Tazour, Leesburg, Cumberland county.
 Lecturer, Eunice Camp, Leesburg, Cumberland county.
 Meets second and fourth Tuesday evenings at Leesburg.
- Fair Lawn, No. 155. Master, Aaron Courter, Fair Lawn, Bergen county.
 Secretary, Wm. A. Cadmus, Fair Lawn, Bergen county.
 Lecturer, A. I. Ackerman, Ridgewood, R. D. No. 2, Bergen county.
 Meets first and third Monday in Grange Hall, Fair Lawn.

Raritan, No. 156. Master, J. C. Hendrickson, Keyport, Monmouth county.

Secretary, H. M. Aumack, Keyport, Monmouth county.

Lecturer, Mrs. J. S. Van Mater, Hazlet, Monmouth county.

Meets first and third Wednesday afternoon and second and fourth Wednesday evenings in I. O. O. Hall, Keyport.

Farmingdale, No. 157. Master, Charles Craig, Freehold, R. D. No. 1, Monmouth county.

Secretary, Cora J. Thompson, Allenwood, Monmouth county.

Lecturer, Mattie Craig, Farmingdale, Monmouth county.

Meets first and third Friday evenings.

Lafayette, No. 158. Master, Brice B. Stanton, Lafayette, Sussex county.

Secretary, Anna Everett, Lafayette, Sussex county.

Lecturer, Mrs. C. V. Runion, Lafayette, Sussex county.

Meets first and third Tuesday in I. O. U. A. M. Hall.

Whitehouse, No. 159. Master, H. Martin Messler, Whitehouse Station, R. D. No. 1, Hunterdon county.

Secretary, Ethel M. Burdette, Whitehouse, Hunterdon county.

Lecturer, Walter H. Opie, Whitehouse Station, R. D. No. 2, Hunterdon county.

Meets Saturday afternoon October to April, evenings balance of year, in Grange Hall.

Frankford, No. 160. Master, Mrs. Wm. R. Bale, Augusta, R. D. No. 1, Sussex county.

Secretary, Mrs. Bertha Conover, Augusta, R. D. No. 1, Sussex county.

Lecturer, Mrs. Robert V. Armstrong, Augusta, R. D. No. 1, Sussex county.

Meets first and third Friday evenings at Branchville.

Shrewsbury, No. 161. Master, Lester C. Lovett, Little Silver, Monmouth county.

Secretary, F. A. Bloodgood, Lincroft, Monmouth county.

Lecturer, J. C. Richdale, Phalanx, Monmouth county.

Meets first and third Tuesday evenings at Red Bank.

South Seaville, No. 162. Master, George Sayre, Clermont, Cape May county.

Secretary, Mrs. Clara D. Townsend, South Seaville, Cape May county.

Lecturer, Lizzie H. Westcott, South Seaville, Cape May county.

Meets second and fourth Tuesday evenings in P. O. S. of A. Hall.

Titusville, No. 163. Master, J. Warren Fleming, Titusville, Mercer county.

Secretary, J. Hart Smith, Titusville, Mercer county.

Lecturer, Mrs. Wm. H. Blackwell, Titusville, Mercer county.

Meets first Thursday evening and third Saturday afternoon at Titusville.

Hardyston, No. 164. Master, E. F. Williams, Hamburg, Sussex county.

Secretary, Mrs. M. L. Smith, Hamburg, Sussex county.

Lecturer, Florence C. Martin, Hamburg, Sussex county.

Meets first and third Monday evenings in Mechanics' Hall, Hamburg.

Farmers' Enterprise, No. 165. Master, Wm. W. Roy, Newton, R. D. No. 2, Sussex county.

Secretary, Charles M. Crown, Newton, R. D. No. 2, Sussex county.

Lecturer, Effie Stoll, Newton, R. D. No. 2, Sussex county.

Meets second and fourth Saturday afternoons in I. O. O. F. Hall, Newton.

Blue Anchor, No. 166. Master, Stephen Gardiner, Winslow, Camden county.

Secretary, William Marvin, Blue Anchor, Camden county.

Lecturer, Annie Myers, Blue Anchor, Camden county.

Meets Saturday evenings in Grange Hall, at Blue Anchor.

Palermo, No. 167. Master, Mrs. Minnie Madara, Palermo, Cape May county.

Secretary, Jesse T. Young, Beesley's Point, Cape May county.

Lecturer, Mrs. Sarah Young, Palermo, Cape May county.

Meets Saturday evenings in Mechanics' Hall, Palermo.

Glendola, No. 168. Master, Geo. W. Donahay, Belmar, R. D. No. 2, Monmouth county.

Secretary, E. C. White, Belmar, R. D. No. 1, Monmouth county.

Lecturer, Miss Lillie Slocum, Belmar, R. D. No. 1, Monmouth county.

Meets second and fourth Friday evenings in Mechanics' Hall, Glendola.

SUBORDINATE GRANGES.

251

- Millstone Valley, No. 169.** Master, C. A. Wyckoff, Millstone, R. D. No. 1, Somerset county.
 Secretary, John W. Young, Middlebush, Somerset county.
 Lecturer, Mrs. C. A. Wyckoff, Millstone, R. D. No. 1, Somerset county.
 Meets second and fourth Mondays at Millstone.
- Lawrenceville, No. 170.** Master, Edgar G. Skillman, Trenton, R. D. No. 4, Mercer county.
 Secretary, Mrs. Frank Applegate, 211 W. Hanover Street, Trenton, Mercer county.
 Lecturer, Mrs. VanBuren Leigh, Princeton, Mercer county.
 Meets first and third Tuesday evenings, Grange Hall, Lawrenceville.
- Washington Valley, No. 171.** Master, A. L. Zimmerman, Martinsville, Somerset county.
 Secretary, I. R. Penny, Martinsville, Somerset county.
 Lecturer, William Bartle, Martinsville, Somerset county.
 Meets first and third Thursday evenings at Martinsville Hall.
- Salem, No. 172.** Master, Clifford L. Crispin, Salem, Salem county.
 Secretary, Anna L. Reeves, Salem, Salem county.
 Lecturer, Mrs. David S. Fogg, Salem, Salem county.
 Meets Thursday evenings in Dunn's Hall, Salem.
- Anchor, No. 173.** Master, J. W. Jamison, Cassville, Ocean county.
 Secretary, C. M. Rorer, Cassville, Ocean county.
 Lecturer, Francis Poppee, Lakehurst, Ocean county.
 Meets November to April last Saturday afternoon, balance of year third Wednesday evenings.
- Pleasantville, No. 174.** Master.....
 Secretary
 Lecturer
 Meets
- Pompton Valley, No. 175.** Master, L. R. Lines, Pompton Lakes, Passaic county.
 Secretary, Mrs. L. R. Lines, Pompton Lakes, Passaic county.
 Lecturer, Mrs. Isaac Van Duyne, Riverdale, Passaic county.
 Meets second and fourth Friday evenings in Durling's Hall.
- Swartswood Lake, No. 176.** Master, B. T. Hill, Swartswood, Sussex county.
 Secretary, Charles M. Hill, Swartswood, Sussex county.
 Lecturer, Mrs. B. T. Hill, Swartswood, Sussex county.
 Meets first and third Friday evenings at Swartswood.
- Stillwater, No. 177.** Master, John W. Earl, Stillwater, Sussex county.
 Secretary, Wm. C. Earl, Stillwater, Sussex county.
 Lecturer, O. Van Horn, Stillwater, Sussex county.
 Meets first and third Saturday evening at Grange Hall.
- Pequest, No. 178.** Master, James Coates, Tranquility, Sussex county.
 Secretary, Clarence Cooke, Newton, R. D. No. 1, Sussex county.
 Lecturer, Mrs. Grace Stickler, Tranquility, Sussex county.
 Meets first and third Thursday evenings in P. O. S. of A. Hall, Tranquility.
- Clayton, No. 179.** Master, Nathan T. Skinner, Clayton, Gloucester county.
 Secretary, J. F. Blakeborough, Clayton, Gloucester county.
 Lecturer, Mary Walker, Clayton, Gloucester county.
 Meets Saturday evenings in Doun's Hall, Clayton.
- Pedricktown, No. 180.** Master, Warren Sparks, Pedricktown, Salem county.
 Secretary, C. B. Green, Pedricktown, Salem county.
 Lecturer, Mrs. May H. Justice, Pedricktown, Salem county.
 Meets Wednesday evenings in Red Men's Hall, Pedricktown, Salem county.
- Pennsgrove, No. 181.** Master, Charles E. Harbenson, Pedricktown, Salem county.
 Secretary, Charles G. Turner, Pennsgrove, Salem county.
 Lecturer, Mrs. Mary Zane, Pennsgrove, Salem county.
 Meets Wednesday evenings in I. O. O. F. Hall, Pennsgrove.
- Westville, No. 182.** Master
 Secretary
 Lecturer
 Meets Saturday evenings.

- Asquackanonk, No. 183. Master, Herman Rubins, Paterson, R. D. No. 2, Passaic county.
 Secretary, Herman Herminger, Paterson, R. D. No. 2, Passaic county.
 Lecturer, Miss Bessie Smith, Paterson, R. D. No. 2, Passaic county.
 Meets second and fourth Tuesdays, Grange Hall, Richfield.
- Plainsboro, No. 184. Master, Frederick F. Grove, Plainsboro, Middlesex county.
 Secretary, H. A. Stults, Plainsboro, Middlesex county.
 Lecturer, Miss Luella Hults, Plainsboro, Middlesex county.
 Meets first and third Monday evenings at Plainsboro.
- English Creek, No. 185. Master, Andrew R. English, Mays Landing, R. D. No. 1, Atlantic county.
 Secretary, Eunice E. Hickman, Mays Landing, R. D. No. 1, Atlantic county.
 Lecturer, May Lee, Mays Landing, R. D. No. 1, Atlantic county.
 Meets at home of Joseph H. Hickman, English Creek.
- Rio Grande, No. 186. Master, W. D. Hand, Rio Grande, Cape May county.
 Secretary, Edna M. Endicott, Rio Grande, Cape May county.
 Lecturer, Emma Fisher, Rio Grande, Cape May county.
 Meets first and third Tuesday in Grange Hall, Rio Grande.
- Moravian, No. 187. Master, James I. Cook, Delaware, Warren county.
 Secretary, Noel M. Harris, Townsbury, Warren county.
 Lecturer, Mrs. Rachel Addis, Hope, Warren county.
 Meets first and third Saturday evenings at Hope.
- Passaic Township, No. 188. Master, George B. Spencer, Chatham, R. D. No. 2, Morris county.
 Secretary, Mrs. F. B. Spicer, Millington, Morris county.
 Lecturer, Mrs. Elber Bebout, Millington, R. D. No. 1, Morris county.
- Johnsonburg, No. 189. Master, Clinton Kerr, Johnsonburg, Warren county.
 Secretary, John M. Darling, Newton, R. D. No. 1, Warren county.
 Lecturer, Mrs. E. G. Ayers, Johnsonburg, Warren county.
 Meets second and last Saturday nights in Grange Hall.
- Manalapan, No. 190. Master, F. G. Stockbridge, Englishtown, Monmouth county.
 Secretary, Henry W. Herbert, Englishtown, Monmouth county.
 Lecturer, Mrs. John A. Okerson, Englishtown, Monmouth county.
 Meets every other Monday evening from January 13th.
- Cologne, No. 191. Master, Herman Baum, Egg Harbor City, Atlantic county.
 Secretary, Wm. F. Hohneisen, Egg Harbor, R. D. No. 1, Atlantic county.
 Lecturer, Mrs. Max Mauroff, Egg Harbor, R. D. No. 1, Atlantic county.
 Meets first Thursday and third Saturday evenings, Liderkrans Hall.
- Allenwood, No. 193. Master, Frank Gifford, Allenwood, Monmouth county.
 Secretary, Peter Tilton, Allenwood, Monmouth county.
 Lecturer, Mrs. Mary Newman, Allenwood, Monmouth county.
 Meets first and third Thursday, Mechanics' Hall, Allenwood.
- Towaco, No. 194. Master, Frank L. Jacobus, Towaco, Morris county.
 Secretary, Ludwig Vogel, Towaco, Morris county.
 Lecturer
 Meets first and third Tuesday evenings in Country Club House.
- North Haledon, No. 195. Master, Frederick Yahn, Paterson, R. D. No. 3, Passaic county.
 Secretary, Mrs. Julia P. Maynard, Paterson, R. D. No. 3, Passaic.
 Lecturer, Arnold Miller, Paterson, R. D. No. 3, Passaic county.
 Meets every Wednesday evening in Borough Hall.
- Adelphia, No. 196. Master, W. K. Hyer, Adelphia, Monmouth county.
 Secretary, Mrs. Rena Johnson, Adelphia, Monmouth county.
 Lecturer, Mrs. John Stricklin, Freehold, R. D. No. 3, Monmouth county.
 Meets first and third Mondays in K. of P. Hall, Adelphia.
- Newport, No. 197. Master, Morton N. Bradford, Newport, Cumberland county.
 Secretary, Harry Lore, Newport, Cumberland county.
 Lecturer, Lizzie Newcomb, Newport, Cumberland county.
 Meets in K. of P. Hall, Newport.

SUBORDINATE GRANGES.

253

Chester, No. 198. Master, Romeo Robinson, Chester, Morris county.

Secretary, Charles Rinehart, Chester, Morris county.

Lecturer, F. B. Tredway, Chester, Morris county.

Meets second and fourth Friday evenings.

Stone Harbor, No. 199. Master, Miss Mary Louise Van Thuyne, Stone Harbor,
Cape May county.

Secretary, Miss F. C. Sank, Stone Harbor, Cape May county.

Lecturer, Mrs. Reese P. Risley, Stone Harbor, Cape May county.

Meets

STATISTICAL TABLE OF FARM CROPS AS REPORTED BY SECRETARIES OF THE COUNTY BOARDS.

COUNTIES.	CORN.		WHEAT.		RYE.		OATS.		WHITE POTATOES.		SWEET POTATOES.		HAY.	
	Average yield per acre —bushels.	Average price.	Average yield per acre —bushels.	Average price.	Average yield per acre —bushels.	Average price.	Average yield per acre —bushels.	Average price.	Average yield per acre —bushels.	Average price per bushel.	Average yield per acre —bushels.	Average price per bushel.	Average yield per acre —tons.	Average price per ton.
Atlantic	35	\$0 85	27	1 05	15	\$0 90	112	\$0 75	150	\$0 90	2	\$19 00	1 1/2	20 00
Bergen	40	83	27	1 05	23	87	93	54	67	64	1 1/2	18 00	1 1/2	18 00
Burlington	45	83	23	1 00	18	80	175	80	150	80	1 1/2	19 00	1 1/2	30 00
Camden	28	95	20	1 20	13	1 10	80	90	75	77	1 1/2	19 00	1 1/2	16 00
Cape May	36	65	19	95	13	1 10	105	60	70	1 10	1 1/2	16 00	1 1/2	16 00
Cumberland	35	.....	25	1 00	14	70	100	75	150	75	1 1/2	15 00	1 1/2	15 00
Essex	45	66	15	95	21	75	150	80	150	75	1 1/2	16 00	1 1/2	16 00
Hauter	35	55	15	1 00	14	70	75	75	75	1 00	1 1/2	18 00	1 1/2	20 00
Monmouth	40	60	22	1 00	21	75	100	70	75	1 00	1 1/2	18 00	1 1/2	18 00
Middlesex	32	65	18	1 00	15	68	25	40	40	80	2	20 00	1 1/2	20 00
Monmouth	40	70	25	1 10	17	90	175	66	150	80	1 1/2	25 00	1 1/2	25 00
Morris	30	75	20	1 10	18	85	42	80	75	1 00	1 1/2	23 00	1 1/2	23 00
Ocean	35	65	14	95	18	70	125	65	75	1 00	1 1/2	17 00	1 1/2	17 00
Passaic	35	80	20	1 00	18	70	100	80	100	1 00	2	16 00	1 1/2	16 00
Putnam	45	60	14	95	17	85	80	70	100	1 00	1 1/2	16 00	1 1/2	16 00
Rockland	35	75	20	1 10	26	85	100	70	100	1 00	1 1/2	16 00	1 1/2	16 00
Sussex	35	75	20	1 10	26	85	100	70	100	1 00	1 1/2	16 00	1 1/2	16 00
Union	35	75	20	1 10	26	85	100	70	100	1 00	1 1/2	16 00	1 1/2	16 00
Warren	35	45	11	95	12	30	31	45	45	80	1 1/2	16 00	1 1/2	16 00

Reports of County Boards of Agriculture

(255)

ATLANTIC COUNTY.

OFFICERS FOR 1913.

President, JOHN HUENKE, SR. Egg Harbor City, R. F. D.
Vice-President, CARL SCHIRMER, Egg Harbor City, R. F. D.
Secretary, WM. F. HOHNEISEN, Egg Harbor City, R. F. D.
Treasurer, WILLIAM LIEPE, Cologne

Board of Directors—

Henry Tapken, Egg Harbor Grange.
 Charles Lingelback, Cologne Grange.
 Joseph Hickman, English Creek Grange.
 M. Showell, Pleasantville Grange.
 Joseph Wiesbecker, Germania Fruit Growers' Union.
 Andrew E. Holman, Hammonton Grange.
 A. J. Rider, Atlantic County Cranberry Association.
 John H. Huenke, at large.

The Atlantic County Board of Agriculture held three meetings during the year 1912, one at Cologne, one at English Creek and the annual meeting at Egg Harbor City. These meetings were held in connection with the different granges in the County. All three of the meetings were noted for the large attendance.

The program prepared by the committee proved an interesting feature of the meetings, many questions of practical value to the farmer were discussed and we believe every one attending were benefited thereby. There were also two Farmers' Institutes held, one at Cologne and the other at Hammonton.

The Spring of 1912 was very wet and cold and planting could not be done at the right time, later in the season the dry weather and heat worked havoc with the growing crops until about the 20th of July. The drought gave way to plenty of rain and naturally all growing crops revived.

The first cutting of hay was a very heavy crop, about two tons or over to the acre, and also cured good.

Strawberries, raspberries, blackberries were not so plentiful, as the drought and heat curtailed the crop, but prices received were very satisfactory to the grower. Early potatoes did not do so well as last year and the price received was lower than last year. Grapes, corn and sweet potatoes were better in yield and quality than last year.

The apple crop was very short in most orchards compared with last year, while peaches and Kieffer pears were more plentiful, most of the farmers are disgusted with the Kieffer pear as the prices received for them do not pay for the handling of the fruit.

The tomato crop did not set so well, yield about five tons per acre. There is not so much interest shown in the planting of tomatoes, as the factory price is only \$8.50 per ton.

Farmers and fruit growers are more interested in the home mixing of fertilizers, and the results received are very satisfactory. There seems to be more interest in the growing of cover crops, in fact, the farmers are trying to get their land in better shape, the aid received by the state is helping them to do so.

There was no epidemic disease in farm animals this last year and farmers are satisfied and feel that they were paid for their labor of the season.

WM. F. HOHNEISEN, *Secretary*.

BERGEN COUNTY.

OFFICERS FOR 1913.

President, F. M. CURTIS,Harrington Park
Vice-President, ISAAC A. HOPPER,.....Fair Lawn
Secretary, JOHN M. MYERS,Westwood, R. F. D. No. 2
Treasurer, FRED V. STROHSAHL,Park Ridge

Bergen County has had a very active year in agriculture, politics and real estate.

The Bergen County Board has grown in membership and interest in the work for the farmer.

We held two well attended institutes, one at Westwood and one at Fair Lawn. The crowning meeting of the year was the result of a resolution passed at an early meeting of the board, that we extend an invitation to the N. J. State Horticultural Society to hold a field meeting in Bergen County.

A committee of three was appointed by President Brandenburg consisting of John M. Myers, Dr. H. W. Collingwood and Herman Tice.

The meeting was arranged for July 17th and on that day there assembled about 400 people on the farms of Dr. Collingwood and David H. Tice.

Automobiles began arriving the day before and all during the morning of the 17th the Erie Railroad was requested to provide extra cars for the comfort of the crowd. It was well they were aware of the many to be carried in excess of their usual number of passengers.

Pascack and Lincoln Granges united to assist the Bergen County Board in entertaining and transporting the visitors free of charge. Automobiles and large farm trucks were at the station and every seat was filled but no one had to walk the mile and a half to "Hope Farm" and two miles farther to the Tice Farm and back to the station. The day was ideal. No time was lost in speech-making. The whole time was devoted to the examination of the results of years of orcharding for profit.

Visitors came from distant states not only to learn of fruit growing, but to get a closer acquaintance with Hope Farm and its people.

Conditions are so different from those to be found in the middle and southern part of the state that some wondered at the patience of our local farmers in working on the hillsides and among the stones. On the Tice Farm, clean culture is the rule and less time and space given to experimentation.

Both Dr. Collingwood and Mr. Tice gave the crowd the freedom of the farm.

Early peaches were ripe and a whole list of berries were just offering themselves from thousands of plants, bushes and trees.

A collation was furnished at cost, and for dessert the luscious fruit made a most delicious finish for a meal in the open air.

Prof. Blake, mounted in a wagon load of young nursery stock, gave a fine exhibition of pruning stock preparatory to planting, also the method of forming the head of the future tree.

The Bergen County Board feels that they received more than they gave in this very successful outing in the interests of horticulture.

JOHN M. MYERS, *Secretary*.

BURLINGTON COUNTY.

OFFICERS FOR 1913.

President, EZRA EVANS,Medford
Vice-President, HERMAN CROWSHAW,Wrightstown
Secretary and Treasurer, H. H. ALBERTSON,Burlington

COUNTY BOARDS OF AGRICULTURE.

259

In reviewing the rural progress made by our county in the past year, we find many things to encourage our faith in the farm as a business investment and as a home; and in the farmers and their children, for the good of the present and future citizenship of our county.

Most crops were up to the average in quantity and were harvested under favorable conditions, with prices well maintained, so that the average returns showed good net profits. Wheat and rye were good crops, and oats were unusually good and the grain heavy. A great deal of corn was planted late, but little of it suffered from frost before being cut, and the yield and quality were very good. Corn was less injured by worms and mould than last year.

The hay crop was abundant, and the season so favorable that good meadows yielded a heavy second crop. Farmers who sell nearly all of their hay may not realize as much as they did from the high prices of last year, but to those who feed a considerable portion of what they raise, and last year had none to sell, an increase in yield means a clear gain of that amount over last year's income. An increasing number of our truck farmers are buying part of their roughage, so that, on the whole, a large crop and moderate prices for hay are of more general benefit than a light crop and high prices.

Peas were a light crop with high prices. Beans showed the usual fluctuations. The second plantings were hurt by the dry spell, so that prices were advanced later but fell off at the end of the season. Tomatoes were an average crop, and melons plentiful but of poor quality.

Peach orchards bore well in some places and failed to bear in others, according to the site of the orchard and the condition of the trees. In many places, and especially on young trees, the fruit buds were killed by the severe winter. Many peach trees on low ground were killed or injured by the very cold winter.

The apple crop was below the average both in quantity and quality, except in orchards which have received the best care, the influence of spraying being noticeable on the set of fruit as well as on the quality. Pears have been plenty and cheap. Sour cherries suffered from leaf blight, but had a fair crop, and are one of the profitable orchard fruits which might be more largely planted.

The first summer meeting of the County Board of Agriculture was held by invitation of the Campbell Soup Company on their farm in Cinnaminson Township on August 24th, 1912, and was attended by over 250 persons. In both the morning and afternoon farmers were shown over the farm, where the trial grounds for testing varieties of tomatoes were inspected and explained. A bountiful lunch was served by the Campbell Soup Company. The meeting was opened by President Charles D. Barton, who thanked the company for their courteous welcome, and the farmers for their support of the meeting. Dr. Dorrance, President of the Company, welcomed the guests to the farm, and explained the effort that the company is making to improve the quality of the tomatoes grown for them.

Prof. W. W. Tracey, of the Bureau of Plant Industry at Washington, had expected to attend, but was prevented on account of illness. H. F. Hall, Superintendent of the farm, gave a very practical talk on the methods of tomato growing, and the bearing on these methods that their experiments have. Their tests are conducted from the standpoint of the consumer as well as that of the producer, as it is necessary to have a tomato of a certain interior quality in addition to being profitable to grow.

The following resolution was unanimously adopted:

"Resolved, That the thanks of the Board of Agriculture of Burlington County and of the large concourse of farmers here gathered, be extended to the Campbell Soup Company for their kind invitation and most generous and bounteous hospitality extended to every one visiting their farm today."

After further inspection of the farm and buildings, the gathering dispersed.

In co-operating with the County Y. M. C. A. in conducting the Boys' Corn Growing Contest, the County Board is helping a most valuable work for the future of the County, as well as for the best interests of the boys. It is refreshing to compare the attitude which these boys take towards farming as a

business, and that of many country lads, whose ambition it is to go to work under a gateway or in an elevator.

About fifty boys grew corn which they exhibited at the Corn Show held in Burlington last month, which comprised 150 different exhibits. Prof. Davis, who judged the corn, said that it was a better show of corn than that at the New York Land and Irrigation Exposition this year. We hope to extend the contest another year to include other crops, some of which might be shown at a summer meeting of the County Board.

The influences which this effort to interest the boys, and indirectly their parents, in better methods of corn growing, has on the yield of corn in this County, can be to some extent determined by the bushel measure. But the influence which it has on the future lives of the boys themselves, on their decision for a farm life, on their ideals as farmers, on the associations they make and the influences consciously and unconsciously brought into their lives which mould their attitude and actions and through their examples reach out to others around them, are not possible of measurement by any exact standard. We have started on a very important movement which has met with great success. It should be broadened and extended and should have the support of all the agricultural organizations in the County. At present the County Board gives no financial support for expenses for conducting the contests, the State appropriation being barely sufficient to meet the expenses of the two meetings during the year. The prize of \$25.00 to send a boy and parent to Farmers' Week at New Brunswick this year, which was offered by the County Board as one of the prizes in the Corn Contest, was subscribed by the officers and some of the directors of the County Board.

The more we put into these contests, the more we shall get out of them of corn and character, which are the best dividends we should expect. There was a time when schools were run by private capital for profit, but except for business colleges that day has mostly passed by. Such institutions are now attended only by the rich or the feeble-minded. There are agricultural contests and exhibits still conducted by private enterprise for the profits of the stockholders, and they have played a great part in the development of our agriculture, and especially in promoting the live stock interests. But as the motives to raise dividends becomes paramount, the best educational efforts have dwindled, many objectionable and parasitic features have developed, until what should be a place of wholesome recreation and education, showing the best types of crops and animals and country life, has failed to meet its opportunities in the light of modern standards. I refer to the County Fair.

The County Board sent to the Union County Poultry and Agricultural Exhibit held December 4th, 5th and 6th, at Elizabeth, five ears each of three varieties of corn grown by the boys and taking first prize in the Corn Contest. This small exhibit attracted considerable attention, and the corn was pronounced by the judges to be of exceptional quality.

Our County may well feel proud that it has been honored by the successful efforts of Henry S. Lippincott of Marlton in securing the silver cup offered by the New York Land and Irrigation Exposition for the best corn.

Education in agriculture and nature study will be a welcome addition to our school curriculums. Every boy and girl on the farms should learn about the common things around them; first by being trained to observe them, then both how to use them profitably and how to enjoy them intelligently, that they may live more useful and happier lives.

The Burlington County Farmers' Exchange during the past fiscal year did a total business of \$615,600. They sold 1,026 cars of potatoes, 99 cars of strawberries, 42 cars of pears and 11 cars of gooseberries, besides produce sold on commission amounting to \$105,200. Goods were sold to growers to the value of \$121,500. Last year the Exchange paid a 5 per cent. dividend on its stock. As the amount of capital required is not large compared with the volume of business transacted, it should not be difficult with wise management to net a dividend

COUNTY BOARDS OF AGRICULTURE.

261

sufficient to attract all the capital required. The fact must not be lost sight of, however, that the function of such an exchange is one of economical and efficient service to its members, and that in preventing market depressions, in eliminating the manipulations of buyers and in effecting a saving to the grower in the purchase of materials, the Exchange is giving value to its members for which credit should be allowed.

CAMDEN COUNTY.

OFFICERS FOR 1913.

President, LEON COLLINS,Merchantville, N. J.
Vice-President, CLINTON CLEMENT,Westville, N. J.
Secretary and Treasurer, JOSEPH BARTON,Marlton, N. J.

Directors—

H. H. Bell, Mount Ephriam.
 T. S. Fox, Laurel Springs.
 Wilmer Collins, Merchantville.
 S. R. Coles, Merchantville.
 J. M. Garwood, Ashland.
 Benj. Barrett, Blue Anchor.
 A. H. Hurff, Berlin, N. J.
 S. S. Batten.
 Martin Schubert, Laurel Springs.
 Everet Garwood, Ashland.

The Camden County Board of Agriculture has just finished a year of increased activity, having been prominent in the conducting of a Corn Growing Contest in the county.

In conjunction with the County Y. M. C. A. we have had an enthusiastic contest, one which we feel has done much for the agricultural interests as well as for the boys of the county.

The twenty-ninth annual meeting of the County Board of Agriculture was held November 16th, 1912, in Grange Hall at Blackwood. At the same time the exhibition of the contest corn and the awarding of prizes for the same took place.

The meeting was the most enthusiastic agricultural gathering ever held in the county. In the morning after the regular business of the meeting was enacted, Mr. Hall of Joseph Campbell Company gave a very interesting and instructive talk on tomato growing. His address was of great value and well received.

In the afternoon the prizes for the corn were awarded, followed by a stirring address by Prof. Minkler of New Brunswick on corn raising. Prof. Minkler struck a sympathetic chord when he congratulated the boys on their success.

We next had an address by A. E. Roberts, National Secretary of the Y. M. C. A., on the "Dignity of Farm Life." Mr. Roberts made a strong appeal to the country folk to endeavor to realize their opportunities and pointed out the opportunities of country life for upbuilding of character.

We feel that the past year has been the most successful, from the point of the amount of good accomplished, that the county has ever experienced. The increased activities has been attended with additional expense, much of which has been met from private sources and we would appreciate any increase in appropriation which the State Board can give us.

JOSEPH BARTON, *Secretary*.

STATE BOARD OF AGRICULTURE.

CAPE MAY COUNTY.

OFFICERS FOR 1913.

<i>President</i> , CLINTON S. CRESSE,	Cape May Court House
<i>Vice-President</i> , HOWARD HOFFMAN,	Cold Spring
<i>Secretary</i> , RALPH SCHELLINGER,	Green Creek
<i>Treasurer</i> , VOLNEY VAN GILDER,	Ocean View

Directors—

Harry Leaming, Cape May City, Lower Township.
 David McPherson, Cape May City, Lower Township.
 Joseph Camp, Pierces, Middle Township.
 Chas. Coombs, Goshen, Middle Township.
 Prof. J. E. Schaefer, Woodbine, Dennis Township.
 Hon. F. L. Ludlam, Dennisville, Dennis Township.
 Dr. W. L. Yerkes, Tuckahoe, Upper Township.
 Enoch Madara, Palermo, Upper Township.

We had our County Board annual meeting at Court House, November 2d, not a very large attendance, but a good meeting. We elected officers for the ensuing year and one delegate to the State Board annual meeting.

We have had a serious disease among our horses and swine for the last two and a half months, nearly all cases proving fatal. The veterinarians have been busy, but no definite decisions satisfactory to the owners.

No particular change in the crops grown as a general thing from previous seasons, taking all as a whole. We have a very peculiar season from start to finish, many of us coming out at the end a great deal better than we were expecting along in August. Very wet spring and late, when it stopped raining it stopped and was very dry and hot before it rained any more. It seems remarkable to see what crops were grown in places.

RALPH SCHELLINGER, *Secretary*.

ESSEX COUNTY.

OFFICERS FOR 1913.

<i>President</i> , A. W. FUND,	Chatham
<i>Vice-President</i> , A. E. HEDDEN,	Verona
<i>Secretary</i> , G. P. F. MILLAR,	Chatham
<i>Treasurer</i> , GEO. E. DECAMP,	Roseland

Directors—

A. E. Hedden, William Deicks, Jos. H. M. Cook, E. O. Wettyen, Henry F. Harrison.

The season just passed has not been as good as hoped for. The winter of 1911-12 was very cold, killing most of the fruit buds. Apples, peaches and pears were only a partial crop. Then in the planting season of May, it was dry, making it impossible to set plants. When the rains did come and crops started they were nearly all behind. The corn made a good crop notwithstanding the drawbacks.

Dairying in Essex County is on the improve. The County, though losing in number of cows, has gained value, some dairies have been discontinued, others are keeping less cows but better ones. The scrub cow is passed and grades and thoroughbred stock is taking their places. The silo is proving its worth and as the year passes new ones are being built. Alfalfa is another adjunct to the dairy which is growing in favor, some have trouble to get a start but each season sees more and more alfalfa grown.

COUNTY BOARDS OF AGRICULTURE.

263

The dairy farmers of Essex County object to being the scape-goat to all human ills and want to go on record objecting to the quarantining of dairies, where no disease is found; and if the same is quarantined the loss to the dairyman will be reimbursed by the city that was benefited.

Farming and dairying does not take all the time of the farmers of this county, for poultry is attracting considerable attention, the chickens with feathers to match Jacob's coat can really be found and in their places are flocks of one solid color, a fair sample of some standard breed. Their owners have organized, calling themselves the Essex County Poultry Association and they feel proud of their feathered charge and have shown their fowls to the public and world in a two-day poultry show held in the largest hall in Caldwell, but owing to the large exhibit, the stage was also pressed into service as show-room, but still some exhibits were turned away for lack of space, and as it was an educational and financial success the association feels proud as they are just about a year old.

You may consider from the foregoing that the farmers work all the time, but that is not so, for "all work and no play makes Jack a dull boy," so with the farmers, they have their picnics and fairs. The Grange picnic at Verona attracts thousands, and local fairs are held where the growers exhibit their products.

Through the grind of work and pleasure the members did not forget the Board of Agriculture, for in the season just passed the Board has held four regular meetings which were very interesting as local topics were discussed and also an institute.

Submitted by the Essex County Board of Agriculture.

GEO. P. F. MILLAR, *Secretary*.

GLOUCESTER COUNTY.

OFFICERS FOR 1913.

President, FRANK KIRBY,Harrisonville
Vice-President, WILLARD KILLE,Bridgeport
Secretary, MINNIE YOUNG,Swedesboro
Treasurer, WM. H. BORDEN,Mickleton

The Gloucester County Board of Agriculture has held four regular meetings since last report at which timely topics of interest to the farmer were discussed. It has also co-operated with the State Board in two Institutes held in the county, one at Williamstown and one at Mullica Hill, also a special session at Mullica Hill on March 9th for the purpose of studying the potato, and the best methods known for its successful cultivation, as well as the diseases to which it is subject and methods of treating them. Farmers were warned to exercise the greatest care to prevent the spread of disease.

The Institute held at Mullica Hill on November 12th and 13th was largely attended and very interesting throughout, and the addresses and discussions on the various subjects were instructive and should prove of practical benefit to every farmer in attendance. Mr. Chas. D. Barton, in his closing remarks, said it was the largest Institute he ever attended, which I think speaks well for Gloucester County farmers.

The year 1912 has been fairly prosperous for the farmer. The extremely wet weather during the early spring proved detrimental to early plowing and caused some delay in planting, but as the season advanced conditions were more favorable, and as a rule fair crops and good prices were realized. The white potato crop was poor and many of the potato growers realized very small profits; while, on the other hand, the hay crop was larger than for a number of years previous.

The South Jersey Farmers' Exchange is in a prosperous condition, and the

earnings of the past year have been very satisfactory to the stockholders. The Secretary, J. Omar Heritage, gives the following as the amount of business done the past year:

Eight hundred ninety-six cars of potatoes for the farmers, and to the farmers, 66 cars of seed potatoes, 48 cars of coal, 5 cars of baskets, 33 cars of lime, 24 cars of manure, 197 cars of feed, 5,673 tons of mixed fertilizer, besides other fertilizer material, 2,000 bushels clover, timothy, crimson and alsike clover seed, 15 tons Paris Green, Pyrox, blight and bug dust and arsenate of lead.

MINNIE YOUNG, *Secretary*.

HUNTERDON COUNTY.

OFFICERS FOR 1913.

President, JOSEPH BODINE, Flemington, R. F. D. No. 2
Vice-President, GEORGE D. BUSHFIELD, Stanton
Secretary, ROSCOE DE MOTT, Three Bridges, R. F. D. No. 1
Treasurer, F. J. TOMLINSON, Pittstown

The Hunterdon County Board of Agriculture held two meetings during 1912. One at Stanton Grange Hall, March 14, at which Professor H. R. Lewis was present and gave a chart talk on poultry keeping.

Considering the unfavorable condition of the roads and weather the meeting was well attended and all were pleased and profited by Professor Lewis' excellent discourse.

The other meeting was held in the Court House, Flemington, November 7, for the purpose of electing officers and appointing delegates for the ensuing year.

This date also proved to be very unfavorable. Nevertheless, Professor F. C. Minkler, who was to address the meeting on the dairy question, was present and although the listeners were discouragingly few he gave us a very interesting and instructive talk on feeding, breeding and stabling dairy cows.

This year's crops and prices are as follows:

	PRICE PAID AT LOCAL MILLS
Oats, 20 bu. per acre.....	\$.40 per bu.
Wheat, 14 bu. per acre.....	.95 " "
Rye, 12 bu. per acre.....	.70 " "
Corn, 35 bu. per acre.....	.50 " "
Buckwheat, 25 bu. per acre.....	.70 " "
Potatoes, 150 bu. per acre.....	.75 " "

The above figures give the average yield and price. But it is only fair to say that some farmers in our county raised corn at the rate of 60 bushel per acre, while others, making a specialty of potatoes, reached a yield of 250 bushels per acre. The dairy industry in Hunterdon is growing and has proven itself profitable this year, owing to a little lower cost of production and better prices, also weather conditions were favorable for milk production during late autumn and winter being warm enough for cattle to be out of doors during the day thus getting needed exercise and air.

While swine are to a great extent crowded out by the dairy industry still those engaged in the business of raising pork for market received a nice profit this year, as this price of feed was lower this fall than last and pork was bringing from nine to eleven cents per pound. At a sale of farm stock in our neighborhood a short time ago eighteen pigs three months old brought an average price of about \$4.25 each, indicating that the hog industry is still alive.

The poultry raising and egg producing business is about the same as a year ago and proves successful for those making a specialty of it, but farmers are dropping it as a side issue and turning their attention to the dairy or other less confining work.

ROSCOE DE MOTT, *Secretary*.

COUNTY BOARDS OF AGRICULTURE.

265

MERCER COUNTY.

OFFICERS FOR 1913.

<i>President</i> , J. T. ALLINSON,	Yardville
<i>Vice-President</i> , H. H. HUTCHINSON,	Robbinsville
<i>Secretary</i> , R. E. HAINES,	Robbinsville
<i>Treasurer</i> , F. W. CRUSER,	Pennington

Directors—

J. W. Hendrickson, Henry Dye, Charles E. Rue, N. F. Woodward, Theo. B. Hunt, W. J. Tindall.

The year of 1912 was one of many climatic changes in our county, in the early spring it was very wet, and farmers that had low land could not get upon it to do any work, then when the rain ceased, it was just as dry as it had been wet, making it very hard to get the crops planted and to get the land in the proper condition to keep the crops growing as they should, especially with this the case with corn. Then the showers in some sections were so frequent that everything did extra well, while in other sections they appeared to miss nearly all the time and, of course, the crops had to suffer accordingly.

Then at the time that the early potatoes were looking their best and the fields were white with bloom, an excessively hot wave came that wilted the vines and nearly cooked the potatoes, and caused them to die before their time, creating a great shortage in the yield, and having a serious effect on all the growing crops. Hayfields that had been mowed looked as though fire had passed over them, they were so dry; and I believe that a large percentage of our farmers in Mercer County instead of counting on the 5 per cent. that they claim they should have on their investment, after they got their fertilizers' seeds and other necessary purchases made, will do well to break square, trusting for a brighter future to crown their labors. My report of the percentage and price of the crops are as follows: Wheat, 90% at \$1.00 and \$1.25 per bu.; rye, 100% at 90c. per bu.; corn, 80% at 60c. per bu.; hay, 80% at \$16.00 per ton; potatoes, 50% at 60c. per bu.; pears, 50%; apples, 25%; milk, 5c. per quart; pork, 9 and 10c. per lbs.

In closing would say that fall sowed grain and grass looked fine up to the first of this month.

Cattle are in splendid condition.

More farmers going into raising hogs than usual.

Sod plowing well advanced in some sections.

A great amount of the fertilizers for the spring planting are now stored in the farmers' buildings, and they are just waiting for the blue bird so that they can get to work.

R. E. HAINES, *Secretary*.

MIDDLESEX COUNTY.

OFFICERS FOR 1913.

<i>President</i> , GEORGE W. MOUNT,	Monmouth Junction
<i>Vice-President</i> , WM. FITZ RANDOLPH,	New Brunswick, R. F. D. No. 2
<i>Secretary and Treasurer</i> , W. H. CLARK,	New Brunswick, R. F. D. No. 1

The regular meeting of the Middlesex County Board of Agriculture was held in the Court House, New Brunswick, February 24th. The President, George W. Mount, in the chair.

Mr. Lewis D. Walker, Jr., delegate to the State Board meeting, gave a very interesting report. I also gave a report as delegate to the State Board.

Mr. Harry R. Lewis, Poultry Husbandman of the N. J. Experiment Station,

gave a very interesting lecture on poultry. He said the largest profit was from eggs.

The regular May meeting was held May 18th with our President, George W. Mount, in the chair.

Mr. A. L. Clark gave a very instructive talk on "Poultry." He said: "What do we keep our poultry for,—we can make from one to two dollars a hen a year. Pure bred stock is the best as you can sell a great many eggs for hatching. Have a good house that is dry, with plenty of fresh air even if it is cold. Keep your own stock and pick out your best cockerels and it is not necessary to change every year.

Mr. J. D. Perrine gave a very instructive talk on improving the soil at a profit.

The Middlesex and Somerset county Pomona Grange and the Middlesex County Board of Agriculture have held three annual excursions, two to Coney Island and one to Glen Island. These excursions have been quite a success. The profits were divided between the two organizations, except \$250 which they put in the bank to pay the expenses for the next excursion.

The New Market Grange held a "Field Day" in September on the farm belonging to John M. Evans. There were good speakers and a large exhibit of corn, fruit, vegetables and fancy articles.

November 23d the annual meeting of the Middlesex County Board of Agriculture was held in the Court House with our President, George W. Mount, in the chair.

The officers for the ensuing year were elected.

The officers made their annual report.

Prof. A. W. Blair, of the College Farm, gave a very instructive lecture on lime and fertilizers, showing that by the use of them and legume crops and deep plowing you could increase your crops 100%.

Prof. Blair was elected a member of our Board.

The Farmers' Institute was held in New Market November 16th. The order of business was as follows:

10:30 A. M.—Peach production for the Home and Market, Chas. D. Barton.

11:15 A. M.—Importance of Farmers Knowing Needs of the Soil, J. F. Gordon.

2:00 P. M.—Good Seed and Profits, J. P. Helyar.

2:40 P. M.—Corn Selection of Seed, Preparation of Seed Bed and Cultivation, Mr. J. F. Gordon.

3:30 P. M.—Diseases of Potatoes, Dr. Mel. T. Cooke.

8:00 P. M.—Books for Farmers, Miss Sarah B. Askew.

These meetings were very profitable to the farmers.

The crops for this year have been very good, especially corn and potatoes.

WM. H. CLARK, *Secretary*.

MONMOUTH COUNTY.

OFFICERS FOR 1913.

<i>President</i> , GEO. T. REID,	Englishtown
<i>Vice-President</i> , G. W. BLATCHLY,	Freehold
<i>Secretary</i> , D. H. JONES,	Freehold
<i>Treasurer</i> , W. M. MOREAU,	Freehold

The Monmouth County Board of Agriculture has held two very interesting meetings. The first meeting on March 9, 1912, in Court House, Freehold, N. J. This was in connection with the State Board. Speakers and topics were as follows:

Reports from delegates attending the State Board, F. P. Jones and J. H. DuBoise.

C. D. Wood, director of main experiment station, subject, "Potatoes"; Dr.

COUNTY BOARDS OF AGRICULTURE.

267

W. T. Cook, Plant Pathologist of New Jersey, subject, "Plants and Their Disease"; D. S. Bodish, Secretary N. J. Audubon Society, subject, "Economic Value of Birds"; Prof. H. R. Lewis, subject, "Poultry"; Dr. Lipman, "Soil Treatment and Fertilization for Potatoes."

The second meeting was held November 23, 1912 in the Court House, Freehold, in connection with the Young Men's Christian Association Corn Growing Contest.

Corn was exhibited by the boys and was judged and prizes were awarded and each exhibitor read an essay on the method of how he grew his corn, which was very interesting, as some of the older men said they had learned something by these essays.

Prof. F. C. Minkler, of New Brunswick, gave an address on corn growing.

Mrs. Alexandra Marcy, Vice-President of Congress of Mothers, spoke of the work of that board.

Prof. John Enright, County Superintendent of Schools, spoke of agriculture being taught in public schools.

Institutes have been held in Englishtown, Farmingdale and Freehold and one proposed for February 20th at Allenwood.

The weather conditions have been quite favorable except a dry spell in the early part of growing season. The Secretary has received but two reports from Township Directors Milstone and Manalapan. Crop and prices are about as follows: Hay, good, \$20 per ton; grain, corn, extra good, 1 cent per pound; wheat and rye, about normal, wheat, \$1.00 per bu.; rye, .80; berries, light crop, good price; small truck, 15% below normal, prices as good as usual but not high; white potatoes, 90 per cent. of good crop, price about 55 cents bu.; butter, 30 cents lb.; eggs as high as 50 cents and as low as 20; live stock, cows much higher, about \$75 for milk cows; horses about as high as usual; veal calves, 9 cents lb.; pork dressed, 10 cents; beef dressed, 14 cents by quarter; farm property high as usual, \$150 to \$200 per acre and many sales are being made.

Very little produce in the hands of the grower January 1, 1913, except hay and corn.

Many auction sales have been held during fall and good prices have been realized for the goods.

Somewhat more fall plowing has been done this year than usual.

More attention is being given to fruit than in former years.

Large amounts of commercial fertilizer is already bought and delivered for use in 1913. Many farmers learning the art and saving by home mixing.

D. H. JONES, Secretary.

MORRIS COUNTY.

The annual meeting of the Morris County Board of Agriculture was held at the Florham Park borough hall last Saturday, December 14, at 2 o'clock. The attendance was the largest in many years and the interest was intense, from beginning to end, the session lasting until dark. Fourteen new members were elected and attended. There were present interested members from Dover, Rockaway, Meyersville, New Vernon, Hanover and other parts of the county.

The meeting was called to order by the president of the board, George E. Felch, following which the report of the secretary, Mr. William F. Ely, was read, a special feature of it being an account of the very successful meetings held, one at Morristown on March 6 and one at Meyersville, April 18. The account of these meetings were approved and adopted as read. With pleasure the prize to the Morris County Board of the silver trophy cup given by J. S. Frelinghuysen, President of the State Board of Agriculture, for the best display over every other County Board of Agriculture or Pomona grange in the State, was accepted. It was won at the Union County Poultry Association and

Union County Board of Agricultural exhibitions.

These officers were elected for the ensuing year: **President, George E. Felch**, Florham Park; **Secretary and Treasurer, William F. Ely**, Madison; board of directors, the two officials named and Messrs. Edgar C. Hopping and William E. James of Florham Park, James Cook and Frank P. Cook, of Hanover, S. E. Young, of Rockaway, W. B. Lindsley and N. D. Goble of New Vernon and J. J. Mitchell, of Troy Hills; delegates to State Board, **S. E. Young** for one year and **George E. Felch** for two years.

OCEAN COUNTY.

OFFICERS FOR 1913.

President, C. M. RORER, **Cassville**
Vice-President, P. DAVITT, **Toms River**
Treasurer, H. R. WILLS, **Toms River**
Secretary, R. C. GRAHAM, **Holmeson**

Director, Two Years—

J. W. Jamison, Cassville. ..

The Ocean County Board of Agriculture has held four meetings this year, 1912, while the officers have made an attempt to infuse more enthusiasm in the work. Still, some of the meetings have not been so well attended as should have been therefore, many have lost the opportunity of the social time which the meetings afford as well as the experience of the lectures that have been given by the speakers.

We find in our meetings, if ever so small, something that quickens the thought and stimulates the mind towards the things in which other members come in contact with, so a meeting is sure to leave us something to study out and help others to avoid in the future.

Ocean County is holding its own as for the crops, considering the climatic condition of the seasons as was demonstrated in the corn growing contest of Ocean County's exhibit at Toms River and New Jersey at New York should make the farmers think life on the farm was worth living.

The cranberry crop in Ocean County was very irregular. Some bogs had nearly a full crop, while others were almost a complete failure, but those that had the berries received a fair compensation for the money they had invested.

Corn, where properly taken care of and thoroughly cultivated, was nearly a full crop, while the neglected fields did not do so well.

White potatoes did fairly well and the price pulled them through all right, while sweet potatoes, a small crop, brought good money.

Grass and grain look promising with about the same acreage as formerly. Poultry raising is on the increase as eggs sell for a good price the year through and young chickens as high as 22, 24 and 26 cents in Lakewood. Eggs, 45 cents a dozen, butter, 35 to 45 cents lb., pork has sold as high as 12 cents wholesale.

Apples, poor crop, Keifer pears, have succumbed to the scale as they don't pay to take care of the trees.

The farming outlook in general has a tendency upward, while the oil prospectors are leasing all the land they can in Ocean County and are booming the county if it pans out all right. Stock wintering good as there is plenty of provender for their consumption.

Our meeting of December 21, held at the farm of C. M. Rorer, near Cassville, was the best meeting of the year as there was a good attendance and very noticeable a High school graduate or a business college student among the audience. There were several subjects discussed as time permitted, and election of officers, after which a very pleasant repast was served by the ladies of the Board.

P. C. GRAHAM,
Secretary.

COUNTY BOARDS OF AGRICULTURE.

269

PASSAIC COUNTY.

OFFICERS FOR 1913.

<i>President</i> , IRA MITCHELL.....	Paterson, R. F. D. No. 1
<i>Vice-President</i> , FRED. C. DAY.....	" " " " " "
<i>Secretary</i> , AARON LAAUWE.....	" " " " " "
<i>Treasurer</i> , FRANK T. TORBET.....	" " " " " "

The Passaic County Board of Agriculture held four meetings during the year 1912. The first meeting was held on February 13, at Haledon, at which meeting we were favored by Secretary Dye and three of his Institute workers. This meeting was largely attended. Mr. Dye spoke on alfalfa, pointing out the benefits derived from this wonderful plant.

Mr. Gillingham spoke on the hog, the audience was very much interested in the points he brought out. Many questions were asked about the rearing and raising of swine. Mr. C. Hulsart spoke on fertilizers, home mixing, vs. the commercial fertilizer. Professor Lewis spoke on the essentials of profitable poultry raising.

Professor Blake spoke on fruits and general orchard management.

The next meeting was at North Haledon borough. This was the largest meeting Passaic County Board ever had. We received seventeen new members. Mr. Clark of New Brunswick spoke on artificial raising and rearing of poultry and getting eggs in winter. The audience was very much interested, which was proven by the many questions asked. The next meeting was an institute held at Richfield at which meeting Mr. Gordon of Ohio spoke on the importance of farmers knowing the need of their soil. The next speaker was Mayor Segar from Passaic, who spoke on the need of demonstration farms.

Mr. Barton, institute conductor, spoke on production of melons, also on peach orchard.

The next meeting was held at Preakness on December 18, which was a business meeting, at which meeting the officers and delegates to the State Board were elected.

GENERAL REPORT.

The Passaic County farmers have had a very profitable year. Crops and prices were very good with the exception of cabbage. The cabbage crop was very large, the prices ruled ruinously low. The dairy seems to be going slowly backward. Prices of grain ruling high and labor being scarce are some of the reasons for its decline.

SALEM COUNTY.

OFFICERS FOR 1913.

<i>President</i> , JOHN P. RIDGEWAY.....	Hancock's Bridge
<i>Vice-President</i> , HENRY M. LOVELAND.....	Friesburg
<i>Secretary</i> , GEORGIA A. DUELL.....	Woodstown
<i>Treasurer</i> , J. GILBERT BORTON.....	Woodstown
<i>Executive Committee</i> —RICHARD WARE	Salem
JESSIE L. COLSON.....	Elmer
LINWOOD BORTON.....	Woodstown
ASHER B. WADDINGTON.....	Woodstown
CLIFFORD CRISPIN.....	Salem
EDWIN GROSCUP.....	Hancock's Bridge

The Salem County Board of Agriculture has held three meetings during the year. Two, the January and April meetings in Woodstown and the October meeting in Harmersville. The attendance has been quite good, but not what it should be. Those who do attend realize the benefit derived, but it seems very difficult to interest people who are too busy to even attend one meeting of farmers in three months. Our programmes are varied and always of interest. The papers prepared and the talks given have been good and have shown that much thought has been given to the subjects. With one exception these have been from members of the Board. At the April meeting we had Prof. A. L. Clark of State College with us who gave us a good talk on winter egg production.

Our winter institute was quite well attended and good talks were given and much interest manifested. Institutes have been held in Elmer and Harmersville. Potato growing is one of the great industries of the county, but the year has been one of varied success, as in some localities the crop was very good and a profitable one, while other fields did not pay expenses. The corn crop was also varied in some localities very good and in others very poor. The very heavy rains were very threatening to the tomato crop, but late frosts made them much more profitable than was anticipated.

The dairy is one of the great industries of the county and some of the large farmers who sold off their cows are again going into the business.

The fruit crop very small. Very little attention paid to the growing of fruit.

When we can have a State demonstration farm in our county this may be remedied.

GEORGIE A. DUELL,
Secretary.

SOMERSET COUNTY.

Our society held only two meetings the past year, not all were well attended. Owing to the heavy spring rains some oats ground could not be seeded, hence a small increase in hay and corn acreage.

Notwithstanding the drouth, the year has been fairly productive. The regular crop rotation is generally practised, with dairying and poultry as side lines and in many instances these are the chief sources of revenue.

Dairying is carried on under many trying conditions aside from natural losses and the hard labor connected therewith, the requirements of the Board of Health are working a hardship to the producer and likewise to the consumer—in time, as the small producer and tenant farmer cannot meet the expensive conditions, they must get more for their product or go out of business. The consumer seems to think he is doing a good work in upholding all the new frills laid down for the production of milk, but he must not forget to pay for them a few years hence.

The labor question is still an all-important and difficult one and just as far as ever from being solved..

Farmers are adding more modern improvements to their homes, the auto is also found on some farms, and with the telephone, rural delivery and improved roads, this should have a tendency to keep the sons and daughters on the farm.

It's not so easy to get improved roads in a strictly farming section unless it lies between county seats or large cities, yet we view with apprehension the going of the boys to the city and the passing of productive farms into the hands of non-productive owners,—why not make our food producing districts the first consideration in granting stone roads and our city friends—the auto tourist the second?

ELLSWORTH BROKAW,
Secretary.

COUNTY BOARDS OF AGRICULTURE.

271

SUSSEX COUNTY.

OFFICERS FOR 1913.

<i>President</i> , ROBERT V. ARMSTRONG.....	
<i>Vice-President</i> , GEO. P. McDANOLDS.....	
<i>Secretary and Treasurer</i> , THEO. M. ROE.....	
<i>Delegates to State Board</i> —THOMAS C. ROE.....	2 years
J. EDWARD DICKERSON.....	1 year

REPORT BY SECRETARY.

The Board has held four meetings the past year and as greater interest is shown we hope to hold more meetings the coming year. At these meetings topics discussed were:—

"The Growing of Alfalfa," "Lime, When and Where its Uses on Our Soils are Most Profitable."

"Which Gives More Satisfactory Results, the Ground or Burned Lime?" The opinion being that burned lime is the more profitable to use on the heavy clay soils of Sussex County.

"Which is more profitable to the dairyman to buy or raise his own stock?"

The growing of fruits and whether commercial apple orchards could be made profitable here and proper varieties of such orchards." The apple and peach crops were exceedingly light ones. The peach crop failure was apparently due to the cold weather late in the season. The peach curl hurt many orchards. Much interest is shown in poultry. A show was held in Newton in which great interest was manifested. Good addresses on "Poultry" are very much appreciated at our Institute and Grange meetings and the meetings of our Board. The dairy industry in Sussex County has not been so profitable the past year, due to the higher prices of grains and lower prices paid by the Borden's, good dairy cows, Holstein-Friesian grades, being at auction \$75 to \$110, farm horses \$150 to \$250.

UNION COUNTY.

OFFICERS FOR 1913.

<i>President</i> , E. R. COLLINS.....	Westfield
<i>Vice-President</i> , G. E. LUDLOW	Cranford
<i>Secretary</i> , C. H. BREWER.....	Rahway
<i>Treasurer</i> , OGDEN WOODRUFF.....	Elizabeth

Eleven regular and two special meetings were held by the Board during the season of 1912. Subjects covering nearly everything in the way of beautifying the home grounds, horticulture, agriculture and bee-keeping were taken up for discussion. The first meeting of the season was devoted to the care of shrubs, pruning, etc., under the leadership of Messrs. W. B. Woodruff and E. P. Beebe, brought out some good points in the care and management of shrubbery and plants. Mr. Woodruff advised planting young stock, learning the habits of individual shrubs or plants and training or pruning at such time and in such manner as to attain both fine specimens and an abundance of bloom. Mr. Beebe said the one important thing was to keep all shrubs in proper form and allow plenty of room for development in order to secure best results, both in regard to growth and beauty of the specimens. The second meeting, devoted to the farm garden, was very ably handled in detail by Prof. M. A. Blake, who advised the laying off of a plot of ground for the garden in a shape, so as to do most of the cultivation with a horse, growing vegetables, etc., between the

rows of bush fruits and arranging for rotation, so as to not grow the same crop year after year on the same piece of ground. This was an evening session and fully 75 attended. February 15. The subject, Spraying, was on the calendar and Professor Farley of New Brunswick gave a very thorough and instructive talk concerning different insects, diseases of trees and fruits together with the best methods of combating them. The subject, What crops will the farmers of Union County plant this season was discussed by members of the Board, March 7. Many crops were advised, one of the members present advised planting some crop that could not be stolen, but failed to give any light upon what that crop should be. Two or three others present reported fairly good success with alfalfa and thought it ought to do well in Union County, if handled right in the start. March 21 was our bee meeting. Dr. Everett D. Lyon, who handled the subject, admitted he got stung frequently, but at the same time, had big success in his apiary and told in a plain, concise manner just how others could keep bees successfully and for profit. Members present heartily agreed Dr. Lyon's talk on bees was the most interesting and instructive they had ever had the pleasure of hearing. April 4 the poultry special, covering the farmyard flocks and the professional poultryman, by Mr. A. L. Clark of N. J. College Farm, was very instructive. Mr. Clark went into detail in regard to methods of hatching, feeding and rearing young chicks. Construction of suitable houses, their convenience and cost of building were shown. Much interest was shown at this meeting, in fact, the poultry industry in the county is growing fast, there being two poultry associations in the county having several hundred members. September 26, a special meeting was called by the president for the purpose of discussing the question of an agricultural exhibit in connection with the Union County Poultry Association. The exhibition to be known as the Poultry and Agricultural Exhibition of Union County, and to be held the first week in December in Elizabeth. Arrangements were made to co-operate in the work and under the management of President Summer of the Poultry Association and officers of this Board, the greatest exhibit of the kind ever held in the county was brought to a complete success. More than 1,200 birds were on exhibition, over fifty entries of canned goods, vegetables, etc., were made, and the display contained many fine specimens, some noted for their large size, others for true to type varieties of different sorts of vegetables, all of which were grown in the county, which goes to show that while considerable farm land in the county has been cut up into building lots, there are still some farmers left. More than 6,000 people attended the show, which to many was remarkable from the fact that only three months' time was had for its promotion and no especial efforts could be made for growing crops for exhibition purposes. It is planned to make the exhibition an annual feature in the county and with this end in view, farmers and gardeners can start early in the season and another time it will no doubt be much larger and better. Owing to the failure of the fruit crop in Union County, the fruit exhibit was very small, but with a good fruit season, I feel sure Union County will not lack for stock for exhibition purposes in that line. Regarding the crop season for the year 1912 throughout the county it has been unfavorable to most crops. The month of April, was cold and wet and very little plowing could be done except in a few localities with light or sandy soils, so that all crops got a late start and were more or less affected by the hot, dry period which followed the cold, wet spring. Apples were an entire failure owing to weather conditions when in bloom. Kieffer pears set heavy, while other varieties only partial crops. Peaches very light, and in some sections buds all killed and in others many trees died. This seemed to be the case where trees had borne several crops. Younger trees not being hurt to as great extent by the winter weather conditions as the older trees. Plums except in sheltered places did not set any fruit, but grapes as usual, were fine and produced heavily, excepting the early varieties, which did not set well on the clusters. Small fruits, strawberries promised well in the early part of the season, but during the ripening season unfavorable conditions cut the crop down one-half on new beds, year old beds did better as they

COUNTY BOARDS OF AGRICULTURE.

273

matured their fruit a week to ten days earlier. Raspberries about all winter killed, blackberries produced a fair crop of fine quality. Hay crop light, oats poor, but wheat good crop and well matured. Corn throughout the county averaged up well, although late in maturing. Twenty-seven lots of five ears each grown in the county, were exhibited at the Poultry and Agricultural Exhibition. Mr. Louis Wenz of Elizabeth, winning a handsome silver trophy cup for the best five ears of either white or yellow corn grown in the county with five superb ears of yellow dent. While available land for trucking and farming purposes is being cut down each year, there are a few truckers who have put in irrigation systems and report big results on the capital invested. Vine crops did not do well. Potatoes owing to successive previous failures of the crop were not planted to any great extent, but the crop grown by those who did plant them the past season was the best grown for several seasons.

Tomatoes, sweet corn and cabbage all produced well and prices received in the market have averaged up well. Many other crops planted in some instances were entire failures and others produced only about enough to pay expenses, so that in averaging up crop conditions little can be said in favor of 1912 over and above the two previous seasons, which have all been late in opening up in the spring and then either extreme periods of wet, followed by drought to such an extent as to injure growing crops to a greater or less degree has reduced the production of crops throughout the county several points below what it would be under normal conditions. Dairy business is on the decrease, owing to several causes and unless conditions change it is quite evident that the time is not far distant when all dairy products will have to be shipped in from a distance.

C. H. BREWER,
Secretary.

WARREN COUNTY.

OFFICERS FOR 1913.

President, JAMES J. COOK, Delaware R. F. D.
Vice-President, NICODEMUS WARNE, Broadway R. F. D.
Secretary and Treasurer, CHARLES M. OBERLY, Phillipsburg

The past year has been fairly prosperous for the farmers of Warren County. There was abundant pasture and held out till late. Something that has not occurred for three or four years.

At our February meeting, Prof. K. C. Davis, from the college farm, gave an address on losses on the farm.

First—The great losses from manure leaching and burning.

Second—Corn Fodder. About 40% of the corn crop is in the stalks. Haul these stalks as soon as possible in the fall. Cut them as fine as possible, and get the 40% of feeding value by molasses, so that the cows will eat them up clean. Don't feed much timothy hay, but such as clover or alfalfa, which contains more protein.

Third—The Robber Cow—By weighing your milk you will find out which ones they are, so you can butcher them.

Fourth—Diseased Cows—One preventative for tuberculosis is plenty of ventilation.

Fifth—Diseased Potatoes—Such as scab blight, reduces the yield and also size.

The same officers were elected as the past year.

There was a motion passed that the secretary correspond with the Pennsylvania R. R. officials to have the agricultural train and the special speakers come in Warren County with their exhibits. Mr. Winner, the Representative having charge of that department, notified the secretary that the train would not come in Warren County this season, but probably later on.

At our June meeting lime was the topic. The burnt lime gave better results than the ground pulverized, as it did not take near the amount as it did the ground pulverized to give the same results. Our next meeting was held in Warren Grange Hall at Broadway on August 7. At this meeting the agricultural train of the Pennsylvania was again discussed and was laid over till next meeting.

Then the improvement of better roads was taken up, and different materials to build them with and also repair them. One of the members said that a mile of concrete road for a sample was being built. The Edison Portland Cement Co. furnished cement for one-third, and the Vulcanite Portland Cement Co. furnished cement for one-third. Also the Alpha Portland Cement Co. furnished one-third for this one mile of sample road of different styles, and dimensions were made on the Morris turnpike in 1912.

Our next meeting was held at Belvidere, November 13. Dairying was the subject. Owing to conditions making it difficult to conduct the business at a profit, some of the difficulties may be mentioned. The high price of dairy feeds. Scarcity and high price of efficient labor. The requirements of the Board of Health under which milk intended for market must be produced and cared for, which some think unjust, and the price paid the farmer for the milk, is entirely too low compared with the cost of production. The Holsteins seem to meet the requirements for milk better than other breeds. Nearly every dairyman engaged in the milk business realizes the fact. That there is always improvement to be made in the dairy stock, and it is an important step in the business as there must be some profit.

It has been the custom of some dairymen to buy all of their cows from the dealer at enormous prices. It is much better to have a registered sire and raise all of the heifer calves from their best milk producers.

There are only a few farmers' sons who stay on the farm after they become of age. With all the improvements, the trolleys, the State roads, the telephone and automobile, the moving picture galleries, draws them to the city and the caring for the different growing live stock and crops on the farm is neglected, unless you can get good laborers to do it for you. The farmer must compete with the manufacturer. The ten hour system must be adopted.

Where a man owns one or two farms he rents them to tenant farmers. Only a few men of that kind farm their own farms. That is one reason why his children do not stay on the farm.

Mr. Winner represented the Pennsylvania R. R. Co. Gave an address about the agricultural train. He said there was one coach fitted up for the exhibits of different kinds of farm produce, etc. You are inside the coach while the lecture is going on.

Mr. Winner urged the farmers of Warren County to grow some special crop and give it to the Pennsylvania R. R. Co., as their own property and they will transport free and place on exhibit at Madison Square, New York City, and any premiums that would be realized on this certain product would go direct to the producer, as there are disinterested persons appointed to do the judging. The only benefit the Pennsylvania R. R. Co. realizes is the increased shipping over the road.

This visit with the train will become permanent, but not the same time of the year. It may be fall, winter or spring. These gentlemen are prepared to answer all questions in regard to agricultural products.

C. M. OBERLY,
Secretary.

CONTENTS.

(275)

NEW JERSEY STATE LIBRARY

CONTENTS.

A.

	PAGE.
Annual Meeting—Minutes of	11
Order of Business,	12, 13
Committees on Credentials, Resolutions, Treasurer's Accounts, Transportation,	14
Committee on Nomination of Officers,	37
Executive Committee—Report of,	14
Treasurer—Report of, and Auditing Committee on,	17, 124
Secretary—Report of,	17
Transportation and Freight Rates—Report of Committee on,	27
State Grange—Report of,	49
Address by—	
Prof. F. C. Minkler—	
"Horse Breeding in New Jersey,"	29
Record of Stallion Examining Board,	31
Breeders' Associations Organized,	32
Discussion on,	33-35
Col. E. A. Stevens, Road Commissioner—	
"The Road Situation in New Jersey,"	38
Division of Traffic, Classified,	39
Cost of same,	40
Discussion on,	41-48
Job H. Lippincott, Commissioner on Motor Vehicles—	
"Automobile Legislation,"	55
Principles of Motor Vehicle Legislation,	56
Co-operation between states necessary,	57
The Reciprocity Law,	58
Additional Revenue Needed, Plan to Increase,	59
Discussion on,	61-69
Dr. Philip B. Hadley—	
"Diseases of Poultry,"	69
Different Diseases and Causes,	70
Relative Value of the Prevention and Treatment of Poultry Diseases,	71
Brooder Pneumonia,	72
Cholera, a Massachusetts case,	73
Blackhead in Turkeys,	77
Feeding Tables,	79-80

	PAGE.
Prof. H. R. Lewis—	
"The Poultry Industry in the United States,"	81
Increase in Poultry in the United States 1900-1910,	82
New Jersey an Intensive Poultry State,	83
Poultry Education and Selection,	85
A Proper House,	87
Feeding Rations,	89-91
Dr. J. G. Lipman—	
"Soy Beans as a Farm Crop,"	93
Soy Beans as a Seed Crop,	94
Varieties,	95
A Substitute for Other Crops,	96
Methods of Growing,	97
Discussion on,	99-103
Dr. C. E. Thorn—	
"Maintenance of Soil Fertility,"	103
Soil Exhaustion,	104
Must Understand Fundamental Principles,	105
18 Years' Experiment with Fertilizers and Manures—Table,	107
Phosphorus, Its Value as a Soil Improver,	108
Some Results of the Experiments,	110
Soil Fertility Not a Purely Chemical Problem,	111
Discussion,	112-115
Dr. H. J. Wheeler—	
"Interrelations of Fertilizers, Crops and Soils,"	115
Lime and Certain Crops,	120
Jos. S. Frelinghuysen, President,	124
The Commission on Tuberculosis in Animals,	125
Education,	127
Good Roads,	131
Federal Aid for Farmers,	133
Dr. Thos. J. Headlee, State Entomologist—	
"Insects Injurious to White Potatoes in New Jersey,"	135
Discussion on,	137-139
Dr. Geo. M. Twitchell—	
"Potato Production from Experience,"	140
Seed Selection Important,	141
Spraying and Spraying Materials,	142
Expense of Production,	143
Lessons Emphasized,	144
Discussion on,	146-149
Prof. M. A. Blake, State Horticulturist—	
"Lessons from the New York Land Show,"	150
Securing Exhibits,	152
Dr. Mel. T. Cook, State Plant Pathologist—	
"Diseases Affecting Potatoes,"	155
Spraying,	160

CONTENTS.

279

Dr. Geo. M. Twitchell—	PAGE.
"The Business Side of the Milk Pail,"	167
Minimized Cost of Production,	168
The Cow and Her Ancestry,	169
Items In Cost of Production,	170
How to Reach Highest Production; Co-operation,	172
Responsibility Beyond Personal Gain,	173
Discussion,	174-176
Dr. B. T. Woodward—	
"Tuberculin Test and the Use of Slightly Affected Tubercular Animals for Human Food,"	176
Tuberculosis an Old Disease,	177
Preparation of Tuberculin, Reading of Temperatures,	179
Meat Inspection Throughout the United States,	180
Bang Method of Quarantining,	182
Prof. H. E. Van Norman—	
"The Scientific Feeding of Dairy Cattle Simplified,"	184
Business Principles,	184
Value of Our Foods In Terms of Energy,	185
Insufficient Food Limits Production,	187
Suggestion for Common Feeding Practice,	189
Mixing Feeds,	191
Discussion on,	194-196
Dr. W. H. Demarest—	
"The Agricultural College and the State of N. J.,"	197
Prof. Alva Agee—	
"The Organization of Agricultural Extension Work,"	199
Dr. C. N. Kendall, Commissioner on Education—	
"Rural School Problems,"	216
Courses in Agriculture Needed in Rural Schools,	217
Obstacles in the Way of Better Rural Schools,	218
Consolidated Schools,	219
Training Teachers and Teachers' Salaries,	220
Prof. Willis L. Moore—	
"The U. S. Weather Bureau—What It Means to the Farmer,"	222
Storms and Cyclones,	225
Method of Forecasting the Weather,	225
Benefits to the Fruit and Farming Interest,	226

B.

Bee Disease Control, Colonies Examined,	234
---	-----

C.

	PAGE.
Committees Appointed on Credentials, Treasurer's Accounts, Resolutions, Transportation,	14
Nomination of Officers,	37
President's Address,	124
Auditing Treasurer's Accounts,	124
County Boards of Agriculture—Reports,	257-274

D.

Dairy Matters—

Number of Cows and Other Cattle in New Jersey,	25
Tuberculosis Commission on,	163
Dr. Geo. M. Twitchell on,	167
Dr. B. T. Woodward on,	176
Prof. H. E. Van Norman on,	184

E.

Extension Work. Prof. Agee,	199
-----------------------------------	-----

F.

Freight Rates, Report on,	27
Feeding Stuffs Law, Report on,	21
Farmers' Institutes,	21
Farmers' Week,	22
Farm Bureaus,	23
Mercer County Delegates Admitted,	92
Sussex County Admitted,	162
Farm Animals, Number and Value,	25
Farm Crops, Statistical Table of,	254

G.

Grange, Report of	49
Officers of State and Pomona Granges,	241-242
Officers of Subordinate Granges,	243-253
Gasoline, Resolution on,	208

H.

Horse Breeding in New Jersey, Prof. Minkler,	29
--	----

CONTENTS.

281

I.

	PAGE.
Immigration Conference, Report on,—Brown,	182
Inland Waterways, President Frelinghuysen,	131
Insects Injurious to White Potatoes, Dr. Headlee,	135
Insects, Report on, Dr. Headlee,	229
Irrigation, Seabrook on	211

L.

Land and Irrigation Exposition—Report on, Blake,	150
Lime, Reduced Freight Rates,	202

M.

Motor Vehicles, "Automobile Legislation," Lippincott,	55
---	----

O.

Officers and Board of Directors of State Board,	5-8
Officers Elected,	201

P.

Poultry Matters, Secretary's Report on,	24
Diseases of Poultry, Hadley,	69
The Industry in the United States, Lewis,	81
Parcel Post, President on,	130
Collins on,	28
Potatoes, "Production from Experience," Twitchell,	140
Diseases Affecting, Cook,	155

R.

Report of—Executive Committee,	14
Secretary,	17
Food Supply,	18
Farm Wages,	20
Feeding Stuffs Law,	21
Boys' Corn Growing Clubs,	22

	PAGE.
Crop Yields and Values,	23
Statistical Tables,	25
Questions on Farm Life and Education,	26
Treasurer,	17
Auditing Committee on,	124
Transportation and Freight Rates, Collins,	27
Rules of Interstate Commerce Commission,	28
Horse Breeding in New Jersey, Minkler,	29
Type of Horse Required,	30
Breeders' Associations Organized,	32
N. J. Horses at Live Stock Show in Chicago,	35
E. B. Voorhees' Agricultural Society,	53
Extension Department Recommended,	54
Commission on Tuberculosis in Animals,	163
Tables of Record,	164
Committee on Resolutions,	202
Committee on Exhibits,	209
State Entomologist,	229
Certificates Granted for 1912,	229-231
Nursery Stock from Foreign Countries,	231
Gypsy and Brown-tailed Moths,	232
Bee Disease Control,	234
Plant Pathologist,	236
Nursery Inspection Certificates Issued,	237
Inspection of Imported Stock,	238
Chestnut Bark Disease,	239
State Grange,	49
Credential Committee,	162
Resolutions and Motions on—	
Exhibit for Next Annual Meeting,	202
Reduced Freight on Lime,	202
Motor Vehicles,	202
Transportation of Children to School and Medical Inspection, ..	203
Cost of Gasoline,	208
For Favorable Tariff Legislation, Denise,	166
S.	
State Board of Agriculture Law, Revision of, Frelinghuysen,	132
Schools, Problems of Rural, Kendall,	216
State Grange Officers,	241
Statistical Table of Farm Crops,	254

CONTENTS.

283

T.

	PAGE.
Treasurer Rider's Report,	17
Auditing Committee on,	124
Tables of Farm Crops,	25
Poultry Feeds, Hadley,	80
Poultry Values and Increase, Lewis,	82
Feed Mixtures I, II, III,	89

W.

Weather Bureau, U. S., Moore,	222
-------------------------------------	-----

NEW JERSEY STATE LIBRARY