NINTH ANNUAL REPORT

OF THE

PENNSYLVANIA

DEPARTMENT OF AGRICULTURE

1903.

WM. STANLEY RAY,
STATE PRINTER OF PENNSYLVANIA.
1904.
PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

OFFICIAL LIST.

N. B. CRITCHFIELD, Secretary.
Stoyestown, Somerset County.

A. L. MARTIN, Dep't Sec'y and Director of Farmers' Institutes,
Enon Valley, Lawrence County.

M. D. LICHLITER, Chief Clerk.
Allegheny.

E. C. FIRST, Stenographer.
Harrisburg.

GEORGE F. BARNES, Messenger.
Rossville, York County.

B. H. WARREN, Dairy and Food Commissioner.
West Chester, Chester County.

O. D. SCHLOCH, Assistant to Dairy and Food Commissioner.
Hamburg, Berks County.

MAY V. RHONE, Clerk, Dairy and Food Commissioner.
Centre Hall, Centre County.

ROSS R. SEAMAN, Messenger, Dairy and Food Commissioner.
Harrisburg.

H. A. SURFACE, Economic Zoologist.
State College Centre County.

G. G. HUTCHISON, Clerk, Economic Zoologist.
Warrior's Mark, Huntingdon County.

LEONARD PEARSON, State Veterinarian.
Philadelphia.

1—6—1903
To His Excellency, SAMUEL W. PENNYPACKER, Governor of Pennsylvania:

Sir: In compliance with the requirements of the act of Assembly creating a Department of Agriculture of Pennsylvania, I have the honor herewith to submit my report of said Department for the year 1903.

CROP VALUES.

The year just closed has been a fairly prosperous year for the farmers of the State. The total value of the cereal crops produced during the year is estimated to be $63,663,082, the value of the several distinct grain crops being as follows: Corn, $25,905,153; wheat, $20,570,371; oats, $12,795,659; rye, $3,568,46; buckwheat, $2,663,180 and barley, $105,873. Some of the other crops produced during the year are estimated as follows: Hay, $52,675,083, potatoes, $13,775,112, and tobacco $1,642,207, making the total value of farm crops, exclusive of live stock, dairy products, poultry and other products of the animal industry of the State, as well as all kinds of fruit, $133,695,484.

ANIMAL INDUSTRY.

The value of the products of the animal industry of the State is more difficult to estimate. The remarkable development in recent years of the live stock industry in the states west of the Missouri river has done much to diminish the live stock production of this.
as well as other eastern states. The Pennsylvania farmer has not been able to compete with his western neighbor, whose location enables him to carry his live stock of all classes through the entire year without the necessity of providing shelter for them and with very little feed, other than the dried Buffalo grass, which they gather for themselves and on which they become almost as well fitted for market as the grain-fed stock of the east. Although the amount of live stock raised in the State is, for the reason mentioned, not as large as our extent of territory would seem to indicate that it should be, the industry is still one of importance and decided progress is being made in the quality of the stock produced. Horses, cattle, sheep and swine are being more carefully bred than formerly. The importance of our dairy industry has led to the careful breeding of dairy stock, and at the present time many herds of exceptionally fine cattle of most prominent dairy breeds may be found in the State. The live stock in the State at the close of last year was estimated as to numbers and value as follows:

<table>
<thead>
<tr>
<th>Animal</th>
<th>Number</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horses</td>
<td>578,247</td>
<td>$147,055,151</td>
</tr>
<tr>
<td>Mules</td>
<td>37,035</td>
<td>3,386,185</td>
</tr>
<tr>
<td>Milch cows</td>
<td>1,044,625</td>
<td>32,947,472</td>
</tr>
<tr>
<td>Other neat cattle</td>
<td>1,000,000</td>
<td>14,000,000</td>
</tr>
<tr>
<td>Sheep</td>
<td>11,333,437</td>
<td>3,850,625</td>
</tr>
<tr>
<td>Swine</td>
<td>1,000,600</td>
<td>10,000,000</td>
</tr>
</tbody>
</table>

Making a total valuation of $211,239,433.

A few Pennsylvania farmers have undertaken the raising of Angora goats, but as yet the interest in Angoras is not large enough to attract attention to their production as one of the distinct animal industries of the State. With the large areas of land in the mountain regions of the State from which the timber has recently been removed, that is especially adapted to the production of the kind of browse suited to these animals, there is every reason to believe that the Angora will, in the near future, occupy a much more prominent place in Pennsylvania than it does at present.

**EVIDENCES OF IMPROVEMENT.**

The best way to determine whether the agriculture of our State is in a more flourishing condition at the present time than it was at any given time in the past, is to compare results. The comparison should not be for too short a period. Therefore, take the figures given in the Eleventh U. S. Census Report, showing the total production of some of the leading farm crops of the State in the year 1889. Placing these figures by the side of those given in the Crop Reporter, issued by the U. S. Department of Agriculture,
giving the total production of the same crops for the year 1903, we have a showing which points to a very decided improvement made during the intervening fourteen years.

The figures given for the two years named showing the production of some of the principal crops, are as follows:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Bushels in 1899</th>
<th>Bushels in 1903</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>65,447,636</td>
<td>42,318,279</td>
<td>33,129,357</td>
</tr>
<tr>
<td>Wheat</td>
<td>39,283,444</td>
<td>21,726,489</td>
<td>17,556,955</td>
</tr>
<tr>
<td>Rye</td>
<td>3,748,325</td>
<td>3,722,616</td>
<td>25,709</td>
</tr>
<tr>
<td>Buckwheat</td>
<td>4,101,218</td>
<td>2,001,717</td>
<td>2,099,501</td>
</tr>
<tr>
<td>Irish potatoes</td>
<td>22,217,925</td>
<td>12,369,315</td>
<td>9,848,610</td>
</tr>
</tbody>
</table>

The only one of the leading cereal crops for which a larger yield is reported in 1899 than in 1903 is oats, the production being 1,091,501 bushels less in 1903 than in 1889.

Another evidence of improvement in the condition of our agriculture, is found in the improved condition of the Pennsylvania farm home. Our State has always been noted for its fine farm buildings; but it is only within recent years that a general movement has been made in the direction of introducing into the farmer’s home the modern improvements that add so much to the comfort of its inmates. Much of this improvement, no doubt, has resulted from the discussion of questions relating to the home at our Farmers’ Institutes; but while the institute lecturers have directed attention to the importance of this subject, the improvements could not have been made without the necessary amount of surplus cash coming into the farmers’ hands, with which to make them. In many sections of the State it has come to be no uncommon thing to find farm homes supplied with the same heating apparatus that is found in the larger towns and cities, while the water supply is so arranged as to provide hot and cold water for every part of the house where needed, making the bath-room and inside toilet practical attainments.

I shall not attempt to enlarge upon the evidences of improvement in recent years in the agriculture of our State; but before leaving this subject, I wish to call attention to one more mark of improvement, which is, the advanced high character of the farm literature of the State. The literature relating to any subject will, to a very great degree, correspond with the condition of the class, association or people in whose interests it is published. It must
necessarily be somewhat in advance of the class it is intended to benefit, without which it could not be a leader of thought, but its advancement will be largely regulated by the progress that is being made by the people it represents and in whose interest it is published. It gives me great pleasure to speak of the superiority of the agricultural papers published in Pennsylvania, and, believing the proposition just stated to be correct, the pleasure is greatly enhanced by the thought that this excellence is at least partially due to a call that comes as the result of better training and better conditions that are to be found upon the farms and in the farm homes of the State.

WORK OF THE DEPARTMENT.

The Department of Agriculture has a large field to cover and its officers and agents have been kept busy during the year with the many duties with which it is entrusted. The regular routine work carried on under the special direction of the Secretary, consisting of Special Examinations, Nursery Inspection, Inspection and Analysis of Fertilizers, Concentrated Feeding Stuffs, etc., together with the publication of bulletins of information, has gone forward in regular order during the year, each item receiving attention at its own appropriate time.

The work of collecting samples of various kinds of Concentrated Commercial Feeding Stuffs found upon the market for analysis was placed in the hands of Mr. Enos B. Engle, who is one of the regularly employed agents of the Department. As Mr. Engle is a practical pomologist, part of his time is devoted to nursery inspection, a work which has been assigned to the Division of Economic Zoology. The season during which the inspection of nurseries must be made in order to be effectual being too short to enable one man to cover the entire State within the period, the services of Professors Geo. C. Butz and W. A. Buckhout, both of whom are connected with the Pennsylvania State College, were secured and they were assigned to the Division of Economic Zoology to assist in this special work.

The period during which samples of Commercial Fertilizers may be secured is necessarily limited to the short time immediately preceding the spring and fall seeding, at which time they may be found in the warerooms of selling agents and upon the farms where they are to be used. To accomplish this work in the short time that could be given to it, the State was divided into twelve sections and an agent was employed for each section. By this means the entire State was gone over in about one month, and six hundred more samples were taken than were ever before taken in a single year.

The acts of Assembly of 1879 and 1901 regulating the manufacture and sale of commercial fertilizers has proven of inestimable value
to the farmers of the State. The cost of such fertilizers used annually in Pennsylvania reaches several millions of dollars, and without the means provided by law to detect fraud, the temptation to unscrupulous men to place upon the market goods of inferior value would no doubt lead to very great abuses. It is unfortunate that a few farmers seem to think that a law requiring a certain fee to be paid by the manufacturer for the privilege of placing each brand of goods that he makes upon the market, adds to the cost of the fertilizer the farmer buys, without securing to him any substantial benefit, and that as a result of this view attempts are sometimes made to get manufacturers to prepare for them special mixtures, for which the manufacturer has filed with this Department no guaranteed analysis and which he has no right under the law to make or sell. It should be remembered that the license fee paid by the manufacturer goes for the payment of the expenses of collecting samples and having them analyzed, so that the character of the goods may be made public and that the prosecution of the manufacturer, if his attempt to defraud is apparent, may follow. If the manufacturer sells but one hundred tons of any given brand, the fee paid amounts to fifteen cents per ton, and if he sells five hundred tons the fee amounts to but four cents. Surely, if this were rightly understood by all, even though the fee were paid by the farmer directly, no complaint would be offered at having to pay so small an insurance fee for the amount of protection secured. Every farmer should interest himself in seeing, so far as he may be able, that the manufacturer observes the requirements of the law.

The official connection of the Secretary with the State Live Stock Sanitary Board has added a considerable amount to the personal work he has had to perform during the year. The leasing of a farm upon which to continue on a larger scale the investigations that have been in progress relating to the immunizing of cattle against tuberculosis, the stocking of said farm, the repairs of buildings and adapting them to the special uses to which they have been applied, together with the purchase of farm implements, the employment of labor and directing the same, have all received the attention of the Secretary, in conjunction with the State Veterinarian. A more complete account of this work is given in the State Veterinarian's report.

In the latter part of the month of April, I received from Mr. A. L. Loop, of North East, Pa., a section of the State where grape culture is one of the chief industries, the following letter:

"North East, Pa., April 21, 1903.

"Hon. N. B. Critchfield, Harrisburg, Pa.:

"Dear Sir: Last fall at a meeting of grape growers of this section, Mr. R. S. Pierce, of this place, and I, were made a committee to see what could be
done in the way of getting State aid to carry on experiments and give grape growers instruction in the way of preventing grape rot and controlling injurious insects, etc.

"We drew up petition to Legislature and secured names of five hundred or so people directly interested in the matter. We had bill drawn up and introduced by our Senator, Mr. Sisson, appropriating $8,000.00 for the work. This passed the Senate without opposition. Mr. Pierce and I made trip to Harrisburg and appeared before Committee on Appropriations with Senator Sisson and Rev. F. N. Thorpe (a large grower here), and Prof. Jno. F. Hicks, who has had charge of this work in Ohio for some years past. The committee * * * gave a negative recommendation. We are utterly at loss to understand why this was done, as this is a thing of great importance to thousands of people in this section.

"I enclose a copy of statistics that we got together to use before committee and others who might be interested. We can give you our assurance that every statement made therein is true to our personal knowledge. Cannot you with your Department do the work for our growers that Ohio does for their growers? Send an expert here. I have only from 10 to 12 acres. I do not need any instruction or example as to what to do, neither does Mr. Pierce, although he has about one hundred and fifty acres in grapes. There are, however, hundreds of others who do need a practical illustration, growers who have 10 to 50 acres each, to whom the loss of two or three crops will mean less of their farms, homes and savings of a lifetime. Rot has appeared in every vineyard in the county the past season and in west end of county it has made total loss of crops. You of course know if anything is to be done, work must be begun in three weeks or so.

"I hope your Department is in a position to take it up. Others will probably write you. Prof. Hicks will, I know, be glad to give you pointers that his experience with the trouble in Ohio has brought him; his address is Wooster.

"Very respectfully,

"A I. LOOP."

To this letter I responded as follows:

"Harrisburg, Pa., April 28, 1903.

"A. I. Loop, Esq., North East, Penna.:

"Dear Sir: Your letter of the 21st instant is before me. I think I shall be able to arrange to come to North East in company with Prof. Surface of this Department, and one or more specialists in the line of Horticulture about Tuesday of next week (May 5th), to meet some of your people and see what can be done to help you. Can you arrange for a place of meeting, and have as many of your grape growers as convenient meet us? If you can, let me know at once, and I will wire you about calling meeting.

"Very truly yours,

"N. B. CRITCHFIELD,

"Secretary of Agriculture."

I at once wrote to Prof. Geo. C. Butz, botanist of the Pennsylvania Experiment Station, and to Prof. John F. Hicks, assistant botanist of the Ohio Experiment Station, to whom Mr. Loop referred in his letter, asking them to meet me at North East, Pa., on May 5th, at the same time directing that a meeting of grape growers
to call at that place and date. At this meeting the vineyardists who were present gave as full a description of the insects and diseases that were the cause of their loss as they were able to give, from which the specialists had with me had no difficulty in determining the nature of the trouble. Prof. Surface at once undertook to look after the destructive insects, and an arrangement was subsequently made with Dr. H. P. Armsby, Director of the Pennsylvania Experiment Station, whereby it was agreed that the work of relief given to the grape growers should be divided between the Experiment Station and this Department, the station taking charge of the fungous diseases, and the Economic Zoologist of this Department, the insect pests. Fortunately for this Department the insects did not appear in such quantities as to make any very serious trouble.

In order to satisfy myself as to the result of the treatment given the vineyards, I visited them during the season when the grapes were being gathered and found the treatment to have been most successful. A very great saving was secured to the vineyardists for the present year, and at the same time such an object lesson was given in methods of treatment as will enable them, in the future, to successfully combat the adversaries with which they must contend. Following is a letter from Prof. Butz, giving a full account of the work that was done:

"State College, Pa., November 15, 1903.

"Hon. N. B. Critchfield, Secretary of Agriculture, Harrisburg, Pa.:

"Dear Sir: The spraying operations in the vineyards of Clinton county, which were the outcome of the conference you arranged for at North East, Pa., on May 5, 1903, have been concluded with the most satisfactory results. The problem of the injurious insects was assigned by you to the Economic Zoologist, but as the insects did not appear in threatening numbers this season, nothing was called for along that line. The spraying proposes to protect grapes against the destructive attack of fungous diseases were under my direction and were carried on in several vineyards. I can now report that the vineyardists are well pleased with practical benefits which may be derived from the proper use of fungicides upon grapes. In the sprayed vineyards of 50 acres of Mr. Z. Rogers, not a single rotted berry could be found at the time of harvesting, while in a neighboring vineyard, not sprayed, from 25 per cent. to 50 per cent. of the crop was ruined. Messrs. Crawford Bros., of North East, Pa., who sprayed their 50 acres of vineyard, as well as other vines, have placed the value of their spraying operations of the past season at $30.00. Many vineyardists who had no faith in spraying last May are now making preparations to spray next season.

"The detailed report of the operations will appear in an early bulletin of the Experiment Station.

"Very truly,

"GEO. C. BUTZ."

DISCOURAGING FEATURES OF THE YEAR.

Among the discouraging features with which the farmers of the State had to contend during the past year, I may mention, first,
an unusually cold summer, with conditions unfavorable to crop production. The season was especially unfavorable for corn. Immediately after the planting season there was in most parts of the State a long continued period of drouth, that prevented the prompt germination of the seed. In many places corn did not come up until this dry period was past, when it was too late to mature in time to be harvested before the winter set in, and, as a result, a great deal of corn remained in the field during the first months of winter, and even now in mid-winter, there is much still standing out. In some localities the wet weather, which set in later, interfered with the cultivation of corn, thus causing the crop to fall short of what it otherwise would have been. The continued precipitation during the season for harvesting wheat and making hay was, in many sections, the cause of great loss, and it is a matter of surprise that with these conditions prevailing, the crop reports are as favorable as they are.

The second discouraging feature worthy of mention was the failure in so many localities of orchard fruits. While in some sections of the State, especially in the southeastern counties, the apple crop was abundant, in other localities the late spring frosts destroyed the crop entirely, and the peach crop, which, in recent years, has become quite important, was much below the average all over the State.

Another source of great discouragement to our fruit growers, and one that needs to be met with resolute and persistent treatment is the presence of the San José Scale in almost every locality of the State. It is unfortunate that this Department does not have the means to render the fruit growers of the State the aid they need in combatting this foe. Without united action on the part of the land owners upon whose premises shrubs or trees that are infested, or that are liable to be infested, with this destructive pest are growing, the fruit producing industry of the State is destined to be greatly injured. It is gratifying to know that in some localities farmers and orchardists are organizing for systematic warfare against this dangerous enemy, and it is to be hoped that the example of such will be followed by others, until such organizations may cover the entire State. The Economic Zoologist of this Department is doing all in his power to assist in this conflict in localities where the people have taken up the fight and to lead it in other places where fruit growers have not been aroused to a sense of the danger to which they are exposed; but without the assistance that we trust the next General Assembly will give us, we cannot hope even to hold our own in the struggle, and much less may we hope for permanent success.
The correspondence of the Department has grown to very large proportions, a fact that I think shows that farmers are appreciating more and more the work that the State is doing, through the Department, in their behalf. Much of the correspondence goes direct to the heads of the several Divisions, to which it properly belongs. Requests for literature published by the Department are answered by the clerks, and there is still left a large amount which comes to the Secretary's desk, much of which has no very direct relation to agriculture, but contains inquiries that are matters of interest to farmers in other directions, and that, therefore, are entitled to receive attention.

AGRICULTURAL ASSOCIATIONS.

The work done during the year by the various agricultural associations of the State has been very helpful. At the meetings of these associations questions relating to the several farm industries of the State are discussed by practical men. Many excellent papers are read, upon topics interesting to farmers, whereby the farm literature of the State is greatly increased. On account of the value of these papers and discussions to the agriculture of the State, it is the policy of the Department to render these associations all the assistance it is able to give, and appropriations have been made during the year from the limited funds at the disposal of the Secretary to aid in defraying the expense of such meetings and the publication of their proceedings. The annual meetings of these associations are usually held in the first months of the year and the reports made of the work done are in reality reports for the preceding year. It has been the custom of this Department to publish such portions of the proceedings of these meetings as have been heretofore published with its Annual Report, as a part of the report for the year in which the meetings were held. This, it seems to me, is not as it should be. For example: The last Annual Meeting of the Pennsylvania State Board of Agriculture was held on the 27th and 28th days of January, 1904, but the reports of the officers, consulting specialists and standing committees were made for 1903 and related to work done during that year. It is evident, therefore, that whatever report is published of that meeting should be made a part of the report of the work done in 1903. To withhold it for an entire year and then publish, would be to allow much of the matter it contains, especially in the way of suggestions for improvement, to lose its value. With this view, such portions of the reports of these associations as it is thought proper to embody in the report of this Department, are included in the present report.
As a result, it will be seen that in some instances the report of the proceedings of two annual meetings of the same body or association appear.

PUBLICATIONS, ETC.

The regular publication of bulletins of information has been kept up during the year. In addition to the monthly and quarterly bulletins issued from the Dairy and Food Division and the Division of Economic Zoology, fourteen miscellaneous bulletins have been published, as follows:

No. 108. The Hessian Fly in Pennsylvania.
No. 109. Tabulated Analyses of Commercial Fertilizers.
No. 110. Containing Statement of Work of Dairy and Food Division from July 1st to December 1st, 1902.
No. 111. Small Fruits, their Origin, Culture and Marketing.
No. 112. List of County and Local Agricultural Societies.
No. 113. Methods of Milking.
No. 114. Tabulated Analyses of Commercial Fertilizers.
No. 115. Proceedings of Annual Meeting of Farmers' Institute Managers and Lecturers.
No. 117. Potash Fertilizers—Sources and Methods of Application.
No. 118. Containing the Law Creating the Office of Dairy and Food Commissioner in Pennsylvania, and also a Digest of the Acts of Assembly Committed to his Administration.
No. 119. Tabulated Analyses of Commercial Fertilizers.
No. 120. The Apple-tree Tent Caterpillar.

The demand for agricultural literature is largely on the increase. Requests for the bulletins, as well as the Reports of the Department, come from every state and territory of the Union, including our recent annexed provinces. Such requests come also from all countries in Europe, from Australia, China, Japan and from Brazil, Uruguay and other countries of South America. Requests for literature of the Department come from all sections of Canada, nearly every week. To meet this demand, about 60,000 bulletins were mailed during the year 1903, exclusive of the regular monthly and quarterly bulletins already referred to.

In response to a call made by the Executive Officer of the Louisiana Purchase Exposition Commission, the Department has undertaken to prepare for the exposition an exhibit of birds, mammals, insects, etc., which will show their economic relation to agriculture. The investigation necessary to be made in order to prepare such an exhibit, as well as the work to be done in its preparation, were placed in the hands of the Economic Zoologist, who is, at the time
of this writing, carrying forward the work as rapidly as is possible with the many other duties pressing upon him. The collection that is being made will be returned from the Exposition to be placed in the contemplated agricultural museum in the new Capitol Building, if the efforts to establish such museum shall prove successful, and so will be of permanent value to the State.

The Executive Officer of the Exposition Commission also requested the Secretary to write an article on the Agriculture of Pennsylvania for a publication authorized by the Commission, entitled "Pennsylvania at the Louisiana Purchase Exposition," which book will be distributed gratuitously at the Pennsylvania Building at the St. Louis Fair. This request was complied with and as the matter contained in the article is pertinent to this report, it is here given in full:

AGRICULTURE OF PENNSYLVANIA.

Persons unacquainted with Pennsylvania are liable to underrate her position and rank as an agricultural state. The fact that she stands first among the states of the Union in the production of iron and coal and second in the value of her manufactured products, naturally leads to the conclusion that but little attention is given to agriculture. Instead of this being true, the thrift of the Pennsylvania farmer is proverbial, and the extent and variety of the crops grown in the "Keystone" State give her a very high rank as an agricultural state.

A number of ridges or mountains cross the State, diagonally, from the southwest corner to the northeast boundary, which favorably affects the climate of certain sections of the State and renders a failure, in farm crops, a thing almost entirely unknown. The soil in the extreme southwest portion of the State is particularly well adapted to the growth of grass. The pasturage of this section is almost equal to the famous Bluegrass region of Kentucky, and, as a result, the farmers of this section turn their attention largely to raising live stock. Many fine cattle, annually, go from these southwestern counties into the coal and coke regions of the western part of the State, where they find an excellent market. Sheep and wool are also numbered among the staple products of this section. The wool products of Greene and Washington counties, alone, in 1900, amounted to 3,008,390 pounds, valued at $631,761.90.
The soil of all the counties, west of the mountain ranges, is of excellent quality, producing fine crops of grass for pasturage and hay, as well as large yields of the chief cereal crops grown in this latitude. Except in sections around Pittsburg, and some of the other leading manufacturing towns in the western part of the State, general farming is usually practiced. While this is the rule, like all general rules, it has its exceptions, and a number of farmers in these western counties are beginning to specialize. Prominent among the specialties receiving attention is the dairy industry. Many fine herds of dairy cows may be found in these western counties, yielding a profitable income to their owners. Many cattle, sheep, hogs and horses are raised in this section that find a ready market in the manufacturing and coal towns that abound in the western and southwestern portions of the State. The extreme northwestern part of the State possesses special advantages as a fruit-growing section. The influence of the lake upon the climate is such that the fruit crops grown are rarely injured by the late frosts of spring or the early frosts of autumn so common in other portions of the State. The largest vineyards in the State are to be found here, and the grape-growing industry is a source of great profit to those who are engaged in it. Many carloads of grapes are shipped from this section every year. Peaches, plums, apples and other orchard and small fruits are produced here in great abundance and are sold for good prices at the city of Erie and other points near home. From Erie county eastward along the New York boundary, conditions are much the same that are found in the western part of the State, except that the country is somewhat more elevated and portions of it quite mountainous. But even upon the mountains in this part of the State the soil is of good quality and seems to be especially adapted to the growth of grass. The leading farm industries in this northern tier of counties are dairying and stock raising. Large quantities of milk are shipped from these counties in refrigerator cars to the cities of New York and Philadelphia, while a number of creameries and many cheese factories are engaged in preparing the products of the dairy for market in a more condensed form. The valleys near the center of this northern boundary are well adapted to the growth of tobacco, and wherever planted excellent fields of this valuable crop are produced.

The eastern border counties of the State are not so uniform in their natural features and soil products as those last named. The surface of the northeastern counties is somewhat broken and mountainous, while the southeastern counties are comparatively level. In the northeastern section fine crops of grass, oats and barley are produced, as well as a considerable quantity of maize or Indian corn. Except in the valleys of this section Indian corn does not re-
receive the same attention that is given to other cereal crops. The principal reason for this is to be found in the fact that in the more elevated sections of the north the season is shorter and the cooler climate is not so well adapted to corn production, while other crops grow equally as well and, in some instances, better than in the lower lands of the south. General farming is practiced in these northern counties of the east boundary with many exceptions in favor of dairying.

The southeast section of the State or southern counties of the eastern border, possess a climate adapted to the production of all the crops grown in this latitude with equally favorable soil conditions. The vicinity of these counties to the city of Philadelphia has much to do in determining the kinds of crops to be grown or the distinct branch of the farming industry to which their population shall turn their attention. The immense milk supply required to meet the wants of this great city gives the milk dairy a very prominent place among the farmers of this section, and some of the most finely equipped dairies to be found anywhere in America are located here. Truck farming, or market gardening, is also very profitable in this section, and large areas of farm lands are devoted to this industry, while other farmers, with equal success, turn their attention to fruit growing, making a specialty of small fruits. The counties along the southern border of the State are also quite different in their natural features. Going west from the neighborhood of Philadelphia along the boundary, the country for a distance of about one hundred and twenty miles, presents an unbroken appearance. The slight elevation of this section and its location immediately east of the Appalachian Mountains, which favorably affects the climate, together with an exceedingly rich limestone soil make it one of the best farming sections to be found anywhere upon the American continent. The principal grains grown in this section are corn and wheat. Tobacco is also one of the staple products and as the quantity of tobacco grown in other parts of the State is limited, it is the large amount produced in this section that gives to Pennsylvania the distinction of being one among the first states of the Union in tobacco production. The animal industry of this section is also very important. Cattle, sheep and swine are among its farm products, while many cattle are shipped into this section from other points and are fed here for the Philadelphia and New York markets. From twenty to twenty-five thousand head of cattle are distributed every year to feeders from the stock yards of Lancaster city alone. Here, also, are to be found many finely equipped dairies, the dairy herds being composed of well-bred and well-selected stock and the dairy barns and other buildings being most complete in all their appointments.

The remaining counties of the southern border are more or less
broken, but in every one of them are to be found rich valleys where
fine crops of grain, grass and fruit are grown, and where the occu-
pants of the farm homes are prosperous and happy.

The interior counties of the State, in their soil and climatic condi-
tions, are so much like the border counties as to render a detailed
description, such as has been given of the border counties, unnec-
essary. Everywhere in the State, where proper care has been exer-
cised, the native and cultivated grasses grow luxuriantly. As a
result of the adaptation of the climate and soil to grass production,
hay is a never-failing crop. In 1903 the value of the hay crop
amounted to $52,675,083.00.

The principal grain crop grown in the State is maize, or Indian
corn. While the high altitude of some portions of the State render
the seasons too short for profitable corn growing, the peculiar
adaptation of other sections to its growth causes the State to
average well as a corn-producing state. The rich sections known
as the Cumberland, Lebanon, Lancaster and Chester valleys, in the
east; the Monongahela valley, in the west, and the Penns, Buffalo
and other smaller valleys in the central part of the State are ex-
ceptionally fine corn-growing sections, where large quantities of
this valuable cereal is grown, much of which is fed to live stock
upon the farms where it is produced, thus contributing to keeping
up the fertility of the soil in these naturally rich valleys, and, at
the same time, yielding a fair income to the farmer. The corn
crop of the State in 1903 amounted to 45,447,636 bushels, valued at
$25,965,153.00. The average production per acre was 31.2 bushels.

As a wheat-growing state, Pennsylvania possesses several ad-
vantages over some of the other states of the Union. As already
stated, the soil of the valleys is usually of that rich limestone type
that seems to be inexhaustible and, in many sections of the State,
where the land has been under cultivation for nearly two centuries,
crops are grown that surpass the crops grown in the virgin soil
of some other sections of the country. On the more elevated lands,
in the mountainous portions of the State, the snow covering af-
forded the growing crop during the winter prevents it from being
winter-killed, and the dry, cool air, incident to the increased alti-
itude, produces a quality of grain harder and richer in its good
flour-making qualities than can be produced under other conditions.
The quality of the flour made from the wheat grown upon the table
lands of the State, if properly manufactured, is but little, if any,
inferior to the flour made from the hard spring wheat grown in the
Red River Valley and other sections of the northwest.

The total wheat crop of Pennsylvania in 1903 amounted to 26,-
063,444 bushels, valued at $30,570,371.00. The average yield per acre
was 15.6 bushels, an average equalled by very few states of the
Union.
The third in value of the cereal crops produced in Pennsylvania is the oat crop. As if to create a fair average for all sections of the State, nature seems to have provided that in the portions of the State possessing the least adaptation to raising corn, oats shall grow luxuriantly. It is no uncommon thing to see large fields of oats, in some of the more elevated counties of the State, that yield from fifty to sixty bushels per acre. The very high value that oats possess as a feed for dairy stock gives to this grain a special importance in this State, where the dairy industry is so prominent. The total production of oats in the state in 1903 was 34,582,863 bushels, valued at $12,796,659.00. The average production per acre was 28.6 bushels.

Of the grain crops, next to the oat in value and production comes rye. Large quantities of rye are raised in the dairy sections of the State that is cut before ripening and fed as green roughage in the early part of the summer before other forage crops are sufficiently advanced for use. There are certain sections of the State that yield unusually large crops of this valuable cereal. Notably among these sections is the eastern slope of the Allegheny Mountains in the southern part of the State, where a red colored soil is found that seems especially adapted to the production of rye. The total number of bushels of rye raised in the State in 1903 was 5,746,535 bushels, valued at $3,562,346.00. The average production was 15.4 bushels per acre.

Another of the valuable grain crops grown in Pennsylvania is buckwheat. Everywhere upon the uplands of the State, during the mid-summer months, large fields may be seen covered with the beautiful white, sweet-scented bloom of growing buckwheat. Under favorable circumstances from thirty-five to forty-five bushels may be produced per acre. Until recent years the buckwheat crop was not counted among the money crops of the Pennsylvania farmer. What he needed for consumption in his own family was made into flour and the remainder of the crop was fed to stock. At the present time, however, the demand for the flour or meal is so great that with an equally great and yearly increasing demand for buckwheat middlings as a dairy food, the farmer whose soil and climatic conditions are favorable to its production, finds buckwheat to be a very valuable ready-money crop. The total yield of buckwheat in the State in 1903 was 4,161,213 bushels, valued at $2,663,180.00.

The last of the grain crops to be mentioned is barley. That so little barley is grown in Pennsylvania seems very strange to the writer. Years ago, when the only variety, of which we had any practical knowledge, was the heavily bearded; and when we had no means of harvesting except by cutting with grain cradle and binding

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by hand, there was some excuse for avoiding this crop on account of its being so unpleasant to handle. But with the excellent varieties of smooth barley, from which we may select our seed, and the improved harvesting machinery that we have at the present time, it seems strange that so little of this valuable cereal is grown. In the northeastern part of the State, where most of the barley grown in Pennsylvania is produced, the yield is but 33 per cent, less per acre than the yield of oats, while the price per bushel is 50 per cent, greater than that of oats. The total yield of barley in the State in 1903 was 18,959 bushels, valued at $165,873.00.

Another valuable farm crop that is extensively grown in Pennsylvania is the potato crop. Everywhere in the State the Irish potato yields well, while the quality produced is unsurpassed. In 1903 the total production of potatoes was 22,217,923 bushels, valued at $13,775,112.00. The average production was 91 bushels per acre.

During the last twenty-five years the business of producing vegetables and flowers in winter time, under glass, has grown to very large proportions. This business is conducted on small farms close to large cities. It happens, however, that in some purely agricultural districts, and particularly in the southeastern corner of the State, there is a large development of the business of producing vegetables under glass. On farms in this same section mushroom production is an important interest and quantities of this highly priced product is shipped daily during the season to the markets of all of the large eastern cities. The principal flowers that are produced are roses, carnations and violets. This business is still growing at a rapid rate and is becoming an important feature in the agriculture of Pennsylvania.

An article on agriculture of Pennsylvania would be incomplete that made no reference to the amount of maple sugar produced. Although the manufacture of maple sugar is limited to small areas, there is, nevertheless, a comparatively large amount made in the State. In recent years great improvement in methods is noticeable. The old-styled furnace, with its heavy cast-iron kettles, has disappeared and the galvanized iron evaporating pan, with furnace attached, has taken its place. By the improved methods, a better quality of both sugar and syrup is produced, and while there seems to be a decline in the annual production, owing to the fact that many farmers seem to think that greater profits can be realized by turning their sugar orchards into lumber and devoting the grounds to other purposes, there will, no doubt, remain for many years to come, farms on which these delicious luxuries are produced and from which those who are willing to pay a fair price may receive at least a limited supply. The total yield of sugar in the State reported for the year 1899, the last year for which we have any report, was 1,429,540 pounds.
Several references have already been made to the live stock industry of the State, but not in the specific manner that its importance demands. I shall, therefore, conclude this Report on the Agriculture of Pennsylvania by directing more particular attention to its live stock.

In the earliest days, Pennsylvania took high rank in horse production. While a large number of road horses were bred, the Quaker and Dutch settlers were more inclined to the production of horses of the highest utility, and so devoted themselves to breeding and improving animals for draft purposes. It resulted that the only definite strain of draft horses produced in the United States was originally and for a long time confined to Pennsylvania. These were the famous Conestoga horses and were used largely for hauling the heavy freight wagons carrying iron and merchandise between Philadelphia and Pittsburg. The rich limestone soil of the farms in the southeastern part of Pennsylvania prove to be admirably adapted to the production of horses with good bone and stamina. Later, less attention was paid to breeding draft horses, or, perhaps, it would be more correct to say that the attention of breeders was divided between draft and road horses, and at present many farms are devoted largely to raising light horses for racing, riding and driving. Some of the first Hackney stallions brought to the United States were brought to Pennsylvania farms, and these have made a decided impress on the character of the horses of some of the eastern counties. One of the largest horse importing farms in the United States, until a few years ago, has its headquarters in the northwestern part of the State of Pennsylvania, and through the draft horses and coach horses imported by this firm the horse stock of western Pennsylvania, and of other states as well, has been greatly improved.

A number of imported draft horses were brought into the southwestern part of the State about a half century ago, and from that time to the present the practice of bringing such horses into this section has been continued, and, as a result, some of the finest draft horses produced anywhere in America are still bred in the southwestern and southern part of the State, on the farms whose table lands and rich valleys border upon West Virginia and Maryland. To enumerate the trotting bred stallions that have been bred or have been used in Pennsylvania, and the high class harness horses that have been produced here, would be to catalogue many names best known to horse breeders.

While many horses are bred in the State it is, nevertheless, true that at the present time the farmers of Pennsylvania do not produce nearly so many horses as are needed to carry on the work of the State, and horses and mules are imported in large numbers from the west. There are, however, still sold in all the
eastern markets, and for exportation a large number of horses, classed as Pennsylvania draft horses. Many of these horses are western horses that have been fed and fitted for market on the farms of Pennsylvania. The feeding and fitting for market of horses is something that is understood to perfection by many farmers of this State. On the first of January, 1903, there were in Pennsylvania 578,247 horses, valued at $47,055,151.00, and 37,035 mules, valued at $3,386,185.00. Pennsylvania is practically the largest horse and mule consuming State in the country; that is to say, in connection with the vast industrial enterprises, mining, oil production and commerce of the State, more horses and mules are employed and used up than in any other state of the Union. It is interesting to note, in this connection, that, thanks to an efficient veterinary control, there is less of that baneful disease of horses and mules, glanders, in Pennsylvania than in any neighboring state and, so far as known, less than in any other state in the Union.

In the older days beef cattle were produced in Pennsylvania on a large scale, and some of the earliest importations of cattle of improved breeds were brought to Philadelphia and were used in neighboring counties. At present, however, and as a result of the growth of the larger centers of population, especially in the eastern part of the State, cattle are kept chiefly for dairy purposes, but the dairy interest in Pennsylvania is by no means new. As already stated, most of the land in large parts of the State is splendidly adapted to grass production and the growth of corn. The farms are well watered, a large proportion of them being supplied with cool spring water. This combination of favorable conditions led to early development along dairy lines, and for more than a century Pennsylvania butter has led the market, and, indeed, for much of that time, it has been almost the sole occupant of the highest class of this commodity. At this time, the dairy interests are developed to such an extent that Pennsylvania ranks second in milk production among the states of the Union. There were, in the State, in 1903, 1,044,625 milch cows, valued at $22,947,473.00, and there were also nearly a million other cattle valued at about fourteen million dollars. These great possessions in cattle give Pennsylvania a very high rank among the cattle-producing states and amply justify the great care exercised by the Commonwealth in protecting the health of members of these herds. In the parts of the State that are not favorably located for shipping milk to the cities, creameries and cheese factories are to be found, where the milk from the neighboring farms are taken and manufactured into a more condensed product. I have already alluded to the northern and northwestern counties of the State as those in which most of the cheese factories are located, while butter factories are to be found in considerable numbers in almost all the counties of the Commonwealth.
Sheep are not raised in Pennsylvania in large numbers except in a limited area in the southwestern part of the State, where they have been bred from the time of the first settlement of that region. This section has some of the best flocks of fine wool sheep in the Union and more recently has introduced flocks of long wool sheep. A year ago there were in the State 1,153,437 sheep, valued at $3,850,625.00. The production of early spring lambs has been carried on with great success in some of the eastern counties and for this purpose many flocks of sheep of mutton breeds are kept.

As would be expected in a State where dairying is so extensively carried on, the production of swine has for a long time been an important part of animal industry. One of the few original American breeds of swine, namely, the Chester White, was originated in Pennsylvania and has gone forth to improve the quality of swine in many distant states. There are, in the State, about a million hogs, valued at about ten million dollars.

In poultry production, Pennsylvania ranks fifth among the states of the Union, and with the increased attention to breeding poultry that has developed in recent years, there can be no doubt that it is destined to occupy, ere long, a higher relative position. As it is, Pennsylvania produces annually, poultry and eggs valued at more than sixteen million dollars, and this from less than twelve million fowls, valued at about five million dollars.

Pennsylvania was among the first of the states of the Union to avail herself of the benefits arising from the land grants provided by what is known as the "Morrill bill," which was passed in 1862. As early as 1855 she had established a school of agriculture in the center of the State, so that she was ready as soon as the opportunity came to accept the endowment provided by Congress and to begin to lay the foundation for one of the best industrial schools in the land. In this institution the science of agriculture has been taught for a number of years, and many of her graduates have gone out to accept positions in other states, where their knowledge of scientific agriculture has given them prominence as benefactors of the race. Under the encouragement of the intelligent farmers of the State, the General Assembly of the Commonwealth has, year after year, adopted a policy of increasing liberality towards this institution, and at the present writing there is in process of erection, as a part of the Pennsylvania State College, a building which, when completed, will cost $250,000, in which the science of agriculture shall continue to be taught and where young men who choose farming as their life-work, may so acquaint themselves with the laws that control in Nature's great laboratory as to enable them to understand not only why certain conditions are necessary to success, but how such conditions may be secured. Everywhere within the Com-
monwealth intelligent interest in agriculture is increasing and, although many of the farms in the State have been under cultivation for more than two centuries, the future promises much more for the agriculture of Pennsylvania than has ever been realized in the past.

CONCLUSION.

In closing this report, I desire to express my appreciation of the very efficient work that has been done by the heads of the several Divisions of the Department.

When I took charge of the affairs of the Department, I found the work well organized, each subject of special importance to the State having been assigned by my predecessors to the Division to which it properly belongs. The work of the Department has, in this way, been greatly simplified and the head of each Division, knowing what subjects are especially under his care, is able to give them closer study than they could otherwise receive. The work of every Division has been characterized by intelligent activity and the results secured during the year in every line has been very gratifying. Full information in regard to the specific work of each Division will be found in the reports of the heads of Divisions which are herewith submitted.

I have the honor to be,

Very truly yours,

N. B. CRITCHFIELD,
Secretary of Agriculture.
NINTH ANNUAL REPORT OF FARMERS' INSTITUTES FOR THE YEARS 1902-3.

Harrisburg, Penna., December 31, 1903.

To the Honorable N. B. Critchfield, Secretary of Agriculture:

Sir: I have the honor to present herewith the Ninth Annual Report of the Director of Farmers' Institutes.

The year's work has progressed satisfactorily. I have to report a greater number of days of institute than has heretofore been held in any one year within the State—three hundred and twenty-seven (327) days. The practice of assigning three instructors to attend each institute has been strictly adhered to. The wisdom of this course is fully vindicated by results which follow. Such is the demand amongst our progressive farmers for accurate information relating to the "Soil" which he cultivates; how to increase that great plant-growing quality, Nitrogen, and unlock the scarcely less important elements, Potash and Phosphoric Acid, and make available these combined fertilizers in such proportions as to increase fertility of the land, and at the same time increase the yield per acre, is one of the problems which agricultural science is analyzing for the farmer; hence, we assign to all our meetings one man versed in some line of agricultural science, in order that the farmer may avail himself of such knowledge and light as the chemist has developed within the last decade, which is a wonderful advantage to the farmer, who avails himself of it. Years of experience has fully taught us the importance of having the practical and experienced farmer and instructor attend all our institutes, for by continued years of actual work and experimenting upon the farm, his instructions are accepted as true, and generally adopted as rules of practice.

Pennsylvania, having a greater variation of soil, climate and altitude than any other state, her farm operations are more diversified; hence, no corps of institute lecturers would be complete, unless equipped with a specialist along some line of agricultural pursuits, such as dairying, stock breeding, poultry, horticulture, market gardening, swine breeding, sheep husbandry, bee-keeping, tobacco growing, etc. The specialist farmer is amply qualified to give instructions along certain lines as above mentioned. His example has been the means of lifting many a farmer out of the old rut, causing
him to centralize his efforts upon some special line of operation best suited to his soil, location and market surroundings. Thus we have these three: The scientist, the practical farmer and the specialist.

Did space permit, it would afford me great pleasure to speak of the qualifications of the different persons engaged as institute instructors. By reference to the appended list, a fair knowledge of their topics, standing and equipment for the work can be seen.

The following is a complete list of institute instructors, with their topics; also, brief biography, giving that part of their life devoted to the preparation for institute work.

GENERAL LIST OF LECTURERS, SPEAKERS AND ESSAYISTS, WITH THEIR SUBJECTS.

1903-1904.

BARBER, SPENCER F., Box 104, Harrisburg, Dauphin Co., Pa.
1. The Soiling System.
2. The Silo; How to Build One, and How and When to Fill It.
3. How to Put Milk on the Market in the Best Condition.
4. Proper Stabling of Cows.
5. Scientific Feeding of Live Stock.

S. F. BARBER was born in Union county, Pa., in 1855, was educated in the public schools and worked upon a farm until he was twenty-one. He then went into the mercantile business: 1877-8 was in the employ of the Buck Mountain Coal Company, in Luzerne county, as general manager of their company store, and in 1878-9 was in charge of the company store of the Stout Coal Company. Afterwards traveled in the west, particularly in Colorado, and then spent one year traveling for a dry goods firm in Philadelphia. In 1881 he settled down to farming, and has been engaged in that business ever since. His specialty is dairying, although he raises the general crops usual upon a Dauphin county farm.

BASHORE, DR. HARVEY B., West Fairview, Cumberland County, Pa.
1. Farm Hygiene.
2. Village Sanitation.
No. 6. DEPARTMENT OF AGRICULTURE. 25

DR. HARVEY BASHORE was born at West Fairview, Pa., July 31, 1864; attended Harrisburg Academy; graduated at Yale College 1886; graduated in medicine at University of Pennsylvania 1889, and spent three years in New York city studying hygiene and working in the various city hospitals; since then has been practicing medicine in West Fairview, a suburb of Harrisburg; was appointed inspector for the State Board of Health, and is the author of "Outline of Rural Hygiene."

BEARDSLEE, R. L., Warrenham, Bradford County, Pa.:  
1. How to Renovate an Impoverished Farm.  
2. How to Establish and Maintain a Dairy.  
3. Diversified Farming.  
4. Fodder, Corn, Silo and Silage.  
5. Producing Grass and Making Hay.  
6. Potato Culture.

R. L. BEARDSLEE, of Warrenham, Pa., was born in 1835, received a liberal academic education, and among the studies pursued, was a course in "Practical Agriculture." He began farming for himself at twenty years of age, as a dealer in cattle, and followed feeding and dealing in cattle until about 1864. He then included sheep in his stock business, and continued in this until the western trade reduced the profits, when he began dairying and put in forty cows. He has received as high as $1,000 for a single load of butter. He raises from 1,600 to 1,800 bushels of grain each year, and sells about 1,000 pounds of washed wool and 150 lambs annually, besides from 1,000 to 1,200 bushels of potatoes.

BLACK, W. C., Mercer, Mercer County, Pa.:  
1. Comparison of Beef and Dairy Types of Cattle for Beef Production.  
2. The Beef Breeds of Cattle.  
3. Raising the Calf.  
5. Preparation of the Soil for Successful Crop Raising.

WM. C. BLACK was born in Mercer county, Pa., in 1843. He was educated in common schools, and at Westminster College. A soldier in the war of the rebellion; a teacher in common schools, and a farmer in his native country, where he breeds short horn cattle, Shropshire sheep and Berkshire swine. For fifteen years he exhibited his cattle at the principal fairs in Western Pennsylvania, with a good degree of success. Since the organization of the Pennsylvania Live Stock Breeders' Association he has been chairman of its committee on fairs. By appointment he was a member of the Columbian Exposition World's Fair Congress.

BOND, M. S., Danville, Montour County, Pa.:  
1. History of Discovery and Culture of Potatoes.  
2. Benefits Derived from Farmers' Organizations.  
4. The Farmers' Garden.  
5. Feed and Care of Milk Cows.  
6. A Country Home; What it is.
7. Intensity in Farming a Necessity.
8. My Experience with Commercial Fertilizers and How to Buy.
9. How We Can Keep the Girls on the Farm.

M. S. BOND was born on a farm in Montour county, Pa., February 26, 1834; lived and worked on a farm until eighteen years old, then taught school seven years, then was employed as freight and passenger conductor for nine years, and traveled as lost freight and car tracer and purchasing agent for the Delaware, Lackawanna and Western Railroad Company for five years. Has been for over twenty-five years engaged in farming and market gardening; during a part of this time, engaged in breeding and raising blooded Jersey cattle and still keeps some of the best in the State; has made the raising of potatoes by the thousands of bushels a specialty for twenty-five years; has been and is now using more fertilizer to the acre than any man in his county, and is now making gardening a specialty.

BRODHEAD, C. W., Montrose, Susquehanna County, Pa.;
1. Horseshoeing and Anatomy of Foot and Leg, with Specimens. (45 minutes.)
2. Care of Horses' Feet and Teeth, with Specimens. (40 minutes.)
3. Some Things Every One Should Know who Owns or Handles a Horse. (30 minutes.)
4. Zoology of the Horse; a Nature Study. (Illustrated with chart and specimens.) (30 minutes.)

C. W. BRODHEAD was born December 20, 1852, near White Haven, Luzerne county, Pa. He received a common school education; commenced to work in a horseshoeing and jobbing shop at 16 years of age; worked six years at the business before he knew anything about a horse's foot; then began to study anatomy and to dissect feet and legs, and has been a student of the best authors and in actual practice ever since; has one of the best libraries on animals and agriculture that can be had; is a registered specialist as a veterinary dentist and in animal castrations. He divides his time, in the shop, in the care of a ten-acre vegetable garden, and reading for general information; takes great interest in farmers' organizations, trying to elevate their calling.

BRUBAKER, A. L., Hogestown, Cumberland County, Pa.;
1. Potato Culture. (30 minutes.)
2. The Farmers' Home. (30 minutes.)
3. The Farmers' Education. (30 minutes.)
4. The Farmers' Account Book. (30 minutes.)
5. Other Crops. (A plea to the farmers' boy or girl.) (30 minutes.)

A. L. BRUBAKER was born on his father's farm in Lancaster county, Pa., in 1862. In 1871 the family removed to a farm near Mechanicsburg, Pa., where he worked during the summer and attended school in the winter until twenty-one years of age. He received a good common school education, which was supplemented by several terms at a select school. He has taught country
and village schools for fifteen terms, at the same time managing a farm and working on it in the summer. By close application he has built for himself a fine home, where he gives his attention chiefly to wheat and potato growing.

BURNS, J. S., Clinton, Allegheny County, Pa.:

1. Breeding and Care of Swine.
2. Sheep Husbandry.
3. Training the Colt to Harness.
4. Farmers as We Find Them.
5. The Farmer and His Wife.
7. The Farmer's Accounts.
9. Relation of Stock Raising to Farm Fertility.

J. S. BURNS was born February 22, 1847, on the farm he now owns, near Clinton, Pa. His father died when he was seven years old, and from that time until he was twenty-one he worked upon the farm as hired help, receiving his board and clothing, and attending the public schools in the winter. His education received a brief finish in Linnean Academy, at Clinton. He was married when twenty-one, and soon after bought out the other heirs, and from the farm made the money that eventually paid for it. He has kept strict account of every item of income and expense since he was twenty-one years old, and to this habit of careful accounting he attributes much of his success. He has had large experience in the breeding and care of all lines of farm stock; but during recent years has given more special attention to the breeding of Poland-China swine, and raising mutton lambs, together with the growing of all the different crops usually raised on a western Pennsylvania farm. He has had considerable experience as a correspondent upon agricultural topics, and for a number of years has taken an active part in the institute work of this State.

BUTZ, PROF. GEORGE C., State College, Centre County, Pa.:

2. Peach Culture.
3. Insect Enemies of Farm and Garden.
5. Botany of the Farm.
6. Agricultural Education.
7. Small Fruits.

GEORGE C. BUTZ was born in 1863, in New Castle, Pa.; his father was a nurseryman and florist. His education consisted of a common, though excellent, public school and later of a course through high school. After this he was graduated from the Pennsylvania State College, in the class of '83. This was followed by post-graduate studies, and two years' experience in the fruit districts of Southern California. Since 1887 he has had charge of the Horticultural work at the Pennsylvania State College and the State Experiment Station. For the past four years he has been one of the regular lecturers upon the State Institute force.
CAMPBELL, J. T., Hartstown, Crawford County, Pa.:
1. Construction of Poultry Houses and Fixtures. (25 minutes.)
2. Profitable Egg Production. (20 minutes.)
3. The Louse Problem.
4. Economic Methods of Maintaining the Productivity of the Soil.
5. Proper Physical Condition of the Soil, and How to Get It.
6. Gumption in and About the Farm Home.
7. The Farmers' Garden.

J. T. CAMPBELL was born in Springhill township, Fayette county, Pa., December 18, 1872; is the son of a prominent farmer; received his early education in the public schools of his native district; left the public schools with a more than average education, and at once took up the study of agriculture at home, while working on his father's farm; he studied carefully all leading books and journals of his day. Married in 1894, and took up gardening and poultry culture, and was successful from the start. When the Pennsylvania State College started its Correspondence Course in Agriculture, he took up the work and has since pursued same with diligence. Owns a large farm in Crawford county, upon which he has worked out many important agricultural problems; in poultry culture has been especially successful, having made it a subject of special study, together with soil physics. Keeps in close touch with the State Experiment Station and National Department of Agriculture; has written some for various agricultural and poultry journals.

CLARK, M. N., Claridge, Westmoreland County, Pa.:
1. The County Fair.
2. Buying and Care of Farm Implements.
3. Why the Farmer Should Belong to the Grange.
4. The Farm Journal for the Farmers' Home.
5. The Result of Eight Years Growing Swine.
6. How the Farmer Can Get a Practical Education.
7. The Up-to-Date Farmer.

M. N. CLARK was born near Export, Westmoreland county, Pa., July 16, 1848; received a good common school education, with several years at an academy and a full course at Duff's Commercial College, at Pittsburg; has always taken much delight in farming; is a close observer, and for many years has taken an active interest in agricultural affairs of his county; the cause of education has always found in him an earnest supporter; has been engaged in general farming from boyhood, except a few years spent in selling implements; was several seasons in the fruit-growing regions of the South, and there gained much information in the use of commercial fertilizers and fruit growing; has been a member of the State Board of Agriculture for many years, and at present is looking after the interest of his farm.

CONARD, DR. M. E., Westgrove, Chester County, Pa.:
1. An Inexpensive Up-to-Date Cow Stable.
2. How to Produce Pure and Wholesome Milk.
3. How to Grow and Care for Horses' Feet.
How shall we Replenish Our Dairy Herds.
Some Facts About the Care of Farm Teams.
Some Neglected Points in the Feeding of Calves.

COOKE, PROF. WELLS W., 1328 Twelfth Street, N. W., Washington, D. C.:

1. Economical Feeding of Farm Stock.
2. The Value of Farm Manure and How to Retain It.
3. The Effect of Feed on the Quantity and Quality of Milk.
4. Theory and Practice of Crop Fertilization.
5. Feeding from the Silo throughout the Year.
6. Forage Crops as a Substitute for Pasture.
9. Economy in Feeding the Farmer's Family.

WELLS W. COOKE was born in Massachusetts and educated at the public schools, the University of Iowa, Ripon College, Ripon, Wis., where he graduated in 1879, and the University of Vermont, in which latter institution he took a post-graduate course in chemistry. Had charge for four years of industrial farm schools in the west, and in 1886 was appointed professor of agriculture of the University of Vermont and director of the Vermont Experiment Station, holding both positions until 1893. During this time, for six years, had charge of the organizing and conducting of the Farmers' Institutes of the State. From 1893 to 1900 was professor of agriculture of the Colorado Agricultural College. The past two years has been connected with work of the Correspondence Course in Agriculture at the Pennsylvania State College.

COX, JOHN W., New Wilmington, Lawrence County, Pa.:

1. Soil Fertility and the Preparation of the Seed Bed.
3. Poultry Raising and Feeding for Profit.
4. Easiest and Most Profitable Way to Grow Potatoes.
5. Commercial Fertilizers.

JOHN W. COX was born near New Wilmington, Lawrence county, Pa., December 27, 1868; received a common school education and a course at Duff's Commercial College, Pittsburgh; has spent all his life on the farm; is a breeder of Jersey Cattle on his 200-acre farm, besides Barred Plymouth Rock poultry. Wheat, oats, corn, hay, and potatoes are his principal crops; is much interested in the education of the farmers' children, and is serving his third three-year term as school director; is pursuing the Correspondence Course of the Pennsylvania State College.
ANNUAL REPORT OF THE

CURE, Z. T., Jermyn, Lackawanna County, Pa.:

1. Production and Care of Orchards.
2. Corn Culture.
4. Potato Culture.
5. Education to the Farmer a Necessity. (25-30 minutes.)
6. The Handling of Sheep and the Production of Early Spring Lambs.
7. How the Raising and Early Training of Colts may be a Profitable Adjunct to General Farming.
8. The Proper Handling of Heifer Calves up to, and During the First Year of Maternity.

Z. T. CURE was born in 1848, and attended the public schools, including the city high school, until seventeen years of age, after which he taught school for five years, and has followed farming and stock raising ever since. His school training has been supplemented by extensive reading courses, which, by aid of free translations, covered the subjects taught in college courses, with the exception of higher mathematics. As sources of information on the topics which he discusses, he depends upon experience and observation, aided by Prof. L. H. Bailey, of Cornell University, in the domain of horticulture and kindred subjects, and Andrew S. Fuller on the propagation of plants, etc., and other publications of authority, together with a careful perusal of the best agricultural periodicals of the day and a studious consultation of the latest bulletins of the Experiment Stations. He has had considerable experience in the discussion of literary and scientific subjects before teachers' institutes, and has made a careful study of the topics chosen to present at Farmers' Institutes.

DETRICH, REV. J. D., Flourtown, Montgomery County, Pa.:

1. How to Keep Twenty Head or More of Dairy Animals on Fifteen Acres.
2. Eighteen Years' Experience in Soilin.
3. Sixteen Years' Experience with Wooden Silo.
4. Shall We Grow Crops on a Fifteen Acre Farm and no Fertilizer?
5. Feed, Breed and Care of the Dairy.
7. The Agricultural College and the Farmer.
9. The Small Farm vs. The Large Farm.
10. Bench, Book and Farm.

REV. J. D. DETRICH'S knowledge of agriculture as a science dates from 1882, since which time he has been availing himself of all the bulletins, magazines and books relating to soil, crops, dairying, breeding, feeding and rearing
of dairy animals. This, together with information furnished by the Colleges and Experiment Stations, he has put into practice, and the result has been a satisfactory and profitable system of intensive farming.

DRAKE, W. M. C., Volant, Lawrence County, Pa.:  
1. Preparation of the Seed Bed.  
2. Feed and Care of Farm Animals.  
3. The Value of Clover and How to Get It to Grow.  
4. Fruit Culture.  
5. Potato Culture.  

W. M. C. DRAKE was born on a farm near Volant, Lawrence county, Pa., August 16, 1860; was educated at public school and a Normal School in New Castle, Pa.; passed an examination for teaching; was interested in the Farmers' Alliance movement in Pennsylvania, being president of the county organization one term; was sent as a representative of the Pennsylvania State Alliance to the Labor Conference at St. Louis, February 22, 1892. All his life has been spent on the farm. For several years past has been in partnership with a brother conducting a market garden, together with handling fruit of 40 acres of orchard and farming 600 acres.

FOIGHT, JOHN G., Export, Westmoreland County, Pa.:  
1. The Farmer of To-Day.  
2. Small Fruits on the Farm.  
4. Farm Literature.  
5. Why Should Farmers Organize.  
6. Our Boys and Girls, the Best Products of our Farms. (15 minutes.)

JOHN G. FOIGHT was born on his father's farm in Westmoreland county, Pa., in 1842; was educated in the public schools and at Laird Institute, Marysville, Pa.; enlisted in company F, 204th Pa. Vols., August, 1864; discharged at close of war at Vienna, Va. He began farming for himself in 1868, and has been actively engaged at it ever since, with average crops about as follows, each year: 600 bushels wheat, 800 bushels oats, 1,200 bushels corn, 400 bushels potatoes, 100 tons hay, and ships to the city $1,600 worth of milk per year, from 12 to 14 fine shorthorn and Ayrshire cows.

FORNEY, DAVID P., Hanover, York County, Pa.:  
1. Corn.  
2. Common Sense in the Dairy.  
3. Limitation of Production in Agriculture.  
4. Farm Statistics.  
5. The Boy and the Farm.  
6. The Instructive Changes in Farm Life.

D. P. FORNEY was born in Hanover, York county, Pa., of Pennsylvania Dutch parentage. Educated in the common schools of Hanover and at Penn-
sylvania College, Gettysburg. Began farming forty years ago on a fifty acre farm, and now farming about two hundred acres and running a dairy of twenty-five cows and selling their milk on a retail route. Has been statistical agent for both State and National Department of Agriculture for more than thirty years and has been president of Farmers' Agricultural Association of Adams county, almost all the time since its establishment and is yet. During this time has spoken before agricultural associations of every sort almost every year, and has done a good deal of writing for the agricultural papers.

FUNK, DR. J. H., Boyertown, Berks County, Pa.:

1. Southern Versus Northern Apples for Pennsylvania.
2. Peach Culture. (30 minutes.)
3. The Commercial Orchard as a Business. (30 minutes.)
4. Pruning, Fertilizing and Thinning. (30 minutes.)
5. Cultivation Versus Mulching for Fruits. (30 minutes.)
6. Spraying; When, How and What For. (30 minutes.)
7. Small Fruit Culture. (30 minutes.)
8. Potato Culture. (30 minutes.)
9. The Birds and Insects as Friends and Foes, and How to Distinguish Them.
10. Soil Fertility; How to Get and Retain It. (30 minutes.)
11. The Family Garden. (30 minutes.)

Dr. J. H. FUNK was born March, 1844, and was raised on his father's large dairy farm in Montgomery county, Pa. At the age of 19 years he commenced the study of medicine. Graduated from the University of Pennsylvania in spring of 1865. After practicing a few years, became interested in fruit growing, and raising and sale of nursery stock. Planted a large orchard in 1879 but finding New York state varieties not suited to the latitude, visited the largest orchards in the different states, and in the spring of 1896 planted another large commercial orchard of several thousand trees, all of southern origin. He now has one of the finest orchards in the State. In his orchard an off-year is unknown.

GROFF, PROF. GEO. G., Lewisburg, Union County, Pa.:

1. Farm Hygiene. (1 hour.)
2. Dairy Hygiene. (1 hour.)
3. The Origin and Restoration of Soils. (1 hour.)
4. Weeds of our Farms. (30 minutes.)
5. Modern Life Built on Chemistry. (30 minutes.)
6. The Teachers Needed in our Rural Schools. (30 minutes.)

GEO. G. GROFF was born on a farm in Chester county, Pa., in 1851; was educated in the public school, Treemount Seminary and Michigan University. Taught in public school, West Chester State Normal School, and since 1879 in Bucknell University. Served in the Spanish-American War as Brigade Surgeon and under the military government, was Superintendent of Public Instruction in Porto Rico. Has been a member of the Pennsylvania State Board of Health almost since its organization. Is engaged in fruit growing and experimental agriculture. Dr. Groff has done much institute work, both at Teachers' and Farmers' Institutes.
HALL, HORACE H., Ellisburg, Union County, Pa.: 

1. Does the Silo Pay?  
2. Two Crops a Year for the Silo.  
3. Cement Stable Floors are Economic.  
4. Strawberries for the Home and for Market.  
5. How to Seed for Permanent Pasture.  
6. Dynamite; Its Uses on the Farm and How to Handle It.  
7. Farmer Telephone Line; How to Build and Maintain One.  
8. A Neglected Study in our Schools.  
9. How to Keep the Boys on the Farm.  
10. Our Greatest Duty as a Citizen.

HORACE H. HALL of the Triplet Oak Farm was born on a farm near Coudersport, Potter county, Pa., in 1853. He received most of his education in the common schools, though he attended the Emporium graded and the Coudersport high schools for a limited time. He received his first teachers' certificate when twenty and taught in the schools of Potter county for twenty years, mostly in the district schools, though he served as principal of the Galeton and Oswayo graded schools. When not engaged in teaching he worked at farming or in the lumber woods. At forty he turned his whole attention to farming, having bought 134 acres of bark slashing and woods, which he stocked with sheep while he was clearing and stumping, and in about ten years he has logged and stumped fifty acres, built substantial farm buildings, changed from a sheepman to a successful dairymen, and is a large producer of the finest strawberries.

HANTZ, PROF. J. M., Merrittstown, Fayette County, Pa.: 

1. Potato Culture.  
3. The Dairy Cow.  
4. Our Homes.  
5. How to Build up a Run-Down Farm.  
6. The True Idea of an Education.  
7. The Growing of Strawberries, Raspberries and Blackberries.  
8. Soil Moisture and Soil Culture.  

PROF. J. M. HANTZ was born in Westmoreland county in 1844; has had the advantages of a thorough college training, and has been a professor in different academies, colleges and universities for years. Having been reared on a farm and always feeling an interest in farm life, he has been, for the last twelve years, actively engaged in farming in an intensive way, following a three year rotation. He is interested in dairying and has made the dairy cow a special study; he has been a member of the State Board of Agriculture for many years and takes a deep interest in agriculture. Having thus had a practical knowledge of farm life since boyhood, he is prepared to talk to farmers from real and scientific knowledge as well as from actual experience.

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HARLAN, HON. A. D., Wenonah, N. J.: 

1. Alaska; Our Land of the Midnight Sun. (70 to 90 minutes.)
2. Hawaii and the Hawaiians; The Great Advantage the Islands are to our Nation. (60-90 minutes.)

ABRAHAM D. HARLAN was born in Chester county, Pa., September 3, 1833; educated in the public and private schools of the county; spent ten years on the farm; was a merchant for fourteen years; served in Christian Commission during the summer of 1862 at Fortress Monroe, Harrison Landing, Washington and Antietam; served in an independent company of cavalry and was first lieutenant of the 157th Regiment of P. V.; transcribing clerk of the House of Representatives, regular and special session of 1864; message clerk of the same body 1865, 1866 and 1867; assistant clerk of the Constitutional Convention of Pennsylvania, 1872-73; special clerk in the Internal Revenue Department for two years; assistant cashier of customs at the Port of Philadelphia for six years and one-half years; represented Chester county in the Senate for ten years and was Chairman of Agriculture for eight years; had charge of the Diplomatic Gallery of the United States Senate for four years; was special agent of the United States Treasury for two years in Alaska.

HARSHBERGER, J. W., Ph. D., Philadelphia, Pa.: 

1. Rusts of Agricultural Plants and How to Combat Them.
2. Accumulation of Soil Nitrogen.
3. The Role of Leguminous Plants in a Rotation.
4. The Roots of Plants and What They Teach.
5. Mosquitoes and How to Combat Them.
6. The Life History of a Dozen Weeds.
7. Smuts and Related Fungi.
9. The Botany of Maize, or Indian Corn.

JOHN W. HARSHBERGER, Ph. D., was born in Philadelphia, January 1, 1869. His early education was received in the public schools, terminating in his graduation from the Central High School of Philadelphia in 1888. He entered the University of Pennsylvania on a city scholarship, taking his B. S. there in 1892 and his Ph. D. in 1893, when he was made instructor in Botany, General Biology and Zoology, a position which he still holds. In addition Dr. Harshberger has studied at Howard University and at Berlin, Germany, and has traveled extensively for botanical purposes in Mexico, the West Indies, California, Maine and Europe, where he carefully inspected the several noted botanical institutions. Dr. Harshberger has been identified with the American Society for the Extension of University Teaching, the Pocono Pines Summer School, the Department of Lectures, University of Pennsylvania. He has been recorder of the Botanical Section of the Academy of Natural Science, and is a member of the more prominent botanical societies in America. His published works consist of, Maize; A Botanical and Economic Study, 1893, pp. 125, translated later in Mexico into Spanish; The Botanists of Philadelphia, and their Work, 1898, pp. 157, forty plates, and Students' Herbarium for Descriptive and Geographic Purposes, 1901, pp. 210. He is
botanical editor of a new American English Dictionary under course of publication by J. B. Lippincott Company, and is engaged at present in writing An Introduction to the Phytography of North America, for a firm in Leipzig, Germany. His printed papers number above ninety, mainly on Botany and related subjects.

HERR, JOEL A., Cedar Springs, Clinton County, Pa.:  
1. Feeding and Care of Cattle.  
2. Fertility.  
3. Fruit Growing.  
4. Farmers' Accounts.  
5. Specialties in Farming.  
8. The Bright Side of Farm Life.  
9. Selection and Care of Milch Cows.  
10. Education Through Organization.

JOEL A. HERR was born in Clinton county, Pa., and educated in the public schools and at Dickinson Seminary. He served in the Civil War and has been a student, teacher and farmer all his life. He lives now on a farm and gives special attention to fruit culture and stock raising. He is a member of the State Board of Agriculture and a trustee of the Pennsylvania State College.

HILL, W. F., Mont Alto, Franklin County, Pa.:  
1. Potato Culture.  
2. The Farmers' Chance.  
3. Our Education, Our Capital.  
4. Soil Conditions for Successful Plant Growth.  
5. Saving and Applying Manure.  

W. F. HILL was born in South Shenango township, Crawford county, Pa., March 4, 1867. After attending several different schools he spent three years at Allegheny College. From college back to the farm, to which he added another by purchase later. He is an active advocate of organization for farmers in the township, county, state and nation. After acceptably serving in subordinate and Pomona Grange offices he was, in 1894, chosen lecturer of the State Grange, and in 1898 was elected Master of the State Grange organization. He is also a trustee of the Pennsylvania State College, and a member of advisory committee of the State Experiment Station.

HOOVER, HON. E. S., Lancaster, Lancaster County, Pa.:  
1. Cultivation of the Tobacco Plant; Its Proper Curing.  
2. Handling and Preparation for Market.  
3. Incentives to Farming.  
4. Failure in Farming and the Causes.  
5. System on the Farm.  
6. Farming the Chief Support of the Nation.  
7. Soil Improvement.
8. Farmers' Institutes; Their Importance and Benefit.
9. Care of Farm Crops.
10. Proper Use and Care of Farm Machinery.
11. The Horse; His Breeding, Rearing and Training.

E. S. HOOVER was born in Lancaster county, Pa., in 1839, was educated in
the public schools, White Hall Academy and the State Normal School at
Millersville, taught school four terms, owns and controls a farm. Is engaged
in general farming, at one time gave special attention to growing and feed-
ing of live stock, especially in raising and training horses, and later devoted
himself to the horticultural branch of agriculture. Acquired knowledge of
agriculture by study, actual experience and experimenting. Is at present
time a member of the board of trustees of Millersville State Normal School;
wast a member of Legislature, 1853-1854; for some time and at this time en-
gaged in Farmers' Institute work.

HULL, GEORGE E., Orangeville, Ohio:
2. The Farm Creamery.
5. Marketing Farm Products.
6. The Farm Water Supply.
7. Feeding Steers for Market.

GEORGE E. HULL, of Orangeville, Ohio, the subject of this sketch, a num-
ber of years ago moved upon a worn-out farm without buildings in Mercer
county. By industry, perseverance and intelligent effort he has succeeded
in restoring it to the highest state of fertility; has placed thereon substantial
and convenient farm buildings, and educated his children, without other in-
come than that derived from the farm. His silos, stock scales, farm imple-
ments and improved live stock are the admiration of all progressive farmers.

KAHLER, HON. A. J., Hughesville, Lycoming County, Pa.:
1. Soil Fertility.
2. Corn Culture.
3. Taxation and How it Affects the Farmer.
4. Hogs for Profit.
5. Concentration of Schools in Rural Districts.
7. Proper Care of Barnyard and Manure.
8. How Best to Keep the Boys on the Farm.

A. J. KAHLER was born in Hughesville, Pa., in 1834; was educated in the
public schools and afterwards taught school in his native county; has always
lived upon a farm; has filled every local office in his township; was a member
of the Legislature in 1891-1892; was president for six years of the County
Agricultural Society; is a member of the State Board of Agriculture and
has been identified with most of the leading farm organizations of the State.
LEDY, J. H., Marion, Franklin County, Pa.:

1. General Fruit Growing; How to Take Care of Trees.
2. Peach, Apple and Plum Culture.
3. Pruning, Cultivating and Fertilizing the Orchard.
4. The Farmers' Garden.
5. Alfalfa; Its Value and How to Grow It.
7. Tomatoes and Cantaloups; How to Grow Them.
9. Roads and Road Taxes.
10. Crimson Clover and Soja Beans; Their Value and How to Grow Them.

J. H. LEDY was born in Marion, Franklin county, Pa., August 3, 1864, and received his education in the common school in Guilford township and at the Chambersburg Academy. After leaving school he engaged in the mercantile business for seven years at Marion and Waynesboro, Pa. In the spring of 1889 he accepted a position with S. Smucker & Co., wholesale grocers of Philadelphia. He remained with this firm four years, when he was elected register and recorder of Franklin county, after which he became half owner and business manager of the People's Register, of Chambersburg, an independent journal of large circulation. He now owns and superintends 151 acres of apple trees, inlaid with peaches and plums. Mr. Ledy is a practical fruit grower, who loves the work and has turned his whole attention to it.

KERN, D. N., Allentown, Lehigh County, Pa.:

1. Twenty-Eight Years' Experience with Poultry on the Farm.
2. Sixteen Years' Experience with Fish Culture on the Farm.
3. Twenty Years' Experience with Bees.
5. Potato Culture.
6. Wheat Culture Illustrated.
7. Feeding and Watering the Cows.
8. Keeping Accounts of the Farm.

D. N. KERN was born in Shimerville, Lehigh county, Pa., June 24, 1849, was raised on his father's farm; was educated in public schools, afterwards attended a high school near Philadelphia, Pa. When seventeen years old learned the gunsmith and plow making trades. In 1870 took his father's farm and farmed till 1897. Then retired from farming and moved to Allentown, Pa., where he used his leisure time in studying agricultural and archaeological books; also traveled a great deal.

LEHMAN, AMOS B., Fayetteville, Franklin County, Pa.:

1. Breeding, Feeding and Profit of Hogs.
2. Forestry for Farmers.
3. Our Insect Friends and Foes.
4. Comparison of Profits; Dairy vs. Beef Cattle.
5. Legumes for Feed and Fertility.
7. Corn and Cow Peas for the Silo; A Balanced Ration.
AMOS R. LEHMAN was born in Scotland, Pa., on the Lehman homestead, September 2, 1859, of Pennsylvania-German parentage. He had access to the public schools until sixteen years of age. This school training has been supplemented by an extensive investigation of the best authorities and personal experiments upon the subjects of farm theory and practice, i.e., aiming to produce the greatest amount of product at a minimum cost. He began farming for himself in 1884, and makes a specialty of corn and legumes, hogs, beef and dairy cattle. He was for three years State lecturer of the Farmers' Alliance and Industrial Union, and is at the present time experimenting to prove that farmers can't use acid phosphate at a profit, neither can they afford to pay $20.00 per ton for nitrogenous feeds. Farmers should soon learn to mix fertilizers and grow protein.

LIGHTY, L. W., East Berlin, Adams County, Pa.:

1. The Farmers' Cow; Her Care and Feeding.
2. Producing and Marketing Dairy Products.
3. Silo Experience and Practice.
4. Soiling and Soiling Crops.
5. Culture and Feeding of the Corn Crop.
6. Value, Care and Application of Farm Manure.
8. Education for our Boys and Girls; What and How.

L. W. LIGHTY was born in York county, Pa., in 1857; attended the public schools of his neighborhood; afterwards attended a select school in Adams county and then taught school for seven winters. During this time he attended the York County Academy one term and also attended the State Normal School at Millersville. He then kept store, but not liking the business, he got out of it, and started in the poultry business, keeping both market and fancy poultry, and engaged in bee-keeping and the culture of small fruits. In 1883 he purchased the farm upon which he now lives. The land was worn out and the buildings quite dilapidated. He has improved this until it is now one of the best farms in his county. He has a large library of standard books, keeps a selected dairy of cows, and has all the modern improvements needed to equip a first class farm.

McDONALD, JOHN T., Delhi, N. Y.:

1. How I have Made Dairy Farming a Success.
2. How I Make Poultry Pay with the Dairy Farm.
3. How it has Paid Me to be a Jack-of-All-Trades.

JOHN T. McDONALD was born in 1842, near Delhi, N. Y., and lives upon a farm of about 200 acres, 160 of which is improved. He was educated in the public schools; began farming in 1875, went heavily into debt for his farm, and paid for it in twelve years, at the same time improving the buildings and land. He produces from 20,000 to 25,000 pounds of butter annually, which he sells for 35 cents per pound. He turned out last year about $10,000 worth of produce. He keeps ninety cows, and they average a little over 200 pounds of butter each. He sold, during the year, over $2,000 worth of chickens, eggs and turkeys.
McDOWELL, PROF. M. S., State College, Centre County, Pa.:  
1. Commercial Fertilizers.  
2. Lime and Its Action.  
4. Barnyard Manure.  
5. Why Educate.

M. S. McDowell was born in Mifflin county, Pa.; attended the public schools, and Lewistown Academy; entered Pennsylvania State College in 1888, and was graduated in '92; after graduation was connected with a fertilizer manufacturing establishment in Baltimore, and later came to the chemical department of the Experiment Station, with which he has been connected four years.

McWILLIAMS, D. B., Port Royal, Juniata County, Pa.:  
1. Manure and Fertilizers; Their Value and Application.  
2. How Plants Feed and How to Feed Them.  
3. Education Through Organization.  
4. The Ideal.  
5. How the Natural Agencies Help the Farmers.  
6. The Ship that Passed in the Night. (Evening.)

MENGES, PROF. FRANKLIN, York, York County, Pa.:  
1. The Advantages of a Knowledge of Chemistry to the Farmer.  
2. Fixation of Free Nitrogen Explained.  
3. Nitrification; Conditions Necessary to Produce It.  
6. The Functions of the Various Foods Necessary to Plant Growth.  
8. The Necessity of Education for the Farmer Compared with Other Vocations.  
10. Insect Friends and Foes of the Farmer. (20-30 minutes each.)

PROF. FRANKLIN MENGES, Ph. D., was born forty-four years ago at Menges' Mill, York county, Pa.; the first nineteen years of his life were spent on his father's farm, with all the ardour that farming meant in those days; he then began a course of preparation for college at the Baugher Academy, Hanover, Pa., and entered and graduated from Pennsylvania College, Gettysburg, with the class of 1886; was immediately tendered and accepted the position of assistant professor of chemistry in his alma mater, which position he held until 1896, when he came to York and took the professorship of the sciences in the York high school, which position he now holds; received the degree of Ph. D. from his alma mater for special work in chemistry, mineralogy and physics. He has for years been a student of the “Experiment Station Record,” and has continued an interest in practical agriculture, and has lectured before Farmers' Institutes.
NORTHROP, C. D., Elkland, Tioga County, Pa.: 

1. Feeding and Care of the Dairy Cow.
3. How to Use the Babcock Test in the Dairy. (Illustrated.)
4. Crop Crop and Silo.
5. Potatoes and How to Grow Them.
6. Farm Fertility; Experience with Run-Down Farms.
7. Education for Farmers and Their Children.
10. Broad Tires and Good Roads.

C. D. NORTHROP was born in Brookfield, Tioga county, Pa., in 1854; was educated in the public schools at Woodhall (N. Y.) Academy. In 1891, he attended a dairy school at Geneva, N. Y., under the auspices of the New York Dairymen’s Association. For the past twenty-one years he has made a specialty of dairying and the making of fine butter. He has been a teacher in the public schools, and has devoted a good deal of time to lecturing before alliances, granges, farm clubs, etc.

NORTHUP, HENRY W., Glenburn, Lackawanna County, Pa.:

1. Selection, Care and Management of the Dairy. (30 minutes.)
2. Practical Experience with the Silo. (30 minutes.)
3. Potato Growing. (20 minutes.)
4. The Exhaustion and Restoration of Our Soil. (30 minutes.)
5. Fruit Culture. (20 minutes.)
6. Farm Products and How to Market Them. (20 minutes.)
7. Nature Study for Country Schools. (20 minutes.)
8. Educating the Farmer and Increasing his Usefulness. (20 minutes.)
9. Desirable Country Homes and How to Enjoy Them. (20 minutes.)

HENRY W. NORTHUP was born on a farm in Abington, once considered the banner agricultural township in Luzerne county; he was educated in the public schools and at Madison Academy. His chief business is that of farmer and dairymen; has been greatly benefited in this line of business for the last ten years by having associated with some of the best and most practical agriculturists in this and adjoining States in the institute work; has had some experience in fruit and market gardening and in the disposition of these products in the city of Scranton, where an excellent market has been secured.

ORR, T. E., Beaver, Beaver County, Pa.:

1. Poultry Breeding. (30 minutes.)
2. Poultry Feeding. (30 minutes.)
3. Poultry Houses and Yards. (30 minutes.)
4. Poultry Incubators and Brooders. (30 minutes.)
5. Poultry as a Side-Line for Farmers. (30 minutes.)
6. The Farmer and the Public School. (30 minutes.)
7. The Farmer as a Business Man. (30 minutes.)
8. Your Youth and Mine on the Farm. (40 minutes.)
9. The Smallest, but Most Useful Implement. (20 minutes.)
10. Ship the Sow in the Night. (40 minutes.)

T. E. ORR was born in Brooke county, Va., September 28, 1855. When nineteen years of age he was on the stock farms of his father and grandfather and attending country schools. From 1872 to 1876 he taught country school two winters and attended National Normal School balance of that time, graduating in 1876. Taught surveying and civil engineering in 1876-7. From 1877 to 1886 was superintendent or principal of public schools as follows: Mt. Vernon, Ind.; Le Mars, Ia.; Wellsburg, W. Va., and Bridgeport, O., doing Teachers' Institute work each summer. Leaving Bridgeport in 1886, and at a salary of $1,000 per year, he took an interest in the "National Stockman and Farmer," being one of its publishers and editors, which position he occupied until 1901, doing occasional Farmers' Institute work and acting as expert judge on poultry and live stock. Mr. Orr has always been closely identified with live stock and poultry associations.

PATTON, JAMES Y., New Castle, Lawrence County, Pa.:

1. Breeding and Feeding Poultry.
2. Winter Eggs.
3. How I made Dairying Profitable.
4. Silos and Silage.
5. How to Grow Good Clover.
7. When and How to Apply Barnyard Manure and Why. (15-20 minutes each.)

J. Y. PATTON was born forty-two years ago, and has been engaged in agriculture all his life; has conducted a dairy for the past fourteen years, and engaged in the poultry business for seven years.

PEACHY, J. H., Belleville, Mifflin County, Pa.:

1. The Farmer's Boy; His Education.
2. Half Hour in the Corn Field.
3. Hogs for Profit.
4. Soil Improvement.
5. Care of Farm Animals.
7. The Inside of the Farmer's Home.
8. The Making of a Farmer.

J. H. PEACHY was born in Mifflin county, Pa., in 1851. His boyhood was spent upon a farm; was educated in the public schools, and graduated from the Ohio Normal University in 1881. After completing his course at school he followed teaching. In 1887 he began farming for himself and gave attention chiefly to raising hogs, sheep and cattle.
PHILIPS, HON. THOMAS J., Atglen, Chester County, Pa.:

1. The Silo an Economic.
2. Renewed Fertility: How to Get It.
3. Lime; Do You Need Some?
4. Profit or Loss in the Dairy.
5. Commercial Fertilizers; Their Nature and Use.
6. Intelligent Feeding.
9. How Shall We Study and Teach from Nature?
10. The Wife’s Share.

THOMAS J. PHILIPS was born upon a farm in Chester county, Pa., December, 1846; attended public and private schools and graduated from Bucknell University in 1867; spent three years in manufacturing iron, and traveling, and then settled upon the farm where he still lives, giving special attention to dairying and raising dairy stock, but devoting much of the 200-acre farm to the production of mixed crops, suitable to that location and market. That he has been a success is attested by the fact that he has been a director in a national bank for many years, a manager in one of the largest fire insurance companies in the State, and of a building and loan association; served two terms in the State Legislature, as a representative of the farming interests; he has contributed acceptably from time to time of his experience to the agricultural press, and in every way has kept in the front amongst the most progressive of his locality, believing in higher education, attractive country homes, and that success is the result of individual effort and judgment.

RIDDLE, W. H. H., Butler, Butler County, Pa.:

1. The Practical Farmer.
2. The Value of Pure-Bred Stock to the Farmer.
3. The Value of Humus.
4. The Home and Its Surroundings.
5. What is Doing to Advance Agriculture.

W. H. H. RIDDLE was born at Carnegie, Allegheny county, Pa., December 11, 1840; lived and worked on his father’s farm until about 18 years of age; attended Sunbury Academy, where he received an academic course; after teaching school seven years, read law and practiced thirty years. During twenty-five years the subject of this sketch owned and managed a farm; he also helped organize an agricultural and fair association, and has taken an active part in its management for the past twenty-two years, being its president for ten years; has been a member of the State Board of Agriculture since 1886, and local manager of Institutes for Butler county. A love of agricultural pursuits led him to abandon his law office and devote his entire time to the management of his farm of some 200 acres, upon which special attention is given to the propagation of plants under glass, etc.

SCHOCK, OLIVER D., Hamburg, Berks County, Pa.:

1. Poultry on the Farm.
2. Good Local Government.
5. The Family Garden.
6. Floriculture in the Country.
7. The Responsibilities of Farmers.
8. Progress in Agriculture.

OLIVER D. SCHOCK was born on a farm near Hamburg, Berks county, Pa., in 1858, and has always taken a deep interest in agricultural and horticultural affairs. He was educated in the common and high schools, including a course in a commercial and scientific academy. At the age of fifteen he became a newspaper correspondent, and continues to represent leading daily papers and agricultural journals. For a number of years he served as a special agent of the Pennsylvania State Board of Agriculture, and later as a clerk in the office of the Board, assisting Secretary Edge. With the creation of the Department of Agriculture, in 1895, Governor Hastings promoted Mr. Schock to the position of Chief Clerk of that Department, which position he filled until July, 1899. After several years experience in mercantile pursuits, he was appointed in the spring of 1903, under Governor Pennypacker's administration, to the position of assistant to R. H. Warren, Dairy and Food Commissioner of Pennsylvania, which position he now holds.

SCHWARZ, HON. R. F., Analomink, Monroe County, Pa.:

1. Success with Crimson Clover and Vetches. (45 minutes.)
2. Market Gardening and Small Fruit Growing. (Two parts, 30 minutes each.)
3. The Commercial Orchard. (25 minutes.)
5. A Thorough Understanding of the Fertilizer Question. (35 minutes.)
6. Does Poultry Pay. (20 minutes.)
7. Good Tools; How to Use Them and Their Care. (20 minutes.)
8. The New Road Law and the Farmer's Duty Under It. (20-40 minutes.)
9. Vegetables and Fruits for the Farmer's Table. (25 minutes.)
10. Why Education is as Essential to the Farmers' Success as to that of Men in Other Occupations. (45 minutes.)

R. F. SCHWARZ was born near Berlin, Germany, in 1833; educated in Ducal Gymnasi and Ducal College, at Dessau. He came to New York in 1871, removed to Chicago in 1873, and 1875 bought a farm in Monroe county, in this State, where he has since followed the business of fruit growing and market gardening, devoting at the present time about thirty acres to this pursuit. He was a member of the House of Representatives two terms, 1893 and 1895.

SEEDS, R. S., Birmingham, Huntingdon County, Pa.:

1. Value of Fertility and Cheapest Way to Get It. (30-40 minutes.)
2. What Constitutes a Country Home. (30-40 minutes.)
3. Education and the Farmer. (30 minutes.)
4. Benefits Derived from Farmers' Institutes. (20 minutes.)
5. What I Know About Roads. (20 minutes.)
6. Soil Improvement, the Keynote of Agriculture. (30 minutes.)
7. Mistakes of Life Exposed. (E. L.) (60 minutes.)

R. S. SEEDS was born in Huntingdon county, Pa., in 1852; was educated in the public schools and at the Shade Gap Academy. He was raised upon a farm and traveled for eighteen years among the farmers, selling agricultural implements. In 1892 he bought a farm that had been run down, which he has greatly improved.

SEXTON, HON. JASON, North Wales, Montgomery County, Pa.:

1. What is Successful Farming. (20 minutes.)
2. The Production of Lambs for Early Market. (20 minutes.)
3. How Farming Can be Made to Pay. (20 minutes.)
4. Our Wasted Resources. (20 minutes.)
5. How to Make the Dairy a Success. (30 minutes.)
6. Why Farmers Should Encourage Road Improvement. (20 minutes.)
7. What the Farmer's Home and its Surroundings Should Be. (30 minutes.)

JASON SEXTON was born in Schoharie county, N. Y., in 1834, and was educated in the public schools of his township. Worked upon his father's farm, who always kept a dairy of from twenty-five to thirty-five cows, making both butter and cheese; enlisted in the Union army in 1862, and served throughout the war; upon retiring from the army he bought his father's farm of 200 acres, going in debt for two-thirds of the purchase money, and paying 7 per cent. interest. He continued the dairy, but in 1874 sold the farm, and in 1878 moved to Montgomery county, Pa., where he now resides. He there became manager of William M. Singerly's farms, comprising 825 acres of land. He had charge of the breeding of several hundred registered Holsteins and Jerseys, Southdown sheep and Berkshire pigs, also feeding as many as 125 steers and from 500 to 1,000 sheep, besides milking a large dairy of from 50 to 100 cows.

STOUT, W. H., Pinegrove, Schuylkill County, Pa.:

1. Fruit Growing.
2. Experience in Draining Clay Bottom Land.
3. Theory vs. Practice.
5. Wasting Manure.
6. Geological Observations. (30 minutes each.)

W. H. STOUT was born October 18, 1840, in Lower Nazareth township, Northampton county, Pa.; was educated in the common schools and engaged in various occupations, serving an apprenticeship at coopering and milling; also as clerk and traveling salesman; has lived on his present farm for the past twenty-seven years, and is engaged in general farming, trucking, fruit growing and bee-keeping; has acquired practical and scientific information by observation and study; speaks English and German.
STUART, K. R., Callensburg, Clarion County, Pa.:  
1. Raising Swine for Profit. (20-30 minutes.)  
2. Dairy Bacteriology. (30-40 minutes.)  
3. Sheep Husbandry. (25 minutes.)  
4. Shall We Educate the Farm Boy. (30 minutes.)  
5. Centralization of Township Schools. (45 minutes.)  
6. The Home and the School. (30 minutes.)  
7. The Advantages of a Scientific Education to the Farmer. (30 minutes.)  
8. Fruit Culture for Home and for Market. (30-40 minutes.)  
9. Stable Manure. (20 minutes.)  
10. Life; What is it. (50-60 minutes.)

SURFACE, PROF. H. A., Economic Zoologist, Harrisburg, Pa.:  
1. The Economic Value and Protection of Our Native Birds. (40-50 minutes.)  
2. General Principles and Methods of Insect Warfare. (Illustrated.)  
3. The Hessian Fly in Pennsylvania. (Sometimes illustrated by lanterns.)  
4. Nature Study and Agriculture in the Public Schools. (25-30 minutes.)  
5. The Centralization of Schools. (20 minutes.)  
6. Higher Education for Farmers’ Boys and Girls. (15-20 minutes.)  
7. The Elements of Success. (15 minutes.)

HARVEY ADAM SURFACE, M. S., Economic Zoologist, was born on a farm in Warren county, O., in 1867. He worked on the farm and attended and taught country school. He was educated in the Lebanon (O.) Normal, the Ohio State University, the University of Illinois, Hopkins (Stanford) California Seaside Laboratory and Cornell University. He taught in the Ohio State University, the University of the Pacific, Cornell, the Ithaca schools, teachers’ institutes and the Pennsylvania State College. He held a fellowship in Cornell and was also appointed Dykman Research Fellow in Columbia University. He was field naturalist for the Illinois State Biological Station and University Extension lecturer in New York. He has also been lecturer in Zoology at the West Coast Chautauqua Assembly and scientific assistant on the United States Fish Commission. He has taught in every known grade of school work, and is noted for his enthusiasm and ability as a teacher, speaker and writer. He is ornithologist of the Pennsylvania State Board of Agriculture, and is making investigations of insects for the Pennsylvania State Department of Agriculture and fishes for the Pennsylvania State Fish Commission. Among his writings are articles on nature study, zoology, mollusks, insects, fishes, birds, mammals, pedagogy, anatomy, etc. He is nature study editor of the “Popular Educator,” ornithological editor of “American Gardening,” member of the American Society of Naturalists, American Association for the Advancement of Science, the American Ornithologists’ Union, the Pennsylvania State Audubon Society, etc. He makes a specialty of the biologic and economic features of his subjects. He was appointed Economic Zoologist by Governor Pennypacker in 1903.
THAYER, DR. I. A., New Castle, Lawrence County, Pa.:

2. How to Tile Drain.
4. Preparation of the Seed Bed. (40 minutes.)
5. Stable Manure.
7. The Clovers as Food.
8. The Clovers as Fertilizers.
10. Strawberry Culture.
11. Feeding and Care of Farm Animals.
13. Home Hygiene.
14. Nature Studies. (20-30 minutes each.)

DR. I. A. THAYER was born near Warren, O., in November, 1840. He was reared on a farm of which he was foreman for a number of years under a scientific and successful farmer; was educated in Hiram College, under the presidency of Gen. Garfield. He graduated in medicine in 1866, and practiced that profession several years. Since laying down that practice he has been engaged in public speaking, having during fifteen years filled important lecture engagements from Boston to St. Louis, under the management of the leading lyceum bureaus. He has recently finished the course in crop production and that in live stock production in our State College. For nine months in the year his time is given wholly to his farming operations, for years conducting a veritable experiment station where he has worked with a book in one hand and a hoe in the other; hence, he is equipped with a practical knowledge that he has the ability to express in the clearest manner.

WALTZ, SAMUEL W. H., Williamsport, Lycoming County, Pa.:

1. The Apiary. (Illustrated.) (20-60 minutes.)
2. Corn Culture. (Illustrated.) (20-40 minutes.)
3. The Apple Orchard. (Illustrated.) (20-40 minutes.)
4. "Home, Sweet Home." (Evening Lecture.) (60 minutes.)
5. Profitable Poultry Keeping. (Illustrated.) 20-40 minutes.)
6. Our Insect Friends and Foes. (Illustrated.) 20-40 minutes.)
7. The Culture and Value of Clover. (Illustrated.) (20-40 minutes.)
8. The Farmer's Garden and His Table. (20-40 minutes.)
9. The Ideal Cow—Her Fare; Her Care; Her Ware. (20-40 minutes.)
10. Some Common Birds and Their Relation to Agriculture. (Illustrated.)
11. Lost Fertility; the Cheapest Way to Regain It and the Best Way to Maintain It. (20-40 minutes.)
12. The Farm Workshop and Library; their Influence on the Character of the Country Youth. (20-30 minutes.)
13. Is the Common School Furnishing the Proper Education Needed by Farmers' Boys and Girls. (20-40 minutes.)

14. Clover, Cow and Hen: the Winning Money-Making Combination of the Twentieth Century Farmer. (20-40 minutes.)

SAMUEL W. H. WALTZ was born in Anthony township, Lycoming county, Pa., January 8, 1838. He was educated in the public schools, Muncy high school, Lycoming County Normal School and Williamsport Dickinson Seminary. He taught in the public schools for several terms, and was afterwards elected a member of the school board of his native township. His home has always been on the farm, and he grew to manhood among scenes and circumstances that thoroughly imbued him with an intense love for nature and the intrinsic value of self-reliance. Mr. Waltz is essentially a self-made man, experience being his best teacher. He began to study agricultural science in boyhood and ever since has strenuously endeavored to follow those principles taught him by experience. He regards experience his safest teacher, but is always ready to entertain, with due consideration, what others may have acquired and ever anxious to profit by their diligence and research, which stand him in good stead to acquire those elements of knowledge that go to make up a progressive and up-to-date agriculturist. He is particularly fond of horticulture, botany, ornithology, apiculture, geology and astronomy, all of which bring him in close touch with every-day life on the farm.

WALLACE, MRS. MARY A. ("Aunt Patience"), Ellwood City, Lawrence County, Pa.:  

1. A Country Home; Its Convenience, Sanitation, etc.  
2. Domestic Science.  
4. The Summer Plague. (30 minutes each.)

MRS. MARY A. WALLACE is a daughter of the late Chester W. Ballou, Esq., one of the most successful and progressive of the pioneer farmers of Lawrence county, Pa. She was educated in the public schools, and Beaver Seminary, Beaver, Pa., and previous to her marriage taught school in her home district. Later, to her household duties, she added newspaper work, and became widely known in literary and journalistic circles through her pen name, "Aunt Patience." Mrs. Wallace was a charter member of the Pittsburg Women's Press Club, and was its treasurer for a number of years. She is also prominent in patriotic societies, and this year delivered the Memorial Day address at Slippery Rock Presbyterian Church, and at the close was given a public vote of thanks by the soldiers present. Her home is on a farm near Ellwood City, Pa.

WATTS, PROF. R. L., Scalp Level, Cambria County, Pa.:  

1. How Plants Feed and Grow. (30 minutes.)  
2. Conservation of Soil Moisture. (30 minutes.)  
3. Care and Management of Orchards. (30 minutes.)  
4. Apples in Pennsylvania. (30 minutes.)  
5. The Cultivation of Small Fruits. (30 minutes.)  
6. Market Gardening. (30 minutes.)  
7. Nature Study in the Public Schools. (30 minutes.)  
8. Beautifying the Home Grounds. (30 minutes.)
9. Opportunities and Advantages for Young Men on the Farm. (30 minutes.)

10. Mental Equipment for Farming. (30 minutes.)

R. L. WATTS was born at Kerrmoor, Pa., June 5, 1869; raised on the farm of his father. Martin Watts, which farm was largely devoted to fruit culture. Entered Pennsylvania State College in 1887; graduated from agricultural course in June, 1890. He was elected Assistant Instructor in Botany and Horticulture of the University of Tennessee and Horticulturist of the Agricultural Experiment Station of this institution in September, 1890. Later he was made Instructor of Horticulture, followed by Assistant Professor of Horticulture and Secretary of the Experiment Station. Besides the regular duties as secretary, he had charge of the Farmers' Institutes of the State, held under the auspices of the University and State; he prepared programs, conducted correspondence and participated in the meetings. While at the Station he conducted various experiments with fruits and vegetables in the greenhouse and out of doors, the results of which have been published in bulletin form. He wrote Farmers' Bulletin No. 39, on "Onions," for the U. S. Department of Agriculture. For several years he was editor of the fruit and vegetable department of the "Southern Florist and Gardener;" he is now engaged in gardening and fruit culture with a poultry plant to accommodate 500 hens.

WATTS, D. H., Kerrmoor, Clearfield County, Pa.:
1. The Dairy Herd—The Stable; The Feed.
2. The Silo and Why Profitable.
4. The Steam Engine; How Used on Our Farm.
5. Farm Buildings and their Location.
6. The Apple Orchard.
8. Recollections of the Old Farm Home. (30 minutes each.)

D. H. WATTS was born near Kerrmoor, Pa., May 25, 1861, was raised on the farm of his father, Martin Watts, and educated in the public schools, which schooling was supplemented by a few months attendance at the Indiana State Normal School. He has always been interested in farmers organizations and served two years as president of the Clearfield County Agricultural Society. He located upon his farm in 1886 and erected thereon modern buildings and established a dairy plant where fine butter for a special trade is produced. The growing of fruits is also a specialty. On his farm, known as "Orchard View Farm" there are 3,000 apple, peach, pear and plum trees, all his own selection and planting.

WAYCHOFF, G. B., Jefferson, Greene County, Pa.:
1. Drainage.
2. Lime and Liming.
3. Raising Clover.
4. Clover as a Food.
5. Clover as a Fertilizer.
6. Unlocking Soil Fertility.
7. Leaks on the Farm.
9. The Farmer's Opportunity. (20-25 minutes each.)
B. H. WAYCHOFF was born and raised on a farm; was educated in public schools, and attended Monongahela College, graduating in the scientific course. Taught several years in public schools; also taught in Monongahela College, in Beaver College and in Beaver High School, and has had considerable experience in public speaking. At the age of 23 he bought a poor and almost abandoned farm, and by drainage, liming and raising clover, together with good tillage, it has been brought up to a good degree of productiveness.

There were held, in all, of what may be termed regular scheduled institutes, 327 days. These meetings were sub-divided into thirty-one institutes of one day each, and seventy two-day institutes, and two three-day institutes, or two two-day institutes with sessions continued for three days. In addition to the regular schedule, there were held twenty-one special meetings, in which the Division of Institutes joined with the pomona granges, farmers' unions and clubs in what may be properly termed special or local institutes.

These 327 days were sub-divided into 831 sessions. The average attendance upon each of these sessions was 150, or a total of 123,384. We expended, last year, in the employment of instructors, for hall rents, hotel and traveling expenses and incidentals, in all, $15,000. We employed, last year, in all, fifty-two State speakers or instructors. Associated with these instructors in the different counties of the State where institutes are held is a vast army of local institute workers, who read papers on the various lines of farm work, joined in the discussion of topics, and have thus become a mighty force in the development of the work within the bounds of the State. The one new line of work, only partially inaugurated, is the sending of specialists in the line of the leading agricultural industries as carried on in the State to give special instructions as to management of the dairy, handling of milk, ventilation of the barn, etc.; also, in horticultural lines, mixing of spraying material and how to use it, demonstrating the difference between insects and fungous diseases, and how to apply the remedies suited to each.

Special mention should be made of the work accomplished in this line by Prof. H. A. Surface, Economic Zoologist of this Department, who has devoted much of his time in attending these meetings and giving valuable instruction to the farmers on topics above mentioned. I am pleased to say that in so far as we have advanced in this line of instruction, results have been entirely satisfactory.

This report would be incomplete without making mention of our Annual Meeting of Institute Managers and Lecturers, held at Huntingdon, Pa., June 2, 3 and 4, which meeting may be fairly regarded as representing the topics and standard of work embraced in our general institute plan. The proceedings of this meeting are published in bulletin form, three thousand of which have been distributed throughout the State, and the same will be found inserted in another part of this volume.

4—6—1903
## PENNSYLVANIA FARMERS' INSTITUTES. SEASON OF 1892-93.

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<th>County</th>
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Tabulated reports from the various local agricultural societies reinforces my recommendations last year, as to the importance of encouraging none but expert judges to pass upon the merits of all competing articles, as more than two-thirds of the societies have adopted this practice. The attendance last year was not so great as in previous year, 911,074 being in attendance, as compared with 1,024,250 in 1901. Collection of membership fees, however, shows a marked increase—$7,872—as compared with $2,297.10 in 1901. Paid in premiums, $91,261.06, as compared with $113,347.93, in 1901. The falling off in attendance was no doubt a result of violent wind and rain storms which prevailed in the months of September and October; so furious were these storms in some instances as to drive the people from the grounds. This was especially true whilst the fair was in progress at Nazareth, Northampton county, where the exhibits were in every line large and of special merit.

Too much emphasis cannot be placed upon the importance of the active farmers of Pennsylvania taking charge of these agricultural exhibits, and so controlling them as to eliminate therefrom all exhibits and shows of immoral and doubtful propriety, thus by exercising proper attention, care and discretion, these fairs will become real object lessons, living and vital examples showing forth the best features of agricultural advancement in its various departments. The appended list will show in detail the corporate name of each society, address of president and secretary, also date and place where fairs were held during 1903:
<table>
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<tr>
<th>County</th>
<th>Corporate Name of Society</th>
<th>Name and Address of President</th>
<th>Name and Address of Secretary</th>
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<td>J. P. Nissey, Hummelstown</td>
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<td>Howard A. Chase, 1400 S. Penn St., Philadelphia</td>
<td>Eno B. Engle, Waynesboro</td>
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<td>H. S. Mohler, Mechanicsburg</td>
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<td>L. Rhone, Chairman, Centre Hall</td>
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<td>Cyrus T. Fox, Reading</td>
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<td>C. D. Dore, Canton</td>
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<td>J. V. Mancig, Carrolltown</td>
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<td>Chas. E. Drinkman, Lehigh ton</td>
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<td>John Blanchard, Bellefonte</td>
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List of County and Local Agricultural Societies, with Names and Addresses of Presidents and Secretaries, and Dates for Holding Fall Exhibitions of 1905, Etc.—Continued.

<table>
<thead>
<tr>
<th>County</th>
<th>Corporate Name of Society</th>
<th>Name and Address of President</th>
<th>Name and Address of Secretary</th>
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<td>Erie</td>
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<td>John S. Carter, Waynesburg</td>
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<td>T. E. Warne, Carmichaels</td>
<td>John V. Hathaway, Carmichaels</td>
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<td>Dennis Merphey, Wind Gap</td>
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<td>Benj. Reon, Punxsutawney</td>
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<td>J. L. Groninger, Port Royal</td>
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<td>Wm. Streeter, Chincilla</td>
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<td>Lionel Wisnup, Moscow</td>
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<td>G. W. Nitrazour, Lebanon</td>
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<td>Harry B. Schull, Allentown</td>
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<td>Geo. H. Fowle, Stoneboro</td>
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<td>John P. Orr, Mercer</td>
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<td>W. D. Steinbach, Milton</td>
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<td>H. A. Growman, Bethlehim</td>
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<td>H. C. F. Stephens, Newport</td>
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<td>David Rust, Horticultural Hall, Phila.</td>
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<td>P. K. Moore, Trent</td>
<td>R. S. Fay, Orwigsburg</td>
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<td>H. J. Hoffman, Jennes</td>
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Note.—Where dates, etc., are omitted, no replies to requests for same were received by this Department.
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<td>Oseoda</td>
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<td>Mansfield</td>
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<td>Burgottstown</td>
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<td>Seelyville</td>
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<td>John H. Womack</td>
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Note.—Where dates, etc., are omitted, no replies to requests for same were received by this Department.
*Including races.
**Including race purses.
$Per share.
*CROP REPORTS.

Our crop report has been placed in bulletin form and upwards of 3,000 copies distributed amongst the farmers of the State. Since 1899 there has been, with but few exceptions, a uniform and steady advance in the price of farm products. Along with this increase in crop values has come advanced wages for farm labor, as will be noted by reference to brief table scheduled since 1899, as follows:

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<td>12</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Labor, per day, without board</td>
<td>1.11</td>
<td>1.15</td>
<td>1.23</td>
<td>1.25</td>
</tr>
<tr>
<td>Labor, per month, without board.</td>
<td>10.00</td>
<td>10.55</td>
<td>11.55</td>
<td>11.00</td>
</tr>
<tr>
<td>Farm land, improved, per acre.</td>
<td>56.00</td>
<td>56.00</td>
<td>56.00</td>
<td>56.00</td>
</tr>
<tr>
<td>Farm land, average, per acre.</td>
<td>38.00</td>
<td>38.00</td>
<td>38.00</td>
<td>37.00</td>
</tr>
</tbody>
</table>

The Farmers' Institutes in Pennsylvania have, since their organization, experienced a steady and uniform growth. The demand on the part of the farmers of the State for accurate information relative to every subject associated with his occupation exemplifies the importance of the work. When we come to consider its importance, the vast interest involved, yet he must realize the fact that last year we held 327 days of institute at the nominal cost of $37.50 per day. This sum includes all expenses connected with said meetings, both under county and State management. In order that this great work should be equipped in a manner commensurate with its importance and the demands of the farmer, the coming Legislature should, and I trust, will appropriate the sum of $25,000 annually for the carrying on of this great and important work.

Respectfully submitted,

A. L. MARTIN.

Deputy Secretary and Director of Institutes.

*See Appendix for Tabulated Report.*
REPORT OF THE DAIRY AND FOOD COMMISSIONER.

HARRISBURG, Pa., December 31, 1903.

Hon. N. B. Critchfield, Secretary of Agriculture:

Dear Sir: I have the honor to present for your consideration the following report of the operations of this Division of the Department of Agriculture, since my appointment to the position of Dairy and Food Commissioner by his excellency, Governor Samuel W. Pennypacker.

Having assumed charge of official duties on April 1, 1903, the report will cover a period of the nine months ending December 31, 1903.

WORK OF THE DIVISION.

The work accomplished and the results attained in the enforcement of the several acts of Assembly placed under my administration are unprecedented, both in the number of prosecutions instituted and the fines and license fees collected and paid into the State Treasury. These figures are respectfully submitted for the information of all concerned. The detailed report which follows shows that the total amount paid into the State Treasury, including fines, costs of analyses, etc., aggregate $93,458.71. An examination of the legal records show that about 1,800 prosecutions were ordered since April 1, and the number of suits instituted and the amount of fines collected proves conclusively that the pure food laws are being more rigidly and successfully enforced in Pennsylvania than in any other state of the Union.

It is also safe to assert that the information imparted to those who are engaged in the manufacture and sale of food products will prove a lasting benefit to the trade as well as to the public, generally, resulting in a deserved regard for the pure food laws by the former and ability on the part of the latter to secure better and purer food products than ever before without any increase in cost. Owing to the more general enforcement of the dairy and food laws of Pennsylvania, the danger to health through the use of harmful adulterants and poisonous drugs as preservatives, is now receiving
almost universal attention, and as a result, many correspondents from all parts of the State have volunteered information that in numerous instances has proved helpful in eradicating existing evils. The plain system of absolute fraud in the sale of inferior articles deserved condemnation, but when lives were placed in jeopardy, it was imperative that official action should be rendered as vigorously and promptly as possible.

TENDENCY TO ADULTERATE.

The prevailing custom to adulterate articles of food and drink is but one of the many devices that are being resorted to to an alarming extent for the purpose of gaining wealth speedily. Many years ago, that brilliant and observant author, Ruskin, referred to the fact that poisoning people of large estates was employed in the Middle Ages, in order that such estates might fall into other hands. Adulteration of the food of people of small estates is a method extensively employed to-day to accumulate large estates quickly.

Public officials and lawyers have spent many busy hours in devising methods whereby these evils might be counteracted, if not entirely controlled, in order that the health and purses of all concerned may be protected, and the dishonest and unscrupulous manufacturer, jobber, wholesaler and retailer deterred from committing offenses against the laws of the Commonwealth. That the fraudulent producer and unscrupulous agent are still in the field is made self-evident by the exceptionally large number of prosecutions which were instituted during my short term of office.

NEW METHODS OF DECEPTION.

New methods of deceiving and defrauding the public are constantly being brought to light, and when prosecuted, these transgressors of the laws are equally prolific in presenting unique and novel defenses. Just how to close such loopholes of escape is one of the problems that confront the Commissioner and his legal advisors, but it is gratifying to be able to report that in nearly every instance the remedy to meet the emergency has been found and that, in the main, the efforts to enforce the laws through numerous suits, resulted in their successful termination. While our legal advisors met many obstacles in their part of the work of enforcing the laws, a continued perseverance and unquestioned honesty of purpose resulted in winning many critical and important cases and also resulted in the conviction and punishment of the transgressors.
PURE FOOD LEGISLATION.

The successful work accomplished in this Commonwealth has mainly resulted from the "Pure Food Act of 1895," which was regarded at the time of its passage as the most perfect pure food law that had, up to that time, been adopted by any state of the Union. In a number of instances this act was made by other states a basis for the enactment of pure food legislation. The results attained have confirmed its utility and demonstrated its justice.

It is, however, true that my brief incumbency of the office has shown the need of some additional legislation. While certain statutes now in force are very good in their character and scope, there are certain changes to be recommended at a later and more appropriate period, that could not do otherwise than still better fortify the Commissioner and his assistants against possible delays and annoyances in the courts, and in securing a more speedy and proper termination of all suits. It is essential that delays occasioned by minor causes and quibbling shall be avoided, as the best moral effect is secured when the guilty ones are speedily brought to justice.

FOOD PRESERVATIVES.

The use and abuse of food preservatives is a subject that has received my earnest and serious consideration. The fraudulent practice of employing injurious preservatives that are tasteless and not noticeable to the consumer has been on the increase, notwithstanding the existence of laws prohibiting their use and providing severe penalties in cases where the laws are violated. It is asserted by eminent medical authorities that few, if any, food preservatives have been discovered which are entirely nontoxic, and which do not have a marked influence on digestion, even when taken in small quantities. The people of Germany decreed wisely when they declared that the use of all preservatives in articles of food and drink should be prohibited. Manufacturers and dealers usually commit two wrongs when using such agents: First, they violate the laws of the State, and, second, they add to the article a substance which, in many instances, is injurious to health. A number of dealers have been found selling the same preservative, "mixture" or "compound" under a variety of names.

Another feature that attracted attention was the fact that the mysterious (?) "compound" was in some instances sold at prices from double to twenty times its true value. The physiological studies made and the evidence which has accumulated all condemn the addition of salicylic acid and certain other preservatives under all circumstances. Commercial food preservatives that are deleterious to health are placed under the ban of the Pennsylvania pure
food laws, and, as in the year just concluded, it shall be my purpose to continue an active warfare against their unwarranted and illegal use.

ADULTERATED CEREAL PRODUCTS.

The cereals and the numerous preparations made therefrom form a very important part of human food and constitute a large part of the trade in food products. These articles, particularly flour, are susceptible of manipulation to the detriment of the consumer. In one of the leading flour-producing states the practices of adulteration became so common that it was necessary for the legitimate and honorable producers to combine, in order that their trade reputation might not be entirely destroyed by unscrupulous producers and dealers. As a result, anti-adulteration leagues were organized, and today their former prestige is being gradually restored, and the demand for their products has once more attained a normal and healthy condition. It is probable that, with your approval, cereal products will be a subject of special examination at a later period.

CONSIDERATION OF CASES.

The Commissioner respectfully reports that in the preparation of a case for prosecution, its various phases are carefully considered and that possibly more pains are taken and more expense incurred in securing evidence than has been customary in the past. It is only when actual fraud and deception have been attempted or practiced, or when positively harmful or poisonous adulterants, admixtures, dyes or compounds are employed in the preparation of goods for sale, that the law is invoked to correct abuses and thus prevent physical injury to a long-suffering and much-defrauded class of consumers.

EDUCATING THE PUBLIC.

A vast amount of the work of the office force, as well as that of the attorneys, special agents and other assistants, connected with this Division, might very properly be regarded as of an educational character. The official correspondence has assumed very large proportions, and the concern manifested in the work of securing better and more wholesome food and drink for the people has aroused an unparalleled interest in all sections of the Commonwealth. Wherever actual fraud was shown by correspondents the Commissioner promptly exercised his legal authority to improve conditions, whether they were either local or general in character. This hearty co-operation of the public materially added to the zeal and inspiration necessary to successfully enforce the laws.
EXAMINING MILK SUPPLY.

The nine months of my incumbency of this office has been a period of intense activity as the facts presented in tabular form will attest. Conspicuous amongst the many investigations conducted was an examination into the milk supplies of numerous cities, towns and boroughs. This work was inaugurated primarily because the selling agents of "milk preservatives" were reported as having been unusually successful in disposing of their preparations, such as formaldehyde, boric acid, benzoic acid, "boron compounds," etc. Our investigations, in numerous instances, resulted in the finding of these materials, together with coloring matter, some of which is very poisonous in its character. The condition of the milk and cream sold in some towns was of an alarming nature, the use of harmful drugs having reached proportions hitherto unknown. In fact, it is claimed that the use of excessive amounts of such preservatives was directly responsible for the increased mortality amongst small children in Western Pennsylvania towns, while in other cases infants were made ill and narrowly escaped death before the cause was discovered. While preservatives and antiseptics interfere with digestion, even in the case of the strongest adult, it is very easy to surmise what disastrous effects must follow when administered to a weak and tender babe, whose only food consists of this poisonous, and death-dealing fluid.

EXCESSIVE DOSES OF POISON.

The analytical results showed conclusively that preservatives were not only freely used by milk dealers, but that in scores of instances, the quantity used was far in excess of that required to prevent fermentation, thus adding to the great danger connected with their use. The fact that such fluids and compounds can be sold at comparatively low prices is a menace to health and life, because their cheapness induces many unscrupulous and ignorant producers and venders to drug their milk and cream to a very dangerous extent and to use artificial preservation or "embalming" as a substitute for cleanliness.

IMPOSING DOUBLE FINES.

It is a remarkable fact that a second investigation following closely upon a test which had resulted in a number of arrests, convictions and payments of fines of $50.00 each, again resulted in capturing some of the same offenders in the drag net of justice. The penalties for the second offense were doubled, and, so far as we are able to ascertain, a more healthy condition of affairs exists at the present writing.
MALT AND VINOUS LIQUORS.

The preliminary examination recently inaugurated of some of the malt and vinous liquors that are being sold in Pennsylvania has attracted wide attention. The subject is one of prime importance, and the indications lead to the belief that the legitimate brewer and distiller will be in most hearty accord with the Commissioner in his endeavor to enforce the law. Imitation, drugged and poisonous liquors are positively harmful and pernicious in their effects. The harm done when such products are allowed to have an unrestricted sale is simply incalculable, and the danger to human life is particularly great when they are sold for medicinal purposes, when none but the purest and best stimulants are recommended by physicians. That the imposition practiced was a far-reaching one cannot be controverted, as the number of prosecutions successfully brought against liquor dealers, hotel keepers, druggists, etc., will attest. Many thousands of dollars were paid into the State Treasury in fines imposed for the sale of such adulterated, compounded and chemically preserved liquors, and the work will be continued until, if possible, the present conditions are removed.

ANALYSES OF BEER.

A preliminary examination of the beer that is being sold in Pennsylvania has been commenced and is now in progress as the result of the alleged use of harmful adulterants. These analytical tests were made mainly to discover preservatives. A summary of the chemists' reports shows that out of a total of 136 samples of beer analyzed 100 brands did not contain preservatives, while 26 samples were drugged more or less heavily with salicylic acid or other antisepsics. Twenty of these prosecutions against brewers, hotel keepers and proprietors of restaurants were settled in the courts upon the payment of the usual fine and costs. Six cases are still pending and remain unterminated. In five of these unfinished cases, the grand juries found true bills, and the cases will be tried in the several courts, at the earliest possible date.

The following correspondence explains itself:


"My Dear Sir: In August and October, 1903, prosecutions were begun against Messrs. Carl Lampe, Dennis McGowan, James F. Shannon, William Wallace, Charles W. Souls and John F. Betz & Sons, for the alleged sale of beer reported by our chemist to be adulterated. Early in December of this year, true bills were found against these defendants with the exception of John F. Betz & Sons, whose case, as I am informed, has not thus far been presented to the grand jury."
It is the wish of this Department that these cases should be tried as promptly as possible. Will you kindly let me know when they will appear on the list, so we may make our preparations to have the evidence ready and may, if necessary, have attorneys present who can aid you with their knowledge of the cases and possibly suggestions?

These cases have, in the past few months, been the cause of several unpleasant editorials in certain newspapers. By having them speedily disposed of by the court, we can avoid a repetition of such unjust criticism.

"Very truly yours,

(Signed)  B. H. WARRREN, M.D.,
"Commissioner.

To Hon. John C. Bell, District Attorney, Philadelphia."

The appended reply fully explains the conditions as they exist in the courts of the county of Philadelphia:

"District Attorney's Office,

Dr. B. H. Warren, Commissioner, Department of Agriculture, Dairy and Food Division, Harrisburg, Pa.:

"Dear Sir: I have your favor of the 30th ult., requesting a speedy trial of the cases of the Commonwealth vs. Carl Lampe, Dennis McGowan, James F. Shannon, William Wallace, Charles W. Soulas and John F. Betz & Sons, for the alleged sale of beer reported by your chemist to be adulterated. In these cases the indictments were only found by the grand jury at the December term of court, with the exception of the case against John F. Betz & Sons, which, though returned by the magistrate, has not yet, I believe, been acted upon by the grand jury.

"In reply, I beg to say, that I will put these cases upon the list and try them in due course, as soon as reached. I am obliged to say to you, however, that unless there is some special and urgent reason requiring an immediate disposition of these cases, I shall not be likely to be able to try the same for a considerable lapse of time, perhaps several months.

"In spite of my best efforts to expedite the disposition of the criminal business, there are now over four thousand untried indictments in this county, and I find it difficult, if not impossible, to keep abreast of the work of the grand jury.

"Your cases, therefore, unless there be exceptional reasons as above noted, must await their turn. Regretting the necessity for the delay, I am

"Yours truly,

(Signed)  JOHN C. BELL,
"District Attorney."
No. 6. DEPARTMENT OF AGRICULTURE. 71

The list of unfinished Philadelphia cases to which District Attorney Bell alludes is as follows: The Harrisburg case cited is of but recent origin:

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Article</th>
<th>Manufacturer</th>
<th>Action by Magistrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carl Lampe</td>
<td>63 N. 10th St., Phila-</td>
<td>Beer</td>
<td>Brewed by Peter Schemm &amp; Son, Philadelphia.</td>
<td>Held in $500 bail for court.</td>
</tr>
<tr>
<td></td>
<td>delphia.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dennis McGuigan</td>
<td>7th &amp; Saratoga St.,</td>
<td>Beer</td>
<td>Brewed by Peter Schemm &amp; Sons, Philadelphia,</td>
<td>Held in $500 bail for court. (True Bill).</td>
</tr>
<tr>
<td></td>
<td>Philadelphia.</td>
<td></td>
<td>Forby Wm, Linch, Philadelphia.</td>
<td></td>
</tr>
<tr>
<td>James F. Shannon</td>
<td>102 S. 10th St.,</td>
<td>Beer</td>
<td>Tannhaeuser, The Berger &amp; Enge Brewing Co.</td>
<td>Held in $500 bail for court. (True Bill.)</td>
</tr>
<tr>
<td>Chas. W. Soulas</td>
<td>Betz Bldg., Broad st.,</td>
<td>Beer</td>
<td>Old Stock Lager, Pale Export, J. F. Betz &amp; Son,</td>
<td>Entered bail for court. (True Bill.)</td>
</tr>
<tr>
<td>J. P. Side</td>
<td>Grand Hotel, Harrisburg</td>
<td>Beer</td>
<td>F. A. Peth &amp; Son (Tivoli Beer), Philadelphia.</td>
<td>Waived hearing and entered bail for court. (True Bill.)</td>
</tr>
<tr>
<td>William Wallace</td>
<td>Ridge Avenue, Phila-</td>
<td>Beer</td>
<td>Bottled by Wm. Linch, Philadelphia.</td>
<td>Held in $500 bail for court. (True Bill.)</td>
</tr>
<tr>
<td></td>
<td>delphia.</td>
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IMPROVED LIQUOR SUPPLY.

It is but fair to give the gratifying information to the public that there is an appreciable improvement in the liquor now being offered for sale, as compared with the conditions that prevailed six months ago. When the investigation was commenced fully 85 per cent. of the samples of blackberry brandy, cordials, etc., which were subjected to analytical tests were found to contain salicylic acid, coal tar dyes, as well as other coloring matter, glucose, and a variety of other objectionable ingredients, while in scores of instances the liquor itself was entirely spurious and failed to contain a trace or particle of the blackberry, grape or fruit after which it had been wrongly named.

WOOD ALCOHOL AND OTHER HARMFUL DRUGS.

The preliminary examination made into the alleged use of wood alcohol, a most harmful substitute for grain alcohol, in compounding and blending whiskey, etc., has just been fairly begun, and while the research is in its incipiency, the results obtained by chemical analysis, show that the use of wood alcohol is less common than has been suspected. Some of the higher grades of whiskey were sub-
jected to the test, as well as the cheaper and inferior brands of goods, and a general examination will be continued until entirely reliable and trustworthy conclusions may be reached. Wood alcohol was not found in the majority of samples.

Prof. C. B. Cochran, chemist, in a recent report to the Commissioner, declared that so far as his investigations extended, all of the whiskey bottled in bond and bearing the Government stamp was found pure. Other whiskies are pure when taken out of bond; some of them are afterward subjected to manipulation, and in such goods there are occasionally found traces of wood alcohol, glycerine, red pepper and coloring matter. Eminent authorities declare that hundreds of the unfortunate classes who inhabit insane hospitals and asylums for inebriates, were brought to their terrible mental and physical conditions not alone through the excessive use of liquor; but that the vile and poisonous adulterants contained in the liquor were in a large degree responsible for the evil effects produced. The bad effects of the continued use of alcoholic liquors, both upon mind and body, are in themselves a sufficient evil, and when to this is added the destructive influence of such drugs and poisons as are frequently used in compounding and adulterating such beverages the limits of toleration are passed. Legislation adequate to stop the nefarious practices of those engaged in the manufacture, distribution or sale of adulterated liquors, who recklessly sacrifice the mental and physical well-being of their confiding customers, for the sake of increasing their revenues, cannot be too speedily adopted.

OLEOMARGARINE AND RENOVATED BUTTER.

The enforcement of the laws enacted to regulate the manufacture and sale of oleomargarine and renovated or "process" butter in Pennsylvania has received due attention at the hands of the Commissioner. The financial statement incorporated into this brief resume of the work performed shows, in a measure, what has been accomplished in the interest of these two important acts of Assembly. The amounts collected from license fees for the manufacture and sale of oleomargarine and renovated butter show very clearly that the laws are being enforced, and that the sale of these substitutes for the genuine product of the American dairy cow has not decreased.

DAIRYING INTERESTS.

The following quotation from a circular letter issued by this Division is respectfully submitted, as it gives, although in a condensed form, some idea of the importance of the interests to be protected:
"The gradual increase in population, combined with a rapid development of the transportation facilities, have not been without a beneficial effect upon the vast dairying interests of Pennsylvania. These facts make it possible for the dairy representatives and farmers, generally, not only to sell their products to an increased constituency, but at materially higher prices. The latest figures obtainable report that the value of dairy products in Pennsylvania are exceeded by but one State in the Union, aggregating $35,860,110 per annum, and that, according to the last census, there were 32,600 farms in Pennsylvania which derived their principal income from the dairy. In 1900 the State had 943,773 dairy cows and these produced 487,033,518 gallons of milk in one year. The total number of farms in the State, as reported by the last census, is 224,248, and the number reporting dairy products was 290,036, with a total valuation of $35,860,686. The butter made on 159,837 of these farms aggregated 74,221,085 pounds, of which amount 51,309,835 pounds were sold by the producers."

These figures at once reveal the somewhat startling evolution that has been effected from a simple and crude beginning, to the high standard of dairying that prevails to-day throughout this State. I am especially anxious to foster this industry and to protect consumers against the sale of illegal dairy products. If renovated butter be sold without a license, or if oleomargarine be sold without a license or illegally colored, or if a dairyman sell preserved, watered or otherwise adulterated milk, the offender in each case when detected, will be held to a strict accountability.

The oleomargarine and renovated butter acts legalized the sale of these commodities, but the Legislature has placed certain conditions in the statutes that must be fully observed by both manufacturers and dealers, as well as the proprietors of hotels and boarding houses, and wherever oleomargarine and renovated butter may be sold or used outside of the private family.

I would respectfully solicit the cordial co-operation of the agricultural class, including granges and all kindred organizations, as well as that of the press and citizens generally, in my efforts to abolish all illegal traffic in substitutes for pure butter and other dairy products.

OLEOMARGARINE IN CHARITABLE INSTITUTIONS.

During the brief term of official life, covered by this report, it was discovered that oleomargarine was being used to a considerable extent in certain charitable and penal institutions which received State aid, and were therefore prohibited by the legislative enactment, from using the same under any conditions. Prosecutions were instituted against certain officials in different counties for violations of the law prohibiting the use of imitation or adulterated dairy products in charitable or penal institutions, and in all such prosecutions the cases were sustained by the courts, and the defend-
ants subjected to a fine of $100.00 and costs. In order to avoid the possible plea of ignorance, every superintendent and manager of such institution within the Commonwealth was advised of the existence of the law in question, and informed that all violations, when discovered, would be rigidly dealt with. Although there are nearly five hundred such institutions in Pennsylvania, including hospitals, almshouses, county prisons, workhouses, homes and asylums for the deaf and dumb, blind and insane, etc., all of which are subject to the supervision of the Pennsylvania Board of Commissioners of Public Charities, the information and warning imparted was not lacking in effect. The enforcement of this commendable legislation protects the unfortunate inmates of such institutions who have no means for self protection from such imposition.

VALIDITY OF LAW AFFIRMED.

Hon. Hampton L. Carson, Attorney General of the Commonwealth, rendered an opinion and in discussing the above act of Assembly, expressed himself as follows:

"The inmates of such charitable or penal institutions have no option in the matter, either in the purchase or in the consumption of the article. They are not clothed with the discretion vested in all other citizens of the Commonwealth as to whether or not they shall buy or use the article so manufactured and sold after receiving, through the marking of the packages, full notice of its contents. They are obliged to take exactly what is furnished to them, and, inasmuch as it is prescribed by the act of the 23d of May, 1883, as a part of the management of the charitable institutions, that the inmates shall not be furnished or compelled to use the substance described in the act of May 21, 1885, I view this as a regulation, not of the manufacture and sale of oleomargarine, but as a part of the regulation and discipline of a penal and charitable institution."

The best evidence of the fact that the law is being generally observed is the statement made by prominent dealers in oleomargarine that their trade from such institutions has entirely vanished. As these unfortunate human beings are obliged to use whatever may be furnished them, it is deemed proper to avoid, so far as practicable, all possible imposition upon the inmates of such institutions, as well as the taxpayers who support them.

COMPOUND LARD.

The field for educational work was also extended so as to reach those who were selling compound lard for the genuine pure fat of swine, contrary to law. The sale of compound lard, under certain restrictions is not prohibited, and it can be sold without subjecting the vender to prosecution when the provisions of the law regulating its sale are complied with. After the proprietors or owners of
a number of stores had been brought into court in various counties of the Commonwealth, the lard manufacturers, as well as the jobbers and retailers became thoroughly convinced that the law could no longer be safely disregarded, and the theory that pure lard could not be placed upon the market in salable condition during the hot summer months was abandoned. One marked result of these compound lard prosecutions is the fact that the same party is seldom found violating this law a second time after arrest and conviction. The tendency to substitute compound lard for pure lard on the part of provision dealers and others was far too common, and it was only after heroic treatment of the question that the imposition was checked, if not practically abolished.

SWINE IN PENNSYLVANIA.

Pennsylvania, with its vast agricultural interests, is entitled to protection against the illegal sale of "compound lard," and the cooperation of all concerned is heartily solicited. I shall be glad to learn of any violations, and where proof is available, prosecutions will follow.

The Census report of 1900 shows that on the 224,248 farms in Pennsylvania, no less than 1,107,981 head of swine were kept or raised in that year. It also appears that nearly every farmer had a surplus quantity of lard for sale, thus proving the importance of securing a proper observance of the lard laws of the Commonwealth. Compound lard can be produced at much less expense than the genuine article, and when sold as pure lard at a reduced price tends to produce a like reduction in the price of the genuine product. The same report shows that there was a decrease in the number of swine raised in Pennsylvania since 1890 of 13.3 per cent., which was probably due to the introduction and increased sale of "compound lard."

The love of money, with its kindred tendencies as usual, is responsible for these violations of the law, and the worst feature is the undeniable fact that the poorer classes, many of whom have large families to support, are the greatest losers from this fraudulent practice.

ANALYTICAL WORK.

The analytical work required has been very extensive, and, comparatively speaking, considerably in excess of any similar period in the history of this Division. Results attained were commensurate with the expenses incurred, and many of the existing evils were speedily corrected when the manufacturers and dealers realized that all food products must be labeled true to name, and that no fraud of any nature, if discovered, would be tolerated.
STATE LABORATORY NEEDED.

The results accomplished have demonstrated the absolute need of increased facilities for analytical work. At the present time, the thousands of samples of food and drink which are collected by the special agents of this Division for analysis are submitted to chemists located in various parts of the Commonwealth, and as some of these chemists are also doing a large amount of private work, delays in analyses and in securing reports of results are inevitable. It is believed that the State could profitably and with great advantage to the work, establish a chemical laboratory at Harrisburg, and I would heartily recommend such a project. Its utility and economy can hardly be questioned. The establishment of such a laboratory would also materially assist in more promptly detecting violations of the law and expediting court trials. This subject should receive early and careful consideration. If established, the laboratory could be made available for other analytical work of the Department of Agriculture, which is now being performed by special contract by outside parties.

BENEFICIAL FOOD LEGISLATION.

Pennsylvania has, perhaps, done more for the improvement of the food supply of her citizens than any other state in the Union. This State will no longer be permitted to become the dumping ground for bad food. The laws, with a few needed changes, are ample and will continue to be enforced. The unjust ideas that were prevalent at one time have been removed, and the policy carried out and recommendations made by this Division have driven from our markets many of the fraudulent products which formerly commanded a ready sale. Their projectors at first condemned the law as being too severe, alleging that it was the only law of its kind which did not contain a proviso to give it elasticity, as in the case of the laws of certain other states. Wilful and fraudulent adulteration has been carefully checked, while the legitimate trade has always been accorded the most careful consideration in order that possible wrong or injustice might be avoided; and this class of tradesmen are to-day amongst the staunchest supporters of the beneficent pure food laws of Pennsylvania.

MEATS DOSED WITH DRUGS AND DYES.

It has been discovered that agents of certain manufacturing and wholesale concerns are endeavoring to flood the State not only with illegal preservatives, which are employed to "doctor" milk and cream, but they are likewise imposing on many butchers and other dealers in meats by the sale of preservatives which are sold under
attractive trade names. Certain of these preservatives used to prepare meats, especially Hamburg steak, pork, sausage, "chopped" meats, fresh roast beef, beef steak, etc., contain a considerable quantity of sulphites which our chemists and medical experts claim are most injurious to health when added to articles of food and drink.

Coal tar or other objectionable coloring agents are also found by chemists in these chemically prepared meats.

Some of the dealers who have placed these health destroying preservatives in the hands of our well disposed and honest tradesmen, give, it is said, guarantees of purity, and assert that these products comply with the laws of Pennsylvania. They attempt to impress the improper and untruthful claim that these fortifying agents are "Boron Compounds," hence are permitted by the act of April 27, 1903.

The meats, poultry, etc., which are treated with these objectionable drugs and pigments are generally sold at reduced prices, so as make them more attractive to the poorer classes, hence the wage earner, who requires a most nourishing and healthful diet, is slowly, yet surely, undermining his physical powers when he consumes, as a part of his daily fare, these meats laden, as they are, with insidious poison.

A number of prosecutions of preserved, fresh meats have been started, and our efforts to prevent such outrageous practices will be continued with unabated vigor until the nefarious business ceases, and when the General Assembly again convenes, a measure should be promptly passed which will absolutely prohibit the use of all preservatives on meats, poultry, etc., which are sold as fresh.

OBJECTIONABLE SULPHITES.

The following paragraphs concerning sulphites are from the pen of Adolph Koenig, M. D., editor "Pennsylvania Medical Journal," Pittsburg, Pa.:

"There are three kinds of sulphites in common use, viz., Sodium Sulphite, Potassium Sulphite and Magnesium Sulphite, all having practically similar properties.

"The first of these is the one ordinarily used as a preservative, especially for chopped meats (Hamburg Steak), and sausage. It is chosen in preference to other preservatives for the reason that in addition to its germicidal and antiseptic properties, it has the property of freshening the color of meat, and thereby making it more pleasing to the eye, and, consequently, more salable.

"Sodium Sulphite is described in the United States Pharmacopoeia as 'colorless, transparent, monoclinic prisms, odorless, having a cooling, saline, sulphurous taste.'

"The sulphites are rather unstable salts: when exposed to the air they are prone to change into sulphates by the absorption of oxygen."
"When the sulphites are decomposed in the stomach or in meat the first product is $SO_2$ or sulphur dioxide gas. This gas immediately combines with a molecule of water and forms sulphurous acid $= SO_2H_2O$ (or $H_2SO_3$) which is much more active than the gas and represents the poisonous action of the sulphites.

"As sulphites they possess little or no germicidal action. Whatever action they possess in that line is due to the liberation of sulphurous acid, which is readily liberated when sulphites come into contact with acids. In fresh meat for instance, there are found acid phosphates, which, when the meat is treated with sulphites, attacks them and breaks them up with the liberation of free sulphurous acid, and it is that substance that acts as the preservative. Given by the stomach the sulphites are attacked by the hydro-chloric acid naturally found as a constituent of gastric juice, and here also sulphurous acid is the result.

"Sulphurous acid is a powerful corrosive poison and its action in the stomach is baneful in several ways. First, it lowers the vitality of the tissues with which it comes into contact. Second, it interferes with the digestive powers of the ferments in the gastric juice, and third, it lowers the nutritive value of the food itself. Absorbed into the blood, Harrington says, it exerts in large doses, a marked and sometimes fatal poisonous action, and small doses, long continued, affect seriously the circulation, lungs and kidneys. Indeed, it cannot but affect seriously owing to its corrosive nature, any living tissue with which it may come into contact, and should under no circumstances be permitted to be used as a food preservative."

**IMPURE-DRUGS AND MEDICINES.**

The correspondence of this office has developed the fact that the man who buys medicine, as well as he who buys food desires to know that he is getting what he pays for, and that no imposition is being imposed or practiced upon him. A preliminary examination of certain articles revealed a condition that was not entirely satisfactory. There are but few opponents who would not admit the wisdom of and actual necessity for making the suggested investigations of drugs, and where the opposition is loudest, selfish personal interest is often conspicuous.

The drugs sold in Pennsylvania, when sold under or by a name recognized in the United States Pharmacopoeia should conform to a certain standard of strength and purity. In the case of so-called "patent" medicines there seems to be a wide field for investigation on account of their unlimited scope for doing great harm. The universal extent to which they are used makes it important that they should be free from any substance that is injurious to health. If the assertion that is often made be true, that many of these medicines are made up largely of inferior alcoholic liquors and other constituents, harmful in character, the public have a right to know it, and if untrue, justice to the proprietors of these medicines could only be done by determining the disputed question by chemical examination.
RULINGS AND REGULATIONS.

After a careful consideration of the requirements for an intelligent and conservative interpretation and enforcement of the pure food law of June 26, 1895, and after consultation with my attorneys I was satisfied that no fixed “ruling” could be safely or legally adopted, as no officer or citizen not connected with the judicial branch of the government has a legal right to annul an act of Assembly. Hence, the so-called “rulings” which were in force under previous administrations were revoked. This action was rendered necessary because of the possibility of such personal views interfering to a greater or lesser extent with legislative enactments, and the further fact that certain manufacturers and dealers were inclined to interpret such “rulings” more liberally than may have been originally intended. The attitude of the Commissioner can not be better or more fully expressed than by the phraseology of the laws with the enforcement of which he is charged. Where exceptional cases may appear to work a hardship or cause excessive trouble and expense, the only remedial agency that can be safely recommended is legislative in its character. The Commissioner can only enforce the laws in their entirety, and it is not within his province to pursue any other course.

CRITICISMS OF ARTICLES OF FOOD.

I desire to call attention to the fact that my special agents are specifically instructed to withhold criticism of any articles of food or drink that may be found in the markets. It is not within their province to either condemn or recommend and thereby hinder or aid the sale of any article of food or drink which may come under their notice, excepting by a special order to that effect from the proper authority, should the exigencies of the case demand such extreme action. When in the regular routine of their official duties, samples are purchased, sent to the chemist for analysis, and adulterants or harmful ingredients are found, or where fraud is practiced the Commissioner orders prosecutions to be instituted, but even in such instances a general condemnation of such an article or the part of agents would not be permissible. Different manufacturers employ varying formulas, and it often occurs that the same manufacturer produces goods under the same label with very material changes of ingredients, to meet competition in different localities.

PUBLICITY IN ENFORCING LAWS.

Publicity is most efficacious in enforcing the pure food laws. This has been well illustrated in numerous instances. While such treat-
ment of offenders may appear somewhat drastic, honest manufacturers and dealers in food and drink commodities have nothing to fear. Dealers who have been flooding the markets with inferior and adulterated goods will soon find that the publicity accorded to prosecutions by the press and publications of the Dairy and Food Division will destroy their objectionable and unlawful business. Another gratifying fact consists in the knowledge that even those articles which were formerly grossly adulterated are now sold by the same firms in a pure or unadulterated state. Energetic action at a critical time has produced a marked change for the better, and the officials in authority will continue to perform their several duties vigorously, fearlessly and impartially, shielding no one, but simply obeying the mandates of the law.

DAIRY AND FOOD BULLETIN.

Upon assuming charge of the duties incumbent upon the Dairy and Food Commissioner, it was at once determined that a monthly resume of the operations of this branch of the Department of Agriculture was exceedingly desirable. After consulting with my legal advisors and having received your approval, a publication known as the "Monthly Bulletin" was issued regularly. This publication relates entirely to the operations of the Dairy and Food Division of the Department of Agriculture. It is distributed to all who apply for it that are interested in the work of enforcing the dairy and food laws of this Commonwealth. Each number gives a brief resume of the work accomplished by the Commissioner and his force of assistants during the preceding month, and as it is distributed gratuitously, and only upon application by those especially interested, it reaches the desired class of readers, and aids most effectually in the educational work. By authority of law, nearly twenty-five thousand copies are distributed monthly. The bulk of this large edition reaches grocers and general storekeepers, while the miscellaneous list includes representative people of this and adjoining states who are interested in the enforcement of the laws relating to this Division. The numerous letters received by the Commissioner show most conclusively that a strong public sentiment in favor of pure and better articles of food and drink has been aroused. Whether the comparatively small tradesmen who might possibly complain because of the publicity given to suits brought against them come under the ban, or whether a business produces millions for the investor, the same publicity is accorded to all in the columns of the "Monthly Bulletin." This medium of publicity has already accomplished an almost incalculable amount of good, and assisted very materially in successfully enforcing the various acts of Assembly placed under the administration of this Division.
REPORT OF ANALYSES.

The regular publications of the "Monthly Bulletin" and other printed matter already referred to, containing as they do, a complete statement of analyses made by the chemists, it would be unnecessary repetition to give such a statement in this report, and it is therefore omitted.

To reprint the thousands of chemists' reports, together with a history of prosecutions ordered and their termination, lists of articles of food found not adulterated, etc., would alone require a volume as large as the annual report of the Department of Agriculture. The number and variety of samples analyzed during the past nine months can best be comprehended by an examination of the files of the "Monthly Bulletin."

LIST OF LICENSES ISSUED.

Owing to frequent requests, complete lists of the oleomargarine and renovated butter license certificates issued appear regularly in each number of the "Monthly Bulletin." This enables dairymen and others interested to promptly discover and report violators of the law. All licenses expire with the close of each year. The following financial statement will prove of special interest in connection with the sale of oleomargarine and renovated butter in Pennsylvania:

REPORT OF RECEIPTS OF THE DAIRY AND FOOD DIVISION FROM APRIL 1 TO DECEMBER 31, 1903.

In compliance with your request I shall present as part of this report, the appended financial statement relating to the amounts received by this Division for oleomargarine and renovated butter license certificates, and also the amounts received through prosecutions brought against the numerous offenders against the dairy and food laws of Pennsylvania. The period covered by these figures includes the brief official term, namely, from April 1 to December 31, 1903, inclusive.

All of these license fees and the fines and costs collected were promptly paid into the State Treasury, in conformity with the provisions of the several acts of Assembly placed under my administration for enforcement.

But for the fact that unavoidable delays in securing analytical reports retard prosecutions, and because of the dilatory court proceedings in some sections of the Commonwealth, the aggregate receipts, although presenting a most favorable showing, would have been considerably augmented.

As the present Commissioner assumed charge of the office under 6—6—1903
Governor Pennypacker's administration, on April 1st, the amounts collected between January 1 and April 1, 1903, by my predecessor are stated separately.

The statement for the year 1903 is as follows:

**PURE FOOD FINES.**

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1 to April 1</td>
<td>$1,798.39</td>
</tr>
<tr>
<td>April 1 to December 31</td>
<td>37,953.79</td>
</tr>
<tr>
<td><strong>Total during 1903</strong></td>
<td><strong>$39,752.18</strong></td>
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</table>

**OLEOMARGARINE LICENSES.**

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1 to April 1</td>
<td>$31,617.70</td>
</tr>
<tr>
<td>April 1 to December 31</td>
<td>6,293.48</td>
</tr>
<tr>
<td><strong>Total during 1903</strong></td>
<td><strong>37,911.18</strong></td>
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**MILK FINES.**

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 1 to December 31</td>
<td>$6,093.56</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,093.56</strong></td>
</tr>
</tbody>
</table>

**OLEOMARGARINE FINES UNDER ACT OF 1899.**

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1 to April 1</td>
<td>$37.66</td>
</tr>
<tr>
<td>April 1 to December 31</td>
<td>578.54</td>
</tr>
<tr>
<td><strong>Total during 1903</strong></td>
<td><strong>616.20</strong></td>
</tr>
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</table>

**OLEOMARGARINE FINES UNDER ACT OF 1901.**

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1 to April 1</td>
<td>$2,356.75</td>
</tr>
<tr>
<td>April 1 to December 31</td>
<td>3,550.53</td>
</tr>
<tr>
<td><strong>Total during 1903</strong></td>
<td><strong>5,907.28</strong></td>
</tr>
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**OLEOMARGARINE FINES UNDER ACT OF 1893.**

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 1 to December 31</td>
<td>$125.88</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125.88</strong></td>
</tr>
</tbody>
</table>

**RENOVATED BUTTER FINES UNDER ACT OF 1899.**

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1 to April 1</td>
<td>$17.37</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17.37</strong></td>
</tr>
</tbody>
</table>
RENOVATED BUTTER FINES UNDER ACT OF 1901.

January 1 to April 1, ...................... $296 51
April 1 to December 31, .................... 1,335 54

Total during 1903, ......................... 1,632 05

VINEGAR FINES UNDER ACT OF 1897.

January 1 to April 1, ...................... $112 18
April 1 to December 31, .................... 667 16

Total during 1903, ......................... 779 34

lard fines.

April 1 to December 31, .................... $357 00

Total, ....................................... 357 00

RENOVATED BUTTER LICENSES.

April 1 to December 31, .................... $266 67

Total, ....................................... 266 67

Total, ....................................... $93,458 71

In order that a proper comparison can be made as to the progress of this Division of the Department of Agriculture, the following statements showing the aggregate receipts for the two preceding years, 1901 and 1902, are also presented:

1901.

Pure food fines, .......................... $4,883 23
Olomargarine licenses, 1899, ............... 20,516 74
Olomargarine licenses, 1901, ............... 1,089 26
Milk fines, ................................. 225 00
Olomargarine fines, 1899, .................. 5,446 97
Olomargarine fines, 1901, .................. 2,070 87
Renovated butter fines, .................... 120 00
Cheese fines, ................................ 105 00
Vinegar fines, 1897, ....................... 73 12
Renovated butter licenses, .................. 175 00

Total, ....................................... $34,705 19
ANNUAL REPORT OF THE

1902.

Pure food fines. .................................................. $8,082 20
Oleomargarine licenses, ........................................ 23,927 05
Milk fines, ......................................................... 1,177 24
Oleomargarine fines, 1899. .................................... 3,238 18
Oleomargarine fines, 1901. .................................... 5,225 75
Renovated butter fines, 1899. ................................ 5 90
Renovated butter fines, 1901. ................................ 572 68
Renovated butter licenses, ..................................... 766 67
Cheese fines, ...................................................... 168 50
Vinegar fines, ...................................................... 447 24
Lard fines, ......................................................... 23 00

Total, ............................................................. $43,635 41

AGRICULTURAL ORGANIZATIONS.

Realizing the magnitude of the dairy industry and the importance of its development, I have endeavored to interest and secure the more active co-operation of all agricultural organizations in the enforcement of the law. The help received through the State, Pomona and Subordinate Granges, Farmers' Alliances and kindred agricultural organizations was of especial value, and merits this grateful acknowledgment. The Pure Butter Protective Association, through its officers, namely, Thomas W. Sharpless, president; Isaac W. Davis, secretary, and W. E. Drennan, chairman of the executive committee, also assisted very materially in the effort to place Pennsylvania in the first rank as a dairy state. By the earnest and intelligent co-operation of the above named organizations, at least several thousand dollars were collected and paid into the State Treasury on account of fines imposed and license certificates issued as the result of information received of violations of the oleomargarine and renovated butter laws.

GROCERS UNITED IN THE WORK.

The Retail Grocers' Association, of Philadelphia, through its energetic secretary, William H. Smedley, has also demonstrated its sympathy with and support of rational pure food legislation. Representatives of similar associations throughout Pennsylvania have given their hearty support, although no other class of business men in the Commonwealth have greater issues at stake. While separate and independent views might have prevailed at the beginning relative to the utility and propriety of certain legislation, the opportunities to realize the beneficent effects of such laws,
when properly enforced, have demonstrated their actual worth, and whatever doubts may have existed, have been removed so that the legitimate manufacturer, producer, jobber or retailer has, with rare exception been converted into a genuine advocate of the pure food laws of Pennsylvania.

**LIVE STOCK SANITARY MATTERS.**

The Commissioner begs leave to make grateful acknowledgment of the valuable assistance rendered by the officials of the Pennsylvania Live Stock Sanitary Board. Many dairymen and others who desired information relative to the care and improvement of their live stock and products, received much helpful assistance from Dr. Leonard Pearson, who holds the responsible position of State Veterinarian, and to whom many inquiries were referred. The cooperation of such interests is most desirable, and the consequent good that follows meets with hearty appreciation on the part of the agricultural classes, who have occasion to ask for advice or information. Having opportunity to know the important objects and high purposes at which the State Live Stock Sanitary Board aims, and the good it is accomplishing, this acknowledgment is freely bestowed. This is especially true because proper dairy barns, better sanitary arrangements, absolute cleanliness, proper food and greater intelligence on all these subjects will insure purer milk, better cream and butter, and thus the public has received a service of the highest value.

**NEWSPAPER COURTESIES ACKNOWLEDGED.**

The influence of the press has been a valuable and potent factor in the enforcement of the dairy and food laws of Pennsylvania, and the friendly assistance so freely rendered has at all times proven an inspiration to renewed efforts to enforce the pure food laws with still greater zeal. Its sympathy and approval of the difficult task afforded genuine pleasure and much encouragement to all interested, and thanks are due and hereby freely acknowledged for the courtesies extended. The meanest kind of stealing is from the poor by means of adulterating their food supplies, yet instances have been known where defendants attempted to create or arouse false or mistaken sympathies, thus endeavoring to poison the public mind by newspaper criticism. Happily these cases were insignificant in number, and the usual wise discernment of the editors prevailed. No manufacturer, jobber or concern which makes or sells an adulterated article can long continue its imposition and live under the glare of the newspaper publicity that must accompany every honest prosecution.
GRATEFUL ACKNOWLEDGMENTS.

For the uniform and valued courtesies received through the Secretary of Agriculture, and his constant willingness to advise and assist in the solving and adjustment of the many intricate questions which frequently arise in connection with the work incident to a careful and conscientious interpretation and enforcement of the dairy and pure food laws, especial gratitude is hereby acknowledged. Although his duties are varied and burdensome, his valuable time was always available whenever his co-operation and friendly help were needed. It was largely through his hearty approval and earnest encouragement that the Commissioner was enabled to produce the present gratifying results, and it is with the assurance of the continuation of this hearty assistance and co-operation that I venture the hope that still greater benefits for the masses may be secured during the coming year, if our health and lives are spared.

In numerous instances, the Secretary of Agriculture and Dairy and Food Commissioner in response to requests received from dairymen, patrons of husbandry, business people and others, visited together various sections of the State to organize systematic investigations into violations of the laws. The co-operation of the State officials and the public has produced excellent results and established public confidence to an unparalleled degree.

In concluding, words of appreciation and gratefulness are also due to numerous persons, including attorneys, chemists, special agents, office force, and others who have rendered valuable assistance in their several capacities. The Commissioner entertains for them a personal and friendly regard, for without loyalty to the work and a willing and conscientious recognition of duty, our best efforts would have proven unavailing. It is our bounden duty and within our reach to greatly benefit the general public, and the experience of the nine months just ended justifies the belief that their support, sympathies and best wishes for continued success are not lacking. Our duties are only begun. May the future be gracious and grant a still greater measure of success!

Very faithfully yours,

B. H. Warren.

Dairy and Food Commissioner.
REPORT OF THE STATE VETERINARIAN.

Harrisburg, Pa., December 31, 1903.

Honorable N. B. Critchfield, Secretary of Agriculture, Harrisburg, Pa.;

Sir: I have the honor to present to you this report on the work of the State Veterinarian for the year 1903. With the report of the Veterinary Division of the Department of Agriculture, I have incorporated a report of the work of the State Live Stock Sanitary Board, for the reason that these two lines of work are so intimately connected that it does not seem possible to disassociate them. While the State Veterinarian is an officer of the Department of Agriculture, authority for the control of the infectious diseases of animals is not vested in the Department of Agriculture, but in the State Live Stock Sanitary Board. This Board is composed of the Governor of the Commonwealth, the Secretary of Agriculture, the Dairy and Food Commissioner and the State Veterinarian. It will be seen that while the State Live Stock Sanitary Board is a separate organization, all of its members, with the exception of the Governor, are officers of the Department of Agriculture, and thus it happens that the Board has come to be looked upon as a part of the Department of Agriculture although, strictly speaking, this is not the case.

During the year that has just closed, the work that has fallen to me as State Veterinarian and as Secretary of the State Live Stock Sanitary Board, has continued to grow in volume and, I believe, in importance to the well-being of the animal industries of the State. It is pleasing to record the fact that, as heretofore, this work has been carried out in complete harmony and accord with all of the organized agricultural, live stock and public health interests. The live stock owners of the State realize that it is chiefly in their interest that diseases of animals are controlled. It is a great exception to find a live stock owner who is not willing to co-operate heartily and effectively in such measures adopted by authority of the State as may be necessary to repress an outbreak of an infectious disease among animals. While this condition is one that, theoretically, seems to be entirely natural, if not inevitable, it is, nevertheless, worthy of note for the reason that in many states the most active opposition similar work has had to meet, has been from the owners of animals. There can be no difference of opinion among
owners of live stock as to the desirability of eradicating diseases that damage or destroy their valuable animals. But opposition comes when it appears that the measures that have been adopted are not well planned to effect the purpose in view, or when the measures of repression are more burdensome and expensive than the disease that they are intended to repress. Even in the latter case, in times of serious danger, live stock owners will co-operate if the necessity for the measures that it is proposed to employ, is made clear to them.

As a result of the friendly co-operation between the State Live Stock Sanitary Board and the owners of live stock, outbreaks of infectious disease are in most cases immediately reported to the Department, with the knowledge that the most effective measures that are authorized and can be employed, will be used in the interest of the individual owner, as well as in the interest of live stock owners in general.

The work that comes under my care increases in importance and volume from year to year, in proportion to the growth of the live stock interest of the State, to the extent that domestic animals and the public, through the products of domestic animals, suffer with or are threatened with disease, and to the extent that the work of this office is appreciated and called for. As Pennsylvania grows in population, there is a constantly increasing need for food products of animal origin—for milk and other dairy products—for poultry products and for beef, mutton and pork. A large part of the additional supplies of food stuffs that are required comes from other states, but still the demands upon the farms of Pennsylvania are sufficient to cause a steady increase in importance of those branches of agriculture that are related to the animal industries. The greatest growth has been in connection with the dairy industry.

Pennsylvania ranks second among the states of the Union in milk production, and bids fair soon to occupy the first position. The business of producing milk appears to develop most rapidly upon the rather high-priced farms in the most thickly populated sections. This condition long ago gave rise to the business of bringing cows from less thickly populated sections, where land is cheaper and where the cattle can be raised more economically, to those districts where milk is in greatest demand. At first, dairy cows for this use were purchased in the interior of the State and were driven to the neighborhood of Philadelphia, where they were sold to milk producers. Later, the business developed of shipping such cows by rail from the central and western parts of Pennsylvania and from adjoining states. Recently, it has become common to ship cows long distances. Many of the dairy cows in Eastern Pennsylvania have come from Tennessee, Missouri and the districts tribu-
tary to the great cattle market at Chicago. The number of cows brought annually to Pennsylvania in this way amounts to from 15,000 to 20,000. There are many sections of Pennsylvania admirably adapted to the production of cows for this use where the industry is but little cultivated or is ignored.

Whether based upon sufficient reason or not, there is no doubt that the dairymen who buy all of their cows and who do not raise their calves, much prefer larger cows that show a preponderance of Shorthorn blood. Such cows, if in good condition, with well-developed udders, of good conformation, and giving promise of large milk yield, generally command the highest prices at sales of dairy cows. The reason for this is that when their term of usefulness as dairy cows has passed, they are worth considerable to the butcher, and when beef is high they are sometimes sold, dry, for as much as they cost, fresh. It would, appear, therefore, to be well for those who wish to engage in the business of producing cows for sale in the milk-shipping districts to use bulls of one of the breeds of cattle that are large and at the same time are heavy milkers, such as the dairy Shorthorns or the Red-polls.

On the other hand, farmers who are so situated that they can themselves raise the cows that they need, appear to derive greatest profit from the use of some one of the special-purpose dairy breeds as the Jersey, Guernsey or Holstein-Friesian. It would mean a great deal to the cattle raisers of the State if the money, amounting to millions of dollars, paid for cows from other states, were retained in Pennsylvania. In many districts it would be more profitable to market cattle than to sell crops from the farm, and it would do much to conserve and improve the fertility of the soil. In addition to purchasing dairy cows from other states, Pennsylvania imports every year a large number (from 25,000 to 30,000) steers for feeding. If an effort were made to supply the cow market by breeding Shorthorns or Red-polls this would, at the same time, result in the production of a large number of steers valuable for feeding.

For some reason but little attention has been paid in many parts of Pennsylvania to the production of cattle of a definite type and of high quality. This is in marked contrast with the condition that prevails in the cattle-raising districts of most of the central and western states, where it is the exception to find animals that do not clearly show the prominent characteristics of one of the imported breeds. No cattle raiser can afford to use a bull that is not pure-bred and of the best quality obtainable, and after having started in a definite line of breeding, a change should not be made lightly; a change should not be made excepting for the strongest reason. The objection that will be raised to this suggestion is that good bulls are too expensive. A little investigation will show that
this is not really the case. Good bulls of any of the imported breeds may be bought as calves for low prices and may be shipped in crates, by express, at comparatively small cost. But even if a high price is paid for a good bull that is mature and that has shown his worth for breeding, the increased cost will soon be returned in the extra value of each of his progeny. By co-operation of several farmers in a neighborhood, a bull may be purchased for the use of several herds. Members of farmers' clubs have found it profitable to join in the purchase of a good bull or a good stallion.

In many parts of Pennsylvania, nondescript animals are raised of no definite breeding which can be classed fairly as "scrubs." To properly mature such an animal costs almost as much as to properly mature a highly bred animal, which, on maturity, will sell from 25 to 50 per cent. more than its plebian competitor. There is no room in the animal husbandry system of this State for animals that are not bred and designed for high utility in some definite direction. There is an improved breed that is adapted to the conditions and possibilities of every section of the State. If the conditions of life are too rugged for the large breeds, and if the conditions in respect to the market for milk are not good enough to justify keeping the Channel Island cattle, such breeds as the Devon or Ayrshire may do well and work great improvement in the existing cattle population. The seed for improvement is near at hand, because there are in this State many of the best herds of cattle to be found anywhere. It is to be hoped that the need for improvement will become so manifest that our own progressive breeders will have a better home market for herd improvers. This subject is one that deserves the serious attention of farmers' institutes and local agricultural organizations of all kinds. There are, approximately, 1,000,000 milch cows in Pennsylvania and about 2,000,000 cattle of all kinds. By improved breeding the average value of each of these animals could readily be increased $5, and this would mean an addition of $10,000,000 to the resources of the State.

The work of the laboratory of the State Live Stock Sanitary Board has always been an important part of the activity of the Board. The laboratory continues to occupy the rooms provided for it free of charge in the Pepper Clinical Laboratory of the University of Pennsylvania. It is gratifying to be able to state that authoritative work has been done by this laboratory in many directions, and that it is now one of the most productive laboratories of the kind in this country. All of the tuberculin, mallein and anthrax vaccine used for the Live Stock Sanitary Board have been made in this laboratory, and the total value of these products that have been made and used in the State more than equals the total cost of the running expenses of the laboratory. The advantage derived from the laboratory in
making its own biological products, lies not only in the financial saving afforded in this way, but also in having perfectly fresh and reliable material available at all times for immediate use.

The use of tuberculin continues to increase as its accuracy as a diagnostic agent become more widely known. I believe that the great increase in the use of tuberculin in Pennsylvania is due largely to the fact that the preparation used is always fresh and reliable and that misleading results have not been obtained through the use of faulty material. The mallein test has also increased very largely the past year. The results from the anthrax vaccinations that have been made have been wholly satisfactory. The vaccine material used in the experiments upon cattle against tuberculosis, has also been prepared in this laboratory.

Dr. S. H. Gilliland has made an anti-tuberculin serum with which he and Dr. C. Y. White are experimenting in the prevention and cure of tuberculosis. The work that Dr. Gilliland has done in this direction is original work and will be reported upon separately by him.

The laboratory is used more and more each year by the veterinarians of the State as a place for obtaining an authoritative report upon the pathological material submitted. It often occurs in the course of a veterinarian's practice, as in the course of a physician's practice, that diseases are met with that cannot readily be diagnosed. To establish a diagnosis requires a careful laboratory examination of a secretion or tissue or pathological product. The physician who is confronted by a case of this kind may have access to any one of a very large number of laboratories at medical colleges and hospitals throughout the State, but the veterinarian is without any opportunity for assistance excepting that which is furnished by the State Live Stock Sanitary Board. To be sure, the large laboratories maintained for the use of physicians, are sometimes called upon for assistance, but these laboratories are equipped and maintained to do such work as physicians require done. They are not accustomed to examine material from animals. Their directors are, as a rule, unfamiliar with the diseases of animals, and, generally, they do not care for this kind of work. Consequently, if it were not done by the laboratory of the State Live Stock Sanitary Board it would not be done at all, as was the case before this laboratory was established. Frequently it is of much public importance that a diagnosis of a disease of animals shall be established quickly and accurately. In the beginning of an outbreak of anthrax, for example, it is of vital importance that it shall be known at the earliest possible moment whether the disease under observation is anthrax or not. If the diagnosis of anthrax is established, it is possible immediately to take such measures as will
circumscribe and control the outbreak. Exposed animals may be vaccinated and rendered immune, the carcasses of those that have died may be disposed of by burning, and the premises may be thoroughly disinfected. In this way the outbreak is nipped in the bud, as it were. On the other hand, if the diagnosis were not promptly established and there remained a doubt as to whether the disease were anthrax or something else—and the differential diagnosis is sometimes quite difficult—effective measures would not be taken under such conditions. Without a definite diagnosis the carcasses of animals dead of anthrax would be permitted to lie upon the ground, their parts to be distributed by dogs and birds as well as by water and wind, and this may result in the condition that exists in old infected districts. In such districts the germs of this disease, having entered the soil, retain their life and their virulence for many years and are, at all times, available for the infection of animals that pasture over such regions or that drink the water that has drained across infected soils, or that feed upon the crops grown there.

Similarly, in outbreaks of black-quarter or Rindersenche, it is of great importance to the animal husbandry and the Commonwealth, to establish promptly an accurate diagnosis.

In the diagnosis of the above-named diseases and of rabies, glanders and hog cholera, the laboratory has rendered valuable assistance, and is called upon for aid by veterinarians, health officers and live stock owners in all parts of the State.

For several years a good deal of attention has been paid in the laboratory of this Board, to the bacteriological and microscopic study of milk. This has resulted in the accumulation of a large amount of data in regard to these important subjects that are just now attracting so much serious attention. And if, as seems probable, it becomes necessary for the State Live Stock Sanitary Board to take a more active part in the matter of dairy inspection, the facts that have been accumulated in the records of the laboratory in respect to the above items, will be of great practical advantage. Part of this material has already been published in papers and addresses by Dr. Ravenel and Dr. Gilliland.

In field research some very important discoveries have been made in relation to the pathology of forage poisoning of horses. This work has been reported upon by Dr. D. J. McCarthy and Dr. M. P. Ravenel. Their report is published as an appendix to this report. This piece of work is of great importance because it reveals the alteration that has occurred in a large number of horses afflicted with this disease. Under the auspices of the State Live Stock Sanitary Board, certain definite causes for forage poisoning of horses have been revealed and a pathology of the disease has been made
known. Formerly, both the cause of the disease and its pathology were shrouded in mystery. Through knowing the cause of forage poisoning, it has been possible, in a great many cases, to prevent the disease, and the knowledge of the pathology that has been given us by Drs. McCarthy and Ravenel must be regarded as the first effective step toward rational treatment.

The greater part of the energy and resources of the laboratory have been devoted during the past year, to the study of immunization of cattle against tuberculosis. This work was started some years ago, and has been reported upon in part by Dr. S. H. Gilliland and the writer, who have had the entire responsibility for it. Our work has been amplified and, as will be shown in another part of this report, it has been placed on such a basis as to be tested under practical farm conditions.

The legislature of 1903 enacted two laws which are destined to have an important influence on the work of the State Live Stock Sanitary Board. These are the acts of Assembly that follow:

No. 60.

AN ACT

To encourage the repression of tuberculosis of cattle, and to provide for the disposition of the carcasses of meat-producing animals that are infested with tuberculosis to a degree that renders their flesh unfit for use as food.

Section 1. Be it enacted, &c., That whenever it comes to the knowledge of the secretary of the State Live Stock Sanitary Board, or an agent of that Board who is authorized to inspect animals, that a meat-producing animal, killed for food, was found to be infested with tuberculosis, or with a disease resembling tuberculosis, it shall be the duty of the secretary of the State Live Stock Sanitary Board, either himself or by deputy, or of an authorized agent of the State Live Stock Sanitary Board, to make an inspection of the said dead animal and its parts, for the purpose of ascertaining whether it is or was infected with tuberculosis, and, if infected, to what extent.

Section 2. If it shall be found that the animal, from which the carcass or meat came, was infested with tuberculosis, or other infectious disease, and to a degree that renders the flesh unfit for use as food, the said dead animal, carcass or meat, shall be condemned, and shall be disposed of by the use of any method that is approved by the State Live Stock Sanitary Board. For the guidance of inspectors of animals and meats, and of agents of the State Live Stock Sanitary Board, rules for the inspection of the carcasses of meat-producing animals may be promulgated by the State Live Stock Sanitary Board, or, in the absence of such rules, the rules of
the United States Bureau of Animal Industry, that cover the inspection of animals and carcasses for tuberculosis in abattoirs under federal inspection, shall be observed.

Section 3. When it is decided by a meat inspector, approved in respect to competency and reliability by the secretary of the State Live Stock Sanitary Board, or by a member or agent of the State Live Stock Sanitary Board, and certified by him in writing on an official form that shall be provided for this purpose by the State Live Stock Sanitary Board, that the flesh of a meat-producing animal is unfit for use as food, on account of the fact that the animal from which it came was infected with tuberculosis to an injurious degree, the said meat or carcass may be appraised, by agreement between a member or agent of the State Live Stock Sanitary Board and the owner or his agent, or, if an agreement cannot be made, three appraisers shall be appointed, one by the owner or his agent, one by the State Live Stock Sanitary Board or its authorized agent, and the third by the two so appointed, who shall, under oath or affirmation, fairly and impartially appraise the meat or carcass, taking into consideration its apparent market value at the time of appraisement: Provided, however, That such appraised valuation shall not exceed five cents per pound, nor twenty-five dollars for the entire carcass.

Section 4. The amount of the agreed or appraised valuation shall be paid by the State Live Stock Sanitary Board, in the same manner as other expenses of said board are paid, upon the presentation of satisfactory certificates of condemnation and valuation, and satisfactory evidence in writing that the condemned animal has been continuously in the State of Pennsylvania for not less than four months prior to slaughter, and that the carcass was disposed of in such a way that had been approved by the State Live Stock Sanitary Board.

Approved—The 25th day of March, A. D. 1903.

SAML. W. PENYPACKER.

No. 80.

AN ACT

To prevent the spread of the disease known as rabies, or hydrophobia; and to authorize the quarantine, restraint, confinement, or muzzling of dogs, during outbreaks of this disease; and to empower the State Live Stock Sanitary Board to enforce the provisions of this act.

Section 1. Be it enacted, &c., That whenever the disease known as rabies, or hydrophobia, shall occur among the dogs or other animals, in any locality of Pennsylvania, and it is adjudged by the State Live Stock Sanitary Board that the disease is spreading, or is
liable to be spread by dogs that have been exposed, the said Board may order the quarantine, restraint, confinement, or muzzling of any or all dogs, within the limits of the locality in which the danger of infection is deemed to exist. The authority hereby conferred is not to annul or restrict the authority now possessed by cities or boroughs to quarantine, restrain, confine, or muzzle dogs, within the limits of their respective jurisdictions.

Section 2. A quarantine, or order to restrain, confine or muzzle dogs, shall be operative when it is approved by a majority of the members of the State Live Stock Sanitary Board, and when a copy of it has been left at the usual place of residence of the owner of the dog that it is believed to have been exposed to rabies, or hydrophobia; or when the notice or order to quarantine, restrain, confine or muzzle dogs, has been published in each of two papers in each of the counties within which the regulation is established, and when printed notices, giving the text of the regulation or order, have been posted in public places, in the locality in which the regulation or order applies.

Section 3. Should dogs be permitted to run at large, or to escape from restraint or confinement, or to go without muzzle, in violation of the quarantine, or regulation, or order, established by the State Live Stock Sanitary Board to restrict the spread of rabies, or hydrophobia, as provided by this act, such dogs may be secured and confined, or they may be shot or otherwise destroyed, and the owner or owners thereof shall have no claim against the person so doing.

Section 4. Any person violating the provisions of this act, or of a quarantine, or of a regulation or order to restrain, confine or muzzle dogs, duly established by the State Live Stock Sanitary Board, for the purpose of restricting the spread of rabies, or hydrophobia, in the manner provided in the other sections of this act, shall be deemed guilty of a misdemeanor; and upon conviction shall forfeit and pay a fine of not less than ten dollars nor more than one hundred dollars, at the discretion of the court.

Approved—The 27th day of March, A. D. 1903.

SAML. W. PENNYPACKER.

Reference has already been made to the development of the dairy industry of Pennsylvania. This industry now ranks as the most important part of the agriculture of the State. The steadily increasing demand for milk denotes that the dairy industry must continue to grow. It is, however, to be observed that milk consumers are becoming more particular as to the quality of the milk they consume. This is shown by the increased attention given to milk inspection by boards of health and by the State Dairy and Food Commissioner, as well as by the growth of milk businesses that are con-
ducted on a high plane and aim to furnish none but the most wholesome milk. So many farmers are now dependent upon the milk market for their income that anything that affects this market deleteriously, has far-reaching importance.

While the greater part of the market milk that is produced is of good quality, unadulterated and wholesome, it occurs, every now and then, as undesirable conditions occur in other businesses, that milk that is not desirable or safe for use as food, is delivered to customers. Some of the undesirable qualities of milk accrue in the household of the consumer, others at the hands of the dealer, others during transportation, and still others at the seat of production.

In order that milk may be good, it is necessary that it shall be produced under proper conditions, and that it shall be handled properly at every step on its way to the consumer's table. It is necessary, first of all, that the cows furnishing the milk shall be in a condition of health. Milk is harmed not only by the existence of tuberculosis and all other constitutional or infectious diseases, but also by local diseases of the udder. Microscopic examination has shown that a considerable proportion of cows furnish milk containing pus cells and streptococci. These elements and organisms show that the udder is, or has been, the seat of a purulent inflammation. Sanitarians consider that milk of this description is unwholesome and should not be used. This means that it is necessary to exclude from milk production, cows with garget or with other evidence of inflammation of the udder. Generally, this is done, but through lack of attention, it is sometimes overlooked with the result that the milk is contaminated and the consumer is injured. Another important factor in the production of wholesome milk, and perhaps the most important factor of all, is cleanliness—cleanliness in relation to the cows, cleanliness of the stable, cleanliness of the utensils and of the milker. Some cows are so kept, and some premises are so constructed and maintained, that the production of clean milk is quite out of the question. The harm that comes from the use of dirty milk is believed to be very great, and no one has a right to sell it.

The importance of a pure water supply on dairy farms is sometimes overlooked and with dangerous results, as was clearly shown by a recent incident in connection with the milk supply of Philadelphia. A large number of people became afflicted with typhoid fever in two of the wards in the southern part of the city. At that time there was so little typhoid fever in other parts of these particular wards, where the water supply was the same, that the attention of the health authorities was drawn to this unusual distribution of the disease. Investigation showed that practically all of the
persons, numbering from fifty to sixty, that were suffering with typhoid fever, had obtained milk from the same milk man. An examination into the source of the milk sold by this dealer showed that it came from three farms in a nearby county. On one of these farms there were several cases of typhoid fever, and the conditions were such as to render inevitable the contamination with the germs of typhoid fever of both the spring house and the well at the dwelling house. A review of the history of the occurrence of the disease upon this farm and among the people using the milk from this farm, showed that the disease started among the consumers about two weeks after it started on the farm, and not another case developed after this milk supply was cut off. These facts and the other attending circumstances were such as to convince the health authorities that the disease had been carried in milk from this farm to the city. This case is cited here to illustrate the necessity for care in milk production.

By far the majority of milk producers wish to furnish milk that is above reproach. It may cost a little more to produce clean milk than to produce dirty milk. If it does not cost more money there is at any rate an additional expense in supervision and care. It is not fair to those who take the care that is necessary in the production of clean milk to allow careless, slovenly individuals to sell their product under the same conditions in the same market. Moreover, it is unfair to the consumer to have delivered to him milk that is unwholesome and that may contain the germs of an infectious disease. It appears, therefore, that distinct advantage would accrue both to the producers of good milk and to consumers, if there were such an inspection of dairies as would raise the standard of those who are doing the poorest work and would exclude from the market milk that is likely to be unwholesome.

There is no question as to the wholesomeness of good milk or as to its importance in the dietary. There is scarcely any other food that is more nourishing, or that is so easily assimilable, and few that are as cheap. There is, therefore, every reason why milk should be consumed in large quantities by the people of towns and cities. A feature that has served heretofore to restrict the demand for milk has been the suspicious character of some of the milk that has been sold and lack of confidence in the general supply.

Milk is peculiar in that it may not show evidence of serious defects. The appearance of milk has little and often no relation to its wholesomeness; therefore, to a greater extent than with any other food, it is necessary for the consumer to have confidence in the quality of this product.

The consumption of milk per capita in the various cities of the
United States is shown by a report of the Dairy Division of the United States Department of Agriculture. From this report it appears that the amount of milk consumed in Philadelphia is much less than it is in many other cities. In St. Louis and Louisville, where the milk is admittedly of low grade, and where the cows are fed on brewer's grain or brewer's slops, the quantities consumed per day per inhabitant are 0.37 and 0.39 pint respectively. In Philadelphia, the quantity consumed is 0.46 pint; in New York, 0.76 pint; in Rochester, 0.83 pint, and in Boston more than one pint per inhabitant per day. There appears to be no sufficient reason why more milk should be consumed in New York City than in Philadelphia. If Philadelphia should consume in proportion as much milk as is consumed by the inhabitants of New York City, this would give rise to a demand for an additional supply of at least 150,000 quarts per day. This would necessitate the employment of, say, 25,000 additional cows, which would mean the addition of at least 1,000 additional farms, worth, with their equipments, approximately $8,000 each, to the business of producing milk for the Philadelphia market. In other words, additional capital to the extent of $8,000,000 would find employment in this industry.

Experiments made at the State Agricultural College in Maine and elsewhere have shown that where milk enters largely into a dietary, it is not taken as additional nutriment but is substituted for nutriment in another form and usually in the place of meat. This seems to support the belief that if milk were more extensively used, it would not be at the expense of any local farm product, but it would be at the cost of meat, the largest part of which, at present, comes from the west. With these facts in view, I wish to suggest the desirability of a State inspection of dairy farms to be carried out for the purpose of correcting faulty conditions that exist that are a menace to the consumers of milk and that injuriously affect the trade. Several of the western states and Massachusetts have adopted this system. The results are beneficial. Whether the plan, if it were introduced here, would prove to be useful or not would depend, first, upon the character of the supervision, and, second, upon the intelligence and industry of the inspectors.

Expenditures.—For the fiscal year ending May 31, 1903, the State Live Stock Sanitary Board was allowed $10,000.00 for its general work in repressing diseases of animals. Expenditures under this fund may be classified as follows: For tubercular cattle, $24,996.90; for glanedered horses, $941.00; for inspecting tubercular cattle and herds, $2,964.65; for inspections for the purpose of suppressing disease other than tuberculosis and for vaccinating cattle against anthrax and blackleg, $3,035.84; for tags, marking cattle, for materials for vaccine, tuberculin and for shipping, for cremating carcasses,
serving quarantine notices and enforcing quarantines, $1,658.68; for supplies, postage, office help and miscellaneous expenses, $3,488.11; expenses for enforcing the law requiring the inspection of dairy cows and for cattle for breeding purposes brought into Pennsylvania from other states, $2,914.82.

Glanders.—The following list shows the distribution among the counties and the extent of prevalence of glanders during the past year:

<table>
<thead>
<tr>
<th>County</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berks</td>
<td>1</td>
</tr>
<tr>
<td>Bradford</td>
<td>1</td>
</tr>
<tr>
<td>Butler</td>
<td>9</td>
</tr>
<tr>
<td>Cumberland</td>
<td>1</td>
</tr>
<tr>
<td>Centre</td>
<td>1</td>
</tr>
<tr>
<td>Chester</td>
<td>1</td>
</tr>
<tr>
<td>Dauphin</td>
<td>1</td>
</tr>
<tr>
<td>Fayette</td>
<td>1</td>
</tr>
<tr>
<td>Franklin</td>
<td>1</td>
</tr>
<tr>
<td>Luzerne</td>
<td>4</td>
</tr>
<tr>
<td>McKean</td>
<td>2</td>
</tr>
<tr>
<td>Mercer</td>
<td>9</td>
</tr>
<tr>
<td>Montgomery</td>
<td>2</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>3</td>
</tr>
<tr>
<td>Susquehanna</td>
<td>6</td>
</tr>
<tr>
<td>Wayne</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
</tr>
</tbody>
</table>

It will be seen that the disease was widely distributed, occurring in many parts of the State, but that its prevalence was not great in any section. The most extensive outbreaks were found in Butler and Mercer counties; in one instance, among a load of mules belonging to a horse and mule dealer, and in the other instance among the horses of a livery stable. The outbreak in Susquehanna county was next in order, necessitating the destruction of six horses. The other cases were scattering, with but one or two in a place. These statistics show clearly that the disease was in every instance of recent introduction and, indeed, in almost every case it was possible to trace the disease to an afflicted animal from another state. That glanders is frequently brought into the State is well known and this is not to be wondered at in view of the fact that it is quite prevalent in several western states and also in parts of New York State and in parts of New England. In order to prevent the distribution of this disease, it is necessary not only to deal promptly with every infected animal, but to investigate every report indicating the possibility of the existence of glanders. A large number
of communications are received from veterinarians, health officers and stock men to the effect that certain horses are or are suspected of being afflicted with glanders. Investigations made in such cases usually show that the suspicion is not well founded. In following up reports of this kind it is often sufficient to make a physical examination, and in this way ascertain that glanders does or does not exist. In some instances it is necessary to resort to a laboratory examination of the discharge from the nose or from ulcers upon the skin, or to the mallein test. Since the laboratory examination requires more time than the mallein test, the latter method of diagnosis is more frequently employed. During the year, 183 horses and mules were tested with mallein. Nearly all of the animals that were condemned as glandered were thus tested. The test has been found by experience covering more than ten years, to be exceedingly reliable and, indeed, if made under proper conditions, almost infallible.

Where glanders is found to exist and it is learned that horses or mules have been in close contact with the infected animal, through working in the same team or through association in the stable, it is customary to apply the mallein test to the animals so exposed. It happens frequently that animals so tested react to mallein in a characteristic way, both in respect to rise of temperature and in respect to swelling at the point of injection. Such reactions are taken to indicate that the animal is actually infected with glanders. That this is the case is shown by the excessive rarity of similar reactions among horses not known to have been exposed. When an animal exposed to glanders, but showing no external evidence of this disease, is found to react in this characteristic manner, it is placed in quarantine through serving upon the owner an order requiring him to keep and care for the animal in a way that is specified. It is not always required that the animal shall be closely quarantined and isolated. If it is believed that the owner can and will observe the precautions that are necessary, he is permitted to use the horse under certain restrictions. It is required, for example, that the horse shall be stabled nowhere excepting in his own stable and stall, that he shall not be tied or allowed to stand in a public place where horses gather, that he shall not be permitted to drink from a public watering trough, that he shall not be driven or worked with another horse, etc. After a period of from four to six weeks, the horse is again tested with mallein and retests are made at subsequent intervals of from four to six weeks, until upon two successive tests the horse has shown no response to the mallein test whereupon, if he shows no external signs of glanders, it is considered that the infection has been overcome and the quarantine is raised. Usually,
it has been found that the quarantine can be raised after the fourth or fifth test. This system has been in operation for several years and horses that have at one time been under suspicion and have been freed from suspicion in the manner stated, have been under observation since for two, three or four years and have shown no evidence of glanders and have not propagated glanders among the horses with which they have worked and have been stabled. Unfortunately, it has not often been possible to make post mortem examinations on horses so treated, but through so much of this work as it has been possible to do here, and through work of this character that has been done abroad, there appears to be little ground to doubt that under such conditions the disease may be actually cured and that such nodules as are found in the lungs or elsewhere, may be free from living bacilli of glanders. In a number of cases it has been found that horses that do not cease reacting to the mallein test, subsequently break down with this disease. Since, however, such horses are continued in quarantine no harm has come from permitting them to remain alive until the disease has reached a stage of development rendering it possible to diagnose it by means of a physical examination. If such horses had not been tested with mallein, since they did not at first show external signs of glanders, they could not have been kept under careful observation and under the complete or partial quarantine that they were kept under, and so they would have had an opportunity to have distributed infection.

This method of dealing with glanders has the advantage of being conservative to a very high degree and at the same time of being effective. In other words, by means of it, it is possible to eradicate glanders with a minimum of expense and loss. No horse is destroyed that does not present physical signs of glanders, and no horse that has once reacted is relieved of suspicion until he has been under observation for at least three months, during which time he has shown no evidence of glanders either upon physical examination or repeated mallein test.

The efficiency of this method is perhaps best shown by the infrequency of glanders in Pennsylvania, and the fact that the cases that do occur, can, in practically all instances, be traced to infection from without the State.

Whether mallein may actually be classed as a curative agent or not is a point upon which evidence gathered in this work is insufficient to base an opinion. It may be, as is held by some, that glanders is a disease from which in its very earliest stages a large proportion of horses recover, and that the disappearance of the mallein reaction in horses that have been exposed and have once reacted, is but evidence of the course that the disease naturally follows in
a large percentages of instances. A few experiments have been made with the view of deciding this question, but the data is still insufficient. At any rate, there is no reason or excuse for the treatment or for the maintenance of a horse that shows visible signs of glanders.

Anthrax. Anthrax has occurred during the past year in the following counties: Chester, Crawford, Cumberland, Erie, Franklin, Jefferson, McKean, Philadelphia, Susquehanna, Warren, Wayne and Wyoming. Last year anthrax occurred in all these counties excepting Crawford and Philadelphia, and, in addition, occurred in the counties of Bradford, Clarion, Lancaster, Lycoming, Perry and Sullivan. Although it is not safe to draw definite conclusions from this observation, it appears to indicate that the distribution of anthrax is being diminished. The outbreaks that were observed varied in size, but usually were quite small, not more than five or six animals dying of anthrax in any one outbreak. Immediately, in every instance where anthrax was reported, provision was made for the safe disposition of the carcass of the victims of this disease.

Vaccination has been practiced on all the animals where anthrax has occurred, and has been applied to all the exposed animals on farms where the disease appears and also on neighboring farms whenever it was considered that there was danger of infection. The vaccination consists in injecting, with a hypodermic syringe, a small quantity of a culture of anthrax bacilli that has been so reduced in virulence as to be incapable of producing disease in cattle. The second vaccination is applied twelve days after the first. The second vaccine material is also a culture of anthrax germs of diminished virulence, but they are somewhat more potent than those used for the first vaccine. It is customary in some places to use a third vaccine, but this has not been found to be necessary in our work. Two vaccinations have regularly furnished complete protection. It has been observed, however, that immunity thus conferred may disappear in the course of a year, so that vaccination every spring is advisable where animals must be exposed. There are numbers of farms in different parts of the State where the rearing of cattle is impossible without the protection afforded by vaccination. Upon such farms it is necessary to vaccinate every year, and if uninfected cattle are brought to these farms it has been found repeatedly that they die of anthrax while the vaccinated animals remain immune.

It is of highest importance that the carcasses of animals dying of anthrax, shall be cremated or deeply buried and covered with lime. If the carcass is disposed of in the careless way that is customary in so many farming districts, the anthrax germs that it contains may enter the soil and become distributed over a consid
erable area. Anthrax is caused by a bacillus which, after death, is found in the blood and in numerous places in the vascular parts of the body. This bacillus has the peculiarity of forming a spore that is excessively resistant to unfavorable conditions of life and that may retain its vitality and virulence in the soil for many years. Therefore, when the carcass of an animal that dies of anthrax is neglected, the soil may become infested with the germs of anthrax and from this point they may be distributed by wind or water, or by the feet of passing people or animals, and infect susceptible animals with which they come in contact. Even forage grown on soils infected with anthrax, has been known to convey the disease. All of these evils that are of such a very serious nature and continue for so many years, may be avoided by disposing of the carcasses of anthrax victims by cremation or deep burial. If burial is practiced, the grave should be so arranged that it may not be washed out by flood and it should be so deep and so protected that it may not be excavated by dogs or other animals. Moreover, a layer of lime several inches thick should be spread over the carcass before the earth is filled in, in order to prevent earth worms from burrowing in the carcass and subsequently carrying the infectious material obtained from it to the top of the ground, where it would be available to infect large animals. It has been shown that this danger is a very real one and should be guarded against in the manner recommended.

Of all methods of disposing of carcasses of anthrax victims, the best is cremation. Even if the carcass is deeply buried and the grave is protected so that it may not be opened, there is a possibility that surface or subterranean water draining through the grave may convey the germs of anthrax long distances and bring them to the surface at a lower level. It has been shown by actual experiments that the germs of anthrax can be washed through several feet of earth. The cost of cremation is small, but it is not much more, if any more, than a proper burial, and when it has been carried out this serious danger has been removed for all time.

Instructions for cremating carcasses of animals dead of anthrax, have been given repeatedly in these annual reports. Advice has also been furnished upon this point by letter. It appears, however, that there is still need for instruction upon this procedure, because wasteful and laborious methods are still occasionally practiced or cremation is neglected.

To cremate a carcass with a minimum of fuel and labor, it is necessary that the carcass shall be placed above the source of heat, and shall be burned from below. The reason for this is so evident that it would seem that one would instinctively adopt this plan, but
every now and then attempts are made to destroy carcasses by piling wood on top of them and burning this. The result is that the surface of the carcass is scared and charred, but the great bulk of it is not consumed or even heated through. To properly cremate a carcass requires from one-half to three-quarters of a cord of wood. The wood should be piled in such a way as to make a pyre from six to eight feet square and about two feet high. It is well to have some large sticks, such as railroad ties, for this purpose. The wood should be well sprinkled with kerosene in order to help ignition. The carcass is to be drawn to the top of this pile upon poles used as skids. After the carcass is in place, the fire is to be lighted and the skids and everything that is contaminated with blood from the dead animal should be thrown upon the fire. Detailed instructions for cremating a carcass with the least possible amount of fuel by methods successfully used in Germany, are given in the annual report from this division in the year 1902. This report appears on pages 154 and 155 of the Department of Agriculture for that year.

It seems to be desirable that this opportunity should be used to give warning anew in regard to the danger of skinning anthrax carcasses or making post mortem examinations upon them. The danger from these operations are two fold, and applies first to the person who does the work and who exposes himself to a grave infection and, secondly, to animals or persons who may subsequently become exposed as a result of the infection of the soil where it is contaminated by blood and other juices from the carcass. A great many men who have handled anthrax carcasses, have become infected with anthrax. The infection of the skin with the germs of anthrax results in the production of an area of suppuration and necrosis known as a "malignant carbuncle." This condition can usually be cured if appropriate treatment is promptly applied, but if the condition is neglected, it will lead to general infection and death.

If anthrax is suspected and the diagnosis cannot be made from the symptoms alone, it is best to treat the carcass as though it were known that the animal had died of anthrax, and thus be on the safe side. In order, however, that a positive diagnosis may be established and, thus, uncertainty for the future be removed, a specimen from the subject should be submitted for laboratory examination. For the diagnosis of anthrax a little blood is necessary, because it is in the blood that the germs of the disease are most numerous. It is best that blood for this purpose should be sent in the natural blood vessels, that is to say, in a piece of tissue, rather than to be drawn into a bottle or receptacle and in this way exposed to accidental contamination. A convenient method of submitting a specimen for the laboratory examination has been found
to be to cut off one of the ears of the animal that has died. This small object can be packed in such a way that it is entirely safe to ship it, and, moreover, the specimen can be obtained without opening the carcass, which would almost inevitably be accompanied by grave results. The specimen should be placed in a fruit jar which should be closed and packed in cracked ice in a large bucket. The bucket should be covered and shipped by express to the laboratory of the State Live Stock Sanitary Board, 36th and Spruce Streets, Philadelphia. A tag should be attached to the package giving information as to the origin of the specimen, and a letter giving all of the known facts in regard to the origin, history and nature of the disease should be sent to the State Veterinarian.

Black-quarter. Black-quarter has occurred during the past year in the counties of Erie, Jefferson, Lackawanna, Montgomery, Susquehanna and Warren. The prevalence of this disease has been considerably less than for several years past. This malady is similar to anthrax in that the germ causing it may live for a long time in the soil, and in that the disease is prevented through a system of vaccination. Black-quarter is chiefly a disease of young cattle, selecting those that are in the best condition. It is most prevalent in the spring and fall and in some regions occurs so extensively as to cause very serious losses. Vaccination was applied during the year to 720 animals, and no animal that was vaccinated developed black-quarter, although all of them were on farms or in neighborhoods where the disease had occurred. The vaccine used for this purpose was obtained from Dr. D. E. Salmon, Chief of the United States Bureau of Animal Industry.

Rinderseuche, Hemorrhagic Septicaemia or Spotted Fever of Cattle. In my report for last year a description was given of this disease and a statement was made that its existence in Pennsylvania had been positively proven through researches made by Dr. S. H. Gilliland and myself. The occurrence in Pennsylvania of a disease, closely related, clinically, and in its pathology, to Rinderseuche, has long been known. Although efforts have several times been made to obtain bacteriological evidence as to the nature of this disease, these efforts were not wholly successful until last year during the outbreak in Carbon county in the vicinity of Manch Chunk and Tamaqua. This disease has been reported during the year from several parts of the State, but almost always in the mountainous and less well cultivated districts.

During the past year, however, there have been on well cultivated farms a few outbreaks of the disease. In these outbreaks all the principal forms of rinderseuche have been seen. They are those in which the alterations are most pronounced in the skin, or in the organs within the chest, or in the digestive tract. In Minnesota,
chronic cases of rinderscuche or hemorrhagic-septicaemia have been described by Dr. Reynolds. Chronic cases of this disease have not, up to this time, been identified in Pennsylvania. In Pennsylvania it is confined entirely, so far as is known, to cattle. In some outbreaks in Europe it has been found to extend to buffalo, horses, swine and deer. It appears that young cattle are more susceptible to the disease as it occurs in Pennsylvania than are mature animals.

The cause is an oval bacterium that is found in the blood and oftentimes in the spleen, liver and in the exudates of the thoracic and abdominal cavities and the exudates about the throat and beneath the skin. The mode of transmission of the disease is not yet established, although it is thought by some who have given this subject a great deal of attention, that it is conveyed through the saliva, the discharge from the nose and by the blood that escapes from the anus and that leaks through the skin. The organism causing this disease is somewhat difficult to cultivate and it is one that rather quickly loses its virulence when grown in the laboratory upon artificial culture media. A large amount of investigation has been carried on in Europe and at the laboratory of the Minnesota State Board of Health, for the purpose, if possible, to discover a means of protecting animals against this disease by a process of preventive inoculation. Some of this work carried out in Italy encourages the hope that a successful process of preventive inoculation may be developed, but as yet none is available.

More cases of the "pectoral" form of rinderscuche have been seen during the past year than during any of the previous years, and there has been less of the skin or exanthematic form. The pectoral variety of this disease usually appears in the form of an acute pneumo-pleurisy. In these cases there is high fever, depression, loss of appetite, rapid breathing, dullness in the lower part of the chest, bloody discharge from the nose, some swelling about the head and throat and sometimes swelling of the legs. In most cases death occurs from two to four days after the onset of the disease. Some of these cases are complicated by diarrhoea and by very extensive and painful swelling of the legs, especially about the hocks and knee joints. Upon post mortem examination it is found that there are numerous hemorrhagic areas from the size of a split pea to half a dollar in the subcutaneous connective tissue. If there is swelling about the throat it is found to be caused by an accumulation of serum in the meshes of the connective tissue around the pharynx and beneath the skin. The chest cavity contains a large quantity of serum, usually red in color, that rises from three to six or eight inches above the sternum. The surface of the pleura is coated with more or less fibrin. The lungs are infiltrated with serum, are red in color and sink in water. It has not been pos-
sible in these cases to obtain cultures or suitable material for laboratory examination, and so it is not known whether the organism producing this form of hemorrhagic septicemia is identical with that which caused the outbreak in Carbon county that was studied bacteriologically. An outbreak of hemorrhagic septicemia of the exanthematic type which occurred in Luzerne county in July and August has been studied and reported upon by Drs. Hogg and Phipps of Wilkes-Barre. In this outbreak ten cattle belonging to two owners died. The disease pursued in these cases a rapid course, killing in one, two or three days. The symptoms were depression, weakness, disinclination to move, loss of appetite, staggering gait, bloody discharge from the nose, blood evacuation from the bowels, swelling about the throat and beneath the jaws. In some of them, leakage of blood through the skin on the side of the chest or abdomen was observed. In some, swelling of the legs or beneath the trunk, and cessation of milk flow was seen. Similar outbreaks have been described in the adjoining county of Lackawanna and in Wayne county by Dr. Jacob Helmer, of Scranton.

Whether, as seems probable, the organism of this disease may live from season to season, has not yet been proved, but in the absence of positive information on this point, it has seemed wise to recommend and require the destruction by fire or by deep burial of the carcass of all animals dying of this disease. Where this malady has occurred on settled farms and in or about farm buildings, disinfection of the most thorough character that could possibly be employed has been recommended. In some instances the disease has occurred several years in succession among cattle on the same farm or on the same mountain cattle range, and has then disappeared and the cattle have remained exempt. It is, nevertheless, true that the disease is very much more prevalent in some parts of the State than in others. In some districts it seems to be stationary and occurs in greater or less prevalence every year.

Here is an important and wide and, probably, profitable field for research work.

Rabies. Rabies is known to have existed in the past year in the following counties: Allegheny, Beaver, Bedford, Blair, Bucks, Carbon, Centre, Chester, Clinton, Clearfield, Columbia, Crawford, Delaware, Erie, Franklin, Lackawanna, Lawrence, Luzerne, Lycoming, McKean, Montgomery, Montour, Northampton, Northumberland, Philadelphia, Potter, Schuylkill, Somerset, Sullivan, Susquehanna, Westmoreland, Wyoming and York. Heads of animals from nearly all of the counties listed above have been sent to the laboratory of the State Live Stock Sanitary Board for examination and diagnosis, with the result that it has been proven by microscopic examination, confirmed in numerous instances by inoculation tests, that rabies
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has existed as stated. Rabies has been proven not only in dogs but also in cows, calves, sheep, swine and horses. Notwithstanding the very great prevalence of rabies that has been shown by investigations carried out during the past year, it is believed that the disease is not actually so prevalent as it was during the previous year; the greater number of cases reported being due, to a large extent, to a desire to obtain definite information in regard to diagnosis and as a result of greater efforts to obtain such reports.

The increased efforts that have been made to obtain reports of outbreaks of rabies has been due to the passage of a law by the last Legislature, which was approved by the Governor March 27, 1903. The text of the law follows:

No. 80.

AN ACT

Section 1. Be it enacted, &c., That whenever the disease known as rabies, or hydrophobia, shall occur among the dogs or other animals, in any locality of Pennsylvania, and it is adjudged by the State Live Stock Sanitary Board that the disease is spreading, or is liable to be spread by dogs that have been exposed, the said Board may order the quarantine, restraint, confinement, or muzzling of any or all dogs, within the limits of the locality in which the danger of infection is deemed to exist. The authority hereby conferred is not to annul or restrict the authority now possessed by cities or boroughs to quarantine, restrain, confine, or muzzle dogs, within the limits of their respective jurisdictions.

Section 2. A quarantine, or order to restrain, confine or muzzle dogs, shall be operative when it is approved by a majority of the members of the State Live Stock Sanitary Board, and when a copy of it has been left at the usual place of residence of the owner of the dog that it is believed to have been exposed to rabies, or hydrophobia; or when the notice or order to quarantine, restrain, confine or muzzle dogs, has been published in each of two papers in each of the counties within which the regulation is established, and when printed notices, giving the text of the regulation or order, have been posted in public places, in the locality in which the regulation or order applies.

Section 3. Should dogs be permitted to run at large, or to escape from restraint or confinement, or to go without muzzles, in violation of the quarantine, or regulation, or order, established by the State Live Stock Sanitary Board to restrict the spread of rabies, or hydrophobia, as provided by this act, such dogs may be secured and confined, or they may be shot or otherwise destroyed, and the owner or owners thereof shall have no claim against the person so doing.
Section 4. Any person violating the provisions of this act, or of a quarantine, or of a regulation or order to restrain, confine or muzzle dogs, duly established by the State Live Stock Sanitary Board, for the purpose of restricting the spread of rabies, or hydrophobia, in the manner provided in the other sections of this act, shall be deemed guilty of a misdemeanor; and upon conviction shall forfeit and pay a fine of not less than ten dollars nor more than one hundred dollars, at the discretion of the court.

Approved—The 27th day of March, A. D. 1903.

SAML. W. PENNYPACKER.

In view of the existence of this law it has been possible to deal more effectively with rabies than has been possible in previous years. The State Live Stock Sanitary Board has frequent requests from boards of health and from individuals in all parts of the State to investigate and to assist in the repression of rabies. Interest in this matter is due not alone to the great losses among domestic animals that are caused by this affliction, but also on account of the danger to which human beings are exposed when this disease prevails among the animals of a region.

A few years ago it was the fashion of a number of individuals to deny the existence of rabies and to ridicule those that claimed to recognize it. Whenever a report of rabies was placed on record it was the signal for an outburst of ridicule, protest and denunciation. There was a propaganda organized and sustained by enthusiastic and well meaning, but misguided, people, which had for its object the dissemination of the view, first, that there is no such disease as rabies, or, that if there is, it is of such rare occurrence as to be of little significance, and second, when the first ground became untenable, of the view that rabies does not occur in man and that the cases that do occur are really hysteria caused by fright. In substantiation of the latter view, physicians of long and extensive experience were quoted as having stated that they did not believe that rabies occurred in man because they had never seen cases of this disease. It is strange that such a weak argument could have had any influence whatever. Thousands of physicians have never seen the bubonic plague, the yellow fever or leprosy, but this is not looked upon as a reason for the denial of the existence of these diseases. One positive observation is worth innumerable negative observations. Such a case as is reported by Dr. G. Morton Illman, and has been confirmed by the most searching examinations and tests by Dr. D. J. McCarthv and Dr. M. P. Ravenel, an account of which is published as an appendix to this report, is worth infinitely more than the statement of any individual who claims that he has for many years been looking for cases of rabies, but does not recognize the disease when he sees it.
One of the favorite arguments of those who enjoy denying that rabies exists is that certain keepers of dog pounds who come in contact with and handle large numbers of stray dogs that are gathered up in cities, have been bitten repeatedly but they do not fear rabies and are not attacked by this disease. Of course it is perfectly well known that an animal cannot propagate a disease with which it is not itself infected, and before such a statement as the one above cited can be considered to be of any service whatever as an argument in support of the claim that people may not get rabies from the bite of a mad dog, it must be shown that these pound keepers have been bitten by rabid dogs, and upon this point evidence must be conclusive. It is as sensible to take the word of a pound keeper or a kennel keeper upon the question of a diagnosis of rabies in a dog as to take the word of a policeman or hotel keeper upon the question of a diagnosis of a disease of man. As a matter of fact, many people bitten by rabid dogs develop rabies and die of the disease, and this occurs when the question of hysteria or of fright does not enter into the matter. Young children that know nothing of rabies or of any special danger attending the bite of an animal, have died of rabies. This has occurred in Pennsylvania during the past year. People who are misled by the belief that there is no such disease as rabies and who deny its existence, have died of rabies following the bite of a rabid dog, and this has occurred to my knowledge in Pennsylvania in recent years. So long as any one who made a diagnosis of rabies in an animal or person was, figuratively, hooted at and held up for ridicule, many known cases of this disease were kept private. But this tendency need exist no longer now that it is possible by laboratory means to confirm the diagnosis of rabies and place such a diagnosis upon as sound and unassailable footing as a diagnosis of any other disease.

When the history of opinion on rabies is written, it will be most interesting to follow, step by step, the evidence of conflict of opinion in regard to the existence and prevalence of this disease. It is most interesting and peculiar that such radical and conflicting views should have prevailed on this subject. It is, however, to be noted, and this point should stand out clearly, that men trained in the laboratory and in the experimental study of disease, as well as in clinical or veterinary medicine, are not among those who have denied the existence of the possibility of the ready transmission of rabies.

Here is a disease in which the virus is present in the saliva; therefore, it may be propagated by biting. Nearly all animals afflicted with rabies have a tendency to bite, but since this tendency is strongest in the dog, and since the dog, when rabid, has better opportunities than other domestic animals to roam around the coun-
try and to bite animals and persons, it happens that the chief factor in the spread of rabies is the bite of rabid dogs. When one sees as, unfortunately, there have been such frequent opportunities in Pennsylvania to see, a large number of animals bitten by a dog that possessed an apparently uncontrollable desire to bite, whose whole habit and demeanor had undergone a sudden change, and who died of a general paralysis within a week of the beginning of the abnormal condition, and when subsequent investigation shows that a large proportion, sometimes even from 75 per cent. to 100 per cent. of the animals bitten, develop symptoms and tendencies similar to those shown by the dog by which they were bitten, it can not be doubted that there is a very real and a very dangerous disease. It may be shown by further investigation that it is of wide distribution and that it causes very great losses in Pennsylvania.

The chief difficulty that has occurred in connection with enforcement of procedures directed against rabies, has come from the lack of public sympathy and support. It is on this account that it has everywhere, in foreign countries and in other states as well as in Pennsylvania, been difficult, event to the point of impossibility, to enforce adequate measures of protection against this disease. When, after rabies had prevailed extensively in Great Britain for a long series of years, it was proposed that the only effective general measure that is known, should be placed in operation and that, for a time, all dogs should be muzzled, the procedure was met by a storm of protest and opposition that threatened to cause the disorganization of the British Board of Agriculture. But, the measure was adopted and it was enforced. It was required that all dogs should be muzzled, that no dogs should be admitted to the country without a proper certificate of health, and without undergoing a term of quarantine. By these means rabies has been completely exterminated in England, and for two years not a case of rabies has occurred in that country. Similar measures have been used and similar results have been obtained in Scandinavian countries and in parts of Germany. The countries of continental Europe are generally unfavorably situated in respect to the eradication of rabies and as they have not succeeded in arranging to co-operate in the eradication of this disease, it happens that countries such as Germany where active repressive measures are in operation and, generally, are successful, are still infested, from time to time, by the entrance of rabid animals from across the frontier. Similarly, one of the American states is not in position to eradicate rabies so long as it is surrounded by states that do not adopt equally effective measures.

If all the dogs in Pennsylvania were quarantined and muzzled for six months, and if no dogs were permitted to cross the State
line, rabies would become extinct in Pennsylvania. It will be evident, however, that the admission of dogs from other states could not be prevented and rabies exists and is quite as prevalent, or more prevalent, in all of the adjoining states as it is here. Hence, if rabies were completely eradicated here Pennsylvania would be subject to almost immediate and to frequent reinvasion. Still, there is satisfaction in the knowledge that rabies does not spread rapidly across a country.

The range of a rabid dog is rarely more than a few miles. When a number of dogs within the limits of this range have been bitten and have developed rabies, the disease is pretty thoroughly established in that district, and from these limits may be spread by developed cases a few miles in all directions. From these limits it is spread by animals afflicted with the disease of the next generation into a larger zone, and so on until a whole state, or whole group of states, has been invaded.

It will be seen by reference to the list of counties in which rabies has occurred during the past year that a large proportion of these are border counties or, if not immediately adjoining, are close to, the State line. There is, however, one important exception to this. There is a group of counties extending in a north-easterly direction from the center of the State and embracing the counties of Centre, Clinton, Lycoming, Northumberland, Montour, Columbia, Sullivan, Luzerne, Wyoming and Lackawanna, in which a large number of cases of rabies have occurred during the past year.

Quarantines have been placed on dogs in all of these counties, and the prevalence of the disease has been greatly restricted. It is hoped that the continuation of these measures in localities where they are especially needed, will result in the elimination of rabies. There is no doubt that this result could be more quickly reached by establishing a general quarantine of all dogs in the State, but so long as neighboring states have no organization to co-operate effectively in an effort to repress rabies, and so long as there is no United States law upon this subject, it seems that such a general quarantine which, after all, could afford but temporary relief, would not be justifiable.

It is clearly evident that the measures that are adopted are of value, although they are not so immediately or completely effective as would be more stringent quarantines applied to larger districts.

The plan that is adopted in dealing with rabies is as follows: Upon the receipt of reports of the existence of rabies in any part of the State, an investigation is made to determine the distribution of the disease. Authority is immediately given to a local agent of the State Live Stock Sanitary Board to quarantine all dogs that are known to have been exposed or that there is reasonable cause
to believe may have been exposed to infection. This quarantine is established by the serving of a notice on the owner, under which the dog is required to be confined and not to be permitted to go at large unless muzzled or led. In other words, the dog must be confined, or if he is permitted to go in public places or to escape from direct restraint it is required that he shall wear a close and well fitting muzzle that will effectually prevent biting. Dogs that are known to have been bitten by a rabid dog are required to be very closely confined until they are destroyed. Destruction of such dogs is provided for under the act of Assembly approved April 1, 1834.

Whenever it is possible to obtain the head of an animal that is alleged to have died of rabies, this specimen is sent to the laboratory where it is examined by Dr. M. P. Ravenel or Dr. D. J. McCarthy. The quick method of diagnosis by histological examination is one that is usually adopted, for it has been shown by many control examinations made by the inoculation of rabbits, that the histological method is eminently reliable.

When quarantines of individual animals are established in this way, a good many, often more than one-third of the quarantined dogs, are destroyed by their owners who do not wish to incur the risk that would result from the development of rabies in the quarantined animal. The others are held in quarantine 100 days from the time of the possible exposure. When several cases of rabies have occurred in a given district, and it is evident that many dogs have been exposed that cannot be identified, a general quarantine is established by proclamation of the State Live Stock Sanitary Board of all dogs within a specified area. In order that such a quarantine may be enforced, arrangement is made with the constable or other local officer to destroy dogs found running at large in violation of the quarantine. This method of enforcing the quarantine is most effective, and results in the destruction of a large number of stray and homeless dogs that are usually quite worthless and miserable and are a source of great danger in a district where rabies prevails. When a quarantine of dogs has been established in a borough by ordinance of a borough council, it is important to the efficacy of the quarantine that dogs in the immediately surrounding territory shall also be kept under restraint. In such cases, upon request from borough authorities, quarantines are established upon dogs in the surrounding townships.

A large number of instances are known wherein dogs that have been quarantined have developed rabies, but as they were at the time under observation and restraint, they were destroyed before there was an opportunity for them to propagate disease. In this way, rabies has been kept in check and often completely eradicated.
from entire counties, and much anxiety and loss have been prevented; for wherever the disease exists these are the inevitable concomitants.

As a general measure toward the control of rabies, it will be of high utility to diminish the number of useless and worthless dogs in almost every part of the State. The system of taxing dogs, as it is practiced, is not sufficient to accomplish this purpose. A great many dogs are not assessed. There is no prescribed method for marking or identifying those upon which tax is paid, and the result is there is at large in the State a vast number of dogs that are under little, if any, control, that do not furnish any revenue and that are a constant menace. I have referred to this matter in previous reports, and am now more than ever convinced that it is desirable that the Legislature should consider seriously and deal with this question.

Forage Poisoning of Horses.—The greatest prevalence of forage poisoning during the past year has been in the counties of Allegheny, Berks, Bucks, Chester, Cumberland, Erie, Franklin and Lehigh. This disease is sometimes known as cerebro-spinal meningitis of horses. This name was first suggested by Professor Large, of Brooklyn, who considered that the symptoms of this disease, consisting of nervous excitement and later in paralysis, were similar to those of cerebro-spinal meningitis of children. This designation is a misnomer, for the reason that the lesions of cerebro-spinal meningitis do not exist in this affection. Indeed, in most cases, no lesions are discernible by the naked eye examination, and the pathology of forage poisoning was for a long time a matter of uncertainty. This subject is one to which much attention has been given at the laboratory of the State Live Stock Sanitary Board, and it is gratifying to report that a pathology for forage poisoning has been worked out and is reported upon by Drs. McCarthy and Ravenel. Their paper is published as an appendix to this report. The effect of this work is to substantiate the observation that has heretofore been made to the effect that this disease is actually a forage poisoning. In a previous report I have called attention to the definite production of this disease in experimental animals by feeding them silage that was somewhat damaged. The observation has been made in numerous instances and by many veterinarians that forage poisoning may be produced by silage even when it appears to be in pretty good condition. As a matter of fact, there is danger of producing this disease whenever horses are fed on any damp and easily putrescible food. Brewer's grains have been known to produce it in many cases, and it has been caused by mouldy hay, oats and corn. It is much more likely to affect horses kept in dark, damp, poorly ventilated stables than those kept in well
lighted, clean and well ventilated stables. The hay seed and chaff that accumulate beneath or in the bottom of a deep box-manger, and that has become damp and mouldy may produce forage poisoning when it is eaten by a greedy or hungry horse. When the disease occurs among horses kept in a clean, bright stable, it is usually due to feeding corn or hay that were damaged before arrival upon the premises.

Contaminated water, wells subjected to overflow and surface drainage, or shallow wells in a porous soil contaminated with organic matter, may give rise to forage poisoning. Since the general facts in regard to the origin of this disease have been made known and the cause avoided, forage poisoning has become less prevalent and is diminishing in prevalence from year to year. The old, unsanitary, dark, damp stone basement bank barns that were formerly regarded so favorably are now known to be unsanitary and unsafe. The need for dryness, sunlight, cleanliness and fresh air are becoming better understood each year, and there are now few who do not realize that a place suitable for the winter storage of turnips and potatoes is not a suitable habitation for farm animals.

No one who can avoid it would think of living in a dark cellar, where the wall is damp and covered with mould. Light, dryness and fresh air are just as necessary for domestic animals as for the families of their owners. It is because these facts are becoming better appreciated and because more attention is given to the quality of the food, that forage poisoning is becoming less prevalent.

Since this disease does not respond at all readily to treatment, and is fatal in a high percentage of cases, it is important that it shall be prevented. Prevention can be accomplished by the observance of the points referred to above.

Cow-pox.—This is a disease that is most likely to occur in large herds of dairy cows that are recruited by purchase. Where a large number of animals are kept together and many additions are made to the herd or flock, there is greater probability of infection than in the case of smaller herds, and especially when these herds are self-sustained. Tuberculosis, contagious garget and abortion occur more often in large herds to which purchased animals are frequently added than in small breeding herds. In such herds there is not only greater opportunity for the admission of the disease, but there is also greater opportunity for its spread after it has entered.

During the past year, several large dairy herds in the eastern part of the State have been seriously infested with cow pox. Generally, cow pox is not in itself a serious disease, but when eruptions occur on the udder and teats of milking cows, and these are
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disturbed twice a day by the milker, secondary conditions may arise that cause serious results.

Cow pox is a fever characterized by the occurrence of vesicles upon the skin of the teats and udder, thighs, abdomen or other parts of the body. The vesicles occur four or five days after exposure by contact. The vesicles are transferred in a day or two into postules; gradually the layer of cells covering them is softened, then it breaks away, leaving a raw surface which covers with a scab and heals more or less slowly. The whole course of the disease, from the appearance of the vesicles to complete healing may not be more than ten days.

The disease is very mild and without special significance except in milking cows. As a result of the manipulation incident to milking, the vesicles are broken, the raw surface beneath becomes inflamed and suppurating sores develop. The surrounding tissues become inflamed so that the teats and skin of the udder are swollen, reddish, sensitive and of higher than normal temperature. The inflammation thus engendered may extend into the cavity of the teat or milk cistern and sometimes leads to an infection of the substance of the udder. This infection is not a cow pox infection, but is an infection with streptococci, the germs causing suppuration and present on account of the preparation that has been made for them by the cow pox infection. The infection of cow pox and the purulent infection may be carried upon the hands of the milker from cow to cow until a large proportion of the members of the herd are affected.

The passage of this disease through a herd is slow, and it may require from two to four months for it to disappear, and after it has disappeared it is likely to have left behind a number of permanently damaged teats and udders. The damage consists in deformities of teats due to the contraction of scar tissue, that occurs where there was much loss of tissue from deep or extensive ulceration; from stricture of the teats; from rough, dry irritable skin covering the teats, that is constantly subject to irritation and cracking; from the growth of callosities; from long continued streptococcus infection of the udder and from the permanent destruction of quarters of the udder as a result of severe mastitis following such infections.

After cow pox seems to have disappeared from a herd of dairy cows as an acute disease, it is found that the infection lingers in the premises or upon the animals for a period of several months. Consequently, other animals that are introduced into the herd are exposed and are likely to become infected if they have not previously suffered with cow pox.

Since cow pox in itself is a mild disease, and since bad conditions that follow in its wake are the result of secondary infections and
of rough manipulation, every effort should be used to avoid the
causes of complications. During the acute stage of the eruption,
the udder and teats should be washed at least twice daily with a
warm antiseptic solution, such as lysol 1½ per cent., or creolin 2½
per cent., or bichloride of mercury 1 to 1,000, or a solution of boric
acid in water may be used for this purpose. If possible, rain water,
or other soft water or distilled water, should be used for making
this solution, because it leaves the skin less harsh and with a less
tendency to crack. Following the wash, and before milking, the
teats should be annointed with sweet oil or with cosmoline. After
milking, oxide of zinc ointment should be applied. If the scabs are
not softened and the secretion of pus diminished by these appli-
cations, the udder and teats should be well washed, soaked and
softened with warm water and castile soap before the antiseptic
wash is applied. The operation of milking should be conducted
as gently as possible. The milk should not be used for human food.
If this treatment is observed the course of the disease is likely
to be mild and without permanent bad results. The infected cows
should be kept apart from the herd and not milked until the sound
cows have been milked.

In Europe, where sheep pox is a prevalent disease, it has been
the practice for a great many years to vaccinate all sheep added to
a flock in which there is likely to be infection. In nearly all coun-
tries of Europe it is, indeed, required that all sheep exposed to pox
shall be vaccinated. The method is to apply the virus to a scarified
area on the under surface of the tail or upon the ear by a process
similar to the vaccination of people against small-pox. By this
means sheep are rendered immune. It is well known that young
cattle that are used for the production of vaccine virus become im-
une to cow pox. From these observations it would appear that
this disease might be prevented among cattle by preventive inocu-
lation, and thus avoid the injurious effects to fresh milking cows
added to dairy herds where cow pox exists, or has recently pre-
vailed. For this purpose, the glycerinated vaccine lymph used
for the vaccination of people could be used. In applying it, the
skin should be shaven over an area of three to four inches in di-
ameter. This surface should be cleansed by washing with soap and
water. The soap should be washed off by rinsing with water, after
which the skin may be dried by the use of clean towels. The skin
should then be scarified by making several shallow line incisions.
These should go through less than one-half the thickness of the
skin, and should not be deep enough to cause much, if any, bleeding.
The virus may then be applied and rubbed thoroughly into these
incisions with a spatula or case knife. Vaccination could be applied
in this way between the thighs, above the udder. By vaccinating
a cow when she is not giving milk, practically all danger of injury to the udder would be avoided. In this case, the vaccination might, indeed, be applied directly to the skin of the udder. From the large experience that has been had in the vaccination of cattle for the production of vaccine virus, it is evident that no serious results need be anticipated from such vaccination as is here proposed, provided the work be done in a cleanly and surgical manner.

Hog Cholera.--Hog cholera has occurred in the following counties: Adams, Bradford, Bucks, Clinton, Columbia, Delaware, Franklin, Lancaster, Montgomery, Philadelphia and Somerset. Hog cholera is not now stationary in any part of Pennsylvania. Outbreaks, as they occur, are controlled and the disease is usually eradicated before it has spread much.

The occurrence of hog cholera, in almost every instance, may be traced directly to the introduction of hogs from other states. Some of them, no doubt, are diseased when shipped, others contract the disease in the cars and in the pens and stock yards through which they pass. There is so much hog cholera in the great swine-producing states of the Middle West that it is impossible to keep stock cars and stock yards free from infection from this disease excepting by frequent and thorough cleansing and disinfection. Unfortunately, this is not practiced and so there is great risk in shipping hogs that are not intended for immediate slaughter. Hogs that are to be kept and fed should be either purchased in the neighborhood from farms that are known to be free from cholera, or, if purchased at a distance, and in a region that is known to be free from infection, they should be shipped in box cars that have not been used for the shipment of live stock, and they should by no means be unloaded at public stock yards or pass through the chutes or pens that it is customary to use for hogs.

No practical method for immunizing hogs against hog cholera has yet been devised, although this subject is still receiving careful attention at the hands of experts employed by the Bureau of Animal Industry.

When hogs are purchased for addition to established herds, they should be placed under a system of quarantine and kept entirely apart from the hogs formerly on the premises until a period of ten weeks has elapsed. It would also be well to dip purchased hogs in an antiseptic solution made with one of the cold tar disinfectants before they are permitted to associate with healthy animals. The object of dipping is to destroy disease germs that the animal may carry on the surface of its body, and also to destroy parasites. Should a purchased hog kept in this way develop cholera, the extension of the disease to the sound herd could be prevented; whereas, if the purchased animal were introduced at once into the
buildings occupied by the sound hogs, the whole herd would be exposed and much loss might occur.

The need for quarantining for the period recommended depends not only upon the fact that the hog may have been exposed to cholera and that subsequently it may develop and thus be able to propagate this disease, but also in the fact that animals coming from a herd in which cholera exists, may harbor the germs of cholera in their intestines for a long time. The quarantine advised is valuable in diminishing the danger from both sources.

**Mange of Horses.**—This is a prevalent disease in several of the western states, and it is said that it is becoming more prevalent from year to year. Mange and glanders prevail so extensively among horses in some of the far western states that horses from such states are refused admission into some of the states of the middle west until they have been carefully examined and their freedom from infection has been proven. Such inspection at the border of the State would not be justifiable so far as Pennsylvania is concerned, because, although glanders and mange are from time to time introduced from other states, it is possible to control them by measures taken within the State and to require and provide for inspection would cost more than the sum of the present or prospective losses from these two diseases.

Mange of horses was practically unknown in Pennsylvania until about four years ago. During recent years it has prevailed more extensively each year and requires careful attention in order that its distribution may be kept within bounds and the disease may be prevented from spreading within the State. Up to this time nearly all of the horses afflicted with mange were contaminated before they reached Pennsylvania, although upon some farms and in some stables the disease has gained considerable distribution among native horses. This disease has prevailed most extensively in the counties of Allegheny, Berks, Northumberland, Perry and Philadelphia.

Mange is injurious to horses in that it destroys the coat and the appearance of the animal and by the irritation of the skin that it causes, the rest of the afflicted horse is disturbed and broken. From this cause a horse looses strength and is unable to do his accustomed work. The disease is not a direct cause of death, although it is stated that on the open ranches of the west, horses with mange are less able to resist the cold and exposure of winter than horses without this disease of the skin, and in this way mange is indirectly a cause of mortality.

Foals and young horses are more likely to be afflicted than mature horses, but in this State the disease has occurred among horses of all ages.
Many remedies for mange have been tried, including all of the usual antiseptic washes, ointments and liniments that are commonly recommended for this disease. The best remedy that has been tried and one, indeed, that has shown itself to be thoroughly efficacious, is a lime and sulphur wash, such as is used for dipping sheep afflicted with sheep scab. A satisfactory method of making this wash, recommended in a report of the United States Bureau of Animal Industry, is as follows:

Place one-half pound of unslaked lime in a bucket or kettle. To this add enough water to form a paste. Into this paste sift one and one-half pounds of flowers of sulphur and stir the mixture well. Place the sulphur-lime-paste in a kettle with about three gallons of water, and boil. The boiling should be continued until the sulphur disappears, or almost disappears, from the surface, which will require from one to three hours. The solution is then of a chocolate or liver color. Water may be added as necessary.

Pour the mixture and sediment into a bucket and allow two or three hours for the sediment to settle, then carefully dip off the clear liquid, taking care not to disturb the sediment. Place this liquid in a wooden receptacle, or a keg that can be closed tightly to exclude the air, or in a glass receptacle, such as a large demijohn. To the clear liquid thus dipped off, add enough water to make six gallons. The sediment should be thrown away. This mixture can be used freely for washing the horse. As it stains the hands of the person who uses it (although it does no harm otherw'se, and the stain does not last long) it may be applied with a sponge attached to the end of a stick, or rubber gloves may be worn. About one-half of the body of the horse may be covered at a time; that is, on a single day, and the applications should be repeated at intervals of two or three days so long as may be necessary. In the west, where many horses are to be treated, they are dipped in lime and sulphur wash in special vats.

This wash should be applied with a sponge to the diseased area and the surrounding apparently healthy skin. It is well to apply little but not much friction in order to cause the wash to soak through the scurf and accumulation and to penetrate into the burrows and fissures of the skin. The wash should be applied at intervals of two or three days until recovery is complete.

It has been found that the disease can be cured in about three weeks.

Infectious Abortion of Cows.—Infectious abortion has prevailed much less extensively in Pennsylvania during this year than at any time during the past decade. There was a time but a few years ago when infectious abortion was one of the principal pests of breeding cattle, and the loss amounted to several hundred thou-
sand dollars every year. It is now known that the light that has been thrown upon this disease and the treatments that have been recommended by Nocard, Bang and others has resulted in enormous savings to the owners of dairy herds. Until this disease was thoroughly studied and it was traced to a definite infection, the owners of dairy herds were helpless. They could not combat the trouble because they did not know what caused it, nor why the cows aborted. Diverse theories arose as to the cause of abortion, which was ascribed to all sorts of dietetic and hygienic errors. As soon as the bacterial cause of the disease was discovered by Bang and it was shown how this germ operates and is conveyed from animal to animal, it was possible to adopt effective preventive measures.

The occurrence of abortion can not wholly be prevented, but there is now no excuse, excepting ignorance or uncleanliness, for the continuation and propagation of this disease in a herd of cows.

This subject is one upon which a considerable amount of work of investigation has been conducted under the auspices of the State Live Stock Sanitary Board. Not only have bacteriological studies been made of the membranes and fluids of aborted foetuses and of the uterine contents of aborting cows, but aborting herds have been taken in charge and have been treated under the direction of the State Live Stock Sanitary Board until they were cured. This work has been carried on in Susquehanna county, with the co-operation of Dr. E. E. Tower; in Montgomery county, with the co-operation of Dr. E. Mayhew Michener, and in Bucks county, with the co-operation of Dr. W. H. Ridge. From the work that has been done by investigators elsewhere and by the experience obtained by our own investigations, it has been shown that the plan of treatment recommended in the circular printed as an appendix to this report, is thoroughly effective.

The great central fact for herdsmen to remember is that infectious abortions may be kept from spreading in a herd by treating every case as though it were infectious, and thus taking no chances. It is not expensive to burn the aborted foetus and to disinfect the premises occupied by the aborting cows, nor is it expensive to maintain this cow apart from the balance of the herd and to treat her by intra-uterine and intra-vaginal injections until the genital passages are well and the parts are restored to their general condition and are free from discharge.

_Parturient Paresis, or Milk-Fever, of Cows._—Tremendous advances have been made in recent years in the treatment of this disease, which was formerly one of the most destructive and fatal diseases of cows. Milk fever, for this is the name by which this disease is commonly known, was at one time the most dreaded of the non-contagious diseases of cattle. This disease is one that selects
and attacks the best milking cows in the herd, those that are in the prime of life, that are in the best of condition and are most profitable. Many of the heaviest milkers in nearly all herds of pure-bred cattle of the dairy breeds have been carried away by this disease. The significance of this fact from the breeder’s standpoint is very great, because from this cause the breed is deprived of the benefit of the product of many of its most costly and improving members. As an instance: A few years ago the agent of a wealthy breeder of Guernsey cattle, was commissioned to buy the best Guernsey cow that could be found anywhere. A cow that had won a large number of prizes and that was considered the best that could be obtained on the Island of Guernsey was had. After she arrived at the owner’s farm in this country it was found that she had cost about $5,000. This cow died of milk fever after calving for the first time in this country. The great and far-reaching effect upon a breed of a calamity of this sort can scarcely be estimated, but it is evident that it must be very great.

The history of the development of knowledge of this disease is most interesting. It has been regarded at different times as a disease of the womb, as a disease of the spinal cord, as a disease of the brain, as a disease of the blood, and now it is known to be caused by the development of an abnormal condition in the udder.

Any method of feed or care that has the effect of increasing the activity of the udder, predisposes a cow to this disease. It has, for a long time, been known that heavy milking cows in plethoric condition are more likely to be attacked with parturient paresis than are similar cows in low condition. This led some observers to the opinion that plethora is the cause of parturient paresis. This view is not correct, because parturient paresis does not occur in highly nourished cows unless such animals are heavy milkers. The cows of the beef breeds that yield but little milk are not attacked by parturient paresis, however fat and well nourished they may be at time of calving. It is, therefore, evident that high condition is a cause of parturient paresis only in so far as it tends to stimulate the udder. Cows that have once suffered with parturient paresis and have recovered, are predisposed to a second attack and must be watched with particular care at every calving.

The postmortem examination of cows dead of parturient paresis is practically negative. There are no lesions that may be said to be characteristic of the disease, and sometimes when death has occurred quickly, postmortem examination is wholly negative. These and other observations gradually led to the opinion that parturient paresis is an intoxication resulting from the absorption of poisonous compounds produced in the udder at the beginning of the period of lactation. It remained for a Danish veterinarian,
Schmidt-Kolding, to base a successful plan of treatment upon this theory. Schmidt's treatment consisted in injecting solutions into the udder for the double purpose of washing it out and, so far as possible, of neutralizing the poisons that it contained. For this purpose it was found that a 1 per cent. solution of iodide of potash was well adapted and the Schmidt-Kolding or iodide of potash treatment for parturient paresis was used for several years with highly beneficial results. By means of this treatment the mortality from the disease was reduced from 40 to 50 per cent, down to from 14 to 18 per cent. Thousands of cows have been saved by using this treatment. The general introduction of this treatment into Pennsylvania was brought about several years ago by sending to 150 veterinarians full instructions and materials for applying the treatment, with the stipulation that reports upon the animals treated with it, should be returned to the office of the State Veterinarian. Reports upon approximately 200 cases showed 83\% per cent. recoveries. In 1902, Schmidt published, in a Danish journal, a review of the work that had been done in the five preceding years in regard to the development of a plan of treatment for this disease. He had himself found that it was useful to introduce into the udder a considerable amount of air with the iodide of potash solution that he employed. The results from this appeared to be somewhat better than when the idodide of potash solution was introduced without air, although many veterinarians not accustomed to administer air had obtained excellent results (some, indeed, administered idodide of potash solution intravenously and found the treatment to be beneficial, although not so good as when it was introduced into the udder). In the paper referred to above, Schmidt gives statistics on 914 cases of parturient paresis that were treated more or less in accordance with his method. Of these, 914 cases, 884, or 96 per cent., were cured; 12 died of parturient paresis; 6 were killed during the course of the disease and 6 were killed later on account of complications. The treatment Schmidt recommends is to inject about one pint of 0.7 to 1 per cent. solution of iodide of potash and follow this immediately with an injection of air, filtered through cotton, sufficient to widely distend the udder. Other remedies are used, in addition, in cases where heart failure threatens. In this way he had recently treated forty-nine patients, all of which were cured. A number of veterinarians reported at the time Schmidt's paper was presented that they were using injections of air without the other treatment, and that they were obtaining good results.

In the same year (1902) Knusel reported on the treatment of parturient paresis by infusion of pure oxygen into the udder. In treating eighteen cows in this way he found that the result was most remarkable. All of the cows were cured. In many cases improve-
ment was noted in from thirty to sixty minutes after the infusion was made. Animals that were entirely comatose and that were breathing with difficulty and were snoring, whose tongues were paralyzed and were unable to move were, in some instances, upon their feet and eating within an hour.

Other veterinarians in various countries have adopted this treatment and have found it to be exceedingly satisfactory. The leader in this reform in Pennsylvania is Dr. W. H. Ridge, who has equipped himself fully for the treatment of cows by this method, and has succeeded in curing several cases of parturient paresis, all, in fact, upon which he has used this new treatment. Several other veterinarians have had equally good results.

In carrying out this treatment there are several important precautions to observe in relation to the sterilization of the implements and the washing and disinfection of the udder and teats of the cow and of the hands of the operator. If these well-known surgical precautions are not observed, infection of the udder may follow, and although the cow may recover from parturient paresis, she may be permanently injured as a dairy cow. Therefore, no one should attempt to carry out this treatment who is not thoroughly informed and accustomed to the proper use of antiseptics and the disinfection of the surgical utensils and the skin.

The mode of operation of the various substances that have been found to act so beneficially, has not been satisfactorily explained and cannot be explained until there is more definite knowledge as to the precise nature of the toxin which is supposed to be formed in the udder and which, when absorbed, produces in cows the complex group of symptoms known as parturient paresis. The distension of the udder with any fluid or gas that may be injected into it appears to give a certain amount of relief. It may be that relief from this cause is due to the compression of the veins of the udder, due to the distension and pressure upon the tissues outside of them, and by thus shutting off the current of blood leaving the udder, the carriage of toxins from the udder is prevented. It may be that the toxin of this disease is very readily oxidized and destroyed, and that it is on this account that the oxygen infusion is so beneficial. In this way one could also explain the beneficial results that follow the infusion of air and of fluid mixed with air. If the theory of the formation of toxin is correct, the substance that is injected to neutralize and destroy this toxin, should pass into the branches of the ducts of the udder as deeply as possible. The oxygen gas may be forced more directly into the glands than a fluid, and to this extent, other things being equal, it is likely to be more beneficial. It may be that there is an infection of the udder with anaerobic bacteria, and that these are destroyed or rendered harmless by oxygen.
From our present knowledge of this subject there appears to be every reason to believe that the oxygen treatment is the best treatment that has thus far been devised, and if subsequent results with it are as good as those already reported, we may expect to save from 90 to 95 per cent. of all cases of parturient paresis, and by the use of this treatment, the lives of at least 50,000 cows should be saved every year. These are the best cows used for dairy purposes, and if they have an average value of $50, the total amounts to $2,500,000. It is believed that this amount represents conservatively the saving to the country that will come from the general use of the knowledge or the treatment of parturient paresis that has been developed in the last decade by veterinarians. It is a striking illustration of the value of veterinary research to animal husbandry and national economy.

**Tuberculosis of Cattle.**—Tuberculosis prevails in practically all parts of Pennsylvania, but it is much more prevalent in some districts than in others. In some of the mountainous counties, no cases of tuberculosis have been found. In a number of other counties the disease is exceedingly rare, but in the oldest settled parts of the State, where the dairy industry has reached its highest development, and where the herds are recruited by purchase, there is found the maximum prevalence of this disease. Attention has been called in previous reports to the factors that govern the distribution of tuberculosis. This disease is more prevalent in some places than in others, because, having been introduced, it has been permitted to spread from animal to animal, and from herd to herd until, at length, it has attained a very wide distribution. Naturally, the disease was first introduced into the districts importing the greatest number of cows. Such districts were constantly more heavily seeded with tuberculosis through the continued importation of diseased animals. It is possible to ascertain definitely that tuberculosis is comparatively a recent disease in almost all of even the oldest dairy sections. While reports of other diseases came down to us from the early days of the republic, there are few reports of disease of cattle that may be recognized as referring to tuberculosis. Such reports are rare and show that this disease was so infrequent as to be of very little importance. As tuberculosis was not known to be contagious until after it had spread contagion to a tremendous extent, no effective precautions were taken or could be taken to restrict its progress.

A great many things occurred in the early "boom" days of several breeds of cattle that helped to establish tuberculosis in many herds and to scatter it over wide areas. It happened, shortly after the Civil War, that several breeds of cattle were exploited in a way that while it was, no doubt, beneficial in some respects, still it had
an unhealty effect on the cattle industry and prevented it from developing soundly along proper lines and, incidentally, did much to scatter tuberculosis. For about two decades cattle were imported in large numbers; they were boomed by skilful promoters in this country, who were far more capable as advertisers and as salesmen than as stockmen. Under these conditions, cattle of certain strains were sold for fabulous prices. The pedigree of an animal was by many regarded far more critically and carefully than individuality. These statements apply not to one breed of cattle alone, but to at least four breeds. When a cow belonging to one of these enthusiasts, became ill with tuberculosis, the disease was not likely to be identified because so little was known of it at that time. If it were identified, proper steps were not taken to prevent its spread, because such steps had not been worked out and the need for them was not known. Therefore, when a cow believed to be worth several thousand dollars, or even several hundred dollars, developed tuberculosis, she was continued in the herd. Every effort was made to cure her; she was treated and pampered and nursed until she could no longer get about and possibly even then she was permitted to die a natural death in the hope, to the last minute, that there might come a turn for the better. During all of this time the cow was excreting and distributing tubercle bacilli, and during the latter stage of the disease, the seeds of disease were being produced and distributed in enormous numbers. As there was no isolation, it was inevitable that the entire herd should become tainted and that many of its members should, successively, pass through the same disease. It is interesting to observe that most of the herds that were established at such enormous expense during the boom days here referred to, have passed out of existence, and most of them because they were so seriously infected with tuberculosis. From such herds individual animals were sold to go into other herds, and disease was carried and introduced by them. In this way, pure-bred cattle have had a great deal to do with the wide dissemination of tuberculosis among the herds in the United States. This has occurred so often and to such a noticeable extent that there has grown up in the minds of many practical stockmen an impression that pure-bred animals are not desirable because they are believed to be tender and predisposed to tuberculosis. Such, however, is not the case. This impression, which has done a great deal to restrict the market for pure-bred animals and to prevent the improvement of the live stock of the country, is to be traced to the injudicious methods of some breeders and promoters of cattle.

That pure-bred cattle, even of the Channel Island breeds, are no more predisposed to tuberculosis than cattle of other breeds, or
grades, or natives is shown most clearly by the statistics of the inspections made under the auspices of the State Live Stock Sanitary Board. The worst infected herds that have been found in Pennsylvania were herds of natives. Additional proof is furnished by the fact that there are a number of well-established herds of Jersey and Guernsey cattle that are, and always have been, free from tuberculosis. These herds were formed many years ago, before tuberculosis became a prevalent disease and it happened that they were composed of animals free from tuberculosis. Great care has been exercised in purchasing additions to these herds. Added animals have been few in number and generally bulls purchased when calves. In this way the introduction of animals suffering with and scattering the seeds of tuberculosis, has been avoided and the herds have remained wholly exempt.

Through the operation of a similar chain of circumstances some large districts of the State have remained clear of tuberculosis of cattle. These districts are usually interior valleys, more or less isolated, into which cattle may not readily be shipped, and from which the current of the cattle trade is outward. Since these districts were stocked with cattle long ago, before tuberculosis was prevalent, they were stocked with cattle free from this disease and it has happened that the few animals taken in, have not carried infection. But, without repressive measures, all of these sections would, in time, have been reached by tuberculosis precisely as many others have been reached. In some instances, that have fallen under my observation, the introduction of tuberculosis and its spread in a region formerly free from it, have occurred so recently that it has been possible to trace the process step by step. It has been possible, in some instances, to ascertain that, for a long series of years, there has been no disease corresponding to tuberculosis among any of the cattle on a large group of neighboring farms. Later, animals decline and die with tuberculosis in herds on several of these farms and inspection showed the disease to be widely distributed. Investigations in such cases have sometimes shown that the disease started in a cow brought from without, possibly from some famous pure-bred herd. The cow seemed to be healthy when she was purchased and afterwards developed a wasting disease, the description of which enables one to identify it, with a practical certainty, as tuberculosis. Subsequently, other cattle in the same herd developed a similar condition and the bane was carried to other herds in the neighborhood through the sale of cattle from the one first infected. In the beginning of the infection of the cattle of a region, and for a number of years, tuberculosis spreads very slowly. The disease is propagated chiefly by contact. Therefore, as one cow usually comes in contact with but a limited number of
cattle, the individual tubercular cow is not likely to spread tuberculosis rapidly or widely. When several animals have become infected from this individual and are carried to other herds, the disease will spread as many times faster than at first as there are more animals spreading it. As the number of animals distributing disease increases, the ratio of its spread increases until, at length, when one hundred animals have been infected and are distributing the disease it goes at one hundred times the original rate of progress.

Notwithstanding the very wide distribution of tuberculosis in Pennsylvania, which has been so great as to convince many stockmen that little could be done in the way of repression and that they had come to look upon tuberculosis as a necessary evil and to figure the losses caused by it annually as a part of the necessary expenses of keeping cattle, it has been possible, during the comparatively short existence of the State Live Stock Sanitary Board, to bring about a very great diminution in the prevalence of this disease and in the losses from it. The results so far attained encourage the belief that it is not only possible but entirely probable, that tuberculosis may be reduced in the course of a series of years and abolished to a point where it may readily be kept in control and where it will cease to cause losses of material importance. Tuberculosis has already been eradicated from a large number of individual herds and from many large groups of herds. In some instances the disease has been practically eradicated from entire counties. What can be accomplished, and what has been accomplished, in relation to individual herds and groups of herds in large districts, can be accomplished in relation to other herds and groups of herds and in relation to the cattle of the entire State. The task, however, is a large one. The size of Pennsylvania and the great number of herds in the State render complete inspection of all of the herds so expensive an undertaking as to make it impossible of accomplishment under existing conditions. Fortunately, however, Pennsylvania has a body of veterinarians of unusual intelligence and skill. The results that have been accomplished by the State Live Stock Sanitary Board are due largely to the enthusiastic and efficient co-operation of the veterinarians. Moreover, and the importance of this item cannot be exaggerated, the Live Stock Sanitary Board has, at every point, had the most friendly co-operation of the owners of cattle. These facts have made it possible to accomplish a great deal more with the funds at the disposal of the State Live Stock Sanitary Board than could possibly have been accomplished with several times as much money if, as in some states, the veterinarians and live stock owners were not in sympathy with and were not working in co-operation with the authorities having charge of the control of the diseases of animals.
Numerous instances of exceedingly heavy losses arising from the prevalence of tuberculosis in herds could be cited. Two may be taken to serve as an illustration of many. A pure-bred herd that had been built up with much expense and effort, extending over twenty years, became infected with tuberculosis. Infection was shown first by loss of condition of a few of the older cows. These cows gradually became thin, and coughed more or less. When they fell into such a condition that they could no longer be used as dairy animals they were sold for slaughter. Later, some of the younger animals in the herd became unthrifty; they declined in condition, consumed a great deal of food but did not profit by it and were killed or died. This sort of thing was repeated so often that the owner had his herd examined and this led to the removal of several cows showing signs of advanced tuberculosis. But the trouble did not cease, and so a State inspection and State aid were applied for, with the result that all but one of the herd of about thirty cows were found to be tubercular. These cows were killed and the antemortem diagnosis was proven in each case by the post-mortem examination. The fault here was that the owner of the herd permitted it to remain infected for so long without taking effective measures to discover the infected animals and isolate them from those that were still healthy. If this had been done as soon as there was reason to believe that there was infection in the herd, there can be no doubt that a large number of the members of the herd could have been saved. Many instances have occurred wherein herds have been inspected immediately after the appearance of the first evidence of tuberculosis. Unusually, in such cases, it is found that the distribution of the disease is small. Sometimes, when the inspection is made immediately after the owner has received his first intimation of the existence of tuberculosis among his cattle, it is found that the disease is even then widespread and involves a large proportion of the members of the herd. Usually, however, in such cases, the disease has been present in the herd for a much longer time than was at first thought by the owner and the earlier manifestations of its presence were disregarded, through lack of knowledge of their significance.

A recent instance has been observed that instructively illustrates a method by which tuberculosis may enter a herd. A large breeding and dairy herd that had been founded for a long time was known, as a result of its having been tested with tuberculin, to be free from tuberculosis. Some young cattle purchased for addition to this herd were tested with tuberculin and found to be sound. Afterwards, they were pastured for the entire season on an outlying farm, in contact with tubercular cattle belonging to another herd.
When these heifers calved and were placed in the milking herd, it was observed that some of them were unthrifty and a cow in contact with one of them developed a cough, was tested and found to be tubercular and was killed. After this, the entire herd was tested. It was found that the disease was confined to the parts of the premises occupied by the exposed heifers and to animals in stalls immediately adjacent to the heifers that were infected, or in the next stall. The source of the disease that was brought into this herd was clear, and the manner in which it was spreading was clearly shown. In this case, the loss of the herd, or of a large part of it, was prevented by testing the herd with tuberculin before it was too late. If it had been known, at the time, that the heifers had been exposed to infection, and if they had been tested and those that were tubercular had been eliminated before this lot of animals was added to the general herd, a greater saving would have been effected.

While there is no systematic or periodical inspection of all herds in the State and, therefore, no figures can be given to show the exact prevalence of tuberculosis at different times, there are, nevertheless, convincing facts to show that tuberculosis of cattle is decidedly less prevalent in Pennsylvania than it was a few years ago. People who are in close touch with the cattle industry of the State and who are in position to know, in a general way, the extent to which tuberculosis prevails among the cattle in certain sections testify, almost unanimously, that there is a marked diminution in the prevalence of this disease. Perhaps the most striking evidence on this point is that furnished by the chief meat inspector of Philadelphia, Dr. A. F. Schreiber. Dr. Schreiber's experience in this office covers a period of about twelve years. He has been familiar all of this time with the number of tubercular cattle found among those coming from the eastern part of the State to Philadelphia to be slaughtered. His evidence, supported by that of other meat inspectors, slaughterers of cattle and commission men, is to the effect that the prevalence of tuberculosis among dairy cows in Pennsylvania coming to Philadelphia to be slaughtered, has been reduced at least 50 per cent. It is the experience of veterinarians throughout nearly all sections of the State that, for several years, losses from tuberculosis have been steadily diminishing, but still these losses are very great, and they have not diminished as much in some parts of the State as in others. The diminution has been greatest in those sections where the owners of cattle have taken the matter firmly in hand and have co-operated intelligently with the State Live Stock Sanitary Board. Co-operation of this sort is most active and effective in those districts in which tuberculosis of cattle is best understood, and where the greatest amount of work has already been done by the State Live Stock Sanitary Board.
It has come to be pretty generally understood that an animal that declines in condition without visible cause and while continuing to eat well, should be suspected as being afflicted with tuberculosis, and should be isolated from the herd. The suspicion attached to such an animal is intensified if the animal is afflicted with harsh breathing, chronic cough, enlarged glands or chronic discharge from any of the natural openings of the body. There is still, however, need, and, in some parts of the State, great need, for more attention to this fact, because it happens altogether too often that cows that show symptoms of a chronic disease, as described, are permitted to remain in a herd in contact with their herd mates until great and irretrievable damage has been done. Every herd owner should have a place for isolating animals that are in an unthrifty condition, or that may possibly be afflicted with an infectious disease. The need for isolation applies not only to tuberculosis, but is also important in relation to the control of contagious abortion, contagious garget, contagious ophthalmia, and other disease. Every cow showing unthriftiness or evidence of any constitutional ailment should be taken away from the herd and kept in isolation until it has been cured or until a positive diagnosis has been made or, as in the case of tuberculosis, until it has been finally disposed of.

Formerly payments were not made by authority of the State Live Stock Sanitary Board for any tubercular cattle unless the entire herd was submitted for inspection and tuberculin test, for the purpose of entirely eradicating infection and of putting the herd on as healthy a basis as could be reached. In time, the demands for herd inspections became so numerous that it was quite impossible to require the inspection of a herd whenever visible tubercular cattle were found, and so the system was developed of immediately disposing of the animals afflicted with advanced or generalized tuberculosis, or with tuberculosis of the udder, and of deferring the herd test until it could be reached in regular order or, as not infrequently happens, on account of the increased number of applications for herd tests, until there is additional reason for the general inspection. Admittedly, it is unfortunate that every herd in which tubercular cattle have been found, cannot be tested with tuberculin, so that the infected cattle may be designated and kept apart from those that are uninfected. It is, however, quite out of the question to attempt the tuberculin test of all herds in which the disease has been recognized without a very large increase of the funds available for this work. On this account, owners of herds are encouraged to have tests made at their own expense and tuberculin for this purpose is furnished free of charge by the State Live Stock Sanitary Board. Tests of entire herds are made by this Board on as
large a scale as the funds will allow, and in the cases that are most urgent and where the best assurance is given that the results of the work thus carried out will be permanent. Such tests are made only upon the receipt of a signed application from the herd owner as follows:

Request for Inspection and Tuberculin Test of Herd, at the Expense of the State Live Stock Sanitary Board.

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To the State Live Stock Sanitary Board, Harrisburg, Pennsylvania:

Gentlemen: I have reason to believe that some of my cattle are afflicted with tuberculosis, and I wish to have my entire herd inspected, and tested with tuberculin, if such test is deemed necessary by your representative, and the diseased animals disposed of according to the rules and regulations of the State Live Stock Sanitary Board.

I understand that this inspection and test are to be made at the expense of the Commonwealth and, in consideration thereof, I agree to thoroughly disinfect the premises and correct faulty sanitary conditions and thereafter to observe the precautions and measures and to employ the means recommended by your Board to prevent the reintroduction and redevelopment of tuberculosis in my herd. In particular, I agree to purchase no cows for addition to my herd until they have been proven by tuberculin test to be free from tuberculosis, and if 25 per cent. of my present herd shall be found to be tubercular, I will have a re-test made under the supervision of your Board, at my own expense, within eight months from the time of the State inspection.

I certify that, to the best of my knowledge and belief, none of the dairy cows or cattle for breeding purposes in my herd have been brought from another State into Pennsylvania since January 1, 1898, without having been subjected to inspection and tuberculin test, as required by law.

Yours respectfully,

........................................

(Address)................................

....................................... County, Pa.

When the owner of a herd has had a test made at his own expense and has found tubercular cattle and wishes to receive indemnity from the State, an agreement is required as follows:
Request for Assistance in Disposing of Tubercular Cattle in Herds Inspected at Their Owner's Expense.

.................................., 190.

To the State Live Stock Sanitary Board, Harrisburg, Pennsylvania:

Gentlemen: I have had my entire herd inspected and tested with tuberculin and have reason to believe that some of my cattle are affected with tuberculosis.

I have had this inspection and test made at my own expense and now wish to dispose of the diseased animals in accordance with the rules and regulations of the State Live Stock Sanitary Board and to avail myself of the assistance afforded by the Commonwealth in such cases. If such assistance is furnished, I agree to thoroughly disinfect the premises and correct faulty sanitary condition and thereafter to observe the precautions and measures and to employ the means recommended by your Board to prevent the reintroduction and redevelopment of tuberculosis in my herd. In particular, I agree to purchase no cows for addition to my herd until they have been proved by tuberculin test to be free from tuberculosis, and if twenty-five per cent. of my present herd is found to be tubercular I will have a re-test made under the supervision of your Board within eight months from the time of the inspection herein referred to.

I certify that, to the best of my knowledge and belief, none of the dairy cows or cattle for breeding purposes in my herd have been brought from another State into Pennsylvania since January 1, 1898, without having been subjected to inspection and tuberculin test, as required by law.

Yours respectfully,

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(Address).................................

.................................. County, Pa.

These agreement forms are more stringent than those that have been used before, inasmuch as they require more of the owner in the way of improving his premises and in correcting faulty sanitary conditions, and in that the owner agrees to have a retest made at his own expense if 25 per cent. of the animals of his original herd are tubercular.

More herds and more cattle have been inspected during the past year with the view of repressing tuberculosis than ever before. All of this work has been encouraged and in large part supported by the State Live Stock Sanitary Board. During the year, 1,059 cattle have been condemned on account of tuberculosis. These came from 440 herds, comprising 6,801 cattle.
There is at this time practically complete unanimity of opinion, among those who have given the subject careful attention, to the effect that the eradication of tuberculosis from a herd without the use of the tuberculin test is such a slow, laborious and uncertain process as to be unjustifiable under ordinary conditions; although it is known that the losses from tuberculosis in herds may be diminished by subjecting herds to repeated and careful physical examination. By the latter means, the animals that are afflicted with tuberculosis in the most advanced stages, that are excreting the greatest number tubercle bacilli and that are most likely to furnish infectious milk may be detected and removed. But the complete eradication of tuberculosis must, for the present, at least, depend on the use of the tuberculin test. This is so well understood that the demand for the test upon the part of herd owners is growing from year to year.

After the herd is tested and the animals that are tubercular are pointed out, the immediate question confronting the herd owner and his veterinary advisor is, what shall be done with the animals that have reacted and that are infected with tuberculosis? It is well known that the tuberculin test does not indicate the extent of infection, it merely reveals the fact that the animal is infected; the disease may be extensive or it may be slight. It is frequently impossible by means of the most careful physical examination, even with the knowledge that the animal has reacted to the tuberculin test, to determine, while the animal is alive, the location or extent of the lesion. But even in these cases the postmortem examination not infrequently shows that the disease is of such extensive development and is so situated as to permit tubercle bacilli to be excreted by the animal, thus rendering it capable of spreading infection to its associates. From this it is clear that cattle that have reacted to the tuberculin test, even though they appear to be perfectly healthy at the time, are, in many cases, capable of spreading the disease, and all such cattle must be treated as though it were known that they are actually distributing tubercle bacilli. It is not necessary as a sanitary measure, nor is it required by the laws of the State or by regulations of the State Live Stock Sanitary Board, that animals that have reacted to the tuberculin test, and that do not show evidence of advanced or generalized tuberculosis orudder tuberculosis, shall be destroyed. It is required, merely, that such animals shall be so cared for that they may not spread disease. This means that they shall be kept apart from other cattle, and that their milk shall not be used without previous sterilization or pasteurization in a way that will insure the destruction of the tubercle bacilli. Therefore, if cows that have reacted to the test can be maintained as a separate herd and their milk pasteurized before it is used, this is allowed and encouraged.
In Denmark this plan has been in operation for a number of years, and the prevalence of tuberculosis has been steadily diminished by means of it. Not only has this system worked well in that it has resulted in the repression of tuberculosis of cows, but it is evident that along with this economical advantage, no sanitary disadvantage has appeared. This procedure is especially applicable to Denmark, a butter-making country, because it is the practice there for all of the creameries to pasteurize the cream and to sterilize the skim milk before they are used for the manufacture of butter or for feeding animals. On this account, the milk of cows that have reacted to the tuberculin test, is at no market disadvantage. It may be disposed of as readily and for as good a price as other milk. In this country, however, it is difficult to dispose of milk that has to be pasteurized. There is no definite market for this milk. It is regarded with suspicion and, generally, can be disposed of only at reduced prices. Practically, therefore, under our market conditions, the use of milk from reacting cows is not profitable excepting on farms where there are adequate facilities for pasteurizing milk and where butter is made. The market disadvantage to which such milk is subject is the result of ignorance and prejudice. People who are not fully informed upon this subject refuse to use for butter-making, milk from reacting cows even after this milk has been pasteurized and made wholesome. On the other hand, they do not hesitate to buy and use milk from tubercular herds, and sometimes from very extensively tubercular herds that have not been inspected. They do this with the knowledge that tuberculosis is a very prevalent disease of dairy cattle, and they make no effort to ascertain whether the cows furnishing the milk they use are tubercular or not. In other words, they will use the milk from a tubercular herd without hesitation or question until this herd has been inspected and the animals that are most dangerous have been removed and the milk from the other members of the herd, and in the earliest stages of infection, has been rendered perfectly innocuous and wholesome by pasteurization; when this safeguard has been established and the milk is infinitely better than it was before, the former purchaser will refuse to receive it.

This strange situation makes it necessary to adopt special measures and establish new conditions, if the milk of cows that have reacted to the tuberculin test is to be used safely and properly. I have suggested, in a previous report, that arrangements could be made to permit the concentration, upon farms set aside and equipped for this purpose, of cows still in good condition that are known to be tubercular through having reacted to the tuberculin test. If a man could make a business of maintaining a large herd of this description, he could afford to provide the equipment that
is necessary for properly handling the milk and making butter. If such work were officially authorized, under certain prescribed conditions, and were controlled by frequent inspections, it would seem that it might be carried out in a perfectly safe, unobjectionable way, with the result that considerable saving could be effected. It is not likely that any one would care to use any but selected animals in this way. There are, however, some cows in the earliest stages of tuberculosis that are of great value as milk producers and that, still more important, are of great value for breeding purposes. By gathering such cows together so that they could be cared for under such conditions as may be necessary to prevent harm, they could be used profitably and their progeny could be saved.

It has been shown by the Danish work, covering a series of many years, that the calves of cows in the early stages of tuberculosis are born healthy and may be reared in health if they are removed from their dams immediately after birth and are fed milk from healthy cows or pasteurized milk from tubercular cows. If a plan such as this could be put into operation, I would suggest that it be done only under a system providing for the licensing of farms and of men. The licenses should be granted only when it is clear that the work could be done in a perfectly safe way so far as it concerns both the public health and the live stock industry. The licenses should be subject to withdrawal at any time that it becomes evident that the established conditions were not fully complied with. If a number of farms of this character were licensed in different parts of the State, the effect would be to make a market for cows in the early stages of tuberculosis, and this would encourage the testing of herds and the removal of such cows from contact with healthy cattle. At present, there is no means of disposing of these animals excepting by slaughter. As their value is often very much more than the amount that can be obtained either by turning them into beef or by disposing of them under appraisal to the State, some owners hesitate to dispose of them. In consequence, infected cattle are permitted to keep up the infection in herds.

There appears to be no room for discussion upon the principle that if an outlet can be provided for such cattle, that is of such character that owners will be encouraged to dispose of cattle through it, and which at the same time will be open to no valid objections, it will be desirable to establish such an arrangement. If tubercular and tubercle bacilli distributing cows could be gathered from thousands of herds in which they are now members into a comparatively small number of licensed herds, where they could be kept under such supervision and control as would be necessary, as could readily be established, it would seem to be desirable from every standpoint. Of course, these cows might be killed and paid
for by the State, but to do this would require a much larger expenditure than appears at present to be obtainable.

Much benefit in this direction is expected to come from the operation of the act of Assembly approved March 25, 1903, entitled "An act to encourage the repression of tuberculosis of cattle, and to provide for the disposition of the carcasses of meat-producing animals that are infested with tuberculosis to a degree that renders their flesh unfit for use as food," and to which I have referred before.

This act of Assembly makes a long and important step in advance in the matter of disposing of carcasses of animals found, upon slaughter, to be tubercular. Heretofore, there has been no definite or official method for disposing of such carcasses. The result was that the meat of tubercular animals killed surreptitiously on farms or in small out-of-the-way slaughter houses, was placed upon the market and was sold for consumption without restriction. There can be no doubt that as a result of this practice the public has been exposed to the use of large quantities of unwholesome meat. There are many men who would not dispose of their cattle in this way; they were reluctant to lose their cattle that were out of condition and possibly infected with this disease, and so the evil day was postponed from time to time until serious injury to the herd had resulted. By making it possible regularly and in an officially approved way to slaughter animals suspected of being tubercular, under competent inspection, with the understanding that if the flesh is unwholesome it may be appraised within certain limits and will be paid for the same as a cow with tuberculosis of the udder in a milking herd, elimination of such animals is likely to be encouraged. To the public health, the greatest advantage will come from the fact that there will be no inducement to persons who find, after slaughter, that cattle are tubercular, to place the carcass of such animals upon the market, because they may be inspected, appraised and indemnity obtained from the State. Therefore, the result that is expected to come from the operation of this law will be advantageous to the consumer of meats and also to the owners of cattle. It seems to be eminently proper that appraisal and payment by the State should be made in these cases, because the principle of indemnifying owners of animals infected with infectious diseases, that it may be necessary for the benefit of the public to control, is firmly established in the administrative procedures of all civilized countries. It has been found by prolonged trial and the most careful investigation that payments of this kind are profitable to the public and that they enable the public to avoid grave dangers in respect to both health and property, and that more can be accomplished by payments of this kind than in any other way.
The law printed above, provides that rules for the inspection of carcasses of meat-producing animals may be promulgated by the State Live Stock Sanitary Board and that, in absence of such rules, the rules shall be observed that are established by the United States Bureau of Animal Industry, to cover the inspection of animals and carcasses for tuberculosis in abattoirs under federal inspection. Preliminary to the promulgation of such rules by the State Live Stock Sanitary Board, it is proposed that a commission of distinguished sanitarians, bacteriologists and pathologists shall be appointed to consider this question in all of its bearings and to recommend to the State Live Stock Sanitary Board such rules as it may be necessary for the Board to promulgate. Steps have been taken toward the organization of such a commission. Until the commission reports and rules are promulgated by the State Live Stock Sanitary Board, the rules of the federal meat inspection service will be observed.

The law governing the inspection of dairy cows and cattle for breeding purposes brought into Pennsylvania from other states, and which provides that all such animals shall be tested with tuberculin, is working smoothly. The number of animals that it is necessary to condemn is not so great as it was for the first years of the operation of the law for the reason, apparently, that shippers and dealers exercise more care than formerly in the selection of cattle purchased for shipment to Pennsylvania. It is a great advantage to purchasers of cows to be able to buy animals which they know have been recently tested and have proven to be free from tuberculosis. In the enforcement of this law it has been necessary to employ a special agent, who has been constantly on duty in various parts of the State looking up shipments and reports of shipments of cattle from other states, in order to be sure that they are inspected in the manner required by law. No serious difficulty in connection with the enforcement of this law has occurred during the past year.

In connection with the research work that has been conducted under the auspices of the State Live Stock Sanitary Board, it was shown, as reported last year, that by using a system of preventive inoculation or vaccination the resistance of animals to tuberculosis could be materially increased. This process was developed by experiments made upon young cattle and on a small scale to such a point that it was possible to show that animals that had been put through a course of preventive inoculation, or vaccination, were able to withstand inoculations of a culture of virulent tubercle bacilli large enough to cause extensive and even fatal disease in similar animals which had not received this artificial protection. The great practical advantage of being able to vaccinate cattle against tuberculosis impressed the officers and members of the
State Live Stock Sanitary Board so strongly that a request was made to the last Legislature for an addition to the usual appropriation for laboratory and research work, so that a farm might be rented and a herd of cattle established for experimental purposes, with the view of testing and, if possible, of developing the principle and practice of vaccination against tuberculosis as applied to cattle. It was hoped that by this means it might be possible to develop this mode of protection to a point where it could be made of practical value to cattle owners. With this object in view a farm has been rented in Delaware county, within easy reach of the laboratory of the State Live Stock Sanitary Board, and a herd of cattle has been established. It has been necessary to provide some special equipment in the way of laboratory and stable accommodations.

The experiment consists in vaccinating young cattle with vaccine of different kinds, with doses of different sizes and at varying intervals. Each mode of vaccination is tried upon a group of from two to four animals. Along with animals that are vaccinated there are a number of similar animals that have not been vaccinated and that are kept as check or control animals. The vaccinated and unvaccinated animals are exposed to immediate, direct, daily contact with cows afflicted with tuberculosis. The purpose of this trial, as will be seen, is to determine whether and, if so, to what extent, the different modes of vaccination are effective as compared with the conditions found in unvaccinated animals equally exposed. Trial is also being made as to the efficiency of vaccination in the protection of calves from tubercular cows that are reared upon the milk of their diseased mothers and are in constant contact with them.

The principle of immunization of animals against tuberculosis having been proven, information is now particularly desired upon two points, first, as to the most effective and economical method of applying vaccination, with respect chiefly to the number of times that the process shall be repeated, and, second, as to the duration of the immunity that is thus conferred. It will be seen that information of this kind can not be obtained quickly, but it is believed that the object sought is of importance enough to justify a continuance of the experiment on an adequate scale. The final results are not reached and a definite report upon the work cannot be made until the animals under observation have been killed and careful postmortem examinations are made. However, so far as one can judge of the work in its present incomplete state, it is promising and encourages the belief that vaccination against tuberculosis may be placed upon a practical footing.

_Verminous Bronchitis of Calves._—The common lung worm
(strongylus micrusus) has always been known in certain parts of the State, but this past year it has caused more damage than usual. It may be that the damp, cold season has some relation to this unusual prevalence. At any rate, it has been observed that during dry seasons lung worm disease of calves is less prevalent. The parts of Pennsylvania that are most seriously afflicted with this disease are the northern counties, those adjacent to New York state, and in a few of the valleys in the central part of the State. Recently, lung worm disease has appeared among cattle in the Schuylkill Valley.

In some parts of the districts mentioned above verminous bronchitis has proven to be a scourge and through its return from year to year, it has seriously injured and discouraged breeders. The cause of this disease is a thin, round, white worm. These worms reach maturity in the air tubes of young cattle. They are expelled by coughing and afterwards they may continue to live for some time in stagnant water or in damp places. It is not known whether it is necessary for this parasite to pass a part of its existence in an intermediate host, but there is some reason to believe that it is necessary that young parasites developing from the eggs coming from the mature worms that have been coughed out, must pass into some invertebrate animal in order to obtain development. Cattle are usually infected with this disease in the spring or early summer through taking up the parasites with water or with vegetation growing in damp places. It has also been suggested that it is possible that the larvae may be inhaled with dust and dry matter upon the forage. The parasite requires for its development from six to eight weeks. During this time it has migrated to the lungs. Sometimes, the infestation of the lungs is so great as to lead to the almost complete stoppage of the larger bronchial tubes and some of their branches, for distances of several inches. Usually, evidence of disease in the infested calves does not occur until late summer or autumn. On some farms where there is much marshy ground the disease occurs regularly each year about the same time. The effect of the presence of the worms is to cause a severe irritation in the membrane lining of the bronchial tubes, constituting bronchitis. In fatal cases the inflammation extends beyond the air tubes to the lung tissue proper and produces solidification of the lung. The symptoms usually begin with a severe cough that is repeated frequently and which, in time, becomes very distressing. The animal usually continues to eat well and does not decline in general condition until the cough has become harassing and serious changes have occurred in the lungs; then the appetite diminishes and loss of condition is rapid. Generally, the course of the disease is slow, covering a period of
several weeks. The loss of condition, the evidence of the occlusion of parts of the lungs, and the cough, may readily lead one to believe that the young cattle are afflicted with tuberculosis of the lungs. The points of difference are,—the cough is more violent in verminous bronchitis than in tuberculosis, the progress of the disease is much more rapid and the fact that a number of the young cattle simultaneously develop almost exactly the same condition, is evidence rather of verminous bronchitis than of tuberculosis. If, as is sometimes the case, one is able to detect long, slender worms in the coughed out material or in the discharge from the nose, there need no longer be doubt as to the nature of the trouble. The disease has a more rapid and serious course in young, weakly animals than in those that are older and stronger. Upon the examination of the lungs after death, made by cutting the air tubes open longitudinally, the worms may be found in greater or lesser numbers.

The preventive treatment of this disease consists in keeping susceptible animals off of the infested pastures until mid-summer. Cattle kept in the stable and fed soiling crops rarely develop this disease. Danger to mature animals following exposure to infestation with lung worms, is not great. Something can be done to render infested areas less dangerous by draining them and removing all accumulations of stagnant water. In regard to curative treatment, perhaps the most important item is to see that the animals are well nourished and to provide them with generous rations of concentrated food, as bran, ground oats, corn meal or linseed meal, used singly or in combination. The idea of this is to keep the animal as strong as possible so that it may successfully pass through the natural crisis of the disease. When the worms have reached full development they are expelled by coughing. Therefore, if the animal can be kept strong until this time, it will naturally tend to recover. It may safely be said that no medicine is as useful in this disease as good food and plenty of it. To assist digestion and to increase the appetite, a lick should be given of salt containing a little Glauber salts and sulphate of iron. The practice of giving vermifuges by the mouth is not to be recommended because anything given in this way that would be strong enough to influence worms in the lungs would be certain to upset digestion and so do much more harm than good. If the necessary facilities are at hand it may be profitable to cause the infested calves to inhale medicated vapors. This can be carried out by enclosing the animals in a tight room and there vaporizing a mixture of oil of turpentine and tar, one part of the former to two parts of the latter. This can be done by heating the mixture over a water bath.

The most direct way of bringing remedial agents in contact with these parasites is by intra-tracheal injection. In order to practice
this method of treatment it is necessary to have a hypodermic syringe fitted with an extra strong needle. The needle may be inserted between the rings of the windpipe, and in this way medicine may be injected directly into the air passages. A great variety of mixtures are recommended for this purpose. One that is said to be used considerably in Russia, and that is highly recommended is composed of oil of turpentine and tincture of cloves, of each ten parts; carbolic acid and olive oil, of each one part. Ten grammes or, approximately, 2½ drachms of this mixture may be injected daily.

**General.** Other diseases upon which information has been given and assistance to live stock owners has been furnished are, contagious ophthalmia, contagious garget, several parasitic diseases of sheep, several infectious diseases of poultry, influenza, strangles and periodic ophthalmia of horses, actinomycosis and numerous non-contagious affections. No special features have come to my notice in regard to most of these diseases. Interesting conditions that have been observed in relation to a few of them are still under consideration and will be referred to in a subsequent report.

In conclusion, I wish to express my profound appreciation for the helpful co-operation and support that I have constantly received from you and from the other members of the State Live Stock Sanitary Board.

Respectfully submitted,
LEONARD PEARSON,
State Veterinarian.

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**APPENDIX NO. 1.**

Directions for the Treatment of an Aborting Herd.

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**BY LEONARD PEARSON.**

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1. Burn aborted foetuses and membranes.

This material carries the germs of abortion in abundance and burning or deep burial furnish the only means of getting rid of it in a safe way.

2. Isolate discharging cows.

The vaginal discharge from cows that have aborted is very virulent and may furnish the means of infecting other cows. Hence, discharging cows should be kept apart from the herd.
3. Disinfect the premises.

This procedure should be executed with the most exacting care. Partial or inefficient disinfection is practically useless. To disinfect, where fumigation with the vapor of formaldehyde cannot be employed, the spray pump furnishes the best means. It should be borne in mind that disinfectants do not destroy germs that they do not come in contact with. So, all large accumulations of bedding, forage and manure should be removed and every place that may harbor a germ should be reached with the disinfectant. Especial care should be used to drive it into every crack, knothole, behind every loose board, on top of every beam and into every partly concealed hole as well as upon every exposed surface.

A 5 per cent. solution of good (not crude) carbolic acid may be used for this purpose.

Following the disinfection by spraying and the cleaning of the stable, it may be whitewashed with lime—wash containing one pound of fresh chloride of lime to each 3 gallons of water. This may be applied with a brush or, better with a spray pump.

The barn yard should be well cleaned out, the manure being spread in some field that the cattle do not have access to. The bottom of the yard should be well scraped and the earth stained with leachings from manure should be removed. Then the surface of the yard may be flushed with a saturated solution of sulphate of iron or thickly spread with lime. The outer wall of the barn, facing on the yard, and the adjoining fences should be disinfected or whitewashed.

4. Irrigate the genital passages of the cows that have aborted.

The purpose of this procedure is to disinfect the genital passages. A convenient method is as follows:

Hang a bucket containing the antiseptic solution back of the cow. To a spigot on the side of this bucket attach a rubber hose \(\frac{5}{8}\) inch in diameter and about 6 feet long. Insert the hose into the vagina and, if possible, into the uterus of the cow. Allow from 3 to 4 quarts of the warm solution to flow into the cow and out. Take a fresh hose and irrigate the next cow, allowing the first hose to soak in an antiseptic solution in the meantime.

This treatment should be repeated every second or third day so long as there is any discharge from the cow. Afterwards it may be used once or twice a week. As appropriate solutions the following are recommended: Lysol, 1 per cent.; creolin, 2 per cent.; bichloride of mercury, 1:3000; carbolic
acid, 1½ per cent.; boracic acid, 3 per cent.; permanganate of potash, 1 per cent.; alun, 1 per cent.; chloride of zinc, 2 per cent. The last injection, two days before service, should be bicarbonate of soda, 2 per cent.

5. Irrigate the sheath of the bull.

The purpose of flushing out and disinfecting the sheath and the outside of the penis of the bull, is to prevent him from carrying the germs of abortion from one cow to another. This procedure should be enforced before and after each service. This is very important. The sheath may be flushed out by using a small rubber hose and funnel. The end of this hose is to be inserted into the sheath beside the penis, the fore-skin is held together with the fingers and the antiseptic is poured into the funnel. A 1 per cent. solution of lysol is good for this purpose.

6. The long hair at the end of the bull’s sheath should be cut off. Moreover, it is well to clip the hair from under the belly over a circle one foot in diameter surrounding the opening of the sheath. Then, by washing with a sponge this area can easily be cleaned before each service.

7. Wash off the external genitals of each cow every day.

For this purpose use any of the antiseptics recommended above. They can be applied with a clean sponge. The parts washed should comprise the root of the tail, the anus, the vulva and the surrounding skin for a distance of several inches, and the corresponding portion of the tail. A separate bucket and sponge should be used for the cows that are pregnant and those that have recently aborted.

8. Do not breed a cow for about ten weeks after she has aborted. About ten weeks are required for the thorough treatment of a cow that has aborted and she should not be bred before the expiration of this period. If she shows any discharge or other indication of vaginal catarrh she should not be bred for a longer period, or until the parts are in entirely normal condition.

9. A solution of carbolic acid may be administered subcutaneously to each pregnant cow. For this purpose use a 3 per cent. solution of carbolic acid and of this inject 2 drachms every ten days. Should this cause swelling in some individuals, for these use a smaller amount.

10. Remove cows from the herd before they abort, if possible. The purpose of this is to prevent the re-infection of the premises. Of course, this cannot always be done and when a cow aborts in the cow stable thorough disinfection is again required.
11. Repeat the disinfection of the stable from time to time and pay particular attention to the cleansing and disinfecting of the gutters. For frequent flushing of the gutters use a saturated solution of sulphate of iron.

12. Treat the cows accordingly to their individual needs. If a laxative or tonic is needed, give Sal. Car. Eact. of Iron or Arsenic according to the indications.

13. Whenever possible it is well to use a separate bull for the cows that have aborted and another for the sound cows. But even in this case it is important to observe the precautions cited under heading No. 5, using a separate apparatus for each bull.

APPENDIX NO. 2.

A PRELIMINARY REPORT UPON FORAGE-POISONING OF HORSES (SO-CALLED CEREBRO-SPINAL MENINGITIS).

BY LEONARD PEARSON, B. S., V. M. D.

The disease or horses commonly known as cerebro-spinal meningitis has long been supposed to result from the ingestion of food that has undergone fermentation or putrefaction or that has become mouldy. The evidence in favor of this view has, however, never been of a direct but only of a circumstantial nature. While the disease has in many instances occurred on farms and in stables where horses were fed on mouldy or musty grain or ground feed, damaged hay or spoiled ensilage, and it has been assumed that such foods produced the disease, there has always been a lack of proof, first, that these foods were poisonous, and, second, that some other influence had not produced the disease. This absence of proof is due to no lack of efforts to fix the responsibility on suspected food-stuffs. Experiments have been made in large numbers in which suspected materials have been fed to horses in the attempt to produce the disease called cerebro-spinal meningitis, but all of these trials have resulted negatively. So far as the literature of this subject shows, cerebro-spinal meningitis, so-called, has never been produced artificially or under experimental conditions.

10—6—1903
Friedberger and Fröhner state (*Spezielle Pathologie und Therapie*, 1896, fourth edition), in connection with the discussion of mould-poisoning, that feeding experiments are usually without result; but, they add, that it is illogical to conclude from this, in the face of the clinical evidence, that moulds do not have pathogenetic properties. They do not cite any experiments to show that mouldy foods are dangerous; all of their evidence appears to be clinical.

Case. On October 29, 1900, I was asked by Dr. Francis Bridge to see with him a stable in which five horses had died of cerebrospinal meningitis, so-called. The purpose of the consultation was to determine if possible the origin of the disease.

It was found that the horse stable consisted of a row of seven stalls across one end of the stone basement of a large barn. One long side of the basement was against an embankment and had no windows. The other long side was protected by an overhang. There were windows under the overhang and in each end of the barn. In front of the row of horse stalls and running at right angles to it were two rows of cows with stalls for about forty animals. There were two silos on the embankment side of the stable. This silage was thrown down into a dark room, formerly used as a root-cellar, opening into the stable at about the middle. The partition between the part of the stable occupied by the cows and that occupied by the horses consisted of the front of the horses' mangers. This did not extend above the level of the feed-boxes.

A silo had been opened about one week before the first cases developed. The silage was somewhat mouldy on top and had a musty odor. This condition extended down around the sides for several feet. No silage was known to have been fed to the horses, although some could get on their hay, which remained for a time, after it was thrown down from the loft, in the passageway in front of the cows. It was also possible that some of the milkers may have fed a little silage to the horses.

The hay fed to the horses was of good quality and in good condition. The concentrated feed was a mixture of oats, corn and bran, and appeared to be in good condition. It was kept in a covered feed bin in the passageway between the horse mangers and the cow stalls.

All of the seven horses in the stable became weak, showed muscular tremors, difficulty in chewing and swallowing, and gradually progressive paresis, which terminated in death in five instances. The other two horses were removed to another barn and recovered. The duration of the disease was from two to four days. No autopsies were made.

Suspecting the silage, on account of experience in previous out-
breaks and on account of the very mouluy condition of some of it, I obtained a sample and took it to the Veterinary Hospital of the University of Pennsylvania for trial. For the trial a nine-year old-gelding was used that had been in the hospital for two months. This gelding had been quite stiff from osteoporosis, but had recovered largely from his lameness, was well nourished, vigorous, and in good general condition.

The feeding experiment started on October 30th and continued until November 2d. The horse ate altogether approximately one-half bushel of silage mixed with oats and bran. November 2d he ate and swallowed slowly and with some difficulty. His temperature was 100 degrees F. There was no evidence of pain. November 3d there was well-marked paresis of the throat and of the muscles of mastication. The temperature was 100.5 degrees F. There was twitching of the muscles of the flank and shoulder, desire to lie down much of the time, and some difficulty in arising. The inability to swallow continued, and the general muscular weakness progressed. In the evening the horse was unable to stand. The brain was clear. There was no pain. The horse died at 9 A. M., November 4th. Autopsy negative except for swelling and dark red, almost black color of mucous membrane of pharynx and glottis. The mucous membrane of the larynx was congested. The mucous membrane of the stomach was also much congested and showed some echymotic spots on soft mucosa. The stomach contents had a putrid odor. A bolus of partially chewed hay was lodged between the teeth and check, and this had a very putrid odor. There appeared to be an excess of cerebro-spinal fluid. The brain and cord and their meninges were normal.

Another horse, a gelding ten years old, with ringbones on both front pasterns, but otherwise healthy, was given on November 5th four gallons of water that had percolated through a bushel of silage. November 6th he was given three gallons of water from the same silage. November 8th he was given six quarts of silage. November 9th he was offered four quarts of silage, but did not eat more than half of it. Up to November 9th in the afternoon no abnormal condition was noted. It was then observed that he chewed and swallowed slowly. In the evening there was a little tremor of the muscles of the shoulder and partial paralysis of the throat, but he could drink very slowly. He laid down most of the time and was weak. Temperature 98.2 degrees F. No pain. November 10th the horse was found dead in his stall, having died during the night. Upon autopsy lesions similar to those described above were found, but all were less well marked. Other investigations in this connection are now being made, and will be reported later.

As to the name that is usually applied to this disease—i. e.,
cerebro-spinal meningitis—it is evident that the name is inappropriate, because there is no evidence of inflammation in the meninges of the brain or cord. Since this disease closely resembles the sausage-poisonings and meat-poisonings of man and the carnivora, and since the observations recorded above show that the as yet undiscovered infectious or toxic principle resides in the food, I wish to suggest the name "forage-poisoning" as one that would be descriptive and accurate. (The Journal of Comparative Medicine, and Veterinary Archives, Nov., 1900.)

APPENDIX NO. 3.

A PATHOLOGY FOR FORAGE POISONING, OR THE SO-CALLED EPIZOOTIC CEREBRO-SPINAL MENINGITIS OF HORSES.*

(A Preliminary Report.)

D. J. McCarthy, M.D., and Mazycz P. Ravenel, M.D.

The disease known as infectious epizootic cerebro-spinal meningitis of horses is but little understood. In all out-breaks there seems to be a common cause, and there is little or no evidence that the disease is ever transmitted from one horse to another. In some cases the origin can clearly be traced to the food, and Dr. Leonard Pearson has produced the disease by feeding ensilage taken from a stable in which animals had been attacked. The influence of food is well illustrated by an outbreak which occurred in a large stable in Philadelphia. It began in December, 1901, twenty-seven horses being affected, of which ten died. A fresh supply of food was obtained, and piled on top of the old. No new cases occurred under the use of this feed, but in May, 1902, the old food was again reached, and soon after fifty-nine horses developed the disease, twenty-four of which died, and six were destroyed. From his experiments and observations Dr. Pearson has proposed the name "forage poisoning," a name which is more in accordance with the facts as we know them at present. The term "cerebro-spinal meningitis" is not justified by the clinical history nor by post-mortem findings.

*From the Laboratory of the State Live Stock Sanitary Board and the William Pepper Clinical Laboratory.
While forage is no doubt responsible for many of the outbreaks, the actual pathogenic agent has not yet been discovered, though a toxic mold or fungus is supposed to be the cause. All attempts to find a specific micro-organism in the animals affected have failed completely, nor has microscopic examination of the tissues revealed any specific lesion. Gross examination usually shows hyperemia of the brain and cord, and their meninges, with increase of fluid in the subarachnoid spaces and ventricles. This fluid is clear, and we have been unable to discover any micro-organism in it by cultural methods.

Symptoms.—The symptoms are referable to the central nervous system. In mild attacks there is loss of control over the limbs and tail, loss of appetite, and difficulty in swallowing. The inability to swallow is often a marked symptom in more severe cases, and the name “putrid sore throat” has been applied to the disease. There is stupor, apathy, extreme muscular weakness, or actual paralysis. A common symptom is contraction of the muscles of the neck, back, and loins, with more or less opisthotonos. Paroxysms of delirium occur, during which the animal will push against the wall, or show the disorderly movements due to meningeal irritation. Coma and paralysis come on, and death occurs in from five to forty-eight hours. In most acute cases the animal falls and dies in convulsions.

It seems probable that several diseases which are characterized by similar clinical symptoms have been considered as one and the same by observers.

MacCallum and Buckley have found in the brains of horses dying of this disease areas of softening “in the frontal region on each side, anterior to the motor region of the cortex.” This softening was practically confined to the white matter immediately under the cortex, the rest of the brain showing no abnormality. In these areas there was “complete destruction of the brain substance in which the anatomical elements are disintegrated, and largely replaced by a colloid-like material.” The neighboring blood vessels were actually inflamed, with exudation of leucocytes, and passage of the red corpuscles into the peri-vascular lymph sheath and adjacent tissues. In a second outbreak they failed to find the softened areas in the brain, but the condition of the blood vessels was such as to make them believe that they had the earlier stages of the same process. They have given the name “Acute Epizoötic Leucoencephalitis.” (Bulletin 80 of the Marland Agricultural Experiment Station.)

The disease has engaged our attention at the laboratory of the State Live Stock Sanitary Board for several years, and examination by cultural methods have been made whenever possible, but
always without result. We were led to the present investigation more than a year ago while making a study of the value of the rapid diagnosis of rabies after the method of Van Gehuchten and Nély, in the course of which several horses and two calves, which had died of forage poisoning, were used as controls.

Pathological Report.—With the exception of the lesions in the upper gastro-intestinal tract where the infection probably occurs, the only others discovered were confined to the central nervous system, and may be grouped for purposes of description as follows:

1. Lesions of the intervertebral and Gasserian ganglia. 2. Lesions in the cerebral and cerebellar cortex. 3. Lesions in the choroid plexuses of the lateral cerebral ventricles. 4. Lesions of the peripheral nerves supplying the larynx.

Fifteen animals have been studied. In the first six of these the intervertebral ganglia were not examined. In all the nine cases in which these structures have been studied the following changes have been found: In the normal ganglion the ganglion cells are enclosed in a capsule fitting closely around the cell. This capsule is made up of a single layer of endothelial cells. The supporting structure of the ganglion is composed of a loose areola of connective tissue, through which run the nerve fibers on their way to the spinal cord. All of these structures are affected.

The ganglion cells were the seat of extensive chromatolysis. The degenerative changes vary from a simple diffuse chromatolysis—a fusing together and loss of outline of the fine chromatin points in the cell protoplasm—to complete destruction of the cell body and nucleus. At times cells were found apparently normal, except for the accumulation of large amounts of a yellow pigment, staining black with osmic acid. In other cells, besides the diffuse chromatolysis above referred to, the nucleus was found displaced to the periphery of the cell. As the degenerative changes advanced, the cell protoplasm took the stain very strongly and appeared a deep blue by the Nissl method. Marked vacuolation of the cell protoplasm was present in two cases. In four cases some of the ganglion cells were completely disintegrated, filaments of protoplasm remaining among the small mononuclear cells surrounding the capsule.

Capsular and pericapsular changes.—In all nine cases in which the intervertebral ganglia were examined a peri-capsular, small round cell accumulation was present. In some of the degenerating ganglion cells a few nuclei were seen within the capsule in the degenerating cell protoplasm. The accumulation of nuclei around the cell capsule did not always assume a concentric shape, but was often eccentric extending irregularly into the stroma. The cells are all of the small type, the nuclei and the protoplasm being about
the size of a red blood corpuscle. There is no evidence that these cells are due to a proliferation of the original layer of capsular cells. Polynuclear cells, or cells with an irregular nucleus, were not present in any of the specimens examined. It is probable, inasmuch as these cells stand in no relation to the vessels of the ganglia, that they are the result of a proliferation of the stroma cells of the ganglion.

Cortical lesions.—The cortex of the cerebrum and cerebellum was markedly congested both to gross and microscopic examination. The meninges were normal. The ganglion cells were normal to the Nissl and other cell stains. Numerous capillary hemorrhages were scattered throughout the entire cortex of the cerebrum and cerebellum. There were also hemorrhages in the subcortical tissues. The basal ganglia, pons, and medulla were perfectly normal. The spinal cord, outside of some congestion of the gray matter, was normal. The meninges showed no trace of an inflammatory process.

Lesions of the choroid plexus.—The choroid plexus in three of the cases was changed from a filmy membrane to a large triangular tumor-like mass. This mass was of a yellowish-red color, of firm consistency, and measured two and a half centimeters in transverse section. On microscopic examination the increase in size was found to be the result of a proliferation of the elastic tissue surrounding the vessels. By the Van Giesen stain the entire section was found to consist of whorls of delicate fibers starting from the neighborhood of the vessel walls and extending to the margin of the plexus. These fibers were not nucleated, although numerous nuclei of the supporting tissue of the gland were present between the whorls. At the suggestion of Dr. Flexner, the Weigert elastic stain was used and the character of the tissue determined. The ependymal cells covering the villi were normal.

The peripheral nerves.—An examination of the nerves supplying the larynx and the neck by the fresh osmic acid method showed a slight but distinct degeneration. This was present in the nerve up to the ganglion, but was not present in the posterior roots, or the root of the fifth nerve. These lesions in the myelin corresponded to the presence of a marked degree of swelling of the axis cylinder in the substance of the ganglion. Hemorrhagic extravasation into the sheath of the pneumo-gastric nerve was present in one case.

Summary.—Hemorrhagic inflammation of the upper respiratory organs; degeneration of the peripheral nerves supplying these areas; toxic irritation of the intervertebral ganglion as manifested by intense degeneration of the ganglion cells, pericapsular round cell infiltration, and swelling up of the axis cylinders; widespread ca-
pillar hemorrhagic extravasation of the cortical and sub-cortical tissues, tumor formation due to proliferation of elastic tissue of the choroid plexus of the lateral ventricles.

The ganglionar lesions above described closely resemble those described by Van Gehuchten and Nélie in rabies. In rabies, however, there is an active proliferation of the capsular cells with a marked tendency to extension within the capsule, while, as has already been pointed out, the tendency in this disease is to a peri-capsular accumulation of cells. In advanced cases of forage poisoning the ganglion cells may entirely disappear and an accumulation of small round cells remain. Under these circumstances the picture cannot be differentiated from rabies by an examination of the ganglion alone. The perivascular round cell accumulation in the pons and medulla, which is rather constant in rabies, is never present in forage poisoning. There is no degeneration of the peripheral nerves in rabies. The clinical course of the two diseases is entirely different, and there should be no difficulty in separating the two conditions by the pathological lesions.

Professor Van Gehuchten, of Louvain, to whom we submitted the specimens from our first case (a calf), confirmed our opinion that there was a distinctive difference between the ganglionar changes in forage poisoning and in rabies.

Concerning the specimen sent to him he writes: "It cannot be denied that there is a sensible proliferation of the cells of the endothelial capsule, but this proliferation does not, however, appear to me to be as intense as in cases of rabies; so much so, that I would not make the diagnosis of rabies from the examination of the sections alone. I do not think that this animal had rabies. Rabies excluded, there remains a certain amount of proliferation, the cause of which escapes me; but in my opinion the degree of proliferation cannot be compared with that which occurs in rabies."

CONCLUSIONS.

1. The so-called epidemic cerebro-spinal meningitis of horses is not a true meningitis, and presents neither the gross nor microscopic lesions of true meningitis.

2. The evidence goes to show that all epidemics are caused by some poisonous substance contained in the forage. This is proven conclusively in the epidemic mentioned above, and in the experiments of Dr. Pearson.

3. The lesions in the intervertebral ganglia so closely resemble those described by Van Gehuchten and Nélie in rabies, as to offer the presumption that the pathological process in the two diseases is somewhat similar.
4. The differential diagnosis between forage poisoning and rabies depends upon (a) the absence from the medulla and pons in forage poisoning of the perivascular and peri-cellular lesions (Rabic tubercles of Babes); (b) in forage poisoning there is predominance of peri-capsular rather than intra-capsular round cell infiltration of the ganglion cells. (c) Lesions of the larynx and laryngeal nerves. The clinical history is always conclusive.

5. Forage poisoning is a much better and more comprehensive term than "cerebro-spinal meningitis," or than "leucoencephalitis," as proposed by MacCallum and Buckley.

(The Journal of Medical Research, October, 1903, Vol. X., No. 2.)

APPENDIX NO. 4.

A CASE OF HYDROPHOBIA WITH AUTOPSY.*

BY G. MORTON ILLMAN, M.D., of Philadelphia.

I think it is prudent to report this case for discussion, because of the fact that proper precaution, protecting human life from one of the most distressingly fatal infections known to mankind, is overlooked, especially in the large communities of America. In some instances the very existence of the condition is questioned by a few members of the medical profession and by the laity.

The patient was a well-developed male, aged 37, and an electrician by occupation.

Family History.—His family history was negative, with the exception of the fact that his mother died of pulmonary tuberculosis.

Previous Medical History.—Investigation as to the previous medical history showed that the patient had been a comparatively healthy man with the exception of a slight persistent cough, with which he had suffered some years ago, but which had ceased after the patient discontinued the excessive use of tobacco.

Two years ago the patient met with a severe accident, necessitating the partial amputation of three fingers of the right hand. This accident was fol-

*Read before the Philadelphia County Medical Society, December 9, 1903.
lowed during the present year by a severe burn of the right arm and forearm. The patient was just recovering from the latter condition when, upon attempting to caress a strange dog, he was bitten in the palm of the left hand, in the web between the first two fingers.

The wound was thus inflicted August 23, 1903. It bled freely at the time and was cauterized one hour later with a solution of silver nitrate (of questionable strength), followed by pure carbolic acid, and an antiseptic dressing applied. The wound healed kindly without any decided complications.

Premonitory Stage.—In the evening of October 1, 1903, just 39 days after infliction of the wound, the patient's attention was attracted to his left hand by a tingling sensation in the tips of the fingers and in the cicatrix. His wife states that during the following two days he appeared greatly depressed, restless at night, had little or no appetite, and complained of a constantly increasing aching sensation in the left hand and arm.

Spasmodic Stage.—Upon arising from bed in the morning of October 4 the patient complained most decidedly of the left hand, arm and shoulder, and of a pronounced feeling of debility. He went to breakfast, however, as usual, and upon attempting to swallow the liquid it was suddenly and involuntarily expelled from his mouth. He then went upstairs without assistance and lay upon a couch, complaining at the time of feeling extremely weak.

At 10 o'clock A. M. I was asked to attend the patient, and found him decidedly restless, and complaining, in addition to the aching arm and shoulder, of being very chilly. The skin was moist, the muscles relaxed, reflexes normal, and face flushed. Pressure along the nerve trunks and muscles of the left arm and shoulder was slightly painful, but did not seem to be productive of any local or general spasm. Attempts at prolonged conversation, however, seemed to cause, from time to time, a sudden involuntary laryngeal spasm, after which the patient would be unable to resume talking immediately because of a marked dyspnea thus produced. The temperature at this time was 101 degrees F., the pulse 102; and the respirations were 24.

Upon receiving the history of the patient's inability to swallow water while at breakfast, I decided to prescribe an antirheumatic in powder form to be taken with water during my absence, in order to avoid arousing the patient's suspicions regarding my belief in his ability to swallow liquids as usual.

At 3 o'clock in the afternoon I was informed that after a great effort he had swallowed one powder, but that a repetition had been absolutely impossible, and, furthermore, that he had refused all liquids and solids at lunch time. There was now a pain on the left side of the neck which seemed to be most marked along the posterior borders of the trapezius and sternomastoid muscles, radiating toward the occipital portion of the skull.

The patient complained of an almost constant smothering sensation in the larynx, and the slightest efforts to talk would now very readily provoke a laryngeal contraction, during which time the patient continually held his hand to his throat in an effort to relieve his dyspnea and was extremely restless. The temperature continued to be 101 degrees F., the pulse was 98, and respirations 26.

Feeling that future treatment of the patient depended upon an absolute surety as to the diagnosis, I asked Dr. Samuel Wolfe to see the patient, and after a very careful examination and consideration of the definite history Dr. Wolfe came to the conclusion that the case was almost certainly one of true hydrophobia. The actual state of affairs was at once explained to the family, and thus all obstacles to future treatment eliminated.

At 6 o'clock the same evening (10 hours after the first appearance of active symptoms) it became necessary to resort to hypnotics to control the spasms,
which were now becoming very much longer in duration and more decided in severity. Eight mg. (½ gr.) of morphin and .4 mg. (1-150 gr.) of atropin were accordingly given hypodermically with a very beneficial result, enabling the patient to obtain a much needed rest of 4 or 5 hours' duration.

It became necessary to repeat this injection 6 hours later, at which time there was a noticeable hyperesthesia of the left side, especially marked at the time of puncture with the hypodermic needle. The patient's general appearance was now that of a decidedly sick man and one whose suffering was anything but of an hysterical nature, his manifest desire to assist with his treatment and avoid worrying his family being most pronounced.

The second administration of morphin and atropin had only been beneficial so far as respiration was concerned, the injection being repeated at 5.30 A. M. (5½ hours after the second administration) with better results, especially the severity of the laryngeal spasms, but with no decided effect upon the frequency of recurrence.

All attempts to have the patient take food of any variety by the mouth failed, and nutrient enemas (of beef) were resorted to and retained, being given always after a hypodermic injection of the narcotic.

In the afternoon of the second day of the spasmodic stage, Drs. M. P. Ravenel and D. J. McCarthy were called in consultation and made a careful examination of the patient, especially as regarded the nervous symptoms, and stated that in their opinion the case was undoubtedly one of hydrophobia.

There seemed to be a slight tendency to increased salivation during the past 6 hours, and now, regardless of the atropin that had been given, there was a moderately abnormal flow of saliva, probably caused, to a certain extent, by the almost continual movement of the patient's jaws and tongue.

With the approach of evening the general condition became gradually worse, and at 8.30 P. M. a series of spasms developed, extending over a period of 30 minutes. During this series of paroxysms there was increased salivation, intense dyspnea, rolling of the eyes, continual change of position, marked eructations of gas, and the passage at this time of about 6 ounces of urine, making 10 ounces passed within 5 hours. Delirious symptoms now became noticeable, but occurred only at intervals of 2 to 3 hours, and were of very short duration.

During the course of the next 10 hours but 2 administrations of morphin were necessary, the patient resting fairly quiet until Tuesday morning (October 6, the third day of the spasmodic stage), at which time control of the patient became a difficult matter. The excitement became maniacal, and it was feared the patient would do himself personal injury, although his entire appearance was at times one of terrible fear, and he would hold his throat with both hands in a frantic effort to relieve his dyspnea. Attempted inhalations of chloroform at this time and other times gave no relief, and only seemed to increase the suffering.

After some effort .6 mg. (1-100 gr.) of hyoscinc hydrobromate was given hypodermically with a very gratifying effect. This dose of hyoscinc was repeated 3 hours later, and was the last administration of a hypnotic of any kind that was necessary during the remaining course of the disease. The temperature was now 101.6 degrees F., the pulse 124, and respirations 44.

Paralytic Stage.—A few hours later a gentleman who saw the patient pronounced the case one of hysteria of a remarkable type, and was so positive as to his diagnosis that it was decided to put the patient upon hysterical treatment. Accordingly, all medicinal administrations, rectal feedings, etc., were discontinued, and no one except the nurse or a substitute allowed in or near the room.

Twenty minims of sterile water was given hypodermically every 2 or 3 hours,
and the nurse informed me that there was absolutely no effect as to the frequency of the spasms, but there seemed to be a steady decrease in the severity regardless of the time at which the injections of water were given. In other words, it was very apparent that regardless of treatment the patient was slowly passing into the paralytic stage of hydrophobia.

The patient now began to perspire profusely, and vomited for the first time about 4 ounces of yellowish, frothy mucus. The profuse sweating continued, and a few hours later both pulse and respiration began to fall rapidly. It became very evident that a return to medicinal treatment was necessary, and 1 mg. (1-50 gr.) of digitalin and .4 mg. (1-150 gr.) of atropin were given hypodermically with much benefit.

The periods of delirium were now of frequent occurrence and of long duration. When rational the patient declared that the choking sensation had entirely gone from his throat, and that he was now smothering from oppression over the epigastrium, and during a spasmodic attack would put both hands to this region instead of to the larynx as formerly. It was, therefore, decided to endeavor once again to administer a liquid by way of the mouth. Two ounces of milk containing a fluid dram of whisky was brought to the patient, and with a little assistance and encouragement the entire contents of the glass were swallowed without any great effort. On finding himself able to swallow liquids again the patient asked for a cup of coffee, of which he drank a few drams. About 30 minutes later both coffee and milk were vomited and all efforts to repeat the same were forcibly resisted.

In spite of stimulants the pulse and respiration failed steadily and the patient became permanently unconscious, at which time 20 m. of ether was given hypodermically and resulted in a sudden general clonic muscular spasm.

External heat had been constantly applied to the trunk and extremities, and digitalin and atropin given, either together or separately as occasion demanded, until the patient's death of respiratory failure at 7 A. M., October 7, 3 days (71 hours) after the onset of active symptoms, and nearly 6 days after the onset of prodromal symptoms.

The hyperesthesia was a prominent symptom throughout the course of the disease, and became gradually more pronounced until finally both before and after unconsciousness warm applications could only be placed to the extremities very gradually and retained in position with difficulty. Hyperesthesia, as a rule, was most marked on the left side. Very slight stimulations, such as the sudden entrance of light to the room, the running of water and the ringing of the doorbell, were many times provocative of a spasm. The reflexes were increased and the plantar reaction always downward. The pupils became dilated and nonreactive about 8 hours before death.

Delirium began to manifest itself about 36 hours after the onset of active symptoms, became more prominent during the administrations of hyoscin, but was still present during the period of 9 hours when the patient was receiving no medicinal treatment, and continued to the period of unconsciousness.

During the entire course of his illness there was never made in the presence of the patient any mention of or reference to dogs or hydrophobia, and he was made to believe, so far as possible, that
he was suffering from rheumatism of the throat muscles. At no
time during his illness did the patient simulate in any manner the
actions of a dog or other lower animal, although he frequently
referred to the dog-bite as being the cause of his present condition.

The temperature showed a gradual rise until the second day of
the spasmodic stage when it reached 102 degrees F.; after which
it ranged between 101.8 degrees F. and 100 degrees F. The respira-
tions, when at all regular, varied from 28 to 40, and simulated at
times Cheyne-Stokes' respiration, especially after a series of laryn-
geal spasms. After unconsciousness, ether dropped on the larynx
and upper portion of the chest brought about a prompt respira-
tory reaction.

I had an opportunity to make but one examination of the urine,
the specimen being collected during the second 24 hours, after the
onset of active symptoms. It was high-colored, decidedly acid, and
showed a specific gravity of 1,040; there was no albumin nor sugar
present. No microscopic examination was made.

Prophylaxis.—All linens, towels, etc., used around the patient,
especially those contaminated with saliva or vomit, were at once
thrown into scalding water and later boiled. After death, all
needles, thermometers, spoons, etc., were either destroyed or steril-
ized, and the floors, bedding and furniture thoroughly wiped off with
a strong solution of carbolic acid.

Autopsy.—The autopsy was made 10 hours after death by Drs.
McCarthy and Ravenel, with the following results:

The lividity of the dorsal surface of the body was very marked, and rigor
mortis of the upper and lower extremities very well developed.

The skull was thin. The brain and membranes were normal, both over the
convexity and base.

The spinal cord and its membranes were of normal appearance, as were the
pancreas, adrenal glands and spleen.

The lungs showed some adhesions in the right pleural sac, a rather marked
emphysema along the anterior border of the right lung, and an area of healed
tuberculosis at the right apex.

The liver showed a slight passive congestion, otherwise normal.

The heart was normal with the exception of a patch of old pericarditis on
the anterior surface.

The kidneys appeared to be normal. The inner surface of the larynx was
covered with dirty mucus and there was considerable frothy mucus in the
trachea.

Microscopic Examination.—The microscopic examination of the central ner-
vous system shows typical tubercles of Babes in the medulla. The round-cell
infiltration around the blood vessels was very distinct.

Sections of the cerebral cortex and base of the brain show no evidence of
inflammatory change.

Sections of the gasserian ganglion and also of the intervertebral ganglions
show a round-cell infiltration in the stroma, a diffuse chromatolysis of the
ganglion cells, and a vacuolization of some of these cells, with a proliferation of
the capsular cells, in most areas of only moderate degree, but in some areas filling up the entire capsule.

The peripheral nerves and the anterior and posterior roots show no change after careful investigation.

Microscopic study gave perfectly normal appearances in all the viscera with the exception of the kidney. These sections show some congestive swelling of the glomeruli and a cloudy swelling going on to marked degeneration of the cells of the tubules.

In other words, pathologic lesions typical of hydrophobia were found in a case associated with parenchymatous nephritis. Neither the pericellular nor perinuclear round-cell accumulation of the central nervous system nor the lesions of the intervertebral ganglions are seen in cases of nephritis.

Inoculations. — Three rabbits were subsequently inoculated from the medulla of the patient, with the result that all 3 rabbits died after a period of 17 to 19 days, presenting typical symptoms of rabies, and subsequent sections made from the nervous systems of these rabbits showed pathologic changes typical of rabies and corresponding to those found in the nervous system of the patient.

The Dog. — The dog was of the small terrier type, showed no signs of rabies, and is said to have been playing with some children only a short time before biting the patient. The killing and cremation of the dog prevented a subsequent autopsy.

(American Medicine, Vol. VII, No. 6, pages 213-214.)

I close this report with the earnest plea that an effort will be made to have constituted or enforced the proper laws, compelling the muzzling of and quarantining of dogs at all seasons of the year, that society may thus be protected from this fatal condition, and that, if possible, it be thus completely eliminated, as in many foreign countries, notably Australia.
ANNUAL REPORT OF THE DIVISION OF ZOOLOGY.

To the Hon. N. B. Critchfield, Secretary of Agriculture:

Dear Sir: I have the honor to submit the following report of the Division of Zoology of the Department of Agriculture for the calendar year 1903.

On March 30, 1903, the present Economic Zoologist was appointed by Governor Pennypacker, and it is our present duty to render a report of the work of this office for the year now closing. To fully understand this, one should know the conditions confronting the incumbent. When he entered the office, the lack of equipment was especially remarkable. There was no collection of specimens for study or for comparison, almost no reference literature, very few of the publications of the United States Department of Agriculture or of the Bulletins of the various State Experiment Stations of the United States, no mailing list, no facilities for mailing, no mailing machine, no collecting material, no spraying apparatus nor facilities for experimentation, no cabinet nor accessories for preserving insects or other specimens, no room for the proper kind of work, no office boy, scientific assistant, field assistant, nor stenographer.

By your kind aid, Mr. Secretary, and that of the Governor, and the Board of Public Grounds and Buildings, most of the minor deficiencies have been met, and the most urgent needs of the Division have been supplied.

I beg to submit the present report under the following sub-heads:

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(1.) PRESENT EQUIPMENT:

During the year we found it necessary to move from the one small room in the Bay Shoe Factory Building to four rooms on the third floor of the Real Estate Building, corner Court avenue and Locust street. Our rooms are now equipped with a fine metal cabinet for insects and a nucleus of a collection to be placed therein, all of the available bulletins of all the Experiment Stations of the United States and the publications of the United States Department of Agriculture, scientific publications from other sources, including certain current periodicals pertaining to our subjects, a few necessary reference books by private publishers, a rapid mailing machine with 24,500 stencils, a mailing list of over twenty-four thousand names, some apparatus for making collections, three first-class pieces of spraying apparatus for practical work and experimentation, a good case for card catalogues and card indexes, photographic material, a dark room, tools and minor equipment for the essential work of the Division. We have here a main office room, a library reference room, a mailing room and a room for preparing and preserving collections, keeping apparatus, etc.

I should report the fact that during the year we have received the following donations of valuable apparatus: The L. H. Kline Company, Pennsburg, Pa., one bucket spray pump and accessories; The Deming Manufacturing Company, Salem, Ohio, one hand spray pump and case, complete; The Goulds Manufacturing Company, Seneca Falls, N. Y., one Barrel Kerowater Sprayer, complete; The Ripley Hardware Company, Grafton, Ill., one stock feed cooker for boiling the lime-sulphur-salt wash, and the Animal Trap Company, Abington, Ill., five dozen traps, assorted kinds. Acknowledgment should also be made to the directors of the various Experiment Stations, the United States Department of Agriculture, the New York State Museum, etc., and to many publishers who have freely responded to our calls and have sent their publications for use in this office. Notwithstanding the present equipment, we sorely need a few more recent books by private publishers, and named
specimens of our injurious and beneficial species of insects for comparison with the many we are receiving, which are generally not in the proper state for preservation. We also most seriously need a regular stenographer and a scientific assistant.*

(2.) CORRESPONDENCE:
During the year we have written 1,957 copied letters, besides hundreds of letters that were not copied, and thousands of circular letters that were sent out calling for information. Many of these letters are necessarily of unusual length on account of required details.

Specimens have been sent to us for identification or preservation to the number of over 2,000, or an average of about seven per day. These have all demanded the most careful scrutiny, mostly under the microscope, and it was essential that accurate reports must be given to inquirers in order to enable them to save their crops or take such practical measures as each individual case demands.

Much correspondence has also taken place between ourselves and observers in various portions of this State in order to obtain definite knowledge of the various forms of animal life as it exists in the different counties of this Commonwealth. This knowledge is necessary in order to form a working basis for the Zoologist during the coming years of his term. Based upon such correspondence, we shall soon be ready to prepare reports showing the distribution of certain insects, reptiles, birds and mammals in Pennsylvania. We have already prepared such maps, showing the distribution of the San José Scale and Hessian Fly, and have at hand the material for similarly charting the extent of the Seventeen-year locust, or Cicada, during the summer of 1902.

Thousands of letters have been received, calling for publications or for information that could be answered by sending marked copies of published articles, and these and thousands of others have asked for the bulletins which we issue. All such communications receive the personal attention of your Economic Zoologist, and are kept on file for future reference.

(3.) INVESTIGATIONS AND EXPERIMENTS:

The investigations of this Division are of paramount importance to our citizens. The annual loss by the destruction of insects in the State of Pennsylvania is not less than $20,000,000, and the loss by plant diseases is equal to this, making an annual loss to the cultivators of at least $40,000,000 per year through the effects of plant pests. It thus becomes important that something be done to stay the ravages of such pests and diseases, and save for the husbandman

*We are pleased to add that since the above was written Governor Pennypacker and Secretary Critchfield have devised a means to supply these two additional needs.—H. A. S.
this enormous loss. Resting upon me is the responsibility of giving
correct information to all persons who make inquiries of subjects
pertaining to my profession, and if such reports be not accurate, se-
vere injury or loss may ensue for the cultivator. All remedies that
are found to be successful for obnoxious insects in other portions of
the country should be tested in our own State before we can say that
they will be equally successful in our climate, upon our crops and
with our pests. For this reason, although we may have reference
literature upon most of the subjects pertaining to the work of this
office, it becomes important for us to make practical tests and inves-
tigations within our own State. Also, it is very frequent, indeed
that methods are suggested, or even strongly advocated, which,
when tested, are not found to be efficient. An example of this is the
aqueous solution of caustic soda for the San José Scale. This was
advocated in the report of a writer in the far west by a prominent
agricultural publication. Fortunately, we had the equipment, and
immediately tested it, with the result that we are now able to
say with a certainty that it will not prove satisfactory or effective
in our own State. Yet, to-day, there are hundreds of persons ap-
plying this supposed remedy and losing their fruit, crops and trees,
because they do not know that this is not an effective remedy.
Thousands of others in our Commonwealth would be doing like-
wise were it not for the practical test which we gave this sup-
posed remedy, and for our publications, warning our citizens against
relying upon it. We can give several such illustrations for other
insects.

We find it necessary to make investigations of a different nature
in the biological features, habits, haunts, enemies, diseases and
practical measures for the various insects and higher animals
which live within our State. Of the thousands of species of insects
known to attack vegetation in Pennsylvania, there is not one of
which very useful knowledge could not yet be obtained by further in-
vestigation. Of only a comparatively few insects do we know their
complete life history, annual cycles, enemies and simple and effec-
tive practical measures for either suppression or propagation, as
the occasion may demand. This means that we should make prac-
tical investigations when possible, and it is earnestly hoped that
another session of the Legislature will see this office equipped with
a field assistant for aiding in the needed experimentation, investi-
gation and collecting.

We have completed a series of investigations upon the Hessian
Fly in Pennsylvania, which we undertook three years ago at the
direction of Prof. John Hamilton, then Secretary of Agriculture.
The results of these studies are embodied in a bulletin, which has
been so delayed that it has been issued only recently. The results
of these investigations show that all wheat planted the last of August and the first week of September is likely to be attacked with the Hessian Fly. Of the wheat planted during the second week of September, two-thirds of the fields are liable to be infested, and of that planted during the third week of the month about one-third of the fields may be infested, while the fly will not be likely to be bad in that planted during the last week of September, and we have never found it occurring in destructive numbers in any field planted after the first of October.

The San José is by all means the most serious pest to fruit trees and certain kinds of ornamental shrubbery and hedges in Pennsylvania. This insect has become so destructive and so extensive in its distribution that we have been giving it special attention during the entire year. We have now found it in almost every county in the State of Pennsylvania, and we are confident that its presence may be suspected in any orchard that has been planted during the past ten years. We have studied this pest in orchards and in the library, we have experimented with remedies for it, and have endeavored to propagate its enemies. The results of such studies are given in the monthly bulletins of the Division. In brief, it may be said that there is only one unfailing remedy that is safe to use upon all kinds of trees, and which has been fully tested both by the scientist and the practical operator. This is the lime-sulphur-salt wash, made by boiling together for two hours a mixture of lime (30 pounds), sulphur (20 pounds), and salt (15 pounds), with enough water to make it boil well, and finally adding water enough to make the whole amount to 60 gallons. This should be sprayed on the plants while warm. Make two applications per year, one just as the leaves drop in the fall and the other just before they expand in the spring. It is not injurious to any trees, and is a valuable fungicide, as well as a very efficient insecticide. We know where fruit growers in this State have used this wash during the past year and have gathered excellent crops as a reward for their industry, while others in the same region, who failed to use it, had no fruit fit for the market.

In recognition of the very severe injuries of the San José Scale, the need of prompt action and practical measures for this pest, the Pennsylvania State Horticultural Association and also The State Board of Agriculture, during their annual meetings last January, passed unanimous resolutions agreeing to ask the next session of Legislature to appropriate $10,000 annually for two years to the Department of Agriculture for the use of this Division in suppressing this most serious pest of our fruit trees. It is to be hoped that this action will bear good fruit in behalf of our citizens.

Other investigations have been undertaken. Among these are
studies of the Tent-caterpillar, the Codling Moth, the Fruit-tree Bark-borers, Grape Pests and other injurious insects, as well as mice, rabbits, hawks and owls, sparrows, reptiles, toads, etc. These investigations are not completed, but will be continued, and the results published in due time. Our office work, however, is so voluminous as to prevent very much personal scientific work of an original nature. It is to be hoped that this can be remedied by the appointment of the help we need.

(4.) DEMONSTRATIONS:

We have had a great number of calls, especially from the fruit-growing regions of this State, for our services in demonstrating to growers the methods of making and applying insecticides, which have not previously been used. This is especially true for the application of the lime-sulphur-salt wash for the San José Scale. Our office work has been so urgent, however that we could not well undertake such important demonstrations upon an extensive scale, but we have gone to several places, and have met the orchardists in field sessions, and have endeavored to show them how to make and apply the most approved modern remedies. At the numerous public meetings where we have spoken, we have generally exhibited some kind of spraying apparatus for the purpose of showing in a practical manner the difference between spraying and sprinkling, and the necessity for the former rather than the latter.

There is no better means of serving our citizens than to teach them the best methods in this practical work. They hesitate to apply the methods which we have found best, because these remedies are new to them, and they fear that they will make mistakes and be unsuccessful in making such applications. One demonstration in each township in the State would give our agriculturists and horticulturists practical aid to the value of hundreds of thousands of dollars. It is to be hoped that arrangements can be made to enlarge the work of this office, and equip us with a field assistant for such useful services, or with a permanent competent office assistant, that will enable your Zoologist to go into the field to do the work.

(5.) COLLECTIONS:

As has been said above, there were no specimens in this office when we entered it, and we are receiving hundreds every month, with the request that we identify them and tell the inquirers what practical measures should be taken in connection with them. A professional naturalist is unwilling to risk his reputation by basing his communications upon conjecture, or by being forced to do im-
perfect work without a collection of typical named specimens. It is impossible for anyone to name all this great mass of miscellaneous material readily and accurately without types for comparison, since we receive so many kinds. For this reason, and for the proper aid to our citizens, a good, reliable collection of the fauna of this State is essential for the proper kind of work in this office. We have undertaken such a collection, but it necessarily requires great time and care. We now have thousands of specimens in the office, but most of them have been sent in such condition, that they are not fit to be preserved as permanent typical specimens. We should collect our own material expressly for this purpose, and have it preserved in the best possible manner in order to obtain the collection needed for comparison. This is especially true of insects, as we need specimens showing the different stages in the life history of each species in order to facilitate the study of life histories, and also, to give us other practical information. We hope to have time to do this important work when a scientific assistant is appointed.

While our practical work for the agriculturist deals mostly with the enemies and diseases of plants, we must not forget that the broad work of the Zoologist must necessarily extend to the higher animals, including the reptiles, birds and mammals. For this reason we are making studies, notes and observations, as well as collections, of the Vertebrates, and preparing the bases for future publications upon such subjects, especially upon the reptiles in their relation to agriculture. However, such publications can not be completed until we obtain and study many specimens from all parts of the State. For this purpose we are inviting readers and correspondents to make a special effort to send us all possible specimens of Pennsylvania animals of the lower kinds as well as of the higher.

THE COLLECTION FOR THE ST. LOUIS EXPOSITION.

Under this head it is our pleasure to report to you that the Collection of Pennsylvania Animals in Relation to Agriculture prepared in this office for the St. Louis Exposition has been completed in a manner which, under the circumstances, should be quite gratifying to all persons concerned. This interesting exhibit was made possible only through the appreciation and timely aid of Governor Pennypacker, yourself, Col. James A. Lambert, of Philadelphia, and Col. John A. Woodward, of Howard, Pa. The collection was not authorized until December, 1903, and not a specimen was received until the middle of January, 1904. During the subsequent two months all the material for this large and interesting collection was brought together by us, mounted and arranged in cases and shipped to St. Louis.
The chief purpose of the collection was to show, as far as possible, within our limits of time and moderate expenses, the economic features of the more common native animals of Pennsylvania. It was not our purpose to represent the complete fauna of the State, nor to show the rare animals, but rather to exhibit the reptiles, birds and mammals in their relation to agriculture. We should have been glad to have added the insects to this collection had it not been that the time was so short and the collection was made at such time of year as to prohibit the gathering and preparation of the invertebrates.

This collection is prepared and exhibited in thirty-six cases, each eighteen inches in depth, four feet long and three feet high. The animals are mounted in natural attitudes as far as is possible, and the chief element of the food of each, and other important habits, enemies, etc., are shown, as completely as was found practicable. Among the important birds are the fish-eating birds, the ducks, hawks, owls, crows, quail, shore birds, the Order of the cuckoos and kingfishers, the Order of the nighthawks, swifts and humming-birds, and the families of the great order of Passeres, or perching birds, among which are the flycatchers, crows, blackbirds, meadowlark, orioles, sparrows, warblers, thrashers, nuthatches, chickadees and thrushes—the last-named group including the robin and bluebird.

Among the chief kinds of mammals shown are the following: The Didelphidae or opossums, Leporidae or rabbits, Muridae or rats and mice, Sciuridae or squirrels, Hystricidae or porcupines, Soricidae or shrews, Talpidae or moles, Ursidae or bears, Procyonidae or raccoon, Mustelidae or weasels, minks and skunks, Canidae, represented by the foxes, and Felidae or cats, represented by the wild cat, etc.

This will undoubtedly be one of the most attractive and interesting exhibits at St. Louis, and it is our desire to see it returned to Harrisburg and become the nucleus of a State collection, showing our complete natural resources and possessions. It will be a great credit to our State, and I wish to express my very high appreciation of the fact that it was made possible only through the intelligent directions and assistance of yourself and our good Governor. Our thanks are also due to Mr. D. K. McMillan, who, from the start, took great interest in the work, and spared neither time nor effort to make the undertaking a success. Mention should also be made of the work of Mr. Boyd P. Rothrock, expert taxidermist, of Williamsport, Pa., who mounted many specimens and later came to our office and spent six weeks in finishing this collection, and putting it into the best shape for shipment and exhibition. His experience as an expert taxidermist, and his great interest in seeing the collection properly prepared to express our ideas of the economic
features of these animals, have made it possible for us to get this collection into its present form. First-class work in taxidermy has also been done by Mr. Geo. P. Friant, of Scranton, Pa., who mounted many specimens for us. Hundreds of persons contributed to the success of this undertaking by loaning or donating material, or by collecting for us at our direction, and we should gladly give them credit in this report, but we have not now space or time, since this is to be done in another publication.

SUMMER COLLECTING AND INVESTIGATING.

Due to your appreciation of the needs of the office and your kind assistance, I was able to employ an agricultural student of the State College, at a very slight expense, during three months of the summer to collect insects, and make investigations and notes in the fields and orchards for the use of this Division. We now have these specimens preserved in mass as collected, and are ready to perform the detailed work of pinning and identifying them as soon as we have time and the essential accessories. It is through the fact that we have this collection upon which to draw, that it was possible for us to undertake the St. Louis Exposition collection for this Division. This small collection of insects gave us that material which we needed to use in illustrating the food of the insectivorous mammals, birds and reptiles. Otherwise this interesting feature could not have been shown. The collector was Mr. W. R. Gorham, of Coudersport, Pa., and he is to be commended for his zeal and faithfulness in the performance of the work, and for the amount of material and useful notes which have been thus placed at our disposal. It appears proper that I should here make mention of at least some of his investigations of the Codlin Moth, which, with the exception of the San José Scale, is the worst insect of our pomaceous fruits. In time we shall publish upon other investigations, which were made at the same time, but the subject of the Codlin moth being of prime importance is here introduced:

Experiments were undertaken with a view of determining whether the larvae of the Codlin Moth crawls up the trunk of the tree to the scales of bark under which it spins its cocoon and becomes a chrysalis, or whether it descends the trunk in order to reach this place. To determine this a band of sticky fly paper was fastened tightly around the trunk of the tree, and a gunny sack tied loosely around the tree below the sticky band and another tied above it. It was found that 70 per cent. of the larvae descended the tree to find a place to pupate, instead of falling with the apples and crawling up, as is supposed to be the general method. This shows that the method of destroying the fallen fruit in order to avoid the subsequent broods of the Codling Moth can not be wholly
effective or satisfactory. It was found also in opening and exam-
ing recently fallen fruit that the majority of the larvae of the Codling Moth leave the apples before the fruit drops from the tree, even though it should fall when quite green, as in the middle of the summer. A study of the weight of the green fallen apples which were infested, compared with the weight of those not in-
fested, but also fallen, showed that the latter weighed 12 per cent.
more than the former. Another very interesting point is the proof
that the abundance of the Codling Moth in the fallen fruit gradu-
ally increased from the first of July, when the work was under-
taken, until the twenty-fifth of that month, when it gradually de-
creased until the latter part of August, when no more dropped
fruit was found infected with this insect, although the apples
continued to drop from various causes. These facts emphasize the
value of other measures, such as spraying with arsenites, when the
blossoms drop, in order to destroy the Codling Moth, rather than
depending upon the destruction of fallen fruits or the banding of
trees.*

(6.) PUBLICATIONS:

(a) *The Monthly Bulletin of the Division of Zoology.*—Among
the publications of this office there has been a monthly bulletin
of thirty-two pages devoted to the practical measures that should
be followed during each respective month of issue in order to
preserve crops against the effects of diseases, the depredations of
insects and higher animals, and also to preserve our fish, game and
insectivorous birds, beneficial raptorial birds and other beneficial
creatures.

The demand for this bulletin has been so great that our mailing
list is now over twenty-four thousand, or within less than one thou-
sand of the maximum limit, which the law permits printed. In
order to serve all of our citizens who are calling for this practical
publication, it will be necessary for the next session of the Legisla-
ture to provide for the publication of a larger issue. Its distribu-
tion has been confined to those who have requested it, and thus I
can assure you that it is not scattered broadcast over the State
to be lost, but is placed only in the hands of persons who desire to
read and use the information therein contained.

The calls for these Bulletins have been from persons engaged in
every pursuit in life. They have not by any means been confined
to farmers and fruit growers, and a list of the professions or pur-
suits indicated by the letter-heads of our correspondents will em-
phasize this point. I have been pleased to send the Bulletins to
persons without regard to any qualifying features whatever, not

*Since the above was written a Report upon these Studies of the Codling Moth has been sub-
mitted to Secretary Critchfield, and he has ordered it printed as a Special Bulletin by the De-
partment of Agriculture. This will consequently be issued soon.—H. A. S.
only in our own State, but also from almost every State in the Union and also from foreign countries.

(b.) The Zoological Quarterly.—This is a bulletin devoted primarily to the exploitation of the economic features of our native Vertebrates. In it I have commenced a discussion of the value of our native birds, and the methods of preserving those that are beneficial, and avoiding loss by those that may at times be destructive. This discussion will be continued according to the scientific sequence of the orders and families of our native fauna until we have discussed in a systematic manner all of the birds. We hope to issue similar publications upon the mammals, the reptiles and other Vertebrates. This Quarterly Bulletin has been sent to all of those persons who have received the monthly bulletins, and its circulation has, consequently, been the same, or over 24,000 per quarter. We have been fortunate in being able to issue these publications practically upon time. This is due to the aid of Mr. W. S. Ray, State Printer, who has done his part toward serving our citizens promptly.

(c.) Brief Articles for Periodicals.—We have written many short articles for publication upon the subjects pertaining to this office, and the newspapers throughout the State have given a very great amount of space to reviews of our bulletins and the publication of extracts from the same. In fact I wish to pay a tribute to the many intelligent editors of our State by saying that the work of this office could never have reached its present proportions and usefulness without the cordial co-operation and support which we have received from them.

(7.) ADDRESSES OR LECTURES:

A great portion of the work of this office has been to deliver public addresses upon topics pertaining to entomology, ornithology and general zoology, as well as on spraying, plant diseases, etc. Most of the meetings which we have attended have been Farmers' Institutes, in co-operation with Hon. A. L. Martin, Deputy Secretary and Director of Institutes, but we have also spoken at the meetings of farmers' clubs, granges, alliances, teachers' meetings, meetings of the boards of school directors, scientific clubs, schools and other educational and agricultural assemblies, as well as before the Pennsylvania State Horticultural Association, the State Board of Agriculture, the Annual Meeting of the Farmers' Institute Managers and Lecturers and Teachers' Institutes. We have averaged about two lectures per week during the entire year. This has been an efficient means of explaining the subjects pertaining to our profession, and the citizens have uniformly appeared gratified with the kind of services that have thus been rendered them by the Division of Zoology of the Department of Agriculture.
Recently the preparation of bulletins, correspondence and other duties within the office have been so great as to preclude the possibility of public addresses, and we are forced to deny ourselves the pleasure and benefits of going into the various counties, and meeting the citizens personally. I would call attention to that fact that it is very important, if we are going to give the proper services to the residents of the different portions of this State, that I be given an opportunity to become personally acquainted with the conditions surrounding them in the different localities. There is nothing that will give me this knowledge better than to go into the various regions of the State, and see these conditions for myself. Before one can tell how to combat the pests in any one locality, he must understand every particular feature of his subject, as well as the methods of farming, kinds of crops, rotation of crops, methods and time of planting and cultivating, etc., as is practiced in the various portions of our Commonwealth. A competent office assistant would help me greatly in this regard by making it possible for me to get away from the routine duties of the desk.

(8.) ACKNOWLEDGMENTS:

(a.) For Material or Apparatus Donated:

(1.) To many citizens of Pennsylvania we acknowledge our indebtedness for the specimens contributed—either donated or loaned—for the St. Louis Exposition Collection.

(2.) The Deming Manufacturing Company, Salem, Ohio, one spray pump.

(3.) The Ripley Hardware Company, Grafton, Ill., one feed-cooker for boiling the lime-sulphur-salt wash.

(4.) Mr. L. H. Kline, manufacturer, Pennsburg, Pa., one Eagle spray pump, complete.

(5.) The Goulds Manufacturing Company, Seneca Falls, N. Y., one barrel sprayer, complete.

(6.) The Animal Trap Company, Abbingdon, Ill., several stop-thief traps, and other traps for collecting purposes.

(b.) For Publications:

(1.) Books and Bulletins.—We have received bulletins or books from the following sources: U. S. Department of Agriculture—Division of Entomology, Division of Biological Survey, Bureau of Forestry, Bureau of Animal Industry, The Weather Bureau, Bureau of Plant Industry, Bureau of Chemistry and Office of Experiment Stations; bulletins from all of the experiment stations of the United States and from Canada and England. Reports from the various State Boards of Agriculture, bulletins and reports from the New York State Museum, the Illinois State Museum of Natural History, the different State Nursery Inspectors, the British Museum (Natural History), etc.

(9.) NEEDS OF THE DIVISION:

The great needs of the Division have been indicated in the foregoing report, and can be summarized in one phrase: Reorganization of this office upon a broader basis for more extended services. This means office and field assistants, stenographers, curators, room and equipment. We believe that the citizens of Pennsylvania are anxious to see such a reorganization made, and we, therefore, urge the consideration of this subject. It is undoubtedly true that under the present conditions we can not maintain this double pace of excessive duties both indoors and outside.

(10.) RECOMMENDATIONS:

We have, throughout the foregoing report, shown our reasons for making the following recommendations: (a.) Those that are immediately necessary: The first recommendation for extending the usefulness of this office, and reaching our citizens by correspondence and otherwise, is the appointment of a regular and permanent stenographer, and the second is the appointment of a scientific assistant, an office boy or some other kind of help for either the office or outdoor work. With these met, as urgent and immediate needs, we shall be able to successfully continue the work until the next session of the Legislature can make further provisions.

(b.) Recommendations for more effective services, which should be considered by the next session of the Legislature:

(1.) Library facilities and card indexes to our references.

(2.) A complete collection of specimens, not only of insects, but of all other invertebrates and also higher animals, including reptiles, birds and mammals.

(3.) Field assistants for making proper investigations and experiments.
(4.) Provisions for orchard inspection and the suppression of the San José Scale and other pests.

(5.) Room for the proper prosecution of this important work.

(6.) A contingent fund in order that we may be able to meet various conditions as they arise.

(7.) An Insectary or room similar to a green-house for rearing and studying living insects and their enemies.

We have asked only for that which is needed in order to put this work upon a proper footing and to give our citizens the services that are greatly needed, and we earnestly hope that there will in time be a means of supplying these desiderata.

(II.) A REVIEW OF ECONOMIC ZOOLOGY IN PENNSYLVANIA FOR THE YEAR:

It is fitting that we should report upon the chief features of Economic Zoology to which our attention has been called during the past year. This shows the line of investigation and publication that is needed in this State, and also gives a historical record for the future reference of workers on these subjects.

(1.) MOLLUSCA:

Some complaints have reached us of the destruction by slugs or shellless snails, especially in beds of young plants, such as tobacco, and in some hot-beds and green houses. These reports have come mostly from the southeastern portion of the State, and from regions where the soil and atmosphere were damp. Upon garden crops we have found the slugs very abundant and destructive, especially upon peas and cabbage, as well as on other plants growing close together in such a way as to form shade and keep the ground damp. These pests feed during the night or upon damp days, when the air is moist, and conceal themselves under rubbish or in the soil or under boards during the day time, or when the air is dry. If it become very dry, they go into soil for aestivation. When they are to be found, they may be killed by dusting them with freshly-powdered lime. One should hunt them in tobacco beds and other beds of plants, remove them, and then surround the beds or plants to be protected by a row of ashes, or of air-slaked lime. As long as this is kept dry the slugs will not cross it.

(2.) ARACHNIDA, OR SPIDERS AND MITES:

There has been much complaint of red spiders or red mites, especially upon plants in houses or in green houses. Also, the peach-leaf mite upon peaches in nurseries has caused hundreds of dollars' worth of loss. Sulphur is the chief material to use against these either as a dry dust (using the flowers of sulphur), or in water as a
spray, or fumigate with it. Upon young peach trees nothing will be found better than the lime-sulphur-salt wash as made and applied for the San José Scale.

(3.) INSECTS. (a.) Upon Wheat:

The chief pest of the wheat crop has been the Hessian Fly, although this was not bad during 1903. The false army worm, or wheat-headed worm, was present in some places, but birds and parasites aided in holding it in check. To avoid the Hessian Fly one should not plant before the last week of September.

(b.) Upon Corn.—In fields that were planted with corn upon sod ground the cut-worms and grub worms were very bad. These can be destroyed by poisoning them with sweetened bran and paris green or arsenic, or sliced potatoes and paris green, or with bunches of damp clover poisoned with arsenites. This is to be put on the ground along the rows just before or after planting, and applied in the evening. The better plan is to plow the ground in the fall, and cultivate it well and deeply in order to kill the larvae.

The corn-ear worm, or boll worm, has done some damage, especially in the southern and southeastern portions of the State, and is particularly bad upon sweet corn. This is the best combatted by planting an early variety of sweet corn, and then gathering the ears of corn while in the soft condition, and destroying the larvae which hatch from the eggs laid by the moths which they thus entice.

(c.) On Clover.—A minute hymenopterous or wasp-like insect, known as the Clover-seed Midge, has been very destructive in the heads of clover, preventing the perfection of the flowers and seed. This destroys the clover seed to such an extent that many fields can not be made to produce enough seed to pay for the cutting for seed purposes. The best method is to mow the first crop of clover early, or as soon as the blossoms commence to appear. This will destroy the first brood of the pest, and will insure seed from the second crop.

(d.) On Potatoes.—The Colorado potato bug, or beetle, has not been so abundant as usual in most portions of this State, yet in some of the eastern counties it has been unusually destructive. In the latter region an article was circulated in the press stating that ammonia or hartshorn, in water, would kill this insect. We tried this, and found it to be entirely ineffective. The best remedy is paris green or other arsenites.

The Blister beetles, or "old-fashioned" potato beetles or bugs, both the black and brown, have been very destructive in some places. They are not readily killed by arsenites, but may be effectively driven out by whipping with bundles of switches and burning
with a small row of straw strewn between the potato rows, and setting on fire after the Blister beetle have been driven into it.

(c) Cucurbitaceous, or Vining Vegetables.—In vines of squash and pumpkin the squash borer has been very destructive, and it requires a combination of methods to combat this, such as are given in our Special Bulletin, No. 91, upon the insects destructive to these plants. The Stinking Squash bug was not destructive in our State last year, although three years ago it was so abundant in most of the Eastern States that even the regular pickle growers could not produce pickles for their canneries. Its absence is due to parasites which destroy it. The Striped Cucumber Beetles or Bugs were very injurious in the early spring, as usual, and the best truck growers kept them out by using air-slaked lime and turpentine dusted over and around the hills of plants. Some secured absolute immunity by covering their plants with mosquito netting in addition to the lime and turpentine. The larva of this beetle feeds upon the roots of the plants which the adult infests, and these are to be prevented by the use of powdered tobacco in the hill.

(f) Asparagus.—The Asparagus beetle is become more destructive every year, and its range is extending. It is not yet found in all of the counties of our State, and asparagus growers should meet it with prompt measures. Air-slaked lime should be dusted upon the worms or larvae where they occur, and a few plants may be left at one side to treat with a spray of some arsenite. The adults can be driven from one portion of the patch or field to another by sowing over them air-slaked lime to which a little turpentine has been added.

(g) On Cabbage.—The Green Cabbage worm, or larva of the Cabbage butterfly, has not been more destructive than usual, because gardeners are learning to combat it by using paris green before the heads are half-grown, and by wood-ashes, pyrethrum or hellebore, later.

(h) On Celery.—The Celery Caterpillar, which is the larva of a large black and yellow butterfly, has been found doing some damage, and reported to us. This is so large and conspicuous that it can readily be found and removed by hand.

(i) Upon Pomaceous Fruits: Apple, Pear and Quince.—The chief pest of the year was the San José Scale, which has also infested other fruit trees. This is treated in detail in the various issues of our monthly bulletin. The pest has increased to such an extent that it is now found in almost every county in the State, and is killing many thousands of trees. It is important that the Legislature provide us with funds for combating this worst pest of the fruit interests of our country.

The Codling Moth was not destructive in those orchards that were properly treated, but it was conspicuous in those orchards
not sprayed. An insect that is so easily combatted as this should not be permitted to become so abundant as it was in our State last year. A spray with paris green—one pound in one hundred and fifty gallons of water, just after the petals fall, and again in ten days—will be sufficient to insure against the Codling Moth.

Upon these and other fruit trees the Oyster-shell scale and the Scurfy scale have been reported to us by hundreds of persons. The remedies for these are similar to those which we have published for the San José Scale.

(j.) Dupraceous Fruits: Peach, Plum and Cherry.—The San José Scale has also been the chief enemy of these fruits, but in addition to this the plum curculio has been very abundant and destructive. The chief remedy still to be advocated for this is the old method of jarring the tree, and catching the beetles in a cloth or a curculio trap arranged for the purpose. Some practical growers have claimed excellent results by using Paris green and Bordeaux mixture, applied as a spray. The Peach-tree borer has been very destructive, causing serious loss in our State, but we discovered one grower using a simple and effective remedy. This is one pound of concentrated lye in twenty gallons of hot water, and one quart applied while hot to the base of each tree after the mass of gum and rubbish had been cleared away.

(k.) On Grapes.—As far as our investigations and the reports to us show, the insects on grapes have been unusually few during the past year. We went to Erie county several times for the express purpose of investigating the insects injurious to grapes, but at no time could we find them in sufficient abundance to justify extended experimentation. One person sent us word that there were immense numbers of eggs of the Grape Leaf-hopper upon his vines, and by examination we found them to be globules of natural material or exuded sap upon the growing parts.

(l.) In Granaries.—The Weevils (two species), the Angoumois grain moth and the Mediterranean flour moth have been reported to us in stored grain and in warehouses. We have advocated fumigation with hydrocanic acid gas or sulphur. The Flour worm was reported from some of the warehouses of the large railroads, and we advised the cleaning up of all flour and meal left in corners and in cracks of floors, and the filling of cracks with some material that would prevent the flour from settling there, and becoming the food for these worms or beetle larvae. This prevents their multiplication, and appears to have been a successful method.

(m.) In the Household.—A few reports of cockroaches have reached us, and we have advocated rat poison or the use of powdered borax, or powdered sugar and a very little Paris green or white arsenic. A mixture of powdered sugar and plaster of paris in equal
proportions is also said to be effective. For carpet moths, which have been injurious, the carpet should be removed and well beaten in the open air, then sprayed with water containing corrosive sublimate, dissolved in alcohol or warm water, around the edges and where furniture will rest permanently upon it. Clothes moths have been destructive, and should be prevented by putting clothes into tight boxes, sealed with strips of paper, before these pests lay their eggs. Tightly-closed paper sacks will also keep them out. When infested, the clothing may be fumigated or well aired and shaken in the sunshine and open air, and brushed.

There have been a few reports of fleas, such pests have been trapped by sticky fly paper beneath beds and tables and eradicated by thorough cleaning up of the sleeping places of cats and dogs, and by using insect power liberally in the infested rooms. Bed bugs are likely to occur from various causes, and may be killed by applications of benzine or gasoline, and kept out by a liberal use of corrosive sublimate dissolved in alcohol, and put into the cracks of beds or other places that they are most likely to inhabit.

On plants in the house, insects may be found and should be removed by hand picking, or killed by fumigation or by spraying with strong soap suds, tobacco decoction or other remedies in accordance with the species of the pest.

(n.) On Out-door Ornamental Plants.—The Rose slug has been very injurious, and can be destroyed by dusting with air-slaked lime, as for the Pear slug. The Rose scale is often sent to us, and the remedies for this are the same as for the Scurfy and Oyster Shell scales. Osage orange, Japan quince and certain other plants are infested with the San José Scale, and much injury by this pest has been reported to us on shrubbery and hedges, especially along the railroads.

(o.) Miscellaneous Insects.—Much complaint has been made of insects which are general in their attacks, such as June bugs, both adult and larval, and also, the Wire worms. It is difficult to apply effective remedies for the former, but the latter may be met by thorough drainage, good and frequent cultivation and the rotation of crops.

(4.) BIRDS:

The bird concerning which the chief complaints have reached us is the English sparrow. We have advocated poisoning with sugar-coated grain and shooting. One peculiar observation which is worthy of record is the American crossbill (Loxia curvirostra minor) cutting apples to pieces in the fall in order to obtain and eat the seeds. Our chief records of birds have been commendatory, rather than condemning. While there has been some com-
plaint of robins, catbirds and others destroying fruit, this has been caused by the failure of the fruit growers to provide natural food for these birds. Loss from this source can be avoided, if this be done, and the birds can thus be retained. The way to meet this loss is by planting, along the roadside or fences, a few of such trees as service or shad-berry, mulberry, elder, wild cherry, sweet cherry, hawthorn, etc. We have published in our Quarterly and Monthly Bulletins upon this subject. There has been considerable slaughter of the raptorial birds, or hawks and owls, with the result that injurious rodents are increasing, and the consequent loss to farmers and orchardists is becoming greater. The next State Legislature should make provisions for the stringent protection of sparrow hawks and all owls excepting the great horned owl.

The winter has been one of most extreme severity upon quail, and these beneficial game birds have been exterminated throughout entire counties in our State by the prolonged snow and severe weather. It is possible to preserve them by taking proper precautions, and this is better than to attempt to import them in numbers from other States. The methods of saving them have been published in the Bulletins of this Division.

(5.) MAMMALS:

During the year there has been unusual complaint of destruction to farm crops and fruit trees by rodents. In some parts of the State, especially in the Susquehanna valley, rabbits have been particularly destructive to cabbage, while during the winter they have gnawed the bark from many fruit trees, and have thus wrought much damage.

The Meadow Vole, or Pennsylvania meadow mouse (Microtus pennsylvenicus), has destroyed thousands of fruit trees in this State by completely girdling them beneath the snow, and other species of mice have also had a part in this destruction. Trees that were banded with tar, thinned with linseed oil, were not attacked until the middle of January and then the pangs of hunger became so great that these were also injured. We know of one orchard where all the trees were killed late in the winter, although the above treatment had been given. These injurious animals should be poisoned by arsenic, paris green or strychnine. If the snow be kept packed around the trees, the mice will not come out on top of it to eat. The preservation of the hawks and owls is the only means of effectually suppressing such pests.

While there has been some destruction to the young and eggs of game birds by the skunk, it has undoubtedly done much more good than harm in the agricultural regions by destroying injurious insects. In the game preservations the skunks, wild cats, minks

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and foxes have been unusually abundant and destructive, and as a result game birds and game mammals have been reduced in numbers. The foxes and wild cats are also valuable in agricultural regions in destroying mice. We can learn of but few raids upon poultry by predaceous birds or mammals, and we are convinced that the result of the extermination of such birds and mammals has been detrimental to the interests of the husbandman.

(12.) REPORT OF SPECIAL ZOOLOGICAL FEATURES DURING 1903.

It is important that an annual record should be made of the striking zoological features within our State for each year. This will, in the course of time, prove of value, not only to the students of zoology, but also to the husbandmen. In accordance with this idea we here offer the following brief report upon the zoology of our State during the year of 1904 and the winter of 1903-4, which may not be of an economic nature, but of such scientific importance as to be worthy of record in our Annual Report.

**Insects.** The Praying mantis (*Mantis religiosa*), which is a very beneficial predaceous insect in Europe, has been accidentally introduced into certain portions of America, especially in the vicinity of Rochester, N. Y., and during the year we received reports of the occurrence of this desirable insect in two of the counties of our State. These were Luzerne and Northampton. It is to be hoped that this insect will continue to thrive and multiply in Pennsylvania, as it is especially desirable as a destroyer of obnoxious species of insects. The Japanese Mantis (*Tenodera sinensis*) has also become established near Philadelphia, and will prove valuable as a predaceous insect.

The Wheat Saw-fly borer (*Cephus pygmeus*) has been found destructive to the wheat in Elk county, although I have not yet been able to learn definitely of its occurrence in other portions of the State. It is with regret that we have heard of the appearance of this pest within our borders.

**Birds.** During the summer the turkey buzzards or turkey vultures (*Cathartes aura*) were unusual in their northern flight. These have been seen as far north as Williamsport, and a few at State College, Centre county, Pa. Although this beneficial scavenger is so common as to occasionally nest in the southern portion of our State, its occurrence in the northern part is very rare.

During the fall a cardinal, or red bird (*Cardinalis cardinalis*) was seen by us in Centre county, which is, as far as we can learn at present, the only record of this beneficial bird at that latitude and altitude.

The American crossbill (*Loxia curvirostra minor*) was abundant
in the northern portion of our State, and we received a report from Tioga county of this bird cutting apples to pieces in order to obtain and eat their seeds. A specimen sent to us at our request made it possible to be accurate in the determination of the species. I have evidences that this crossbill nests in the central part of Pennsylvania, in the fact that during the middle of the summer of 1902 a pair of old birds accompanied by four of their young were seen for two days upon the State College campus, in Centre county, feeding upon the combs or mites of the cock's-comb elm gall.

During the winter, which was unusually long and severe, there was a decided immigration of northern birds into our State. Especially remarkable among these were the pine grosbeak (Pinicola enucleator), the crossbills (both species of the genus Loxia), the snow flake (Plectrophenax nivalis), and the pine siskin or pine finch (Spinus pinus.)

The severity of the winter resulted in killing most of the quail (Colinus virginianus) of our State, many of the wild turkeys and some of the ruffed grouse. This spring many persons will attempt to procure and introduce quails from other States. We know a few individuals who feed and shelter the quails on their premises, according to the directions given in the Monthly Bulletin, and thus save these birds, which are of such great value to farmers and interest to sportsmen.

During the early portion of this spring (1904) there has been an unusual flight of the aquatic birds. In the vicinity of Harrisburg gunners have shot several species of wild ducks, holeboils', grebe, several specimens of the whistling swan (Olor columbianus) and one specimen of the trumpeter swan (Olor buccinator). We have been fortunate in securing specimens of these very rare birds in this State, and hope to receive funds for having them permanently preserved in a State Museum. There was also an unusual flight of gulls along the Susquehanna river after the breaking up of the ice, and this was doubtless due to the masses of ice filling the bays and covering their feeding grounds near the mouth of the river.

Notwithstanding the severity of the winter, we have recorded two reports worthy of note, the robin having remained in Monroe county, and the bluebird in the southern portion of the State.

Mammals: One occurrence worthy of record is a panther (Felis concolor) in the vicinity of Altoona, Pa., November, 1903; another is the fisher, or pekan (Mustela pennanti) trapped in Monroe county, and sent to this office, where the skin is preserved. This animal is now almost entirely extinct in our State, and this specimen shows its occurrence in a different region from that indicated in Warren's "Poultry Book," in 1897, in which he says "At the present time about the only counties where these animals are to be found are Clearfield, Potter and Sullivan."
One of the rareties of the year is a specimen of the Alleghenian least weasel (*Putorius allegheniensis*) sent to us for the collection of Pennsylvania mammals for the St. Louis Exposition by a friend of West Springfield, Erie county, Pa. Another unusual occurrence is the common weasel (*Putorius novoboracensis*) killed and sent to us in February, which had not changed in color from the brown of summer to white of winter, as is common with this species. This is also preserved in our collection.

It should be recorded that a Canadian beaver dam, with live Canadian beavers (*Castor canadensis*) is at present to be found in its natural condition and in a site selected by these valuable rodents, which are supposed to be extinct in our State, near Stroudsburg, Monroe county, Pa. These are upon land owned by Judge Ettinger, of Stroudsburg, who has fortunately succeeded in having a special law passed by our Legislature for the purpose of protecting this colony.

There has been unusual destruction in the forest preservations, particularly to game birds and game mammals, by foxes, weasels, minks and wild cats. Sunks have also been reported as devouring the eggs and young of ground-nesting species of birds, although upon cultivated ground they are valuable insect-eaters.

The destruction to forest trees by porcupines has been unusual, and there is evidence that in certain portions of our State from Wyoming to Warren counties, the Canadian porcupine (*Erethizon dorsatus*) is increasing. It is interesting to know that we have actual evidence that their natural enemies are the wild cats and foxes. In preparing specimens of the two species last named, the spines of porcupines were found embedded in the skin and flesh of their heads. The porcupine has been unusually destructive to forest trees, and there has also been an unusual abundance of red foxes (*Vulpes pennsylvanicus*) gray foxes (*Urocyon cinereoargenteus*) and wild cats (*Lynx rufus*) in our State during the past year. We also received from Wayne county a specimen of "Cross Fox," which is preserved in our St. Louis Exhibition Collection.
REPORT ON NURSERY INSPECTION

During the year the work of the inspection of nurseries of this State has passed through this office, as in previous years. The inspection has been made by the State Nursery Inspector, Mr. Enos B. Engle, assisted during the month of August by Prof. W. A. Buckhout and Prof. Geo. C. Butz, both of the Pennsylvania State College. For this inspection the State was divided into three sections, Prof. Butz taking the eastern section, Prof. Buckhout the central and southern section and Mr. Engle the western and northern section. The total number of nurseries inspected was 167.

The law requires that when the San José Scale is found in a nursery the trees containing that pest must be destroyed, and all other nursery stock upon those premises must be fumigated, according to methods approved by this Department, before the stock can be sold. All nursery stock grown in the State of Pennsylvania must bear our certificate of inspection, which becomes a license permitting the growers to sell their trees. This certificate is necessary in order to have the trees carried by the transportation companies in our own State, and it is also necessary in order that they may be shipped into other states. Some states further require not only the certificate of inspection, but a certificate showing that the stock has been fumigated, whether the scale had been originally found upon it or not. When nursery stock is not found infested a certificate is granted directly without further requirements, but if it be found infested, then the owners are required not only to destroy all visibly infested stock, but also to construct a fumigating house, that must be inspected and approved by the State Nursery Inspector. They must further make affidavit before selling that they will fumigate all the stock, which is subject to infestation by the San José Scale, and which is grown upon their premises. This fumigation must be done with hydrocyanic acid gas, and the formula that we require is as follows: For every 100 cubic feet of space use one ounce of cyanide of potassium (98 per cent. pure, by weight), two ounces of sulphuric acid (1.83 specific gravity, by measure), and 4 ounces of water. The plants must be subjected to these fumes for not less than forty minutes in an air-tight room or box.

Fumigation can be made successful, and it is safe to plant infested trees that have been fumigated, if the work be properly done,
but it is not always successful owing to the various conditions, which were discussed in the Monthly Bulletins of this Division for January, 1904, in the appended article, entitled "Nursery Inspection in Pennsylvania."

During the year 167 nurseries were inspected of which 56 were found infested. Sixteen nurseries were inspected twice in order to see that the suggestions were carried out, as recommended by the inspector; while it was found necessary to inspect 5 three times, in order to secure satisfactory evidence of proper treatment. Seven nurseries have not yet acted upon the recommendations of this Department, although they were found infested, and we are not assured that they are not going to sell stock, and 2 nurseries upon whose premises stock was found to be infested preferred to go out of business, and leave their trees unsold, rather than go to the expense of constructing fumigating houses, and giving their trees proper treatment.

Nursery stock is inspected not only for the San José Scale, but also for wooly aphis, crown borer and root aphis of strawberries, crown gall, black knot, peach yellows, leaf blight of strawberries, cane blight of blackberries and raspberries, anthracnose, etc.

As a rule the nurserymen of this State have been gratified with the work of the Department in this direction, because they realize that clean stock must beget increased sales. Our inspectors have, with few exceptions, met with every courtesy that the nurserymen could give them. However, a few nurserymen have adopted the short-sighted policy of opposing the work of nursery inspection, not realizing that at the same time they are opposing their own interests. It should be said, however, that these instances are becoming more rare each year, and it is earnestly to be hoped that the shiftless nurseryman, with the shiftless farmer, soon will have become a thing of the past in our State. The conscientious nurserymen of our State have complained of the injustice done to them in requiring them to destroy their infested stock, and fumigate their salable stock each year, while the San José Scale is permitted to multiply unchecked upon the private premises of adjoining neighbors. Often a seriously infested hedge or orchard is seen growing upon the private grounds of some owner close beside a nursery. It needs but the flight of a bird or a strong wind to carry the pest from these infested plants on the private premises to the nursery stock. It appears that their complaint is justly founded, and that our State is justified in taking steps to ameliorate this condition.

Copies of blanks and circulars are used in connection with the nursery inspection in this State will be sent free upon application to this office or to the Department of Agriculture.
NURSERY INSPECTION IN PENNSYLVANIA.

The law of this State requires that all nurseries from which trees or shrubs are to be sold shall be inspected annually, by an expert, in order to protect obnoxious insects and diseases, if present, and to prevent their spread throughout the State and to other states and countries by the shipment of the young trees upon which they might otherwise be disseminated. When trees are found infected with such diseases as Crown Gall and Peach Yellows they must be destroyed, and when infested with such a serious pest as the San José Scale they must be either destroyed or fumigated with hydrocyanic acid gas before any shipment will be permitted from the nursery in which the infested trees were found. This fumigation must be done in a fumigating house that has been inspected and approved by the authorized representative of this Department, and the law further prescribes the exact amount of the potassium cyanide (1 ounce per 100 cubic feet of space) that must be used in generating the gas, as well as the length of time (at least forty minutes) that the infested trees must be subjected to the poisonous fumes in order to destroy the pests.

Other states have similar laws and methods, and no trees of species likely to be infested with San José Scale can be shipped into this State from another without the certificate of inspection from the latter; neither can any trees grown in this State be shipped to another without our certificate of inspection. This is a fairly effective means of checking the dissemination of the most destructive pest that has ever attacked the horticultural interests of America, yet it is not wholly satisfactory in its practical results. Theoretically, fumigation is the very best and perhaps the only certain method of treating the San José Scale, but in practice the destruction is not always effected on account of some of the following conditions or their combinations: (1) A leaky or improperly constructed fumigating house. (2) The use of a cheap grade of cyanide of potassium, which may contain so little of the poison as to fail to generate gas strong enough to complete the desired work of destruction within the allotted time of exposure. (3) Fumigation for too short time or in gas too weak. (4) Fumigating the trees while they are wet, as the gas does not act as effectively on the scale when a film of water covers the bark as it does when the tree is dry. (5) Over-packing the fumigating house, to the extent that the gas does not permeate all the spaces and reach all infested twigs. For these reasons any purchaser of trees is justified in rejecting any bunch of trees which he may receive and upon which he may find the San José Scale, even though they may have been fumigated. To do this he should have
such a proviso in his purchasing contract. He cannot tell whether the scale be dead or alive until the trees start to grow and the pests have time to shrivel or develop.

It is not the purpose of this office to persecute the nurserymen, but rather to aid them. There are not one-half as many fruit trees planted annually in this State as there should be, and throughout the southeastern portion of this State, where the San José Scale is rampant, there will not be one-tenth as many trees bought and planted this year as there would have been had the scale proven less destructive during recent years. When it is possible to assure prospective purchasers that the pest will not be carried to their premises on infested stock, and that it can be held in check by simple and effective means in growing orchards, then the sales of fruit trees will increase, and this very important industry will commence to assume something near the important rank it should in this great Commonwealth.

Since the first of August last 167 nurseries have been inspected in this State by the State Nursery Inspector, Enos B. Engle, assisted by Professors Wm. A. Buckhout and Geo. C. Butz, of the Pennsylvania State College. Many of them were visited twice and some thrice. All this important work has gone through this office, and a record of every detail is kept here.

The following is a list of the nurserymen of Pennsylvania whose trees have been inspected and who have complied with the requirements of the law, holding certificates entitling them to sell and ship stock:

### Adams County.

<table>
<thead>
<tr>
<th>Name</th>
<th>Place</th>
<th>Acres</th>
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<tr>
<td>M. E. Hartman</td>
<td>Arendtsville</td>
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<tr>
<td>William Starner</td>
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<tr>
<td>A. D. Taylor</td>
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<tr>
<td>E. W. Cook</td>
<td>Aspers</td>
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<tr>
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<td>Mrs. Angelina Sheeley</td>
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<td>A. S. Wright</td>
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<tr>
<td>Eli Garrettson</td>
<td>Biglerville</td>
<td>2</td>
</tr>
<tr>
<td>Charles Wilson</td>
<td>Biglerville</td>
<td>½</td>
</tr>
<tr>
<td>H. L. Bream</td>
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</tr>
<tr>
<td>C. A. Hartman</td>
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<td>½</td>
</tr>
<tr>
<td>J. P. Stover</td>
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</tr>
<tr>
<td>J. M. Hare</td>
<td>Fairfield</td>
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<tr>
<td>C. L. Longsdorf</td>
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</tr>
<tr>
<td>B. F. Wilson</td>
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</tr>
<tr>
<td>George E. Wright</td>
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<td>1</td>
</tr>
<tr>
<td>Storrick &amp; Hariman</td>
<td>Gettysburg</td>
<td>13</td>
</tr>
<tr>
<td>N. M. Horner</td>
<td>Gettysburg</td>
<td>1½</td>
</tr>
<tr>
<td>C. A. &amp; J. E. Stoner</td>
<td>Gettysburg</td>
<td>13</td>
</tr>
<tr>
<td>Cornelius Bender</td>
<td>Idaville</td>
<td>½</td>
</tr>
<tr>
<td>H. W. Sowers</td>
<td>Latimore</td>
<td>1½</td>
</tr>
<tr>
<td>Charles J. Wilson</td>
<td>Mummasburg</td>
<td>4</td>
</tr>
<tr>
<td>Mrs. G. P. Weaver</td>
<td>New Oxford</td>
<td>1</td>
</tr>
<tr>
<td>W. E. Grove</td>
<td>York Springs</td>
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</tr>
<tr>
<td>John Kurtz</td>
<td>York Springs</td>
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**Allegheny County.**

<table>
<thead>
<tr>
<th>Name</th>
<th>Place</th>
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</tr>
</thead>
<tbody>
<tr>
<td>J. B. Murdoch &amp; Co.</td>
<td>Pittsburg</td>
<td>10</td>
</tr>
<tr>
<td>J. Wilkinson Elliott</td>
<td>Springdale</td>
<td>30</td>
</tr>
<tr>
<td>G. R. Elliot</td>
<td>Westview</td>
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**Beaver County.**

<table>
<thead>
<tr>
<th>Name</th>
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</tr>
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<tbody>
<tr>
<td>Mackall Bros.</td>
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<td>32</td>
</tr>
<tr>
<td>James Smith</td>
<td>Beaver Falls</td>
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</tr>
<tr>
<td>A. P. Goodwin</td>
<td>Industries</td>
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**Bedford County.**

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Austin Wright</td>
<td>Alum Bank</td>
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</tr>
<tr>
<td>Jacob Earnhardt</td>
<td>Bedford</td>
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**Berks County.**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>William Stoudt</td>
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**Butler County.**

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Pierce Bros.</td>
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**Blair County.**

<table>
<thead>
<tr>
<th>Name</th>
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</tr>
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<tbody>
<tr>
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<td>East Freedom</td>
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## Bucks County.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>J. L. Lovett,</td>
<td>Emilie,</td>
<td>10</td>
</tr>
<tr>
<td>Somerton Nurseries, 125 S. 5th St., Somerton</td>
<td>Phila., A. U. Bannard, Mgr.</td>
<td>20</td>
</tr>
<tr>
<td>Henry Palmer,</td>
<td>Langhorne,</td>
<td>4</td>
</tr>
<tr>
<td>Horace Janney,</td>
<td>Newtown,</td>
<td>7</td>
</tr>
<tr>
<td>D. Landreth's Sons,</td>
<td>Bristol,</td>
<td>10</td>
</tr>
<tr>
<td>The W. H. Moon Co.,</td>
<td>Morrisville,</td>
<td>225</td>
</tr>
<tr>
<td>S. C. Moon,</td>
<td>Morrisville,</td>
<td>50</td>
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## Chester County.

<table>
<thead>
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<tbody>
<tr>
<td>George Achelis</td>
<td>West Chester,</td>
<td>200</td>
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<tr>
<td>The Conard &amp; Jones Co.</td>
<td>Westgrove,</td>
<td>4</td>
</tr>
<tr>
<td>The Dingee &amp; Conard Co.</td>
<td>Westgrove,</td>
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<tr>
<td>Rakestraw &amp; Pyle</td>
<td>Kennett Square,</td>
<td>150</td>
</tr>
<tr>
<td>J. A. Roberts</td>
<td>Malvern,</td>
<td>16</td>
</tr>
<tr>
<td>Hoopes Bros. &amp; Thomas</td>
<td>West Chester,</td>
<td>600</td>
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<tr>
<td>J. B. Reif</td>
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## Clearfield County.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>W. S. Wright</td>
<td>Clearfield</td>
<td>½</td>
</tr>
<tr>
<td>G. L. Tyler</td>
<td>DuBois</td>
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## Crawford County.

<table>
<thead>
<tr>
<th>Name</th>
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</thead>
<tbody>
<tr>
<td>Prudential Orchard Co.</td>
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## Cumberland County.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>John Peters &amp; Co.</td>
<td>Mt. Holly Springs</td>
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<tr>
<td>D. C. Rupp</td>
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## Dauphin County.

<table>
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<tbody>
<tr>
<td>C. P. School</td>
<td>Fisherville</td>
<td>4</td>
</tr>
<tr>
<td>Gilbert Troutman</td>
<td>Millersburg</td>
<td>¼</td>
</tr>
<tr>
<td>J. R. Snavely</td>
<td>Progress,</td>
<td>5</td>
</tr>
<tr>
<td>Rife &amp; Ulrich</td>
<td>Royalton,</td>
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## Delaware County.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Oak Nursery Co.</td>
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<tr>
<td>Oak Nursery Co.</td>
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<tr>
<td>J. J. Styer</td>
<td>Concordville</td>
<td>3</td>
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<tr>
<td>The Folsom Nursery</td>
<td>Collingdale</td>
<td>3</td>
</tr>
<tr>
<td>M. F. Hannum</td>
<td>Concordville</td>
<td>1</td>
</tr>
<tr>
<td>Samuel Johnson</td>
<td>Collingdale</td>
<td>1</td>
</tr>
<tr>
<td>W. L. Rementer</td>
<td>Lansdowne,</td>
<td>1</td>
</tr>
<tr>
<td>Conrad Lamm</td>
<td>Lansdowne,</td>
<td>2</td>
</tr>
<tr>
<td>W. E. Caum (Lessee)</td>
<td>Haverford,</td>
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</tr>
<tr>
<td>No.</td>
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<td>Name.</td>
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<tr>
<td></td>
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<tr>
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<tr>
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<td>Girard,</td>
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<tr>
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<td>Name.</td>
<td>Place.</td>
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<tr>
<td></td>
<td>J. Sterling &amp; Son.</td>
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<tr>
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<td>Name.</td>
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<tr>
<td></td>
<td>Byer Bros.</td>
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<td>Name.</td>
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<tr>
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<td>Name.</td>
<td>Place.</td>
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<tr>
<td></td>
<td>John G. Engle.</td>
<td>Marietta,</td>
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<tr>
<td></td>
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<td>Littitz,</td>
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<tr>
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<td>H. M. Engle &amp; Son.</td>
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<td>Bonview,</td>
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<tr>
<td></td>
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<td>Ephrata,</td>
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<td>O. W. Laushey.</td>
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<tr>
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<tr>
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<tr>
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<tr>
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<tr>
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<tr>
<td>R. B. Haines &amp; Co.</td>
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<tr>
<td>C. H. Wilson</td>
<td>Gladwyne</td>
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<tr>
<td>J. B. Heckler</td>
<td>Lansdale</td>
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<tr>
<td>Wm. Sturtzbecker</td>
<td>Lansdale</td>
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<tr>
<td>J. W. Thomas &amp; Sons</td>
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<tr>
<td>J. Krewson &amp; Son</td>
<td>Cheltenham</td>
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<tr>
<td>Adolph Mueller</td>
<td>Hoyt</td>
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<tr>
<td>T. Meehan &amp; Sons</td>
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<tr>
<td>C. L. Unger</td>
<td>Chess</td>
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</tr>
<tr>
<td>J. L. Hoobler &amp; Sons</td>
<td>Chess</td>
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</tr>
<tr>
<td>Theodore Roth</td>
<td>Nazareth</td>
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<tr>
<td>Geo. A. Wagner</td>
<td>Alinda</td>
<td>30</td>
</tr>
<tr>
<td>W. Warner Harper</td>
<td>Chestnut Hill</td>
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<tr>
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<td>W. H. Harrison</td>
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<tr>
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<tr>
<td>Robt. Craig &amp; Son</td>
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<td>Christ. Koehler</td>
<td>Fox Chase</td>
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<tr>
<td>J. F. Boyer</td>
<td>Mt. Pleasant Mills</td>
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<td>J. A. Grim</td>
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<td>F. G. Moyer</td>
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<td>F. G. Arbogast</td>
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<td>H. E. Daniels</td>
<td>Harnedsville</td>
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<tr>
<td>H. C. Pfeiffer &amp; Bro.</td>
<td>Gladdens</td>
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Susquehanna County.

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>E. A. Smith</td>
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</tr>
<tr>
<td>E. B. Sprout</td>
<td>Montrose</td>
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<td>B. D. Hinds</td>
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Venango County.

<table>
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<tbody>
<tr>
<td>H. S. Sutton &amp; Son</td>
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Westmoreland County.

<table>
<thead>
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<tbody>
<tr>
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York County.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
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<tr>
<td>Geo. E. Stein</td>
<td>East Prospect</td>
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</tr>
<tr>
<td>W. S. Newcomer</td>
<td>Glenrock</td>
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</tr>
<tr>
<td>J. G. Patterson</td>
<td>Stewartstown</td>
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</tbody>
</table>

Four other nurseries in this State have been inspected, found infested, and condemned; but as the owners have not filed the affidavit to fumigate, as required by law, they hold no certificate and can not legally sell any kind of nursery stock.

It must not be inferred that the San José Scale was found in all or even most of the nurseries belonging to the persons named above, for it was not. In justice to our nurserymen, it must be said that in general we have found them most anxious to learn what pests may be present upon their premises in order that they may take all possible measures to suppress them and sell only clean stock.—From the Monthly Bulletin of the Division of Zoology.

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CALL FOR THE ORGANIZATION OF A NURSERYMEN'S ASSOCIATION OF PENNSYLVANIA.

We have been asked by some of the prominent nurserymen of this State to aid them in the preliminary work of establishing a Nurserymen's Association. We are requested to issue a call for a preliminary meeting of all persons directly or indirectly interested in this important profession, and consequently take pleasure in hereby suggesting that the best time and place for this is during the Annual Meeting of the State Horticultural Association, at Lancaster, during the 19th and 20th of this month.

It is therefore requested that all persons who desire to receive the benefits of such a society meet at the Court House at Lancaster at 4.30 P. M., on Tuesday, January 19, for discussing plans and organiz-
ing if found advisable. This will give an opportunity for those in attendance to hear the important papers presented at the meeting of the State Horticultural Association and also to take part in the discussions, some of which will be of unusual value to nurserymen. We especially need your help in discussing that most perplexing and important problem of our day: The San José Scale.

Unless we have the co-operation of our citizens, and particularly the aid of our nurserymen, in controlling important pests this office can not hope to obtain the desired results in this direction. For this reason we give the plan our most cordial endorsement, and shall be present to aid in any manner possible. The proposed association should be of great importance in many ways for both the nurserymen and orchardists, besides along the needed line of pest control. It is hoped that every person whose name appears in the preceding pages will attend and discuss the proposed project. Special railroad rates may be obtained by writing at once to the Secretary of the Pennsylvania Horticultural Association, E. B. Engle, Harrisburg, Pa., who will send, upon request, orders for reduced railroad rates upon the Pennsylvania and Reading lines. The fare will be one and one-third for the round trip, good during the entire week.—From the Monthly Bulletin of the Division of Zoology.

THE PENNSYLVANIA STATE NURSERYMEN'S ASSOCIATION.

Pursuant to the above call the nurserymen met in Lancaster on January 21, 1904, and formed an association with the following officers: President, W. H. Moon, Morrisville; Vice President, Thos. B. Meehan, Philadelphia; Treasurer, Thomas Rakestraw, Kennett Square; Secretary, Earl Peters, Mount Holly Springs, Pa.

Persons interested in this organization should correspond with the secretary.

Recommendations: I should here indicate the present deficiencies of our present Nursery Inspection Laws, which I earnestly recommend for the consideration of our next Legislature.

1. Under the present law our jurisdiction of the nurserymen ends when the owner makes affidavit that he will fumigate. While most of the nurserymen of our State are honest, and would not take advantage of this, it is possible for a dishonest owner to avoid considerable expense and trouble by not fulfilling his obligations. We have no authority to determine whether plants have been fumigated, and no means of knowing whether this work be properly done. It should be remembered that improper methods in this
process are worthless, as shown in the above article on "Nursery Inspection." I would therefore recommend that fumigation be made under the direct supervision of an expert or State officer, and would also recommend re-inspection after the fumigation to make sure of the death of the pests. Such precautions are absolutely necessary in order to protect the growing interests of the orchardists of our great State, which annually produces one-seventh of the entire apple crop of America.

II. The nurserymen are justified in their present demands for protection from the serious sources of infestation by the San José Scale upon the premises adjoining those in which their nursery stock is growing. For the protection of the orchardists stringent requirements are made of nurserymen, but unless we take the most radical means to prevent the infestation of their stock, stringent laws, regarding the subsequent treatment of this stock, and even the most careful efforts of our conscientious nurserymen, can not be entirely effective in avoiding the dissemination of the worst of all fruit pests, the San José Scale, which has been called the small-pox of horticulture.

The same kind of condition prevails concerning the infestation of private premises. A man who takes care of his trees is likely to have pests brought to them from the trees that are neglected. This discourages a thrifty and enterprising person, and it means that we are justified in making provisions for the inspection of private premises for the presence of the San José Scale, and arranging to have them properly treated, especially when infested plants are growing near nurseries or other orchards.

III. Another source of great evil in our State is the seedling trees, and the old and neglected trees that are often seen along fences and in the remnants of old orchards. These are the greatest means of breeding, continuing and disseminating serious pests, and we earnestly recommend that the Legislature provide laws for their destruction, or the treatment of such trees that are likely to maintain pests injurious to nurseries or orchards.

In conclusion, I desire to commend the efficiency and industry of our State Nursery Inspector, Mr. Enos B. Engle, and also, of the two assistants, Prof. Buckhout and Prof. Butz, who aided him during the summer.

Respectfully submitted,

H. A. SURFACE,
Economic Zoologist.
PROCEEDINGS

OF THE

TWENTY-SIXTH ANNUAL MEETING

OF THE

Pennsylvania State Board of Agriculture

HELD IN THE

BOARD OF TRADE ROOMS, HARRISBURG, PA.,

JANUARY 28 AND 29, 1903.
MEMBERS
OF THE
PENNSYLVANIA STATE BOARD OF AGRICULTURE.
FOR THE YEAR 1903.

MEMBERS EX-OFFICIO.

HON. SAMUEL W. PENNYPACKER, Governor.
MAJ. I. B. BROWN, Secretary of Internal Affairs.
DR. N. C. SCHAEFFER, Superintendent of Public Instruction.
DR. G. W. ATHERTON, President of The State College.
HON. E. B. HARDENBERGH, Auditor General.
HON. N. B. CRITCHFIELD, Secretary of Agriculture.

APPOINTED BY THE GOVERNOR.

Col. R. H. Thomas, Mechanicsburg, Cumberland county, .... Term expires 1903
R. I. Young, Middletown, Dauphin County, ...................... Term expires 1906
Gen. James A. Beaver, Centre County, ...................... Term expires 1906

APPOINTED BY THE STATE POULTRY ASSOCIATION.

Norris G. Temple, Pocopson, Pa., ...................... Term expires 1906

ELECTED BY COUNTY AGRICULTURAL SOCIETIES.

Term expires.

Adams, ............ A. I. Weidner, ............ Arendtsville, ............ 1906
Allegheny, ............ J. S. Burns, ............ Clinton, ............ 1906
Armstrong, ............ S. S. Blyholder, ............ Leechburg, ............ 1905
Beaver, ............ A. L. McKibben, ............ New Sheffield, ............ 1905
Bedford, ............ S. S. Diehl, ............ Bedford, ............ 1906
Bucks, ............ H. G. McGowan, ............ Geiger's Mills, ............ 1904
Blair, ............ F. Jaekel, ............ Hollidaysburg, ............ 1904
Bradford, ............ L. Piollet, ............ Wysox, ............ 1904
Bucks, ............ W. T. Davis, ............ Ivyland, ............ 1906
Butler, ............ W. H. H. Riddle, ............ Butler, ............ 1906
Cambria, ............ H. J. Krumenacher, ............ Nicktown, ............ 1906
Cameron, ............ W. K. Howard, ............ Emporium, ............ 1906
Carbon, ............
Centre, ............ John A. Woodward, ............ Howard, ............ 1906
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<td>York</td>
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OFFICERS.

PRESIDENT.
Hon. Samuel W. Pennypacker, Governor, .......... Harrisburg.

VICE PRESIDENTS.
Gen. Jas. A. Beaver, ......................... Bellefonte.
C. W. Brodhead, ................................ Montrose.
Joel A. Herr, .................................. Cedar Springs.

EXECUTIVE COMMITTEE.
Hon. Samuel W. Pennypacker, ..................... Harrisburg.
M. N. Clark, .................................. Claridge.
H. C. Snavely, .................................. Lebanon.
Matthew Rodgers, ................................ Mexico.
John A. Woodward, .............................. Howard.
A. T. Holman, .................................. Nekoda.
W. H. H. Riddle, ............................... Butler.
N. G. Temple, .................................. Pocopson.
R. F. Schwarz, .................................. Analomink.
N. B. Critchfield, Secretary ..................... Harrisburg.

ADVISORY COMMITTEE.
N. B. Critchfield, Secretary ..................... Harrisburg.
M. N. Clark, .................................. Claridge.
A. T. Holman, .................................. Nekoda.
W. H. H. Riddle, ............................... Butler.

CONSULTING SPECIALISTS.
Botanist, ...................................... Prof. W. A. Buckhout, .... State College.
Pomologist, ..................................... Cyrus T. Fox, ............ Reading.
Chemist, ........................................ Dr. William Frear, ........ State College.
Sanitarian, ...................................... Dr. Benjamin Lee, .......... Philadelphia.
Microscopists and Hygienists, Dr. H. Leffman, .......... Philadelphia.
Prof. C. B. Cochran, .......................... West Chester.
Entomologists, .................................. Prof. R. C. Scheidt, ...... Lancaster.
                                          Dr. H. Skinner, ............... Philadelphia.
Ornithologist, .................................. Prof. H. A. Surface, ...... Harrisburg.
Meteorologists, ................................. E. R. Demain, .............. Harrisburg.
                                          J. L. Heacock, ................. Quakertown.
Mineralogist, .................................. Col. H. C. Demming, ...... Harrisburg.
Apiarist, ....................................... Prof. Geo. C. Butz, ....... State College.
Geologist, ...................................... Dr. M. E. Wadsworth, .... State College.
STANDING COMMITTEES.

LEGISLATION.
Jason Sexton, Chairman, ......................... North Wales.
A. J. Kahler, .................................. Hughesville.
G. G. Hutchison, .............................. Warriors' Mark.
W. H. Brosius, ................................. Drumore.
W. F. Beck, .................................. Nazareth.

CEREALS AND CEREAL CROPS.
C. B. Hege, Chairman, ....................... Marion.

ROADS AND ROAD LAWS.
S. M. McHenry, Chairman, ................... Indiana.

FRUIT AND FRUIT CULTURE.
Enos B. Engle, Chairman, ..................... Waynesboro.

DAIRY AND DAIRY PRODUCTS.
H. W. Northup, Chairman, ..................... Glenburn.

FERTILIZERS.

WOOL AND TEXTILE FIBRES.
Samuel McCreary, Chairman, ................ Neshannock Falls.

LIVE STOCK.
M. W. Oliver, ................................ Conneautville.

POULTRY.
Norris G. Temple, Chairman, ................ Pocopson.

FORESTS AND FORESTRY.
Dr. J. T. Rothrock, Chairman, ............... Harrisburg.

APIARY.
J. W. Nelson, Chairman, ...................... Shawville.

FLORICULTURE.
Edwin Lansdale, Chairman, ................... Wyndmoor.
TWENTY-SIXTH ANNUAL MEETING OF THE STATE BOARD OF AGRICULTURE.

HELD IN THE BOARD OF TRADE ROOMS, HARRISBURG, PA., JANUARY 28 AND 29, 1903.

PROGRAM.

Wednesday Morning, Jan. 28, 1903.

Call to order at 9.30.
1. Roll Call of Members.
2. Reading of Minutes.
3. Appointment of Committee on Credentials.
4. Reception of Credentials of Members-elect and Delegates.
5. Report of Committee on Credentials.
7. Reports of Standing Committees.
8. Appointment of Standing Committees for 1903.
11. Miscellaneous Business.

Wednesday Afternoon, Jan. 28, 1903.

Call to order at 1.30.

PAPERS AND DISCUSSIONS.

1. REPORTS OF OFFICERS AND STANDING COMMITTEES, Continued.

2. "MARKET GARDENING AND THE MARKETING OF PRODUCE,"
   By Hon. R. F. Schwarz, Analomink, Pa.

   By M. N. Clark, Esq., Claridge, Pa.

4. "POULTRY FOR PROFIT,"
   By Norris G. Temple, Esq., Pocopson, Pa.

5. "HOW TO MAKE REASONABLY SURE OF A SUCCESSFUL CROP OF POTATOES ON HEAVY LIMESTONE SOIL,"
Wednesday Evening, Jan. 28, 1903.

Call to order at 7.15.

1. "TEA, COFFEE AND COCOA,"
   By Prof. C. B. Cochran, West Chester, Pa.

2. "THE RESPONSIBILITIES AND DUTIES OF STATE BOARDS AND
   TEACHERS OF AGRICULTURE,"
   By Prof. I. P. Roberts, Professor of Agriculture in The Cornell University, Ithaca, N. Y.

3. "THE TUBERCULOSIS PROBLEM,"

Thursday Morning, Jan. 29, 1903.

Call to order at 9.

1. "THE IMMUNIZING OF CATTLE AGAINST TUBERCULOSIS,"
   By Dr. Leonard Pearson, Veterinarian of the Department of Agriculture.

2. "SCIENTIFIC HORSESHOEING,"
   By Dr. John W. Adams, of the University of Pennsylvania, Philadelphia, Pa.

3. "THE SOUTHERN COW PEA AND ITS PROBABLE PLACE IN THE
   AGRICULTURE OF THE MIDDLE STATES,"
   By Prof. W. F. Massey, Raleigh, N. C.

DISCUSSION.

ADJOURNMENT.
MINUTES OF THE ANNUAL MEETING OF THE STATE BOARD OF AGRICULTURE, HELD AT HARRISBURG, PA., JANUARY 28 AND 29, 1903.

Wednesday Morning, January 28, 1903.

The Board met in the rooms of the Board of Trade, January 28, and was called to order at 9:30 A. M., Vice President White in the chair. The roll was called, and the following persons answered to their names:

Members ex-officio: Hon. S. W. Pennypacker, Governor; Dr. N. C. Schaeffer, Superintendent of Public Instruction; Prof. John Hamilton, Secretary of Agriculture.

Appointed by the Governor: R. I. Young, Gen. James A. Beaver.

Appointed by the State Poultry Association: Norris G. Temple.


The minutes of the Gettysburg meeting were then read and approved.

The following persons were appointed a committee on credentials: Messrs. Herr, Clark, McClellan, Notestine and Snively.

On motion of the Secretary, a committee, consisting of Messrs. Kahler, Hutchison and Temple were appointed to wait upon the Governor and invite him to attend the meeting of the Board.

The order of business was then taken up and reports of Standing Committees were called for.

The report of Committee on Cereals and Cereal Crops was presented by the chairman, A. I. Weidner, which was, on motion, received and ordered on file.

The Committee on Fruit and Fruit Culture reported, through its chairman, Enos B. Engle. The report was read, and, on motion, was received and ordered on file.

The report of the Committee on Fertilizers was called for and the chairman stated that he had not expected to be re-elected and so had not prepared a report.

The next report called for was on Wool and Textile Fibres. The
chairman, Mr. McCreary, stated that his term as a member of the Board had expired, that he did not expect to be re-elected and, consequently, he had not prepared a report.

The report of the Botanist, Prof. W. A. Buckhout, was read by the Secretary, whereupon the paper was, on motion, received and ordered on file.

Dr. Pearson, Veterinary Surgeon of the Board, reported verbally upon foot and mouth disease recently discovered in New England. He also called attention to the spread of garget, and also to the outbreak of glanders among mules in the anthracite coal region.

The attention of the Board was called to the presence of Prof. I. P. Roberts, of the Cornell University. On motion, Prof. Roberts was accorded the privilege of the floor. He acknowledged the courtesy and spoke for a few minutes in discussion of the report of the Veterinarian. The discussion was continued by Messrs. Hutchison, Jackel, Conard, Nelson, Brodhead, Sexton, Beardslee and Glover.

The report of the Committee on Credentials was then read, and the credentials of the following persons were presented and found in proper form:

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<td>Pinegrove</td>
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<td>January, 1906</td>
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<td>George G. Hutchinson</td>
<td>Warriors Mark</td>
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<td>January, 1906</td>
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<td>William F. Beck</td>
<td>Nazareth</td>
<td>Northumberland</td>
<td>January, 1906</td>
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<td>McKean</td>
<td>January, 1906</td>
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<td>Butler</td>
<td>Butler</td>
<td>January, 1906</td>
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<td>M. Rodgers</td>
<td>Mexico</td>
<td>Juniata</td>
<td>January, 1906</td>
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<td>F. S. Fenstemacher</td>
<td>Launark</td>
<td>Schuylkill</td>
<td>January, 1906</td>
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<td>Watson T. Davis</td>
<td>Ivyland</td>
<td>Bucks</td>
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<td>Col. John A. Woodward</td>
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<td>Henry J. Krumenacher</td>
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<td>Samuel McCreary</td>
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<td>Allegheny</td>
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<td>W. H. Howard</td>
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<td>Cambria</td>
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<td>Dr. M. E. Conard</td>
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<td>Chester</td>
<td>January, 1906</td>
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<td>Norris G. Temple</td>
<td>Pocopson (Poultry Ass.)</td>
<td>Chester</td>
<td>January, 1906</td>
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<td>A. I. Weidner</td>
<td>Arendtsville</td>
<td>Adams</td>
<td>January, 1906</td>
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On motion, the gentlemen above named were duly admitted to membership of the Board.

The following persons, representing agricultural organizations, were, on motion, given the privilege of the floor:
Next order of business was the election of officers.

On motion, Hon. Samuel W. Pennypacker, Governor of the Commonwealth, was elected president of the Board.

The following gentlemen were nominated for Vice Presidents: General James A. Beaver, C. W. Brodhead and J. A. Herr. On motion, nominations were closed, and the Secretary was instructed to cast the ballot of the members for the gentlemen named.

Gen. Beaver was then called to the chair and addressed the Board upon the representative character of the State Board of Agriculture. On motion, John Hamilton, was selected Secretary for the ensuing year.

The following persons were nominated for Executive Committee: Messrs. Woodward, Clark, Holman, Riddle, Temple, Snavely, Rodgers, McHenry and Schwarz.

The Chair appointed Messrs. White and Herr as tellers to collect and count the votes.

The tellers reported that the following persons had received the majority of the votes cast and the Chair accordingly declared them elected: Messrs. Woodward, Clark, Holman, Riddle, Temple, Snavely and Mathew Rodgers.

On motion, Mr. Nelson, of Clearfield, whose term expired with this meeting, was invited to sit as an advisory member.

The hearing of reports of Standing Committees was resumed.

Dr. J. T. Rothrock, chairman of the Committee on Forests and Forestry, presented his report. Discussion followed, participated in by the chairman and Messrs. Nelson, Rothrock, Schwarz, Jaekel and Bird. On motion, the report was read and ordered on file.

The chairman of the Committee on Roads and Road Laws stated that he had no report.

The chairman on Dairying and Dairy Products also stated that he had not prepared a report.
Dr. M. E. Conard, chairman of the Live Stock Committee, presented his report, which was received and ordered on file.

The committee appointed to wait on the Governor, reported that they had performed that duty and that he would be present at the meeting at 2 o'clock this afternoon.

Adjourned to meet at 1.30 P. M.

Wednesday Afternoon, January 28, 1903.

The Board met at 1.30 P. M., Vice President Beaver in the Chair.

The committee on credentials asked permission to make a supplementary report. The committee presented the names of W. P. Bolton, of Bonview, representing the State Horticultural Association, and that of J. Blair Garretson, representing the Adams County Agricultural Society. On motion, these gentlemen were accorded the privilege of the floor.

The report of the Committee on Floriculture was then read by the chairman, Mr. Lonsdale. Discussion followed by Messrs. Pearson, Lonsdale, Patrick, Rogers and Prof. Roberts.

The Governor of the Commonwealth was then announced. He was invited to the Chair, and made a brief address to the Board.

The discussion of the report on Floriculture was resumed, participated in by Messrs. Lonsdale, Governor Pennypacker, Prof. Roberts and Prof. Massey, of North Carolina. On motion, the report was received and ordered on file.

The chairman of the Legislative Committee, Hon. Jason Sexton, presented his report, which, on motion, was received and ordered on file.

Mr. McHenry moved the following: "That we emphatically endorse the recommendations set forth in the report of our Legislative Committee, and instruct our Legislative Committee to use all honorable means to have the same enacted into law." Carried.

The regular program of papers and discussions was then taken up. The first paper was on "Market Gardening and the Marketing of Produce," by Hon. R. F. Schwarz.

The Secretary announced that the meeting of the Executive Committee of the Allied Agricultural Organizations of Pennsylvania, will be held in this hall at 7 P. M. this evening.

Dr. Lee, Secretary of the State Board of Health and Sanitarian of the Board, then presented his report. Discussion followed by Messrs. Brodhead, Dr. Lee and Judge Beaver. On motion, the report was received and placed on file.
The Pomologist of the Board, Cyrus T. Fox, presented his report, which, on motion, was received and placed on file.

On motion of the Secretary, Mr. W. F. Hill, of the Pennsylvania State Grange, and Prof. W. F. Massey, of North Carolina, were invited to sit as advisory members.

The Committee on Credentials reported the name of Mr. E. S. Hoover, of Lancaster county, as representing the Lancaster County Agricultural and Horticultural Societies. On motion, Mr. Hoover was invited to sit as an advisory member.

The report of the Executive Committee nominating the Standing Committees of the Board for the year 1903 was presented and, on motion, the recommendations were adopted, and the report is as follows:
STANDING COMMITTEES.

LEGISLATION.
Jason Sexton, ........................................... North Wales.
A. J. Kahler, ........................................... Hughesville.
G. G. Hutchison, ...................................... Warriors' Mark.
W. H. Brosius, ........................................... Drumore.
W. F. Beck, ........................................... Nazareth.

CEREALS AND CEREAL CROPS.
C. B. Hege, Chairman. ................................. Marion.

ROADS AND ROAD LAWS.
S. M. McHenry, Chairman, ............................ Indiana.

FRUIT AND FRUIT CULTURE.
Enos B. Engle, Chairman, ............................. Waynesboro.

DAIRY AND DAIRY PRODUCTS.
Henry W. Northup, Chairman, ......................... Glenburn.

FERTILIZERS.
Howard G. McGowan, Chairman, ........................ Geiger's Mills.

WOOL AND TEXTILE FIBRES.
Samuel McCreary, Chairman, .......................... Neshannock Falls.

LIVE STOCK.
M. W. Oliver, Chairman, ............................... Conneautville.

POULTRY.
Norris G. Temple, Chairman, .......................... Pocopson.

FORESTS AND FORESTRY.
Dr. J. T. Rothrock, Chairman, ........................ Harrisburg.

APIARY.
J. W. Nelson, Chairman, ............................... Shawville.

FLORICULTURE.
Edwin Lonsdale, Chairman, ............................ Wyndmoor.
OFFICERS.

PRESIDENT.
Hon. Samuel W. Pennypacker, Governor, Harrisburg.

VICE PRESIDENTS.
H. V. White, Bloomsburg.
W. F. Beck, Nazareth.
Joel A. Herr, Cedar Springs.

EXECUTIVE COMMITTEE.
Hon. Samuel W. Pennypacker, Harrisburg.
J. A. Woodward, Howard.
M. Rodgers, Mexico.
H. C. Snavely, Lebanon.
A. T. Holman, Nekoda.
W. H. H. Riddle, Butler.
N. G. Temple, Pocopson.
M. N. Clark, Claridge.
*John Hamilton, secretary, Harrisburg.

*John Hamilton, Harrisburg.
M. N. Clark, Claridge.
A. T. Holman, Nekoda.
W. H. H. Riddle, Butler.

CONSULTING SPECIALISTS.
Botanist, Prof. W. A. Buckhout, State College.
Pomologist, Cyrus T. Fox, Reading.
Chemist, Dr. William Frear, State College.
Vet. Surgeon, Dr. Leonard Pearson, Philadelphia.
Sanitarian, Dr. Benjamin Lee, Philadelphia.
Microscopists and Hygienists, Dr. H. Leffman, Philadelphia.
Entomologists, Prof. C. B. Cochran, West Chester.
Ornithologist, Prof. H. A. Surface, State College.

Mineralogist, Col. H. C. Demming, Harrisburg.
Aplarist, Prof. Geo. C. Butz, State College.
Geologist, Dr. M. E. Wadsworth, State College.

*John Hamilton having resigned as Secretary of Agriculture, N. B. Critchfield, his successor, by virtue of his office, became the Secretary of the Committee.
The order of business on the program for the afternoon session was then resumed.

Mr. M. N. Clark presented a paper on "A Bird's-eye View of the Western Pennsylvania Farms."

The next paper was by Mr. Norris G. Temple, on "Poultry for Profit."

Adjourned until 7.15 this evening.

Wednesday Evening, January 28, 1903.

The Board was called to order at 7.15 P. M., Vice President Brodhead in the Chair.

The first paper of the evening was by Hon. W. F. Beck on "How to Make Reasonably Sure of a Successful Crop of Potatoes on Heavy Limestone Soil."

The next paper was by Prof. C. B. Cochran, on "Tea, Coffee and Cocoa."

Mr. Sexton offered the following resolution:

"Whereas, The material prosperity of the community, State and Nation rest upon agriculture as its foundation, and

"Whereas, The liberal and practical education of the farmer is essential to his success under the sharp competition of recent years, and

"Whereas, The public provision for agricultural education in Pennsylvania is far below that in any other state and entirely inadequate to supply the demand, and

"Whereas, A combined effort is being made by the agricultural organizations of the State to secure adequate and necessary means and equipment for education in agriculture and forestry at The Pennsylvania State College; therefore,

"Resolved, That the Pennsylvania State Board of Agriculture, as a member of the Allied Agricultural Organizations, pledges its hearty support to that effect and recommends to its members that they use all proper means to secure from the present Legislature a liberal appropriation for the erection and maintenance of a suitable agricultural building and the support of instruction in agriculture and forestry at The Pennsylvania State College.

"Resolved, That the Board hereby expresses appreciation of the favorable action of the Legislature of 1901, in making an appropriation for a Dairy Building, and regrets that that appropriation failed to receive the approval of the Governor.

"Resolved, That a special committee of three (3) be appointed to co-operate with the Legislative Committee of the Allied Agricultural Organizations, and that the chairman of said committee be the representative of the Board upon the Executive Committee of the Allied Agricultural Organizations." Adopted.

The next paper was by Prof. I. P. Roberts, of Cornell University, on "The Responsibilities and Duties of State Boards and Teachers of Agriculture." Discussion followed, participated in by Messrs. Ham-
ilton, Martin, Prof. Massey, Prof. Cochran, Dr. Schaeffer, Prof. Roberts, Piollet, Dr. Rothrock, Prof. Surface, Herr, Clark and Fenstemacher.

On motion, the Board adjourned until to-morrow morning at 9 A. M.

Thursday Morning, January 29, 1903.

The Board met at 9 A. M., Vice President Brodhead in the chair.

The chairman appointed on the committee to carry into effect Mr. Sexton's resolution, R. J. Weld, Jason Sexton and W. F. Beck.

The Board, on motion, selected State College as the place for its next meeting, and the time to be fixed by the Executive Committee.

The Secretary addressed the meeting on Legislation for the Board and the future of the Department of Agriculture. He also called attention to the commodious rooms of the Department as planned in the new Capitol Building.

On motion, the regular order of business was changed and the paper of Prof. Massey, on "The Southern Cow Pea and its Probable Place in the Agriculture of the Middle States" was made the first order of the day.

Discussion followed by Messrs. Stout, Massey, Baker and Sexton.

Dr. John W. Adams then made an address on "Scientific Horse-shoeing." Discussion followed by Messrs. Critchfield, Brodhead and Hamilton.

Dr. Pearson made a statement with regard to the use of vaccination in "The Immunizing of Cattle against Tuberculosis," whereupon the following resolution was offered and, upon motion, adopted:

"Whereas, We are convinced of the great value of a successful method of protecting cattle against tuberculosis by vaccination, and

"Whereas, Some results of experiments in this direction that have been made by the State Live Stock Sanitary Board appear to show that such a method may be developed, be it

"Resolved, That we, the State Board of Agriculture, in annual meeting assembled, hereby recommend that an appropriation be made by the Legislature to the Live Stock Sanitary Board for the purpose of supporting further investigations upon the immunization of cattle against tuberculosis to the end that the method may be tested and developed as soon as possible."

Adjourned to meet at 1:30 P. M.

The Board met at 1:30 P. M., Vice President Brodhead in the chair.

14—6—1903
Thursday Afternoon, January 29, 1903.

The first order of business was the report of the Ornithologist, Prof. Surface.

Moved by Mr. McHenry, that the State Board of Agriculture hereby declares itself as opposed to the passage of the bill now pending in the Legislature, which provides for the destruction of owls. Carried.

On motion of Mr. McHenry, the following resolution was adopted:

"In view of the large increase of perfectly worthless dogs, the danger to life by hydrophobia and the immense loss to farmers in this Commonwealth, by the loss of sheep killed by the useless curs, and other depredations on a farm caused by them: therefore, be it

"Resolved, That the legislative body now in session be requested to enact a law, declaring dogs personal property, that it shall be the duty of the assessors to assess said dogs at a value placed upon them by the owners (that the taxes for said dog or dogs be ten per centum of their value per annum, but in no case shall such taxes be less than one dollar per dog). That the taxes shall be collectible as other taxes are. That after the dog or dogs are so assessed the constable of the district shall furnish to each owner of dogs a metal tag on which the number of the dog corresponding to that of the register of the assessed dog made out by the assessor, for which the constable shall receive a compensation of a sum not exceeding twenty-five cents per tag, and it shall be the duty of the constable to kill any and all dogs found in his bailiwick without such tag attached to its collar, for which service he shall receive a compensation of fifty cents per dog killed.

"And said constables make their return under oath to the court of quarter sessions every three months at the regular term, that no dog without a tag can be found in his district.

"And the owner or owners of dogs so assessed shall be liable for all damages caused by them to sheep or other property."

The report of the Geologist, Dr. Wadsworth, was then read and, on motion, was received and ordered on file.

The report of the Mineralogist, Col. H. C. Demming, was presented and, on motion, was received and ordered on file.

On motion, a vote of thanks was tendered to Profs. Massey, and Dr. Adams for their instructive addresses.

On motion, the Board adjourned "sine die."

JOHN HAMILTON,
Secretary.
REPORT OF SPECIALISTS OF THE STATE BOARD OF AGRICULTURE, PRESENTED AT THE ANNUAL MEETING HELD AT HARRISBURG, PA., JANUARY 28 AND 29, 1903.

REPORT OF SANITARIAN.

BY BENJAMIN LEE, M.D., PHILADELPHIA.

By command of the Secretary of Agriculture I again appear before you to offer a few words of friendly advice on that most important topic, the preservation of health, or, to attack the subject on its negative side, the prevention of disease. I was instructed to prepare a report, but, as the occupant of the important position of Sanitarian to this Board has no duties assigned him, he, with great diligence performs no duties and has, therefore, nothing to report upon. I, therefore, venture to style my paper an address rather than a report.

The question may be pertinently asked, whether I have had the advantage of an agricultural training which would fit me to advise a body of practical farmers on matters pertaining to farm and homestead life. I am reluctantly compelled to answer this question in the negative. But I flatter myself that I possess by inheritance certain traits which may command your confidence. My grandfather ran away to sea when a boy, and the surmise is that he cultivated oats of the wild variety with considerable success. For many years, as a sea captain, he ploughed the ocean and his keel drew broad furrows across many seas. His log-books bear witness to the fact that he often passed through harrowing experiences. He invariably called a spade a spade and was in the habit of using such expressions at "Ho(e), there!" or "Hay, you!" when addressing his mariners. I do not think he was a horse breeder, as he never—well—hardly ever—said "dam," although as a naval officer, he was quite familiar with the management of the horse marines, and in navigating the southern seas had many opportunities of studying
the habits of sea cows. If his commands were not instantly complied with, he well understood the value of threshing in enforcing them. He was always able to recognize old Father Neptune by his pitchfork. If, therefore, there is anything in the doctrine of heredity, and I presume all cattle breeders are satisfied that there is, have I not made good my claim to an inherited aptitude for agricultural pursuits? Without further prelude, let me call your attention for a few moments to the subject of

**PREVENTIVE MEDICINE.**

Preventive medicine is unquestionably the medicine of the future. The physician of the future will no longer feel that he has done his full duty when his patient has recovered from typhoid fever, or the surgeon when he has cut off a leg. He will be something more and higher than a mere prescriber of pills and potions. The oldest nation on the face of the earth is the wisest in its initial thought on this subject, although its arrested development has not permitted it to work out the idea satisfactorily in detail. The duty of the Chinese physician is rather to keep his patrons well than to cure them when sick. It has even been asserted that his salary ceases, if, indeed, his head is not cut off, when his patron becomes a patient. The whole trend of modern medicine is towards the discovery of the causes of diseases and their avoidance, elimination or destruction. The ounce of prevention is easily the winning horse in its race with the pound of cure. The subject naturally divides itself into two sub-divisions—preventive medicine as related to the individual, which is called personal hygiene, and preventive medicine as related to the people at large, to which are applied the titles of public hygiene, public health or state medicine. It is to the latter that we will, with your permission, devote a few minutes' consideration.

**PUBLIC HYGIENE AND STATE MEDICINE.**

No sooner do individuals begin to group themselves into communities than the most dominant principal of human nature, selfishness, asserts itself in the effort of each to throw upon his neighbor the duty of maintaining healthful conditions in all property which is held in common; while, at the same time, the proximity of dwellings renders it vastly more necessary to strictly observe domestic sanitary precautions. Each man waits for his neighbor to clean out an offensive gutter or ditch, or remove a putrefying carcass from an open lot. "What is everybody's business is nobody's business." No man is willing to go to more expense or trouble than his neighbor in keeping his own premises in a clean, healthful condition. Every man maintaining an industry disposes of its waste products, however offensive, in such manner as shall involve the
least labor and expenditure to himself. Under such conditions, it does not require a very long period to produce so poisonous a condition of the soil, water and air that disease is recognized as the result of these uncivilized methods. The North American Indians had a very simple plan for meeting an emergency of this kind. Their medicine-man held a pow-wow and declared that the Great Spirit had cursed the ground on which they were encamped, and ordered them to abandon it. This they did with little ado. Strapping their wigwams on the backs of their ponies, and their household effects on the backs of their wives, the braves marched off in search of a site for a new village. In so-called civilized communities, however, habitations and commercial buildings are not so easily transported and possess too great a money value to permit them to be lightly abandoned. The alternative is the establishment of local self-government of the form known as municipal, and the appointment of a special authority to which this most important "nobody's business" shall be assigned. Such authorities discharge their duties with more or less efficiency, usually, unfortunately, it must be admitted, less, inasmuch as, first, selfishness and self-interest cannot be entirely eradicated by an act of incorporation; and, secondly, as communities are invariably unwilling to provide their health authorities with sufficient money to properly carry out the measures necessary for the prevention of disease. Moreover, in small communities, the underpaid officials do not possess the knowledge or training necessary to enable them to recognize and efficiently combat the causes of disease. Hence, as individual families, when crowded into a small space, become the cause of injury or "nuisance," as it is technically called, to one another, so villages and towns, as they multiply, become nuisances to neighboring towns.

The necessity for a central health authority which shall, first, instruct local boards in their duties, secondly, ensure greater efficiency in their administration, and, thirdly, aid the Legislature of the State in framing proper laws for the better protection of the public health and the prevention of disease, uniform in their action throughout the entire body politic, therefore, becomes apparent. Singularly enough, this conclusion was not arrived at until the latter half of the last century. The phrase "State Medicine" is comparatively a new one. It is used to describe a combination of the study of the causes of diseases and of the means for their prevention with that of the appropriate methods of official administration for the enforcement of those means. In different countries the official administration assumes different forms. In England, the central authority is the local government board, to which all local health boards must report and to whose rulings they are amenable.
In the Republic of Mexico, it is the Superior Board of Health which sustains a like relation to the Boards of Health of the several states, while they, in turn, exercise supervision over the municipal boards. In the Dominion of Canada, we find Provincial Boards. In the United States, very few of the states and territories are without a State Board of Health. In some of the states they possess executive powers more or less absolute. In others they are simply advisory. In many they have the supervision of the registration of vital statistics, a very important branch of state administration, and without which it is impossible to achieve the best results for the health of every portion of the state. In the majority of the states, the State Board is in direct relation with the municipal boards, both of cities and of townships. In a few there are county boards of health or county health officers, which form an intermediary body between the two.

This would seem to be the ideal plan; but in every state the genius of the people, and their traditional forms of government, often widely diverse, must be considered if the ready acquiescence of the people is to be obtained. In some states the township seems to be the natural unit of political organization; in others, the county. At one time there also existed in the United States a National Board of Health, whose chief function was the investigation of the cause of disease, and between which and the various state boards a loose relationship existed, principally of an advisory and consulting nature. This board fell to pieces through the influence of state jealousies, mismanagement and the lack of natural cohesiveness. The necessity of some such central body to co-ordinate the different state boards, harmonize conflicting interest, diminish the inconveniences and annoyances of inter-state quarantine, and render seaboard quarantines uniform in their methods of administration, in addition to investigating the great problems of the causation of disease on a scale which the national treasury alone could provide for, has, however, been thoroughly comprehended both by the medical profession at large and by practical sanitarians, who have been untiring in their efforts to secure legislation from Congress to that end. Such an act has at length been passed, and became a law, by receiving the signature of the President of the United States, on the first day of July, 1902. Its title is "An act to increase the Efficiency and change the Name of the United States Marine Hospital Service." The name of that service is changed to "Public Health and Marine Hospital Service of the United States." The title of the "Supervising Surgeon-General" is changed to "Surgeon-General" and his salary is increased to $5,000.00 per annum. Provision is made for the appointment of a permanent advisory board for the hygienic laboratory already in existence,
to be detailed, one member each, from the army, the navy, and the Bureau of Animal Industry, to which five civilians appointed by the Surgeon-General are added for the purpose of taking part in an annual conference for a period of not longer than ten days in any one year.

An annual conference of the health authorities of all the states and territories and the district of Columbia, each to be entitled to one delegate is made compulsory. The Surgeon-General may also, at his discretion, invite a conference with health and quarantine authorities from such states and territories as he deems desirable, as occasion may require; and, on the application of not less than five state or territorial boards of health, quarantine authorities or state health officers, it becomes his duty to call a conference of delegates from such states and territories. Provision is also made for the national "registration of mortality, morbidity and vital statistics." The system of health organization in this country may now, therefore, be said to be complete and symmetrical, comprising a central Public Health Bureau at the National Capital, a board of health in each state and territory, and local boards in every municipality.

THE POWERS AND DUTIES OF HEALTH AUTHORITIES.

Having then the necessary machinery established, what are the powers and duties of health authorities with reference, first, to the causes of disease, and, second, to their avoidance, elimination or destruction?

The powers of boards of health in their relation to the individual citizen, ought to be and in most cases are, autocratic and absolute. The Czar of Russia, himself, scarcely possesses more unlimited authority. This is necessary from the very nature of the case. The matters with which they are concerned are those of life and death, and the utmost promptness of action is often demanded in order that life may be saved and grave disaster prevented. Under common law, the courts are the recourse for those whose lives or health are threatened in any way whatever. To such the courts have always been open. But the law's delays are proverbial, and, since during such delays many lives may be lost and great calamities may result, all legislators recognize the necessity for an authority in this most important domain which may act promptly, independently, and autocratically within the limits of its jurisdiction. Neither person nor property are exempt from its pains and penalties. It may restrain the liberty of the one and destroy the other on the simple ground that in its judgment, such action is necessary for the protection of the public health. "Salus populi suprema est leg." "The health of the people is, indeed, the supreme law."
The highest dignitary of the land is as amenable to its rule as the beggar in the street. Local health authorities often fail to recognize the full extent of their powers and are too timid in their exercise. The law which creates them carefully defines their duties and the limitations of their powers, and within these lines, no one can interfere with them.

The first duty of a board of health is to discover the causes of disease within the territory under its jurisdiction. This it accomplishes in two ways: First, and most important, by insisting on prompt and accurate returns of births, deaths and communicable diseases, from all persons in any way connected with such occurrences, such as physicians, midwives, undertakers and heads of families. In this manner alone can it determine what diseases are prevalent and in what parts of their territory they are most prevalent, and thus arrive at a conclusion as to their causes. Important as is their duty for the abatement of nuisances, this does not compare in beneficent and far-reaching results with that for the enforcement of the registration of vital statistics. And yet this is usually the last which boards of health in small towns are inclined to take up, and that for which municipal legislators are willing to appropriate the least money. The intelligence of a community, or even of a Commonwealth, may be gauged with accuracy by the attention which it devotes to this matter. It is the basis of all intelligent sanitary administration. Secondly, by inspections. These must be made by officers trained to the work, frequently and systematically, especial attention being, of course, devoted to those quarters, villages or districts which the returns indicate as being the foci of disease or centres of infection. Blanks should be provided on which every possible condition liable to affect the health of a street, alley, yard, dwelling, place of business or manufacture should have its appropriate place. At certain seasons, and during epidemics, house-to-house inspections should be made. Systematic inspection of schools is essential.

Having determined the causes of diseases and their haunts, how shall health authorities proceed to their elimination and destruction.

First, by adopting and rigidly enforcing regulations for protecting the purity of food products, especially of meat and milk. These latter articles should be kept under supervision from the pasture and the stable to the slaughter house, the market and the delivery wagon.

Second, by using every means in their power to obtain copious supplies of pure water for their communities. The frequent examination of water supplies, both public and private, and the publication of the results is an important means to this end. Avarice
and official chicanery will oppose them at every step, but they cannot neglect this duty if they possess honesty and self-respect.

Third, by compelling landlords and employers to provide means of ventilation and sufficient air space in all sleeping apartments and work rooms.

Fourth, by compelling private individuals and corporations to maintain their dwellings, places of business and premises in a state of cleanliness and freedom from all nuisances prejudicial to health.

Fifth, by calling the attention of the municipal government to all offensive accumulations on streets, alleys, roads or commons, and to the importance of provision for effective drainage.

Sixth, by strictly isolating all cases of contagious disease, which, in their judgment, demand such treatment for the protection of the public.

Seventh, by instructing those in whose homes contagious disease exists as to the precautions necessary for their own protection and that of their neighbors.

Eighth, by thoroughly disinfecting all apartments, houses, public vehicles, clothing and personal effects which have been exposed to infection.

Ninth, by insisting on the establishment by the municipal authorities of a hospital for contagious diseases, and by removing persons suffering from such diseases to said hospital in every case in which such action is practicable, in an ambulance reserved for that purpose alone.

Tenth, by making provision for the gratuitous vaccination of the poor and furnishing diphtheria antitoxin for the poor on the application of a reputable physician.

Eleventh, by keeping the people informed of the condition of the public health, and especially of the prevalence of any communicable disease, and by distributing, from time to time, circulars instructing the people how to avoid such diseases. Concealment of such diseases is a crime, by whomsoever committed, whether householder, physician or board of health.

Twelfth, while the microscope has failed to demonstrate the existence of bacteria as the cause of some of the infectious diseases with which we are most familiar, such as measles, chicken-pox and small-pox, it has succeeded in the case of so many others, that we are fully justified, reasoning by analogy, in the conclusion that all communicable diseases are dependent on a like cause.

The discovery of these causes, the devising of methods for their prompt recognition, and of means for their elimination and destruction are among the most important duties assigned to national and state boards of health. Such researches call for the expendi-
ture of large amounts of money and are, therefore, not so readily prosecuted by local boards, but the furnishing of opportunities for the prompt diagnosis of such of the communicable diseases as can be thus distinguished is now recognized as the duty of the boards of health of all cities.

Wherever in this summary of the duties of boards of health I have made use of the words municipalities or municipal authorities, I desire to be understood as including those quasi-municipalities known as townships, the importance of which the State Legislature is just beginning to recognize as essential factors in State administration by conferring upon them for the first time in the history of the State, powers of self-government. Two comparatively recent acts make them self-governing as regards the enforcement of sanitary laws and regulations. These enactments have come none too soon. The country districts are sadly in need of sanitary supervision. In the words of another, a practising physician living in the country, "the experience of every country physician will bear us out when we say that such diseases as typhoid fever, diphtheria, scarlet fever and measles have quite as many victims in the country as in the city. There is many a household with a vacant chair by the hearth in every neighborhood in our broad land, which can also testify to this terrible truth." Today he might have added to his list, small-pox, which is going up and down through our rural districts, not like a roaring lion, but rather like a sneaking wild cat, seeking whom it may devour, maim or disfigure. Some years since, I requested a distinguished physician to read a paper before a sanitary convention on "Typhoid Fever and its Prevention." When he came to the platform, he announced that he had taken the liberty of changing the title to "Typhoid Fever, a Disease of the Village and Farm." His essay amply justified the title. "Suburban and rural districts," he maintained, "possess a special liability to this disease, which lies chiefly in the contamination of their water supply. These conditions are easily understood and are usually due to direct communication between cesspools and wells. The fluids percolating the soil from a cesspool near a well, or overflowing in time of rains carry the disease with ten-fold more certainty than the much dreaded sewers of the city. Just so long as townships are without regularly constituted, efficient and intelligent health authorities, just so long will the farmers of our State sow abundant crops of little white headstones in their God's acres as well as of wheat and corn in their broad fields.

In conclusion, it may be asked whether State medicine has achieved results which justify its existence? The answer is not far to seek and is most gratifying and conclusive. In the Census Bulletin of the Twelfth Census of the United States, published
August 20, 1901, Mr. W. A. King, Chief Statistician for Vital Statistics, in a communication transmitting the preliminary statistics of deaths to the Director of the Census, says: "The most important feature of the results presented is found in the decrease in the general death rate in the registration area of 1.8 per 1,000 of population, a decrease of nearly 10 per cent., and the decrease in the rates from the particular diseases to which the general decrease is due. The effect of the advances made in medical science and sanitation, and in the preventive and restrictive measures enforced by health authorities is still more strikingly shown in the comparative rate for the registration cities of the country taken together." In 1890, the death rate was 21 per 1,000, and in 1900 only 18.6 per 1,000, a reduction of 2.4 per 1,000. "The average age at death in 1890 was 31.1 years; in 1900 it was 35.2." The addition of four years to the average of human life in cities within a decade seems almost incredible, but the writer has recently inquired of Mr. King whether, on carefully going over the returns in the meantime, he had seen any reason to modify his conclusions? The reply was, that, on the contrary, they were fully sustained.

More astonishing, if possible, however, are the results achieved by American sanitary officers in the cities of Cuba and in Manila. The annual death rate in Havana has been, in the short space of two years, reduced from 67 per 1,000 to 25 per 1,000, while that terrible scourge, yellow fever, which used to carry off more than one hundred of her people every month, has entirely disappeared. In Santiago de Cuba, similar brilliant results have been obtained. In the city of Manila, the results have been not less striking and gratifying. The death rate for the month of October, 1899, the first month for which we have reports, was 61.39 per 1,000. The death rate for ten months of 1900 was 41.99, as compared with a rate of 33.4 for the same ten months of 1901, figures for the other two months not being available. The present cholera epidemic has, of course, raised the rate, but in the main, the figures go to show that, during the period of American occupation, the death rate in Manila has been lowered nearly fifty per cent. It is true that this wonderful transformation was accomplished under military rule, but this simply means intelligent, honest, fearless performance of duty, backed by an adequate appropriation.

When such results reported by trained and thoroughly reliable observers can be adduced, it is no longer possible for the most incredulous to doubt the immense benefits which sanitary science, applied by sanitary officers, is conferring on the world.
REPORT OF THE BOTANIST.

By Prof. W. A. Buckhout, State College, Pa.

During the year 1902 the Botanist has answered inquiries upon various matters connected with plants and plant life. The most frequent and important were as follows:

1. Specimens of weeds were sent for naming and for directions how best to eradicate them. The range of kinds was not large, nor did it include any which were really new to farmers and gardeners generally, although in many cases new to the senders. Replies to these letters have been necessarily of the same general character, inasmuch as it is doubtful whether there are any specific methods of weed destruction which are practicable on a large scale. Rotation of crops, clean cultivation and fertile soil will ordinarily suffice to crowd out or prevent the entrance of weeds. Indeed, the presence of troublesome weeds means that one or more of these factors is lacking. The process of weed eradication may require some years of patient labor, owing to the difficulty of getting some soils into the fertile condition and in establishing a rotation of crops, but no other methods are satisfactory.

All who are interested in this matter should send to the Department of Agriculture, Washington, D. C., for Farmer's Bulletin, "Weeds and How to Kill Them." This gives the gist of the whole weed question. If the farmers in a given community would unite in a war against weeds, including cutting those upon highways and uncultivated lands so as to prevent seeding, two years would show a marked reduction in weed injury with cleaner fields and better food crops.

One correspondent, intending to make some changes in his yard, raises the query what effect, if any, will be caused by filling in earth about his fruit and ornamental trees. This inquiry is pertinent, since experience plainly shows that any change of grade or level about trees is a check and injury to them. To remove surface earth, thus bringing roots nearer to the air, is generally understood to be an injury, but many persons seem not to have learned that filling in earth about a tree, thus removing its roots to deeper level, is fully as injurious. Sometimes it is sought to minimize the injury by making the filling largely of stone or gravel and by building up a wall about the trunk of the tree. The result is seldom satisfac-
While there is a difference in trees and in soil this is largely theoretical; it is never safe to fill in about a tree more than a foot and the danger rapidly increases with the depth of the filling. The injury may not be marked for several years. That it is not more frequently caused is chiefly due to the fact that, owing to the spread of roots and the inclination of the surface, some parts are left unchanged or so slightly changed that root action is not materially affected. There is much barbarous treatment of trees besides cutting off their roots and surfacing about them with asphalt and pavement blocks, where everything must be sacrificed to the rigid level of the engineer. In case material changes in grade and level are necessary, it will be, in the long run, more satisfactory to remove old trees entirely and reset them, or, if they are too large, to destroy them and start anew with young trees.

3. Many of the inquiries are, naturally, respecting fungi and fungus diseases of cultivated plants. They range over the whole field of that voluminous subject. Some of them are simple and easy, so far as determination of the fungus and the disease are concerned, such as wheat rust, for instance; one soon learns to distinguish this at sight. A patch of rusted wheat, particularly in the fall, is apt to suggest the work of the Hessian fly, and, indeed, they are frequently associated, but not probably as to cause and effect; they are, presumably, independent. Remedy for such diseases is quite a different and a much more difficult matter, chiefly because of the practical difficulties connected with their application. The expense incurred in the direct application of fungicides is frequently prohibitive. Preventive measures are to be sought for, and these take a wide range and often call for a nicety of knowledge and a closeness of observation not appreciated by farmers who are generally slow to change old practices. The conditions surrounding growing plants should be the best which can be made for producing a rapid, continuous and vigorous growth. Such healthy, active plants have a measure of resistance to fungus attack which is not possessed by weaklings.

One must sometimes choose between a variety of vigorous growth and productiveness, though of somewhat inferior quality, and one which is of weaker growth and less productive, though of superior quality, the former being not subject to fungus injury while the latter suffers seriously. Coupled with this must be proper attention to crop rotation, since fungus germs tend to accumulate in a soil or its plant refuse under continuous cultivation of one crop, and can be removed only by periodically introducing some new kind of crop. Burning or removing refuse is a great aid in securing immunity from injurious fungi. The particular case which called out these recommendations was one in which the celery blight was
the fungus concerned. Celery blight consists in an early withering of the leaves of the celery plant and their consequent growth of small, poor and pithy leaf stalks, useless for food. The insignificant little fungus which thus blights the leaves may be reduced in destructiveness by the process of spraying with Bordeaux mixture and other fungicides. But if this remedy is tried at all it should be as early in the growth of the plants as possible or the stalks will be unfit for food. Since the blight is apt to continue into the early fall it is evidence that spraying is of doubtful value. The choice of resistant varieties, clean culture and crop rotation are the most feasible means of relief from this particular pest.

Still more obscure and unsatisfactory with which to deal are certain mould-like fungi which live in the organic debris of the soil, and when conditions are favorable may attack living plants which have been weakened by frost or other means. These soil fungi are not uncommon, but it is comparatively seldom that the conditions are so favorable as to make them effective parasites upon useful plants. Generally, should they attack them at all, they cause but a temporary check and are soon outgrown. It is probable that the use of lime is the most satisfactory remedy for such disorders. At times and places where young grain has been visibly checked in growth and examination has shown these soil fungi as the probable cause it has been noticed that well-limed fields are exempt.

One of the most interesting of recent specific inquiries was that concerning a curious disease of ornamental white birches, which is accompanied by an exudation of red or brown slime, offensive to the sight and smell. These slime fluxes have long been known in Europe upon a variety of common trees, but are yet very imperfectly understood. They appear to be the result of some mechanical injury, or following frost cracks and checks. But they often occur when it seems improbable that there could have been any such causes. Whatever the initial cause may be, the sap of such trees seems to undergo fermentation and to become filled with various kinds of yeast and moulds which cause it to become slimy and frothy to an extraordinary degree.

The writer has never seen this disease, nor is he aware that it has been made the subject of study in this country. Without the lack of more definite information, he does not feel warranted in making any recommendations for treatment.
REPORT OF THE GEOLOGIST.

BY DR. M. E. WADSWORTH, State College.

At the time of my appointment to the office I now hold under the direction of your honorable Board, it was stated to you that my first duty would have to be to the students under my charge, at The Pennsylvania State College, but that I was willing to give such time as I could find to the duties of Geologist. Since my establishment in my present position, my time has been almost exclusively given to reorganizing the Department, and rearranging and enlarging the collections. The result has been most gratifying in the increased interest taken by the students, and in the further fact that the attendance has been doubled within a year.

The chief interest to your honorable Board lies in this: That part of the above instruction is given to the students of the State College of agriculture. At the outset, the students in the agricultural course had instruction under me, only, for one semester for three hours a week, in geology. Such an arrangement as this was unsatisfactory, as these students had to be united in one class with others who had had a preparation more or less satisfactory in the preliminary study of minerals and rocks. After calling the attention of the faculty of the School of Agriculture to the difficulty, I was kindly allowed two hours during the first half, and three hours during the second half of the second semester of the freshman year, and one hour during the first semester of the sophomore year, for the preparatory studies. While an improvement, the time granted is insufficient and too fragmentary for satisfactory work.

The position of Geologist for your Board has brought to me also numerous samples of rocks and minerals, to be determined for members of our rural communities, scattered all over the State. These determinations relate principally to clays, ores of iron, manganese and copper, and supposed cobalt, silver, gold, coal, etc. The amount of ignorance displayed in these matters, and the stubborn unwillingness, on the part of the inquirers, to accept the truth, all point to the preceding moral: that time, more time, ought to be given in all of our agricultural courses, to practical instruction in mineralogy, petrography and general and economic geology.
Why need millions of dollars be wasted by our farmers in vainly trying to obtain native gold, when all he has is some of the yellow sulphides of iron, or of iron and copper, or of shining mica scales, weathered yellow. If they know the simple fact that native gold is soft and will cut without falling to pieces, while all other yellow minerals, mistaken for gold, are harder, and when cut are brittle, no such costly mistakes need exist, even when in minute quantities, the properties of gold can be shown by scratching the supposed gold with a knife blade or a needle point. If it be gold, the metal will ridge up and lay over without breaking, as will a damp soil with a stout sward under the plow. If the mineral is not gold, it will ridge up and crumble on both sides of the furrow, like dry, bare soil under a double mould-board plow. Or, again, if a bit of the mineral is struck by a hammer, it will flatten and spread out, if gold; but crumble, if some other yellow mineral.

Simple practical facts like these, can easily be taught students, if they are given sufficient time for the laboratory practice. The student of agriculture in Pennsylvania, working in any rocky district, ought to have a practical acquaintance with the commoner minerals and rocks; to know how to distinguish the useful from the useless; to have some familiarity with building stones, road-making materials, the modes of occurrence of coal, petroleum, gas, salt, clay, limes, mortars, cement, slate, ochres and mineral paints, fertilizers and waters and ores of iron, manganese, gold, silver, lead, zinc, etc. It is not to be expected that so much work can be introduced into the already crowded curriculums of the various schools of agriculture, but it would be comparatively easy to insert it in the form of options or electives, so arranged that the geological subjects need be taken only by those who have an aptitude for them, or who expect to put them into practical use on their own land. This knowledge is as necessary for the agriculturist to protect himself from being swindled into the belief that he has minerals of value on his land as to prevent his being cheated out of valuable mineral property which he has.
REPORT OF THE MINERALOGIST.

BY COL. HENRY C. DEMMING, Harrisburg, Pa.

The work of the Mineralogist of your Board during the year 1902 was varied and interesting. Much of the time was taken up in other states and territories, but part of this was for the purpose of helping our own Commonwealth in the very important matter of water filtration.

There are three subjects of importance to be reported upon at this time. Some of you may remember the report last year upon soil analysis of every field of a 550-acre farm near Harrisburg. Acting on that report, the owner put a special plot of thirty-five acres in wheat, first adding two of the five constituents recommended. The result was an increase in the crop of seventeen bushels of wheat to the acre, and the largest and soliciest heads of wheat ever seen in this part of the State. The cost of the two constituents was equal to about five bushels of wheat to the acre, leaving a net gain of twelve bushels, or a total net gain of 420 bushels to the thirty-five acres.

Many fires take place in the country and in towns due to “defective flues.” A careful investigation during the year convinces me that the flues and chimneys were not apparently defective when the dwellings were built, but became so by reason of the inferior sand or lime used in the mortar. Of all the states of the Union, Pennsylvania produces the best sand and lime for building purposes, and it has become almost criminal that such inferior stuff is allowed to take their place. An analysis of sand used in one of Pennsylvania’s chief cities gave nearly 20 per cent. organic matter, such as decayed vegetation, animal fats, etc., and some lime proved to be over one-fourth foreign matter. To test the properties of such materials, we had quantities of mortar and plastering made up in my laboratory, and placed between bricks and on walls. We found that fire would find its way through such mortar in the course of a few hours, and that the plastered walls were not only damp in damp weather, but sometimes fairly soggy; that, furthermore, they were porous and unhealthy—in some instances containing infectious germs. The only remedy is the using of best qualities of silica sand and limestone running highest in carbonate of lime.
Pure water has been having its share of attention. We now know that on every farm, as well as in every town home, there is danger of water pollution. Happily, there is a very cheap and effective remedy. The most primitive, as well as effective, is by boiling. But as few resort to this method for cattle, it has been ascertained that if water is allowed to pass through comparatively clean gravel, and then through coarse and fine sand—the whole mass about three feet thick—the upper part to be scraped off to the depth of only half an inch every two months—the animals drinking the water thus purified will be in better condition in every way, and bring a higher price than when allowed to drink the impure water of most of our farms. Many of our good, old-fashioned farmer friends may not see the importance of this, but the time is not far off when the miry barnyard and the impure water of the barn and many of the fields will have to go.
It appears to us that this report should be based upon two general features, one dealing with the personal work of the committee, and the other treating, at least briefly, of the general progress of Ornithology during the past year. This shall, therefore, be the method of treatment.

First, Personal Work of the Committee—This has necessarily been either in disseminating knowledge or obtaining it. The methods of the former have been by (a) private correspondence, (b) by writing articles for publication, and (c) by speaking or delivering public lectures. We ask to be permitted to discuss each in turn.

(a.) Private Correspondence.—During the past year our correspondence upon subjects in ornithology has not been nearly as voluminous as in certain other scientific subjects—especially entomology, but it has been enough to indicate a general "hungering and thirsting" after this knowledge on the part of our citizens, especially teachers. It is one of the encouraging "signs of the times" that teachers in public schools—from the country, the graded and the high schools—are commencing to take such an interest in Nature Studies that they realize the deficiency of their own knowledge (which is the first essential in obtaining more), and are appealing to those persons who should be considered as experts in their several fields for the treasures of truth that may be obtained from the larger storehouses. Since the appointment of this committee a year ago, it has been called upon to answer eleven letters, or about one per month, upon subjects pertaining to ornithology.

(b.) Writing for Publication.—We have written several general articles on birds, mostly of an economic value; but our most fruitful method of reaching the public has been by a series of press circulars sent to every newspaper and other periodical publication in this State, and to some of the agricultural publications issued in adjoining states. These have been widely reprinted and circulated, and we trust that they have proven useful. We should say that they were made possible, financially, by the co-operation of the authorities of The Pennsylvania State College. In the second of these press circulars we discussed "The Economic Value and Protection of Our
Native Birds,” in a manner similar to that outlined by us in our address before this appreciative assemblage one year ago. Also, we published the following method of poisoning such obnoxious birds as the English sparrow:

A. “Poisoned Wheat for Seed-eating Mammals and Birds: It is often desired to poison certain destructive seed-eating animals, such as rats, mice, muskrats, gophers and woodchucks, as well as English sparrows. The difficulty of poisoning these mammals and birds is well known to those who have tried it, as the poison renders the food distasteful to such an extent that it is not generally eaten in sufficient quantity to cause death. This difficulty can be overcome and success can be obtained by first poisoning grains of wheat, then sugar-coating them. To do this dissolve about one-fourth of an ounce (or eight grams) of strychnine in one-fourth of a pint of boiling vinegar, then add water enough to make one pint. Pour this over three or four pounds of wheat and let it soak one day (24 hours), stirring occasionally. Next, spread the wheat in the sun or by a fire and let it dry. When dry, add one pound of coarse sugar to one pint of hot water and boil it down to one-half pint. Stir well and add about ten drops or one-fourth teaspoonful of anise oil. Stir and pour the hot mixture over the dry wheat, stirring thoroughly until cold and all wheat is covered. This is now dangerously poisoned sugar-coated wheat, which has its legitimate uses, but will kill anything that eats it, whether given by intent or accident. For this reason it should at once be labelled and always handled with care. To use it for rodents, bury a small quantity—from a few grains to one-half teaspoonful—just beneath the surface of the soil near the burrow of the animal. Having been buried, it will not be found by fowls or seed-eating birds, but the rodents will readily smell the anise oil and dig it up. In using this bait to kill English sparrows, place it in vessels on roofs and at other places where domestic fowls cannot find it.”

In the third of these press circulars we discussed “The Birds of the Winter Time,” making the following statements that are appropriate just at this season and intended to direct attention toward the efficient services rendered by these faithful but too often neglected allies:


“Certain small birds that remain with us during the winter time are of very great value, although their economic effects are not generally known. Those birds are very beneficial for their destruction of both weed seeds and insects. Some, like the sparrows and horned larks, feed during the winter upon seeds alone, most of which are the seeds of weeds that are more or less obnoxious;
others, like the quail, feed upon both seeds and insects and some feed upon insects alone, even during the winter, when it is popularly thought that no insects are to be found. It is to these and the necessity of preserving them that we wish to call especial attention at this time.

"Two very important small birds that remain with us all winter and feed entirely upon insects, especially in orchards, are the downy and hairy woodpeckers. Members of this family can be known by their dipping flight, their short, sharp notes, their sharp, rigid tail feathers pressed against the tree for support, two toes in front and two behind, insuring a firmer grasp, their hard pecking against wood, their modest white and black colors, and the patch of red on the head of the male. They are found mostly on the trunks and larger limbs of the trees, head upward, searching for grubs, chrysalids, etc. They are erroneously called "sapsuckers," and are killed through ignorance of their own value. They do not suck sap, and do not injure the trees. Protect the small woodpeckers of the winter time and thus protect your fruit crops.

"Two other valuable winter birds are the two species of nuthatches. These can be known by their drab and grayish colors, no red, the call of which is a nasal "pank," and their alighting on the trunks and larger branches of trees, mostly head downward. They do not peck into wood, as do the woodpeckers, but they pry into every crack and crevice and under every possible scale of bark in search of insects of any and all kinds and stages, and will freely eat eggs, such as those of the pear tree psylla, apple aphids, etc., larval such as hibernate beneath loose bark, pupae or chrysalids of all kinds of insects that are to be found in cracks and under bark, and adults or mature insects that are hibernating. For the extraction of such pests these nuthatches have bills that are especially long, slender, straight and pointed.

"Mr. Mann, a well-known pear grower near Rochester, N. Y., told the writer that one year the pear tree psylla had destroyed his entire pear crop, amounting to thousands of dollars in value, and the eggs of the insects were so numerous in the fall that he thought there were no prospects of a crop the following year, but the nuthatches, both species, worked in flocks in his orchard all winter, and in the spring he could scarcely find an insect left. The birds of this one species had saved him thousands of dollars in one winter. These birds are also often mistaken for the so-called sapsucker and ignorantly killed. Is it any wonder that we advise all fruit growers and others to preserve their birds?

"Another remarkably valuable bird of the winter time is the common chickadee. It can be known by its small size, black cap on its head, bluish-gray back and lighter under side, and especially
by the fact that it generally alights on the twigs of trees and swings head downward and every way, while clinging with its feet, like a veritable acrobat. It lives altogether upon insects, and eats an immense number of them, its chief food consisting of the eggs of plant lice, small chrysalids, etc. A study of its stomach contents has proven beyond a doubt that it is one of the most valuable birds known to the farmer and fruit grower.

"The brown creeper also often occurs in our orchards during the winter. It is a small bird, slightly larger than the chickadee, with a very long, slender, curved bill, with which it extracts insects of all kinds and in all stages from their winter hiding places where none but an expert entomologist would think to find them. It is one of the few kinds of birds with stiff and pointed tail feathers upon which it rests at times, as upon a third leg. All of these birds can be aided by putting fat meat, suet, or trimming from butcherings, in trees for them. Place bands of tin around the trees and cats and squirrels will not get the food put up for the birds, which are our most useful allies.

"For quails, it is necessary, while there is prolonged snow, to feed them by setting sheaves of unthreshed grain of any kind in brush piles and scattering straws with grain in the head or brush so the falling snow will not cover it. If this is not done most of the quails in this State are likely to die of starvation soon."

In addition to these we have written a few articles on "Making Bird Boxes in Manual Training Schools," which have proven useful, and also gave directions for bird study in the public schools.

In a text-book on General Biology, prepared by us during the year, we gave due prominence to the scientific and economic features of ornithology, and we have advised and put into successful operation certain new laboratory methods of studying birds, by which the knowledge of the student is derived directly from specimens and living creatures instead of relying entirely upon the indirect and second-hand method of text-book teaching.

In the work of disseminating knowledge of birds by public speaking, we have delivered twenty-eight lectures, chiefly at Farmers' Institutes, both summer and winter, upon the subject of the "Economic Value and Protection of Our Native Birds," reaching over ten thousand persons, and calling attention to the alarming decrease of many kinds of our native birds, the consequently attending increase of insects, and the necessity and methods of our helping our feathered friends.

Our personal work in obtaining new knowledge has been by experimentation, investigation and observation. Having had such a multitude of other primary obligations at the State College, there has
been no opportunity for extended investigations in this line; yet a few simple experiments were undertaken. For example, in erecting boxes or houses for nests, I found that the interesting little house wrens would readily nest in the old skull of a beef or horse, or in a large cigar box with a hole one inch in diameter. This size hole admits the wrens, but excludes the English sparrows. Bluebirds nested in a box 8 in. x 8 in. x 12 in., with a hole one and one-half inches in diameter cut above the middle of one side. From this box, erected on our front porch, two broods of bluebirds came forth last summer. Upon the same porch were the nests of the bluebirds, the wrens, and the song sparrows. This shows how we may practically aid in establishing colonies of birds.

A related experiment was in driving away the English sparrows. The morning the bluebirds were first seen around the box the English sparrows were driven away by us, but of course these persistent intruders returned and entered into combat with the desired tenants. A few missiles convinced the British that overwhelming forces were allied against them, and they retired until toward evening. A skirmish ensued, again ending in favor of the allied forces. For a few days these occasional attacks continued, with the same assistance and results, until the foreigners learned that they were attempting a campaign of hopeless aggression on the land of irresistible enemies, and the native forces gained confidence in their own power and in the faithfulness of their newly-formed allies. Thus were established a happy home and, we hope, mutual pleasures until the sounding of the farewell whistle from a clear sky one autumn evening, and we hope may be renewed with the joyous twitter indicating the welcome return on a fair spring morning ere long.

This shows how, in ornithological affairs, to answer such vexing questions as often perplex human beings regarding the erection of suitable tenement houses and securing desirable tenants.

Another experiment has been in feeding birds. We have found that they will come regularly to food and water placed on a board near a window, where they may be watched and much pleasure derived by watching them. The insectivorous birds of the winter time will enjoy bits of fat meat and crumbs, and nearly all species will eat the parings and cores of apples and other fresh fruits. Also, we have had opportunity to definitely observe the satisfactory results of planting mulberry trees near gardens and berry patches to feed the birds and relieve them from the necessity of their slight attacks on the desirable fruits. This we have had verified by reports from careful observers from other counties—especially Lawrence.

We have made some scientific observations along this line that
naturalists have considered worthy of record. Among these are such records as the occurrence for a few days in the latter part of July of a family of American crossbills (*Loxia curvirostra*) on the campus of the Pennsylvania State College feeding, not on the customary pine seeds, but upon the "cock's-comb" galls of the elm tree and upon the mites that cause these peculiar excrescences. This family consisted of six birds—an adult male, an adult female, and four young of the year. We thus have proof of their nesting in Central Pennsylvania. It is but just to add that they did not fall victims to the insatiable gun of the ambitious collector.

Another record worthy of note because unparalleled, as far as we can learn, is that of the occurrence of the cardinal, or red-bird (*Cardinalis cardinalis*) in Centre county in November. We can not learn of this conspicuous bird having been previously recorded in Centre county. Other observations have been made upon the migrations and peculiar feeding habits of the red-headed woodpeckers.
REPORT OF THE POMOLOGIST.

BY CYRUS T. FOX, Reading, Pa.

As the Pomologist of your honorable body, it becomes incumbent upon me to give the result of observations in regard to the fruit crop of 1902 in Pennsylvania, with some thoughts on the general subject of fruit culture.

APPLES.

First, as to the apple crop. Of all fruits the apple is the most important, and that this is so is evidenced by the fact that the acreage devoted to apples in this State is greater than that of all other fruits combined. Pennsylvania ranks as the third apple-producing state of the Union, being only excelled by New York and Ohio. Missouri is credited with having the largest number of trees, but stands sixth in the matter of production. The apple crop of Pennsylvania in 1902 amounted to 35,000,000 bushels, worth more than $25,000,000.

These figures are somewhat less than those of the previous year, when the crop amounted to 38,000,000 bushels, while in 1900, when the yield was exceptionally large, there were 40,000,000 bushels. Estimating the yield in this State last year at three and one-half bushels per tree, there are 10,000,000 apple bearing trees in Pennsylvania. New York is credited with having 15,000,000 trees, and Missouri with having no less than 20,000,000.

That the apple is a northern fruit, requiring a cold climate, is apparent by the larger yield of the orchards of New York and Canada. New York, having three-fourths as many trees as Missouri, had as large a crop last year as the states of Missouri, Kansas, Illinois and Arkansas combined. The Province of Ontario, Canada, having about one-half as many trees as New York, had a crop of 50,000,000 bushels of apples in 1902, as against New York's 52,000,000. The average per tree in Ontario was seven bushels. These figures are given for purposes of comparison. If as much attention would be given in Pennsylvania to the apple crop as is given in Western New York, where five counties produced one-fourth of the crop grown in the Empire State, it would easily stand at the head of the apple-producing states of the Union.

No other state furnishes apples of finer quality; and yet there are belts stretching across the State particularly adapted to this crop, having the requisite soil and exposure, where but little interest
is manifested in the subject. If these localities were properly designated, and then devoted to apple culture, Pennsylvania would, in the course of a few years, become a large shipper of apples, instead of consuming the crop at home, as well as thousands of barrels from New York, Ohio, Michigan and other states.

While in the aggregate there was a falling off of several million bushels in the yield of apples in this State last year, there were some sections where the crop was uncommonly large. This statement is true in regard to a number of counties, and yet it was not unusual to find a well-bearing orchard in a district in which other orchards bore poorly. This was due probably to a difference in time of blossoming, and to protection from frost in the blooming period, owing to different exposure. In visits which we paid to a number of counties, orchards were seen so heavily laden with fruit that the trees were breaking down. Photographs were taken of some of the fullest trees. One orchard of ten acres in the Shamokin Valley, in the southern portion of Northumberland county, having 100 trees in prime bearing condition, averaged fifteen bushels to the tree. An orchard on the line of Berks and Lancaster counties yielded nearly 10,000 bushels, and the owner has at this time over 6,000 bushels in storage which he is selling in the markets of the city of Reading at an average of $1.20 per bushel. In this orchard much attention is paid to fertilization, and there is a good crop every year.

PEARS.

The pear crop was an abundant one in most sections of the State. The fruit was choice and of excellent flavor. The Bartlett, which is undoubtedly the most popular variety in the entire list, and certainly one of the very best for the table, yielded largely. Unfortunately, it is an early fall pear and cannot be kept any length of time. Such winter varieties as the Duchess, Kieffer and Vicar, while large and showy, are not equal to either the Bartlett or Seckel in point of flavor. The Kieffer, of more recent introduction than any of those mentioned, is grown in Pennsylvania to a greater extent than any other pear. This is because of its wonderful productiveness, and its high color around the holiday season, when the fruit has been fully ripened. It is also a variety that is almost storm-proof, the fruit sticking to the branches no matter how much the limbs may be swayed by the wind. It is, however, one of the least desirable of all for eating, being of poor flavor and rough quality; but for cooking and canning purposes it is one of the very best. In the latter respect it has well been termed "the ideal family pear."
PEACHES.

There was a partial crop of peaches, but the season was short, the early and medium varieties ripening almost at one time. For a week or so there was a glut and prices were low. Later in the season, when the demand was greatest, such fruit as was offered commanded good prices. In some parts of Southeastern Pennsylvania, and along the Pennsylvania and Maryland line, the yield was good. Some new varieties, such as Iron Mountain and Gold Medal, did exceedingly well. One Schuylkill county grower, having mostly Iron Mountain trees, reported having realized $1.50 per basket all around, some having been disposed of at wholesale, while those sold at retail brought $1.50 to $2 per basket. The fine condition of his fruit was due to the fact that he had severely thinned his crop. Had all the fruit which set been allowed to mature the result would have been inferior specimens, which perhaps would not have brought more than fifty cents per basket. The same grower believes in thorough cultivation.

PLUMS.

As to plums, there is not that attention paid in Pennsylvania to this fruit which its importance deserves. For years the plum crop was more liable to attack by insects and fungus diseases than any other. Fruit growers, discouraged by the ravages of the currantia and black knot, for a time discontinued planting. Then came the discoveries in regard to spraying with the Bordeaux and other mixtures. Next came the introduction of the hardy Japanese varieties, such as the Abundance, Burbank, Chabot and Satsuma, which, while free from black knot, are inclined to rot. Nevertheless, they are productive and early bearers, and our markets are now well supplied with plums of these varieties. There was a good yield of plums last year in most counties of the State. The very wet weather experienced in July resulted in considerable rotting.

QUINCES.

Quinces, a rather neglected but not to be despised fruit, did fully well. More attention is being devoted to this fruit because of the good prices which it commands. Fifty cents a dozen is not an unusual price, and in a favorable year an acre in quince trees will readily net $120.

Although the trees suffer from blight, this can be overcome by spraying them. The borer is one of the worst enemies of the quince. It has been found that the application of a strong solution of whale oil soap, two or three times during the season, is a sure exterminator of the borer. Unlike the apple and pear the quince has no "off-year." A crop may always be expected, although the yield is larger in some seasons than in others. As to soil, strong clay loams
are the best for quinces; but the trees also thrive well on damp, gravelly drifts, although they do not stock up so well.

**CHERRIES.**

The cherry crop was excellent throughout the State. The early varieties, such as the Richmond, did particularly well. The late varieties were damaged by excessive moisture. The greatest demand is for sour cherries, and these are being the most extensively grown. They are less subject to rot than the sweet kind. Cherry trees were in healthy foliage all summer, there having been less leaf rust than usual. While the Early Richmond is regarded as the most profitable cherry, some growers lay great store by the Montmorency, which is larger and better than the Early Richmond, although a little later than the latter variety. Other favorite kinds are the Governor Wood, Napoleon Bigarreau, May Duke, Yellow Spanish and Black Tartarian.

**GRAPES.**

The season as a whole was favorable for the grape crop. Although July was rather wet, there were plenty of hot days in August and September to properly develop the fruit, and fine bunches were plenty, especially such as had been bagged. In fact, spraying and bagging was essential to assure success in grape growing. The finest display of grapes in Pennsylvania last year was, beyond doubt, that which was made at the Lehigh County Fair, held in Allentown in September. One grower had 147 plates of grapes on exhibition, and in one collection had 82 varieties. In this collection there was not an imperfect bunch, and every variety was true to its name. Every bunch had been bagged, and perfection was thus obtained. It was a hard matter for some persons to believe that these grapes had not been raised under glass. Other grapes on exhibition, of the same varieties, were decidedly inferior, because proper attention and care had not been given them. Here were fittingly exemplified the correct and incorrect methods of growing grapes.

It is scarcely necessary to refer to varieties, inasmuch, as of the many in the list, there are only a few that succeed everywhere, and they are well known. The Concord, for instance, is nearly everybody's first choice, on account of its size, productiveness and hardiness. Not choicest in flavor, nevertheless, it has that natural piquancy inherited from the wild fox grape, from which it originated, that is liked by most people. The sweetest grapes, such as the Delaware, have not the same bouquet. With the Concord may be classed Moore's Early and Worden as among the best black grapes. Of the white varieties, the four best are possibly the Ni-
agara, Moore's Diamond, Green Mountain and Pocklington. No one, however, should think of growing the Niagara without bagging it, owing to its delicate skin. As to red grapes, the Delaware, Salem, Woodruff and perhaps Brighton (which is an imperfect bloomer) are among the best and most easily cultivated. The Clinton and Ives' Seedling are the wine grapes of Pennsylvania, producing a quality of wine, when the grapes are mixed in proper proportion, equal to the imported claret.

**SMALL FRUITS.**

Small fruits, with the exception of raspberries and blackberries, never did better. Strawberries were late in ripening, owing to the cool weather experienced in May. However, the crop was large. Currants and gooseberries yielded well. Raspberries and blackberries were cut short by the rainy weather in July, there having been only five perfectly clear days. While strawberries were plenty, the supply did not exceed the demand and good prices were obtained. Although the list of varieties is constantly growing, there are no kinds more salable than the Sharpless and Bubach No. 5. The former, however, is a shy bearer, when compared with the Brandywine, Crescent, Cumberland, Gandy, Greenville, Haverland, Parker, Earle and Warfield. Size and color are the strong points of the Bubach. A new variety of great promise, which originated on the farm of D. M. Seyler, in Berks county, a chance seedling, was brought to our attention last year. It is a medium early, a conical berry, of large size and very productive. It has been given the name of the originator's wife—Rebecca.

The Cuthbert raspberry still holds the first place in the reds and the Gregg in the blacks. Other favorite kinds are the Marlboro', Golden Queen, Ohio, Palmer and Souhegan. In blackberries, the Erie and Snyder are among the best, although the former does not succeed everywhere. The latter is well adapted for a cold climate. The Kittatinny, Minnewaski, Taylor and Wilson, Jr., are also recommended. Of course, in regard to varieties of small fruits, it must be remembered, that while certain kinds are well adapted to some sections of the State they do not do so well in other places.

**NUT CULTURE.**

Nut culture is recognized as a branch of pomology and should have a brief reference here. Under this head it may be said that it has been mainly confined to the raising of the improved varieties of chestnuts. The Numbo and Paragon varieties have been grafted on native trees with great success, the grafts bearing fruit in three years, the nuts being more than twice as large as the common kind command double the price at which the latter sell. The Japan
Giant is one of the new importations and is reported to do well on American chestnut trees. Some walnut groves have been set out in Pennsylvania, the idea being to raise the trees, not alone for the nuts, but for wood for commercial purposes. Several Japan varieties are being tried. The English walnut (or Dutch nut) does well in protected situations and is profitable.

GENERAL OBSERVATIONS.

There is cause for congratulation that greater attention is being devoted in Pennsylvania to fruit culture. The promulgation of information by the Department of Agriculture and State Horticultural Association in regard to the best modes of combating insect enemies and fungi has done much to dispel the clouds of discouragement. It is now possible to raise perfect fruit in favorable seasons. And yet, with all the pains taken to disseminate facts concerning insecticides and fungicides, it is surprising that there should be so much defective fruit in our markets. There is no excuse for it. Farmers permit their orchards to go unsprayed because of other pressing work. The fruit grower, however, who is in the business for the money that is in it, realizes that without spraying it is impossible to produce good fruit and, therefore, he gives the matter his earnest consideration. It has been well said that the discovery of the various formulas for fungicides and insecticides has been worth millions of dollars to the fruit growers of the United States. The formulas originally used have undergone some changes, it having been found that weaker solutions are just as efficacious as those first promulagated.

NURSERY INSPECTION.

The system of nursery inspection inaugurated by the Department of Agriculture has also been a great boon to the fruit growers of the State. It has prevented the sending out of trees affected with crown gall, the San José Scale or other diseases and destructive pests. The fact that last year ten nurseries were discovered in Pennsylvania in such bad condition with diseased and infected trees that licenses to sell could not be issued to them by the Department was positive proof of the importance of careful investigation. About one-tenth of the acreage devoted to nursery culture came under condemnation. The most formidable of all enemies of agriculture and horticulture are insect pests and fungus diseases, which result in an annual loss in this country of $300,000,000. Therefore, there cannot be too great vigilance in fighting these destructive agents.
No. 6. DEPARTMENT OF AGRICULTURE.

Upon the appearance of a contagious disease in any fruit region of the State an investigation should be made under the direction of the Agricultural Experiment Station of the Pennsylvania State College, by and with the advice of the Department of Agriculture, and for this purpose there should be an appropriation by the Legislature of $10,000 per annum.

PEACH YELLOWS AND SCALE.

The passage by the Legislature of 1899 of an act to prevent the dissemination of such contagious diseases as yellows, black knot, peach rosette and pear blight, as well as the spreading of the San José Scale, was a step in the right direction. A grower need but call his neighbor's attention to the existence of the law in order to secure the removal of an infected tree. As to peach yellows, the origin and nature of this disease is still a subject of dispute, but it has been definitely determined that it is an atmospheric disease, communicable by inoculation, and that the eradication and destruction of an infected tree is the only safeguard to prevent the ruin of all peach orchards or trees in the neighborhood in which the disease has appeared.

The San José Scale no longer has its terrors. Several sprayings with the whale oil soap solution when the scale is dormant will get rid of the pest. A later discovery, is fumigation by means of hydrocyanic acid, but this is difficult, dangerous and expensive. As to scurfy scales, oyster-shell bark lice and wooly aphis, the application to the bark of a 10 per cent. kerosene emulsion in June will kill 90 per cent. of the young insects. Another excellent wash for winter or early spring is made by taking fifteen pounds of live lime and slaking it with water, in which two pounds of copper sulphate have been dissolved; then add about fifty pounds of fine hard-wood ashes. This mixture, diluted by the addition of fifty gallons of water, should be sprayed on trunks and branches, using a coarse sprayer. This treatment clears off old bark, destroys insect eggs and fungus spores and has a tendency to remove many of the hard scale insects. The effect on the bark is very pronounced. The old-fashioned system of whitewashing the trunks of trees is also recommended. It will go a great ways towards destroying the winter quarters of various forms of insects.

NOMENCLATURE.

The subject of nomenclature is one of much importance. In visits paid to a number of county fairs last fall we found much fruit misnamed. Some well-known varieties of apples, for instance, were
exhibited under the names of the owners of the farms on which they were grown. The Niagara grape was exhibited under a half dozen names. So with the Duchesse, Lawrence and other pears. Some fruits are known by various names and prominent varieties are given local appellations. The Golden Pippin, it may be remarked, has thirteen, the Canada Reinette ten and the Twenty-ounce apple eight names. There are also different types of the same fruit, as, for example, the Baldwin apple, of which at least three types are known. It would be well to have colored plates or lithographs of leading varieties displayed at all exhibitions for purposes of comparison.

FRUITS OF PENNSYLVANIA.

The native fruits of Pennsylvania are many, and some of them are of great excellence, superior in productiveness and hardiness to varieties brought from elsewhere. Northern varieties of apples mature earlier in Pennsylvania than where they originated, and such as the Baldwin and Northern Spy, which, in New York, are winter apples, become fall varieties here. The varieties most productive in Pennsylvania are native to the State, and the work of collating such varieties and ascertaining the history of each should be undertaken. There is no showier nor more salable apple than the York Imperial, which had its origin in York county. It is also one of the best keepers. Lancaster county is the home of the Smokehouse, one of the most desirable of all apples, coming early into use and having a long season. Other natives of Lancaster county are the Agnes, Barbour, Belmont, Breneman, Harnish, Hess, Klaproth, Paradise, Reist and Lancaster Greening.

The Fallawater, or Pound, known also locally as the Tulpehocken, is of disputed origin, both Berks and Montgomery counties claiming it, but the fact that it has been long known as the Tulpehocken (after the stream of that name in Berks county), rather gives Berks the right to it. This apple is such a reliable bearer in Eastern Pennsylvania that no orchardist in that section of the State would think of doing without it, and one enthusiastic admirer of it stated at a fruit growers' meeting that if he was to set out an orchard of 100 trees, every tree would be a Fallawater. The most profitable apples of Berks county are the Baer (spelled also Bare), Keim and Krauser, because of bearing large crops every year. They originated in the county, as did also the Berks Mammoth, Doctor, Evening Party, Gewiss Good, Haas, Hain, Hepler, Host, Hughes, Kelsey, Kuser, Long Stem, Marks, Meister, Neversink, Schwarzbach, Stable, Staudt, Sweet Rambo, White Doctor, Yost and a number of others.

In the adjoining county of Lehigh the Kocher and Lehigh Greening are the favorite locals. Chester county has given us such ex-
cellent varieties as the Dickinson, Jeffries, Melt-in-the-Mouth, Nottingham, Brown and Pennock. Montgomery county is the home of the Jenkins, Rambo, Ridge Pippin and Yacht. Bucks has produced the Bucks County Pippin, Cornell's Fancy, Jackson, Old House and Smith's Cider; Centre county, the Boalsburg and Townsend; Franklin county, the Mentzer; Allegheny county, the Pittsburg Pippin; Lebanon county, the Focht and Winter Sweet; Lycoming county, the Republican Pippin; Clinton county, the Mann; Cumberland county, the Herman and Pink Sweeting; Millin county, the Millin King; Lackawanna county, the Clark; Northumberland county, the Major and Priestly; Union county, the Adams, and Washington county, the Traders' Fancy. These are but a few of the native apples of Pennsylvania, almost every county in the State having several, and we have only mentioned some of the more meritorious.

OTHER NATIVE FRUITS.

As to pears, the Seckel, Kieffer, Brandywine, Chancellor, Kingsessing, Moyamensing, Maynard, Mather, Ott, Petre, Reading, Rutter, Tyson, Uwchlan, Wiest and Watermelon are native of Pennsylvania. In grapes, we have such varieties as the Creveling, Martha, Maxatawny, Merceron, Seltzer, Taylor and Telegraph. In peaches, Pennsylvania can claim two of the largest and finest—the Globe and Susquehanna; also the Red Rareripe, Morris White and other excellent sorts. There are a number of choice native varieties of cherries, such as the Conestoga, Ida and Lancaster Red. The Johnson quince is a native of Lehigh county. As to small fruits, the Sharpless, which stands at the head of the list of strawberries in this State, originated in Columbia county. Other good natives are the Brandywine, of Chester county, and the Jacunda, or Knox's No. 700, of Allegheny.

SOIL LOCATION AND CULTURE.

As soil, location and culture are among the most important considerations in fruit-growing, it is pleasing intelligence, imparted to us by the Secretary of Agriculture in his Annual Report for the year 1902, just published, that a bulletin will shortly be issued by the department, giving much valuable information on these points, and specifying the places in the State where each variety of fruit has shown the best results. It is believed that this bulletin will be of valuable assistance in locating orchards, and in selecting the particular varieties of fruit which are adapted to given localities.

While Pennsylvania can boast of some large orchards, it is cast completely in the shade by the extraordinary operations in some other states. The biggest apple orchard in the United States is in

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the Ozark mountains of Southern Missouri, consisting of 2,300 acres. Another company has just been formed which has purchased 5,000 acres near Lebanon, Mo., every acre of which will be planted with apple trees. When the trees are all bearing it will be the largest orchard in the world. Missouri has come to the fore as a fruit producer. The Ben Davis is the popular apple in that State, and the 5,000-acre orchard alluded to will be planted with but two varieties—the Ben Davis and Jonathan—fifty trees to the acre. This is because these are reliable bearers in Missouri, adapted to the soil and climate, and, therefore, very productive. On account of brightness of color they are also most ready of sale. This matter of color is a very influential factor. In the markets of the large cities any apple will sell "so it's red." A white, yellow or green apple, no matter how much superior in quality, will not sell as readily as a Ben Davis, Winesap or other red fruit. So, likewise, in regard to pears, the Kieffer, on account of its rich color, is the most salable fruit during the holiday season, although of all the winter varieties it is the most tasteless. Consumers of fruit in the cities, however, are being educated in the matter of varieties, and the time is near when the Ben Davis apple and the Kieffer pear will be relegated to the rear. Both have undoubtedly done more to demoralize and degrade the fruit trade in the cities than anything else.

**THE MATTER OF FERTILIZATION.**

An acquaintances of mine purchased several adjoining tracts of land, containing nearly 400 acres, on which he established a fruit farm. The land had the proper exposure but the soil was thin. He spent as much as $10,000 a year for fertilizers, intense cultivation was observed, and to-day the farm is one of the most productive in the United States, yielding every year thousands of bushels of apples, pears and peaches—the fruits principally grown. Although ten miles from the nearest market, the business has proved highly remunerative, the receipts in one year having been as much as $20,000. And this brings us to the very weighty matter of fertilization. Had not the owner spent large sums for manure the tract would at this time, perhaps, be worth but little more than $10 per acre. The lack of fertility of the soil is often the cause of the failure of the fruit crop, and even certain diseases, such as the peach yellows and blight, have been ascribed to this cause. How many farmers think of fertilizing their orchards? Yet they will haul out barnyard manure and spend, besides, large sums for artificial fertilizers for their grain crops, while neglecting their apple orchards, which can be made to bring them more money than any other crops that can be raised. Fruit trees require plant food, and unless properly fed cannot be expected to go on producing.
PENNSYLVANIA FRUIT AT EXPOSITION.

A resolution having been introduced in the State Legislature, which has already passed the Senate, appropriating $300,000 to the St. Louis Exposition, and providing for a Commission to take charge of the Pennsylvania exhibits, steps should be taken at an early day to have the fruit interests of the State properly represented. Although fifteen months will elapse before the Exposition opens, the arrangements for a fruit display should be made this year. Casts and models in wax and plaster can be made of fruits produced in 1903, and space in cold storage houses should be secured in which to keep specimens of next year's fruits. Some winter fruits can be kept in storage for the Exposition. There should be an exhibit of nuts of this year's production. Commencing with strawberries, the display of fruit could be continued until the close of the Exposition. The best native fruits of Pennsylvania, especially, should be shown. Missouri will endeavor to surpass all other states. She made a very creditable display at the Pan-American Exposition in Buffalo in 1901.

Pennsylvania was not represented in the fruit display at the World's Fair in Chicago because of lack of funds. After preparations had been commenced, the promise of exhibits by the leading fruit growers of the State obtained, arrangements for cold storage made and designs for platforms and shelving secured, the State Commission called a halt, as their total appropriation was running low, and it was feared that the expense could not be met. It had been intended to allot $2,000 for the fruit display, although at least $3,000 should have been set apart for the purpose. Other departments, however, pressed for more money, notably mines and mining, and it became evident that unless the Legislature would grant the Pennsylvania Commission $60,000 in addition to the $300,000 already voted there would have to be a curtailment of expenses. A bill was introduced with that end in view, but it failed to carry. Finally the fruit display was abandoned, although later on it was thought that some money could be set apart for pomology. This was in August, and there was no certainty as to the amount of money that would be appropriated or whether, in fact, any could be spared. It was then too late to do anything in the way of getting up a creditable display, and, by the advice of leading horticulturists of the State, your humble servant, who had charge of the arrangements, deemed it prudent to avoid incurring any further liability. It is to be hoped that there will be no such balk in regard to the St. Louis Exposition, and that the fruit interests of our grand old Commonwealth will receive better consideration at the hands of the Commission to be appointed.
REPORTS OF COMMITTEES PRESENTED AT THE ANNUAL MEETING OF THE STATE BOARD OF AGRICULTURE, HELD AT HARRISBURG, PA., JANUARY 28 AND 29, 1903.

REPORT OF COMMITTEE ON FORESTRY.

By Dr. J. T. Rothrock, Chairman.

Your chairman of the Committee on Forestry is again glad to report progress for the past year. In the nature of the case, progress is all he can report, for the work never will be ended so long as men use timber, or so long as general prosperity is based upon abundance of raw material. From the cradle to the grave, there is not an hour in which he can dispense with wood. Remove it from our grasp, and civilization would disappear from the earth.

The year elapsing since we last met has been one of marked activity in forest work. The State is now in actual possession of at least 360,000 acres, with about 200,000 acres more in process of acquisition. The average price paid per acre for all this land has been about $1.90. The quality of the land and the quantity of the timber have not been the only factors in determining the price paid. For the same character of land and the same quality of timber a higher price would, should and must be paid when the purchase is made near a region with large interests at stake, and requiring protection, than when the adjacent territory is barren.

We may cite the case of the Mont Alto Reservation, in Franklin and Adams counties. This occupies the larger part of the South Mountain range, and lies in the fertile region between Chambersburg and Gettysburg. Vast agricultural and manufacturing interests are concentrated there. Timber is needed for fencing, for building and for fuel. Abundant water is needed for farming and for power. That mountain range is the one available spot to satisfy the demands of Cumberland, Franklin and Adams counties, from which the timber and water flow must come. The streams there,
though they drain mostly into the Potomac, nevertheless, water an area of approximately a thousand square miles, or 640,000 acres of farm land. This would allow for 4,266 farms of 150 acres each, less what was occupied by several thriving towns. If you estimate the average value of each farm of 150 acres at $50 an acre, it would mean that the agricultural value of the land was, per farm, $7,500, and of the 4,266 farms, $31,995,000. Of course, the value of the land occupied by towns would be greater. There is no portion of all this wealthy and populous region which is not directly or indirectly influenced for good by the presence of forests upon these mountain regions. It is noteworthy, too, that the good produced by these forests can be produced to the same extent by no other agency of which we have control. Let us suppose that, in round numbers, $100,000 were paid for this land. It would be but about one-three hundred and twentieth of the value of the farm land. It would be paid once for all, and be a perpetual benefit to the whole region. True, the county would lose the taxes on the mountain land, but it would have $25,000 a mile annually on the roads running through the reservations; it would have increase of work for its laborers, and a perpetual supply of cheap timber within easy reach.

Evidently the question to ask is, not whether such a reservation should be created, but what is the least cost for which it can be obtained, because it would appear to be an essential to the continued prosperity of the country. It is nothing to the purpose to say that the same area of land could be obtained cheaper at some distant point. The statement would be true, but it would be misleading, because the Cumberland Valley region in question would receive no direct benefits therefrom.

There is another point to be taken up. Criticism is sometimes made because rough mountain tops have been purchased by the State. It is true, such have been purchased. But would the owner of any extensive tract sell the mountain sides or flats without selling the top as well? Suppose, however, that we left the rough parts still in his hands and purchased only the better portion. The State could never have a continuous area. It would be obliged to endure vexations litigation, increased cost of administration of its lands, and seldom, if ever, be able to obtain the greatest return from its own holdings.

I have taken much of your time to place this subject plainly before you, because I find that those who are not called to deal with such questions, often fail to obtain a proper view of them, and it is important that so vital a question should be fully understood. Everything thus far done in forestry has been foundation work. Now that the State owns land, it should care for it in order to bring about the largest results.
Forestry is for two purposes: First, for protection to the many interests dependent upon timber growth, and, second, for revenue. The first of these has been so often dwelt upon that it requires no further elucidation here. The second, for revenue, demands a fuller statement now. New York State possesses considerably over a million of acres in her reservation system. Recognizing an impending danger to the water flow of the state if the woodlands of the Adirondack and Catskill regions were further denuded of timber, New York took prompt measures to obtain possession of the ground. This was done, in the first instance, mainly by purchase of lands sold for taxes. The land acquired was often purchased, it seems, without the extreme care as to title which our purchases have received. The consequence is that New York has had endless litigation to hold its lands. This Pennsylvania will, in great part, avoid. Timber speculators have endeavored to obtain possession of New York's timber, until driven almost to desperation, the legislation, and the people, by constitutional enactment, have absolutely prohibited all cutting of timber for lumbering purposes on the State reservations. Even the cutting which was necessary for demonstration purposes on the land placed under control of the State Forestry School aroused the most positive denunciation. Now, as a matter of fact, all scientific forestry begins with the axe. Trees which are mature and marketable should be removed. Trees which never can have any value should be cut out. Nothing should be allowed to grow, and use the strength of, or occupy the soil, unless it is the best possible product. It would not be good business methods to tolerate their presence. Besides, except in the case of white pine and hemlock, where these covered the ground densely to the exclusion of everything else, our natural forests have never been the most productive which the soil was capable of sustaining.

Fortunately, Pennsylvania is hampered by no such unwise restrictions as New York. The Forestry Commission not only can, but is expected, to produce revenue from its woodlands as soon as possible, where this can be done without public injury. Taking all of our receipts of this year we have already turned into the State Treasury, directly or indirectly, $19,000. There is no reason why, within a year, we should not be able to show a revenue several times as great, if we are able to go systematically to work to reap the timber harvest which can be removed without injury to the State forests. Such harvesting will be a positive benefit to the remaining timber. For example, there are places where the virgin white pine trees were cut thirty years ago. At that time only the butt cut, or perhaps two logs, were taken, and the remainder of the tree was allowed to lie on the ground. In spite of the years elapsing, the heart of those logs is still sound. Hundreds of thousands
of good white pine shingles could be made from such timber, which is now well seasoned and for the most part practically free from knot. To utilize this material, while it is still valuable, contracts should be made with reliable men to make it into shingles as fast as possible and pay a royalty per thousand to the State for the product. There are thousands of cords of good paper wood on the reservations which should be thinned out to give the remaining timber a chance to grow rapidly. We have, likewise, a vast quantity of good young oak and chestnut suitable for producing tanning extract, which might be removed with advantage to the remaining timber.

Another source of revenue, not, however, to the State but to the agricultural community, should be considered; I mean pasturage of cattle on State lands. It is a cardinal doctrine of scientific forestry that this should not be allowed. I am not, however, prepared to take, off-hand, so ultra a view of the case. There are many instances where, in my judgment, no harm is done by the cattle. If trees are mature and the stand of timber dense enough, or if the growth is so large that the lower limbs have commenced to fall off, but little injury is done. Under such conditions, I am of the opinion that it is wiser to cultivate amicable relations with the farming community, and allow the pasturage of a limited number of cattle upon State land, providing the owners of these cattle will lend their immediate and hearty co-operation in extinguishing forest fires when these occur. I am glad to say that such a cooperation has been most happily established in portions of Clinton and Centre counties. On the other hand, I believe no one living near enough to State land to pasture his cattle upon it has any right to expect such a privilege unless he returns an equivalent to the State in the way of help, when his services are so urgently needed. In my judgment, this matter should be systematically entered upon by the contracting parties. On the other hand, no cattle should be allowed to range over ground where seedlings or young sprouts are coming forward.

Forestry is a new movement in this country. There are governments where, by long experience, a definite, permanent forest policy has been established and from which policy an ample revenue has constantly been derived. Take, for example, Germany. I find that the annual receipts from her forests are, according to Fernow, $100,000,000, or $3.00 gross and probably $1.75 net per acre, from soils that are mostly not fit for any other use, and which by being so used contribute to other favorable cultural conditions. This net income, figured at 3 per cent., would make the capital value of soil and growing stock nearly $60 per acre, and the value of the entire forest resources of Germany two thousand million dollars.
In a country where forestry is so well established as in Germany, it is noteworthy that the State of Bavaria distributed during the period from 1893 to 1899 not less than 127,000,000 tree plants. This is an example which I think Pennsylvania might safely follow. The cost of production of white pine seedlings is exceedingly small. In the state nurseries we can raise them by the million, and I think it would be wise to do so and distribute them among those who have vacant land which could be planted and who would agree to care for them until started in growth.

We have now a well-established nursery of about five acres at Mont Alto. Thus far it is devoted mainly to white pine seedlings. Last autumn we collected and obtained seed from sixty-four bushels of cones. This will be planted as soon as the snow leaves the ground. March is none too early if the ground is in favorable condition. We shall probably soon commence with the red, or Norway pine, and with the various so-called hardwoods.

The most important work which is now pressing is to have the exterior lines of the reservations surveyed and so plainly marked that no one could commit a trespass upon State land without knowing it. This line should be cut out at least six feet wide. Our rangers should ride around the entire tract at least twice a week, and follow any trails running toward State land to ascertain where they lead and for what purposes they are made.

Again, I must call your attention to the following act of Legislature. No matter what your county commissioners may say, this has never been declared unconstitutional, so far as I am informed. It is a just and useful act and you can compel its recognition if you are determined to do so. It is as follows:

AN ACT

To encourage the preservation of forests by providing for a rebate of certain taxes levied thereon.

Section 1. Be it enacted, &c., That in consideration of the public benefit to be derived from the retention of forest or timber trees, the owner or owners of land in this Commonwealth, having on it forest or timber trees averaging not less than fifty trees to the acre, each of said trees to measure at least eight inches in diameter at a height of six feet above the surface of the ground, with no portion of the said land absolutely cleared of the said trees, shall, upon filing with the county treasurer of their respective counties and with the tax collectors of their respective townships or districts an affidavit made by said owner or owners, or by some one in his, her or their behalf, setting forth the number of acres of timber land within the requirements of this act, be entitled to receive, annually, during the period that the said trees are
maintained in good condition upon the said land, a rebate equal to 80 per centum of all taxes, local and county, annually assessed and paid upon said land, or so much of the 80 per centum as shall not exceed in all the sum of forty-five cents per acre, the said rebate to be deducted from said taxes, pro rata, and received for by the respective tax collectors or county treasurer: Provided, however, That no one property owner shall be entitled to receive said rebate on more than fifty acres.

Section 2. All acts or parts of acts inconsistent herewith are hereby repealed.

Approved—The 11th day of April, A. D. 1901.

WILLIAM A. STONE.

There is one point to which I should make allusion here. In my trips through the State I find the farm buildings unprotected against the blasts of winter to an extent which is somewhat surprising, when the value of protection against the cold is so well understood. That it should have been so originally I can well see. The farm was hewn out of the forest, where trees bounded the fields on all sides. The trees were an encumbrance. The cleared area was so small in comparison with the uncleared that a violent sweep of the cold north wind was almost impossible. Now, however, the cleared areas predominate. The protecting forest area is correspondingly reduced, and our buildings need protection. In arranging for this, two methods are open. One is by planting trees which will eventually grow into lumber of a marketable size and the other is by planting such as are intended simply as a hedge. If you can adopt the former, there is a wide range of trees from which to select. Of course, if you plant evergreens, which retain their foliage during the winter, the protecting belt of timber need not be so wide. Densely planted, white pines would soon clear their trunks of lower limbs and to that extent open the barrier to the passage of winds. In other words, they would act, sooner or later, the same as the deciduous leaved trees. According to the character of the soil the oaks, hickories, chestnuts, western catalpa and locust would be the most valuable trees for your belt of protecting woodland. Among the oaks, owing to its dense mass of downward bending limbs, there is no species so valuable for purposes of protection against storms as the pin oak. It has, however, no value for lumber. If you should decide upon planting merely a hedge, I would by all means advise one of two of our native trees—either the arbor vitae or the hemlock. Both grow rapidly and both can be allowed to become twenty-five feet high and either one can be trimmed and kept strictly within hedge size—being at the same time very dense and very ornamental.
Forestry is here to stay. It is a profession. Only the wide-awake agriculturist can hope to succeed in his calling. To this end the State provides a college for instruction in agriculture. This is all right. The only fault I have to find is that the State does not provide for it as liberally as other states do for theirs. So it is with instruction in forestry. The State College is anxious to give thorough instruction in this. There is no class of citizens whose interests are more wrapped up in the water supply for the soil than you are, and there is no other known agency under our control than forests by which it can be influenced.

We desire to take lads on the Mont Alto forest reservation and give them a chance to do a good work for the State and earn for themselves a living and an education at the same time. There, in the woods, is the place to learn practical forestry. From among those lads the best will aspire to a higher education in the science of forestry at the State College.

I am not a political economist. The complications of financial relations puzzle and confuse me; but there is one fact which is so plain that even I can recognize it—to wit: The farmer produces the food of the nation. The keen business man handles it on the markets of the world and sells wheat which he never saw, by the thousands of bushels. The farmer's profit, if there is any, is a mere margin. The financiers' profit mounts up into a fortune. The farmer ends his days usually on a mere living, the latter ends his, as a rule, in affluence. It appears hardly fair that the one who produces that upon which we live, and out of which fortunes grow should receive less substantial benefits than the one who merely sells it. There are but two things which can change this and equalize the returns, namely, education and organization. You will understand, then, why I am so earnest and persistent in my appeal to you to demand for your sons an education which will fit them to compete successfully in the world's work. I can recognize no eternal fitness, or reason, which relegates the farmer or the forester to a position inferior to that of his commercial brother. There is another point to which allusion should be made here in connection with the State Forestry Reservation. It is this. The tendency of the age appears to be irresistibly toward those combinations of capital, called trusts. I am not of the number who consider these wholly undesirable. They undoubtedly do possess great power for good and for bad. In my judgment, President Roosevelt has taken, as he usually does, the sensible position that we should allow them to render all the public service they can, but curb them when by any abuse of power their tendency comes to be evil.

The large bodies of unutilized land in this and in other states
offered them a tempting field. In the natural course of events the time would have come when it would have paid them to invest in such lands at low prices and hold it against the time when discovery of minerals would have made their development profitable, or the increasing scarcity of land, due to increase of population, would have enabled them to reap large financial returns by entering into grazing or lumbering. In either case it would have passed beyond the power of the people. State acquisition of this land secures it to the people. It would be a most unfortunate thing for our citizens if there should ever come a time when the people at large would cease to have ground which was wholly theirs and upon which they could go for the rest and the recreation which are made so necessary by the accumulating demands of our busy civilization.

These reservations now belong to the people, and may the ownership never be changed.
REPORT OF THE COMMITTEE ON FRUIT AND FRUIT CULTURE.

ENOS E. ENGLE, Chairman.

It may be safely said that Pennsylvania is not realizing the full measure of its opportunity as a fruit-growing state. With a variety of soil and climate adapted to almost every kind of fruit that can be grown in the temperate zone, we find our fruit industries of third-rate importance, and, except in a few localities, where movements have recently been made towards commercial planting, no well-directed effort is being made to take advantage of the opportunities at our command.

True, we have some individual planters, especially of peaches, who, for years, have made a specialty of this fruit, and have realized handsome profits, but the so-called “peach belts” have had their rise and fall, and it is a question whether we have today as many large peach orchards in the State as we had ten years ago. Yellows, that fatal disease of the peach, has done and is still doing its work, and now, in addition, we have San José Scale and a number of minor pests and diseases which combine to make the business more discouraging than ever.

Possibly the most important of the neglected fruit industries of Pennsylvania is that of apple culture. It has been shown by experience and observation that we have a variety of soil, climate and altitude in this State that will produce not only the standard and well-known winter apples of New York and the New England States, but, in addition, many well-known local varieties, native to our own State and equal in quality to the best grown anywhere. In fact, it has been admitted by experts and the best judges of fruit, that Pennsylvania apples grown to perfection are superior in quality and appearance to those grown in the great apple-producing districts of the United States.

Notwithstanding the fact that we are not yet awakened to the full importance of our State as a producer of first-class apples, it has been stated recently in public print that in 1902 we stood third in the aggregate yield of apples for the year, New York and Ohio being first and second respectively.
In recent years the commercial idea in the cultivation of apples in Pennsylvania has made some progress. We have learned by practical experience that certain localities are specially adapted to their profitable culture, and that while some varieties will succeed admirably almost anywhere, others have local preferences of soil and altitude.

We are encouraged, therefore, in the hope that the large plantings in recent years in the counties of Bedford, Adams, York, Franklin, Cumberland, Mifflin, Juniata, Monroe and elsewhere are but the forerunners of a movement that will eventually make this one of the greatest of apple-producing and exporting states. Year by year the laws governing the principles of fruit culture are being better understood and more intelligently applied, and while there are many local conditions of soil and methods of culture that must be studied and practiced we are progressing slowly, but surely.

To succeed, we must study more closely the adaptation of varieties to localities; and above all, in the case of commercial orchards, confine ourselves to as few varieties as is consistent with a proper succession of crop and proper fertilization, while in the blossoming season. It is far better, for market purposes, to have five varieties of winter apples than have twenty, or even ten.

In fruit culture, as in agriculture, we must feed our crops that they may feed us in return. Unless we sow we cannot reap. The same intelligent care and attention given an orchard as is given a business or mercantile pursuit, or a crop of potatoes, corn or hay, will usually bring more profitable returns. But the growing of fruit is not the alpha and omega of this calling. Gathering, storing, packing, shipping and selling are equally important problems, requiring, not only intelligent judgment, but some business tact. Just here let an earnest plea be made for fair and honest packing. The market for first class fruit of all kinds is practically unlimited, and if we would establish and maintain a permanent demand for our products it must be along the line of a superior grade of fruit, honestly and tastily placed before buyers. If we would wrest from the Pacific coast fruit growers any of the prestige they have established for fine fruit, it must be done by imitating their methods in reaching the great markets.

But our possibilities as a fruit-growing state are not confined solely to apples and peaches. The same soils and conditions that will insure profit and success in those fruits will do the same with pears, plums, cherries and quinces and the entire line of small fruits. In a state teeming with cities, towns and villages, the inhabitants of which are chiefly consumers and seldom producers, there is an ever-growing demand for all these fruits at remunerative prices.

This report would be incomplete without reference to a bulletin
(No. 106) recently issued by the Department of Agriculture of this State, which is the beginning of a work that will greatly aid the seeker of intelligent information in regard to varieties and their adaptation to soils and localities. It has been prepared by one of our most intelligent and practical fruit growers and is the result of a most systematic and extensive correspondence with practical horticulturists in every section of the State.
REPORT OF THE COMMITTEE ON LEGISLATION.

BY HON. JASON SEXTON, Chairman.

Again your Legislative Committee presents its annual report for your consideration. In so doing we find that we shall, in some instances, make recommendations of measures that have been considered by you, and met your approval at former meetings of the Board, and up to the present time have failed to become laws—some by reason of failing to receive the constitutional majority on final passage, while others failed to receive executive approval after having passed finally. So, undaunted by failure, we shall again, with your approval, appear, by petition at least, before our lawmakers as the humble suppliants of their favor, trusting we shall be heard, and that some good may come to the agricultural classes through our efforts in this direction.

We fully appreciate the good work done by the Legislature of 1901, not only for the public generally, but more especially for the agricultural classes, when they passed, among other bills, the amended oleomargarine bill, the amended pure food law, the amended vinegar law, the amended renovated butter law and the new law regulating the manufacture and sale of commercial fertilizers and some others of more or less importance to the farmers of the State. Among the first of these bills that failed to pass, and that we consider of the utmost importance, is the amended act of 1897 (known as the "Hamilton Road Bill") by providing for and making an appropriation for the building and improvement of our roads that would place the law in active operation, which is now, as it stands, wholly inoperative.

Your committee, as well as yourselves, knowing the many obstacles in the way of securing annual appropriations which would be absolutely necessary when this law once becomes operative, would recommend and urge that a public road fund be created, by asking the Legislature to place an addition tax of one mill, to be collected under existing laws, on all corporate and personal prop-
property, thus creating an annual permanent road fund, to be paid over by the State Treasurer to the county treasurers in proportion to the number of miles of road in each county, and by them to be paid over to the supervisors of each township in proportion to the number of miles in each township—no township to receive a sum larger than the amount raised and expended on the public roads of that township annually. Up to the present time the great burden of constructing and maintaining the public roads has been and is now borne by the farmers and land owners of the State, and, as a result, their acres are taxed almost beyond endurance. Hence, arises the opposition and indifference that is manifest among a large class of our farmers when any public road improvement is advocated that means an additional tax to their already overtaxed acres, and, as the public roads are for the use and benefit of all the people, it is unfair to expect the farmer and land owner to assume to bear the increased burdens of public road improvement that the new and present conditions demand, and we consider it only fair and just that all classes of property and industries, some of which are paying a great deal less than their share of taxes, should contribute their just and equitable proportion toward their construction. This plan, which seems so just and right, and which passed the House as the amended road bill in the session of 1901, would create a permanent annual road fund of nearly or quite two millions of dollars, and would place the plan of "State aid" on a firm and strong basis, and beyond the necessity of the Legislature to make annual appropriations for the public roads, as well as beyond the corrupting influences that emanate from securing such appropriations. We are, therefore, unalterably opposed to any plan that does not tax all kinds of property for road purposes—are decidedly opposed to the placing of our public highways under the control of a centralized State commission.

We regret that the act passed by the Legislature of 1901 appropriating fifty thousand dollars for the erection of an agricultural building at the State College failed to become a law because of the veto of the Governor, and we most respectfully urge the members of the Board to renew their efforts to secure the passage of a like appropriation for the erection of a building at the State College, so much needed, where agriculture, including dairying and forestry, can be taught in all of their branches; and we also urge that an additional appropriation of $10,000 be secured, if possible, for the publication and distribution of bulletins and leaflets to the schools and farmers of the State for which there is so great a demand. We also desire to state, as we have done in the past, that we deem it of the utmost importance that our State College be better—far better—provided for, both in buildings and equipments, for the
teaching of agriculture to our farmers' boys in all of its branches, and instead of asking for the paltry sum of $50,000, $100,000 would be nearer the mark and should be demanded, and the present prosperous condition of our State's finances would and will warrant such expenditure if our lawmakers could only see it, and the necessity for it. We deplore the fact that our agricultural college and school should have been permitted to lag in the rear because of the lack of necessary appropriations to push forward the work. Let us hope that a more liberal policy will be adopted and such appropriations made as will place our agricultural college where it ought to be, in the front rank among the agricultural schools of our sister states. We also recommend that the Board do what it can to assist the Secretary of Agriculture in trying to secure an additional appropriation of $10,000 for the Farmers' Institute work in spreading agricultural knowledge among the farmers of the State; and, also, to repeal the law and extend the authority of the Secretary of Agriculture to publish farmers' bulletins, not exceeding 25,000 copies of any one bulletin; also, to provide that the Department of Agriculture be provided with 8,000 copies of the Annual Reports of the Department for its use. Again, we urge the Board to ask for an appropriation of $3,000, or so much of it as may be necessary, to reimburse them for money expended for their necessary expenses in attending the annual meetings of the Board.

In consideration of the fact that our country roads leading to and from the great cities and towns are being covered with a network of electric trolley lines, which, to 90 per cent. of our people, are a great convenience, we are satisfied they would be of much greater use to the farming community were they allowed to carry freight as well as passengers—it would be of untold advantage to the farmer if he could load his produce on a trolley car at his door and deliver it at his stall in the market or direct to the consumer, and that at a much less rate than he could haul it with his own team. Any service this Board can render to bring about these conditions will be of untold value to the general public and a God-send to the farmer.
REPORT OF THE COMMITTEE ON LIVE STOCK.

By Dr. M. E. Conard, Chairman.

In reporting upon the live stock of Pennsylvania at this time, we feel very much handicapped for want of more definite knowledge of changes that have occurred and are constantly going on affecting values and numbers since the last census. That the values have radically advanced we are very sure, but whether the brute population has decreased in proportion we are very doubtful. In fact, we do not think it has. We believe that a census taken at this time would show a marked increase in money values, but for want of this knowledge a correct sum total cannot be reached. The past two years have presented a remarkable combination of conditions directly affecting the live stock industry of the Eastern States. Conditions that require careful study and intelligent manipulation to accomplish the best results and avoid hardship and loss to the dairy and stock man. The shortage of the corn crops of 1901, followed by the excessively high prices demanded for all kinds of mill feed and the present short crop of hay without a corresponding increase in the prices of milk and butter has cast a shadow over the dairy business, which even though it may be and probably is temporary, has had the effect to induce every keeper of cows to take advantage, more or less, of the inflated beef market to thin out his dairy, and in some cases to dispose of the entire breed and substitute beef cattle. And now that the beef is approaching its original price this move has not proven a judicious one in many cases; but it has had the effect of reducing the number of dairy cows in the country so that the price demanded for them has advanced at least $10 per head in the past two years, making it very oppressive to the man who depends upon the purchasing of cows to replenish his herd.

The sympathetic high price of veal has done much to embarrass the rearing of graded and common stock calves, reducing to a measure the supply of home-raised stock for the dairy. We believe that dairy cattle are demanding a price at the present time, in Pennsylvania, never before surpassed, if it was ever equalled. The con-
stantly improving railroad facilities for the shipment of dairy products from remote districts makes it necessary for the eastern dairyman to compete with his western neighbor at present prices, with little or no hope of relief resulting from advanced retail prices of milk or butter. Hence, it is plainly necessary for us to apply the same business principle as do our mercantile brethren—"Reduce the cost of production."

With the price of dairy products, the prices of feed and labor are more or less arbitrarily governed by conditions over which we do not have control; the only factor left is acquirement of the cow and her productivity, and we believe that under existing conditions this is the most flexible factor in the problem, because it is, in a great measure, possible for the majority of dairymen (not all), by intelligent breeding, feeding and care to raise cows for less money than drove cows cost, and of better quality. Is there not a lack of real business methods applied in the replenishing of a dairy herd and farm stock generally? Are we not too easily influenced by local and temporary conditions?

The recent demand for beef has stimulated the demand for the dual purpose cow, such as the Shorthorn and Holstein grades, rather than the smaller and richer breeds, quantity and fair quality being the acme of perfection.

In endeavoring to procure the dual purpose cows, we wish to encourage radical crosses, as the Jersey and Holstein or Shorthorn, for a less per cent. of such crosses prove to be failures. It is much safer, in selecting dual purpose cows, to obtain animals from the larger breeds possessing this dairy type and by careful mating and feeding develop in them the desirable characteristics for the dairy. Where calves of desirable grades can be had and a portion of the skimmed milk can be retained on the farm for feeding purposes, there can be no doubt that the rearing of such cows can be made a profitable feature of the farming operations.

The reaction following the glut in the horse market is fully upon us, as can be seen by a visit to our city horse market. It is safe to say that horses have advanced in prices 40 per cent. within the past two years. The average horse known in trade as the "general purpose horse," or the "delivery chunk," which is a well-built animal with good legs and feet, making no pretense at style or action, was seeking a market two years ago at about $75, while now he is sought after at from $125 to $150 in the same market. Animals of higher grades are very scarce and demand prices only limited by the ability of the customer to pay. The necessity for us to raise our own is so evident to all that we will not take the time of this meeting to discuss it.
The scarcity of western horses to consume the present satisfactory corn crop has operated favorably to the eastern farmer who was fortunate enough to have a stock on hand for fall and early winter feeding. Prices ranged from $7.50 to $9.50 per cwt., with corn at 50 cents per bushel offered a very favorable opportunity to feed pork at a profit. We believe Pennsylvania was better provided with a stock of feeders than many of the Western states and fared well in taking advantage of the favorable market conditions.

The sheep industry of Pennsylvania does not enjoy the record of progress that belongs to almost all other kinds of live stock, but shows a decrease at the last census of over 40 per cent. since 1890, a condition that is rather a surprise.

Since it is an acknowledged fact that the live stock is the base of agricultural operations, the manufacturer of farm products into marketable commodities, is it not necessary that we should more thoroughly understand the fundamental principles of breeding, feeding and caring for our brutes. The growing and feeding of unprofitable animals is one of the greatest leaks on the farm, and how many farmers are trying to prevent this leak? What is the cause? It is not because we do not have suitable pastures, feeds and climates. It is not because we do not have within easy reach suitable animals of all the breeds for breeding purposes. It is not because we cannot find a fair market for a good animal of any breed or kind, or for her product.

Then, is it not because we do not give sufficient time and careful study to the underlying principles of breeding, feeding and growing animals so as to develop the best possible individual. The better an animal is bred and grown to maturity the better it will pay for its cost, be that what it may.

Now, Mr. Chairman, we do realize that much credit is due to the Director of Farmers' Institutes for his untiring efforts in enlightening the dairy farmer and stock raiser. But we do wish to impress upon the Director of Farmers' Institutes the growing importance of employing on the institute force an increased number of men who are well prepared to discuss with the farmers of this State "Animal Husbandry" in its various phases, and by their enlightenment, dispel from their minds the prevalent impression that breeding is a lottery, and assist them in proving to themselves by actual experience that reasonable, definite result will follow intelligent breeding, feeding and care.
The season of 1902 has varied in different parts of the State and has had its influence on the different cereals and cereal crops accordingly.

Wheat that was sown early in the fall of 1901 has been good and yielded a fair crop; the average that has been reported to the chairman of the committee is about twenty bushels per acre of the early sown wheat. That which was sown late has not done so well, which will bring the general average lower. Many of the farmers in the fall of 1901 deferred seeding until late to avoid the ravages of the Hessian fly, but, unfortunately, the rainfall was light and the ground dry. Wheat that was sown late did not make a good growth and was not in good condition to winter well. The winter, being open, had its effects upon it, especially the late sown wheat and rye that did not have a strong growth of plant, and much of it was injured and winter-killed and many of the fields did not yield near the normal crop.

The quality also was poor in many cases, the fly having got in its work where the wheat plant was not well established and strong. Wet weather, in many instances, had its effect also on the quality; some of the wheat was rushed in before it was dry enough and was mow-burned and did not come out in good condition; others was injured in the field by the rains that came frequently and wet and bleached it, and some sprouted; therefore, the general results in some parts of the State was not satisfactory.

Oats were a good crop, with average above normal; quality also reported good. Some counties report straw unusually good, as long as wheat straw, and well harvested and will furnish much rough feed for stock this winter.

Of rye, the average acreage was very low, below normal and not much grown. In some of the eastern counties it was grown more for straw than for the grain. When put up in nice bundles, straw brings one dollar per hundred pounds in some of the eastern markets.
The corn crop was good, especially in the eastern part of the State. Some of the counties are reported to have had as fine fields of corn as ever grown; other sections of the State, the reports came not so favorable. Some of the corn was frozen down and could not be cultivated properly on account of wet and cold weather in the early part of the season, and the corn did not mature properly and much of the late corn was poor and did not get solid. Some of the counties reported yield above the average; others below. So the general average for the State was about normal.

Buckwheat was not much grown. Some reports indicate about one-half crop.

Grass was a very light crop the past season. In the spring the stand was unusually good, but dry weather set in about the time grass should have made its growth and continued until time for cutting, consequently the crop was very light, with a good proportion of weeds when haying time arrived. So the average for the hay crop is much below the normal.

The winter wheat is in good condition at this time. The fall was favorable, even that which was sown late, having made a fine growth and covered the ground well and the general outlook for a wheat crop is good for season of 1903.

Prospects for grass crop are not so good for coming season. The drought before and about harvest time last summer was very injurious and burned out the young set grass in wheat stubbles in many parts of the State. Some fields do not have any grass on them and will be plowed up for corn and other crops.
It gives me pleasure to be able to say that floriculture is in a most thriving condition, as to the demand—this includes cut flowers—as orchids, roses, carnations, violets, lily of the valley and many other cut flowers. Calla (Richardiææthiopica) are being grown in greater quantity now than in the recent past and find ready sale, so also the same may be said of the brilliant red bracts of the poinsettia pulcherrima. Neither of the two last-named flowers are new, as both were popular twenty or thirty years ago; they later became "old-fashioned" and were considered out of date. Now, old-fashioned flowers are attracting attention again.

The calla and poinsettia are, however, so easily multiplied and grown that the supply is very likely to quite soon exceed the demand. The calla, sometimes called "calla-lily," but botanically it belongs to the Arum family, and is not a lily at all—is grown almost altogether as cut flowers, its peculiar white spathe appealing intensely to the esthetic. The brilliant scarlet bracts (leaves) which surround the insignificant inflorescence of the poinsettia are very popular for Christmas and New Year's Day decorations; everything of a bright-colored nature being more in demand at that season of the year, both as pot plants and cut flowers with long stems. When used as pot plants the poinsettia gives greatest satisfaction, propagating late, say in July and August, and a number of the small plants are placed together in a pan nicely arranged as to size, the larger being planted in the center and smaller ones graded down to the sides.

The difference between a pan and a pot is: The flower-pot in general use is about as deep as it is broad at the top, whereas, the pan is much more broad and shallow in comparison. Pans are becoming more popular each year, as they conform so readily as an ornament, when filled with living plants, to the dinner table.

One of Philadelphia's more prominent retail florists grew 6,000 poinsettia plants for his own holiday trade in Philadelphia at his
The greenhouse establishment in Delaware county, this State. Callas are being more generally grown, though not in such large quantity in any one place.

The tendency in the building of greenhouses is towards a greater permanency in the use of galvanized iron and steel entering into the structures wherever practicable, and the greenhouses are being built much larger now than formerly; especially does this apply to the width and the height of the houses; especially is this the case in which to grow roses. Several advantages are claimed for these wider houses, one of which is the more uniform diffusion of light. This latter point applies more especially when the house is to be used in which to grow the American Beauty rose for cut flowers. In the greenhouses built formerly the maximum width was twenty-six feet, and after the plants have a luxurious growth of five or six feet high, densely clothed with its dark green foliage, it is then the house appears dark and it is dark from a growing viewpoint.

A wholesale flower market was organized in Philadelphia, November 1, 1902, capitalized at $20,000, where it is expected the growers’ product will be distributed among the retail florists of that and other cities, the object being to centralize this part of the business as far as possible.

Floriculture in its various branches is attracting outside capital, as it is found that a large establishment is much more economically and profitably operated than a small place, costing less for heating and labor—two of the most important items in running greenhouses. These growing establishments are best located outside of the larger cities, where the air is more pure and where the shipping facilities are ample and adequate for rush orders. The ideal place, generally speaking, would be on a hillside, facing the south or a little east of south, and convenient to a railroad station, so that the hauling of coal, manure and other freight would be convenient, but far enough removed so that the smoke from the locomotives would not darken the glass. It is better that pot plants should be grown within city limits or easy of access, as they are more bulky and are best delivered by the growers’ own teams and teamsters.

There is no falling off in the demand for palms, ferns, azaleas, etc., for decorative purposes and home adornment, and the floriferous French Begonia Gloire de Lorraine as a pot plant has been found to be a great help at Christmas time, when the supply of the better class of cut flowers is not equal to the demand, as it gives more general satisfaction than the same amount of cash spent on cut flowers alone would do.

As a note of warning, allow your committee to say that if there were enough flowers for all demands at Christmas time there would

be a glut at other times, excepting possibly at the other floral festivals of the year, as New Year’s day, Easter and Thanksgiving day.

In conclusion, the coal strike has affected the profits of floriculture very materially during the present year, more, perhaps, than any other industry. But if it should bring about the use, in some way, of the millions of tons of culm now apparently going to waste in the coal regions it will prove a blessing in disguise.
PAPERS READ AT THE ANNUAL MEETING OF
THE STATE BOARD OF AGRICULTURE, HELD
AT HARRISBURG, PA., JANUARY 28 AND 29,
1903.

THE RESPONSIBILITIES AND DUTIES OF STATE BOARDS
AND TEACHERS OF AGRICULTURE.

BY PROF. L. P. ROBERTS, OF CORNELL UNIVERSITY, ITHACA, N. Y.

Upon whose shoulders rests the responsibility of promoting agricultural knowledge throughout this great Commonwealth? This question is both fair and pertinent at this time. Fair, because the leaders in agricultural thought and the officers or members of your various distinctively agricultural organizations and teachers are largely responsible for the conditions of the rural population and the productivity of your arable lands. A few score men have been chosen as leaders. The multitude will not—cannot—be expected to go faster nor farther than those who have been placed at the head.

The question is pertinent because I address a large body of gentlemen who have been selected because of their fitness to manage the various agricultural associations, with the sole view of teaching the people, trusting thereby to promote and improve the agriculture of the State. You are to originate, plan, and, so far as possible, see to it that your plans are carried out. You hold the power, since you are organized, hence the private individual is not likely to originate or push any new scheme however worthy. If you do not act promptly and energetically you simply block the way.

What is the character and extent of the work the State has handed over to this and similar organizations and the teachers at your agricultural colleges? It may assist us in our efforts to understand the responsibilities, if the number and value of the farms and the chief agricultural products of your State be set forth in figures.

According to the last census there were, in your Commonwealth, 224,248 cultivated farms. Premising that there are as many families as farms and that an average family consists of five persons,
there are 1,121,240 persons living on farms. It is safe to estimate that four-fifths of these are old enough to receive instruction. In round numbers, there are one million persons on farms capable of receiving instruction relating to their calling. In addition, at least, ten per cent. of the urban population is greatly interested in the growing of plants and animals. In 1900 there were produced in this State 117,810,192 bushels of cereals. You owned 871,565 horses and mules, more than a million and a half (1,541,135) sheep, over a million (1,265,327) swine and nearly two millions (1,997,192) of neat cattle, one-half of which (1,022,674) were dairy cows. The value of the principal crops exceeded one hundred and twenty millions of dollars. The value of the hay and forage crop alone exceeded thirty-seven millions of dollars ($37,514,779). The vegetables were worth nearly sixteen million dollars ($15,832,904), and the value of animals sold and slaughtered was more than twenty-seven million dollars. Is agriculture worth the liberal attention of your Legislature?

But the census report does not set forth many of the incidental products of the farms. For instance, if there were 224,248 farms, it may be presumed that there were an equal number of gardens planted when the census was taken. Who would take less than $10 for his planted garden in June? Then, each year, there are $2,242,480 worth of property in the farm gardens of the Keystone State.

In 1896 there were mined in the State 40,600,000 tons of anthracite and 36,000,000 tons of bituminous coal. In 1900 there were mined of both soft and hard coal 79,318,362 short tons. What the average price was of this coal f. o. b. at the mines I am unable to discover. However, this matters little, since it will be but a comparatively short time when the value of mined coal in your State will be nil. A conservative estimate places the unmined coal at eight billions tons and the end of this great industry of your State at 100 to 150 years hence. The agriculture of your State will then be in its infancy. If the soil be kindly treated and intelligently tilled for a long time to come its productivity will steadily increase and the products of your farms, at no distant day, will be more than doubled. If you are wise, by the time the coal beds are exhausted the seamed mountains should be covered by umbrageous forests and the black, bleak, bare hills be clothed in sylvan beauty. Life will then have become normal and man will be found worshipping in God's first temples not made with hands.

Who is to set the legislative wheels in motion that the reclothing of the mountains and hills be begun and in time completed? If this distinguished body of men does not undertake the work no one will. Must we wait until much of the most valuable land in
the valleys is washed to the mouths of the rivers, where it fills the estuaries, before anything is attempted? Must floods and tornadoes devastate the State again and again, and yet again before remedial action is taken? Does the responsibility for prompt action rest with this great organization?

Professor Fernow, of Cornell University, the highest authority on forestry in this country, says: "The supply of timber will not last another thirty years, and even immediate adoption of proper methods of management could not insure long continuance of the supply at the present rate of consumption, which is 25,000,000,000 cubic feet a year. While it is now too late to avert wholly the calamities which follow forest destruction, there is yet time to modify them. What is left of the virgin forests should be protected and cared for and wanton destruction prevented. Few people realize what the consequences of destruction would be. It means that fertile valleys will become wind-swept, torrent-scarred deserts, and vast areas, now productive, will become incapable of supporting human life.

The coming generation will realize all this and wonder that its predecessors were so foolhardy."

Pennsylvania embraces 28,937,600 acres. It is said that one-fourth of this area is covered with the mountains of the Appalachian system, in round numbers 7,000,000 acres. These seven million acres should be covered and kept covered with forest growth.

It will cost something to reclothe the hills, but there is always money enough in a great state like Pennsylvania to carry on and carry out all vital undertakings. What is too often lacking is self-sacrificing, courageous, intelligent leaders. The tree which will bear abundant and precious fruit must be planted by some one. We cannot gather grapes from thorns nor figs from thistles. The rising generation must have ample opportunity for securing advanced and technical training. It cannot set the educational machinery at work. Our children are benefited by the work begun by their ancestors. Where, in all your broad State, can a student go and receive such instruction as will fit him for the management, care and economic development of forests? How many students in your agricultural college are fitted to make an agricultural or soil survey of the State? How many can intelligently advise the farmers as to the best location for orchards, or the best varieties of fruits for any given locality? How many teachers are there capable of teaching the farmers' boys how to keep accounts? Is there a single farmer in the State who can tell from his accounts, accurately kept, whether it is most profitable to rear swine or sheep or produce milk? If not, why not? Because adequate provision has not been made for giving instruction in the principles and practice of account-
ing. Can you imagine any complicated manufacturing industry that could go on for more than a single year without finding out which of the particular branches of the undertaking was carried on at a profit and which at a loss? An establishment may manufacture iron, wire, nails and screws. If, like the farmer, only one single entry book or no books at all were kept and they never took stock or an inventory, the windows of the factory would soon be covered with boards kept in place with their own screws.

The activities on most farms are as many and far more complicated than are those carried on in an ordinary manufacturing establishment, yet on the farm guess-work is substituted for facts. The farmer begins in the spring by guessing it might be well to plow up the old meadow or plant the back lot to potatoes and the front lot to cabbage. In a week he begins to guess that he will not plow the meadow nor plant cabbage. He has no well-matured plan for the year nor for the years to come. Why? Because he is like the small child, ignorant for want of intellectual training. Like the child, he is usually helpless because of his ignorance due to lack of opportunity and inspiration. Again, like the child, he is selfish. Selfishness is the legitimate fruit of ignorance or a lack of training, hence farmers cannot be induced to co-operate. Each wants his own corn harvester when one would do quite well for a half dozen corn raisers.

Who is to blame? Why, the leaders and directors of your educational system. We have been attempting, metaphorically, to train a few boys so perfectly that if by any chance they should fall into the water it is hoped they could swim. Would it not be better to put them into the water and teach them how to swim? They would certainly get the same technical training and more certainly acquire the art of swimming. Why will we persist in educating one boy’s head and another boy’s hands and produce, too often, two monstrosities. The former will despise the latter, and the latter will hate the former. Mistakes of the past rest with the leaders in education; the mistakes of the future will rest with you.

In a similar manner, what is transpiring in the forest domain which I have tried to describe, is taking place on most of your farms. True, here and there, a farm is being conducted more rationally and more profitably than formerly, but for one acre so managed there are many that are steadily growing less productive. Who is to arrest this depletion of the soil if the leaders are timid and hesitating? What did your distinguished and able Governor say a few days since? "Whatever tends to bring about an improvement in the condition of the masses of mankind and assists in their cultivation and elevation is an advantage to the State and should be encouraged." And, again, he says, "I suggest that the Legisla-
tute consider the propriety of imposing a slight tax on some of the
products of the State, the proceeds to be applied to the betterment
of her roads."

These are wise words, but if it is not presumptuous I would sug-
gest that a tax of one-tenth of a mill be levied on all taxable prop-
erty of the State, the proceeds to be expended for the promotion of
agricultural knowledge. We sometimes complain because the pro-
ducts of the west glut our markets and not infrequently we at-
tempt to disparage this section by calling it "the wild and wooly
west." Iowa levied a tax of five mills on all taxable property for
the maintenance of one institution—her state agricultural and me-
chanical college. Would that the East might get a little "wild" and
grow even a short crop of "wool," which would be better than
none at all.

Have the rural citizens of the East lost their pride? Do they pro-
pose to stand aside and let the Western states, born when you were
an old Commonwealth, outstrip you?

These words apply to New York as well as to the State which
keys the arch. The assessable property of this State is $3,528,585,-
578. A tenth of a mill tax would yield $552,858.00, and would mean
that upon each thousand assessed valuation a tax of ten cents would
be levied.

Is such a fund necessary and could it be put to a good use? If
the great masses interested in rural pursuits are to be taught
many teachers will be required. But a teacher cannot teach ac-
ceptably unless he has been taught. Then, somewhere, there should
be a central college or university devoted, among other things, to
training teachers. In this democratic county there is no good
reason why a college may not offer instruction in primary subjects
related to agriculture, thereby giving opportunity for the girls to
secure a better knowledge of cooking and of the English language,
and for the boys to study those subjects related to the art of hus-
bandry and English, and for other boys and other girls to take such
advanced courses as will make them equal in training and in a
knowledge of the sciences and languages to the graduates of the
so-called literary colleges. The leaders in agricultural affairs will
never be equal to the leaders in other professions until they are
equal. And to be equal, they must receive instruction, training,
discipline and development corresponding in quantity and difficulty,
though not exactly in kind, to that received in our great univer-
sities, training equal to that required for entrance upon other
difficult pursuits and professions of life.

If all amounts to this—there must be wisdom shown in outlining
and planning equal to the vastness, intricacies and far-reaching
character of the work to be undertaken. When the work is planned
then ample funds must be provided for carrying on the work. "There is that scattereth and yet increaseth and there is that withholdeth more than that is meet, but it tendeth to poverty." Write in large characters over the doors of every building devoted to the training of farmers—Millions for improving the farms and the farmers but not one unjust cent for the millionaires.

This is fair, for from time immemorial, except for the last few decades, almost nothing has been done for the greatest industry the world has ever known.

"That art on which a thousand million of men are dependent for their sustenance, and two hundred millions of men expend their daily toils must be the most important of all, the parent and precursor of all other arts. In every county, then, and at every period, the investigation of the principles on which the rational practice of this art is founded ought to have commanded the principal attention of the greatest minds." No matter how large provision may be made for investigation and instruction in agriculture it will take a hundred years before the rural population receives full educational justice.

Naturally, your people have paid most attention to the iron and coal industries. From now on agriculture should receive most attention. In three generations your coal will be nearly or quite exhausted. That means that the iron and many other industries will languish. It means that new fields will be sought where fuel is abundant. It means that there will be twice as many railways as can find profitable employment, unless they can be employed in carrying agricultural and forest products to the sea-board for exportation. But will there be any timber forest, or will your forest furnish only a meager supply for fire-wood?

If you practice farm mining, as too many are now doing, the land like the mine will be measurably exhausted in a century. But if reciprocal farming be practiced then the soil will remain in its place and be productive for untold centuries. But you will say that agriculture is not as profitable as many of the other industries. I think that this is true in many cases and this because farming is not rationally carried on. As I write these lines I find on my table two letters from which I make brief extracts:

"We have had about fifty one-half blood winter lambs. Have been shipping some time. The price is so good I wish I had a few hundred more. I purchased the farm just across the road at $140 per acre; have been offered $160 for it. I picked 1,640 barrels of apples from the orchard on the farm purchased and 1,350 barrels from the home orchard. I sold these 3,000 barrels for $6,000. I am not anxious to sell my farms at any price." Another man on the extreme end of Long Island one hundred miles from market
raises on a modest size farm $20,000 worth of garden products, at a cost exclusive of land rental of $10,000. These are only two cases out of many which might be cited to show that trained effort applied to agricultural pursuits brings abundant reward.

Finally, let me say, prompt action should be taken this winter, here, and now to preserve and improve your forests, to furnish facilities for a better and fuller training and education of the rural population, especially the youthful part of it, that citizenship may be elevated and that the arable land may be increased in productivity. This means that a fuller and more comprehensive education must be offered the farmers' children. In my own State the forces are already gathered at Albany. Some of our lawmakers talk not in thousands but in millions. Schemes are on foot for securing appropriations for a multitude of objects, some good, some bad. I presume conditions are much the same in your own State. The best organized forces push the hardest and get the most. Are your various organizations united as to the total and separate wants of the people you represent, or is each organization skirmishing for itself; if so, the three other leading industries are likely to secure the lion's share.
THE SOUTHERN COW PEA AND ITS PROBABLE PLACE IN THE AGRICULTURE OF THE MIDDLE STATES.

By Prof. W. F. Massey, Horticulturist of the North Carolina Experiment Station and Editor of the Practical Farmer of Philadelphia, Pa.

The great problem that has for years engaged the attention of thoughtful farmers on all the older cultivated lands in the country, is how to restore and retain the humus which long cultivation has taken from the soil, and the loss of which has resulted in a more difficult mechanical condition and a greater tendency to suffer from droughts. This is particularly an important matter in the South, for in the southern uplands the original supply of humus has always been smaller in the North, and the continuous cultivation of the soil in the cleanest culture practiced, that of the cotton crop, has deprived the soil of what it had. In the open woodlands of the southern hills the wind in winter blows the leaves off into the bottom, while in the north the snow falls and packs them in place to decay there, so that when first cleared the southern uplands have a thinner coating of vegetable matter than those of the north. But in all of our older cultivated lands the great deficiency is humus. Not that humus, per se, makes the soil fertile, but that it enables the plants more readily to reach the food at hand through the better mechanical condition of the soil which it causes, and especially is it valuable as a retainer of moisture for the solution of plant food in the soil, and enabling the crops to better tide over the droughts that are becoming more and more common as the forests are cleared away and, finally, as a form to retain nitrogen still more available. An ardent advocate for commercial fertilizers some time since advised writers on agricultural matters to "give humus a rest," and insisted that a lavish use of commercial fertilizers was all that is necessary for the profitable production of crops. The statement showed simply how little the man knew of the conditions for the successful use of the commercial fertilizers. These fertilizers do not furnish any humus-making material as a stable manure does, and if we had an abundance of the home-made manures there would be little deficiency in well-manured soil in this respect. But, unfortunately, few farmers, if
any, are so well situated that they can keep up the humus supply in their soil through the use of barnyard manure alone. They cannot get enough of it.

Farmers, in the practical working of their farms, have often discovered facts and left the explanation to the scientists. Long years ago they found that a clover sod plowed under did, in some way, not only supply the soil with humus, but that it actually increased its productivity through the accumulation of organic nitrogen. How the clover did this was for many years a subject for discussion, many farmers imagining that the plants absorbed ammonia from the air. In fact, it is not yet proved that plants cannot or can get the use of the ammoniacal gas in the air. Dr. Gray used to say that he could not see why they could not, but admitted that it had never been proved that they did. It was not until the students of pure science took up the matter that it was discovered that not clover alone, but many other plants of the same botanical order did get the free nitrogen from the air and locate it in the soil in the form of organic matter capable of nitrification. It was found that this work is being done through certain micro-organisms which live parasitically on the roots of some legumes, for it was found that unless these were present the legume had no power to get the free nitrogen. It is still a matter of speculation as to what the exact process is through which these microscopic plants get the nitrogen. But for all the purposes of the farmer it is sufficient to know that they do, and under what conditions they do get the nitrogen. The wonderful adaptation of the processes of Nature to the needs of humanity is well known here. It is well known that green plants, as a rule, take nitrogen through their roots only when it is presented in the form of a nitrate of some base in the soil. It is also known that when the nitrogen has gotten into this form it readily escapes from the soil in the drainage waters. Hence, the importance of the way in which the legumes get and keep the nitrogen. It is not simply an oxydation and formation of nitric acid and, hence, a nitrate left in the soil, but an absorption of the nitrogen and its location in the organism of the plants, where it must subsequently go through the process of decay and be acted upon by the micro-organisms of nitrification before the nitrogen becomes available to plants. This is evidently a provision of Infinite Wisdom, so that the crops of the succeeding year can get the use of the nitrogen fixed in the soil by the growth of the previous season. Were it simply a nitrate left in the soil, there would be little of it for the next year's crops.

Learning, through the labors of the men in the laboratory, the uses of these micro-organisms which live on the roots of legume crops, the farmer has at hand the greatest of means for restoring
the humus to his soil and at the same time supplying the needed nitrogen while growing crops to feed his stock with the most expensive part of the ration, the protein, and at the same time give him supplies of the richest manure.

The great forage and fertilizing crop of the Middle and Northern states is, and probably always will be, red clover. It is a plant well adapted to the climatic conditions in these states, and fits into the usual rotation of crops better than anything that could be adopted in his place. In the South the case is very different. From Virginia southward clover succeeds only in the mountains and Upper Piedmont sections and on a clay soil. In the warm, sandy soils, common in the cotton belt, it is universally a failure. What I have to say, therefore, in regard to the southern pea does not mean that it ever should be adopted in the Middle states as a substitute for clover where clover can be grown well. My first experience with the cow pea was in a beautiful limestone valley in Northern Maryland but a few miles south of the Pennsylvania line. Its luxuriant growth there, and the large amount of forage of the finest kind made from it, caused me to believe that in certain conditions the plant would become valuable far north of where it had generally been grown. Going then to the improvement of a large farm in upper Virginia right at the foot of the Blue Ridge, I again tried the cow pea with the most gratifying success. One spring, having lost my clover over a large field of wheat through an untimely frost when it was germinating, I determined not to resow the clover so late in the season, but to use the cow pea after the wheat had been harvested. This was done, and the result was the heaviest crop of peas I had ever seen. I then began the study of the curing of the crop as hay, and I soon found that a modification of the method I had been using in the curing of clover hay was equally good for the pea vines, and that the only difference was that the peas needed to remain outside longer than the clover. And it is one great advantage which the pea has over clover that it is very little injured by rain on it while curing. I found that my pea vine hay was a very superior article for my cows, and in fact was better than clover hay, for I found that through its aid I could dispense with the purchased bran that I had been using largely. Since that time a number of the Experiment Stations have taken up the same investigation, and have all arrived at the same conclusion I reached over fifteen years ago, that with the cow pea we can grow the needed protein for the cattle ration while growing a plant that helps the soil on which it is grown.

When I moved further south, I was surprised to see how little attention was being paid to the cow pea as a forage crop and soil
improver in the very section where it reaches its greatest value. I at once determined to wage a fight for the cow pea in the South. What I said and wrote on the subject attracted great attention also in the north, and farmers began to experiment with the cow pea far north of where I ever thought it could possibly succeed. What I was endeavoring to do was not so much to extend the culture of the pea northward as to get the southern farmers to realize its value and to understand what could be done through its aid in the improvement and restoration of their worn lands, and thus to get them into a more systematic method of farming for cotton or tobacco. But here and there, all over the north, men claimed to be succeeding with the pea and considering it of great value to them. In Southern Illinois, where clover has gotten to be very uncertain, the cow pea is now a staple forage crop with the farmers. Two years ago a farmer up in Wisconsin wrote to me that he had ripened 100 bushels of the peas and last spring he wrote that he had made contracts with seedsmen to grow 1,650 bushels the past summer, as they assumed that peas grown that far north would be better for northern conditions. A dairyman in Southern Vermont wrote that he had found the pea indispensable, and that with it he was able to do without buying bran. And yet, in the high mountain plateaus of North Carolina west of the Blue Ridge, where the farms lie 3,000 to 4,000 feet above the sea, the cow pea does not thrive to any profitable extent. The nights are too cool and the soil too heavy for the peas. It is noticeable, so far as I have been able to observe, that in any place north of the fortieth parallel if the pea is a success it is on a warm, sandy soil and at a slight elevation above the sea level. Under other conditions it may make a fair growth in the warmest part of the season, and may pay as a summer pasture when grass is dry, but as a forage and hay crop I hardly think it can be a success north of that line on a heavy, clay soil and in a mountain section where the summer nights are cool. When I first began to advocate the use of the cow pea, the editor of a paper published in the Cumberland Valley tried to ridicule what I had written, and said that the cow pea had been tried in Southern Pennsylvania and had proved a failure. Now, where that editor lived there has been great success with this pea. A few years ago, when I was temporarily visiting a town in Eastern North Carolina the first of July, I found a farmer gathering ripe peas and preparing to plant a second crop from the seed. I begged him to plant all that he could, for I felt sure that a pea that would ripen in sixty days from the planting of the seed was the pea that I had been looking for for northern planting. He did as I asked, and I got a Philadelphia seedsmen to introduce the pea under the name of Warren's Extra Early, and it is this pea that is being
ripened in Wisconsin and Michigan. There is no doubt that the cow pea, like Indian corn, has a great capacity for gradually aclimatizing as it is brought slowly north. Years ago we sent to the Delaware Station a great many varieties of peas. Among them was one known in the south as the "Unknown" and "Quadroon," and recently renamed the "Wonderful." This is one of our latest peas, and when brought to Delaware it ripened very few peas, but since then Dr. Neal has told me that it regularly ripens a full crop. Several years ago I had a letter from a farmer in Iowa. He said that he moved there from Southern Missouri, where he had been accustomed to the Black Eye pea as a table vegetable, and thought he would try them in Iowa. He got some seed from Missouri and planted a row in the warmest part of his garden. Of the whole row but one plant matured three pods. These he saved and the next summer planted in the garden and every plant ripened a crop, showing that it was getting aclimated. The following summer he planted three rows along side his corn field. That summer there was a severe drought and the hot winds nearly destroyed the corn crop. A neighboring stockman came over to his house one day to console over the loss of the corn crop, and he showed him the rows of peas growing rankly and of a dark green color. His neighbor begged him to save every seed, for, said he, "that plant will be the salvation of this country in a drought." In Kansas, further south, the crop is being grown with great success and is highly esteemed. These localities, though north of Pennsylvania, with the exception of Kansas, have different soil and climatic conditions. In the eastern part of the Middle states the mountain sections come in with a climate very different from the lower country, and conditions less favorable to plants that need hot summer nights. But it is evident that in such locations in the Middle states, where the soil is light and warm, and the nights are hot enough to give corn its best condition, the southern pea can be grown with success as a forage crop. The investigations of scientists have shown that the nitrogen-fixing power of the legumes is in direct proportion to the amount of available nitrogen in a combined state in the soil, and that where the soil has a large store of available nitrogen these plants will not go through the more difficult method of getting it from the air. In other words, it would seem that the nitrogen-fixing is better done in a soil very poor in nitrogen. But in such a soil it is difficult to get clover to grow at all. And here comes in an advantage of the cow pea in the fact that it will grow in a soil far poorer than clover will. From various sections we hear that it is increasingly difficult to get a stand of clover as they once did. In such cases the cow pea stands ready to help. It has been shown that acidity in the soil is detrimental to the growth of clover be-
cause the microbes will not thrive in an acid soil. But the cow pea delights in an acid soil, and is damaged by a direct application of lime. Of course, in most instances, where the soil does not lack fertility, an application of lime will restore the conditions which clover needs, but in other cases it may be an advantage to use the pea in building up the soil, for the growth of clover for the organic matter it furnishes will make the application of lime for the clover more effectual. The south does not need clover, since the southern farmer can, with the pea, accomplish all in a few short weeks that the northern farmer takes two years to do with clover. As a quickly grown source of forage of the finest kind, and of nitrogen for the soil, there are few plants that can equal the cow pea where it attains its best development.

Now, as to its place in the agriculture of Pennsylvania and other states in this latitude. There are large sections of the State of Pennsylvania in which I would never advise the farmers to waste time and money in experimenting with the cow pea as a forage and hay-making plant. The elevated mountain country, with the heavy clay soil will present conditions that will always result in a small growth and an unsatisfactory crop. But all along the southern tier of counties south of the fortieth parallel, from the mountains to the Delaware and in the lower Susquehanna Valley, there are thousands of farms where the cow pea can be used as a forage crop to great advantage. Not, as I have said, that it can ever, or ought ever, to supersede clover, but to come in as a supplemental crop to save a legume growth when clover fails, as it often does. Then, too, there are other sections of the State where the pea can be used as a summer pasture to enable the farmer to tide over a drought and save his grass from utter destruction. If pastured before blooming, the pea can be eaten down several times during the summer, and there is no pasture that will give more or better milk. I once pastured down a piece of peas in the Virginia mountains three times during one summer. If an early sixty-day pea is used, there is nothing that will make a finer hog pasture in the fall, when the peas are ripe, and the hogs will need little corn to finish them off after being taken from the pea field. Where the conditions of soil and climate are favorable to a strong growing vining variety, like the large Black or the Clay, they will make the finest of hay. The large Black and the Clay from North Carolina seed ripened seed at Cornell some years ago, while seed of the same varieties from the far south failed to ripen, showing the adaptation of the pea to climatic conditions. There is no one point in regard to the cow pea about which there is such a diversity of opinions as the making of the hay. The general opinion in the south is that it is very hard to cure, and one sees all over the south
all sorts of contrivances for this purpose. Some stick up bushes all over the field to hang the vines on to cure. Some make scaffolds of several stories of fence rails and put a thin layer of hay on each shelf. The result of all these contrivances is that they finally get a lot of dried stems and lose the leaves, the best part of the whole, and what they get is of an inferior quality. I long ago came to the conclusion that unless we could cure the hay in a more business-like manner and in a more economical way, we could not afford to make it at all. I began experimenting with it many years ago, and soon found that the same method I had been using with clover was equally well adapted to the pea hay, provided some allowance is made for the ranker growth and heavier stems. For thirty years I have had no difficulty in making the finest of hay from the cow pea as easily as from clover. But, to show the difficulty of getting men to properly apply a method of practice of any kind, I have gotten numerous letters saying that the writers had tried my method and that the hay had moulded. The only answer I could make to these men was “come and look at the hay in my barn, which was cured as I advise, and is not mouldy but sweet and green in color.” Telling farmers how to cure legume hay is somewhat like telling men who have had no experience how to grow mushrooms. I can grow mushrooms easily and with certainty, but I never knew a man to take directions for growing mushrooms and make a good crop with the first effort. The trouble in making legume hay of any kind comes from the fact that no two crops are in precisely the same condition, and there are variations in the weather, so that the farmer needs to know how to handle the crop under various conditions. I told one farmer this season that my pea vine hay was put in the barn the third day after cutting it. He wrote to me afterwards that he left some of his out six days and then it moulded in the barn. He had doubtless let it lie and heat in the cocks, which I never allow. I cut my peas as soon as the first pods turn yellow. The tedder follows the mower, and keeps the vines tossed during the day. Cutting in the morning only, I rake the vines into winrows in the evening. These are turned and dried the next day and cocked. The following day, if I find that I can take a handful of the hay, and, with a hard twist, can see no sap run to the twist, the hay goes in the barn that afternoon. But if not yet ready to stand this test I turn every cock and remake them, and never haul in till the hay stands the twist and is free from any external moisture. Once in the barn I let it alone. It will heat some in the mow, and if then stirred it will be sure to mould, but let alone it will cure perfectly whether the barn is shut or open. With a little common sense and judgment a farmer can soon learn the conditions on which success de-
pends. In fact, I have gotten so used to making good pea vine hay that it seems to me about the easiest hay made. And yet, nine men out of ten all over the South will tell you that the great drawback to the pea hay making is the great difficulty in curing it. Last summer we had a series of institutes in the western Piedmont country of North Carolina. I invited the farmers when they came to attend the State Fair at Raleigh to step across the field adjoining the fair ground and look at the hay made as I advised. Our Commissioner of Agriculture, who was with the party, said that I was taking a heavy risk, as the hay was yet to be made. I told him not to fear, and when the fair came on I had the pleasure of showing the hay to more than one doubter. I enter into these details because there are a great many locations in this State where the hay can be profitably made and used. But the greatest use here for the cow pea, and the great use it will be in the greater part of the Middle states is as a fertilizing crop direct. No matter if the season is too short for the peas to ripen, the dead vines will bring more humus-making material on the soil at a slight cost than you could haul there for years in manure, and it will be gotten there in a very short time. In sections where the hay can be secured I do not consider it good farm economy to use so valuable a food crop simply as manure, but where it cannot be matured for hay it is well worth growing as a fertilizing and humus-making crop. Another fact in regard to the cow pea is worth relating. A farmer in Illinois wrote to me that he had a field of peas caught by frost and killed before maturing. He turned a bunch of cattle on dead pea vines, and they got fat on them before the snow came. Where the vines do not mature for hay they can be profitably fed off after they are killed.

For the farmer in the Middle states then, the cow pea comes in as a catch crop to take place which a failure of clover has left vacant; as a means for providing a summer pasture to tide over a drought that makes the grass short and worthless, for it will flourish under droughty conditions when most other plants fail; as a plant to put in the hog lots and make cheap pork, and finally as a plant to gather nitrogen from the air and restore humus to the soil even where it fails to ripen seed. Then, too, as a pasture where it has failed to mature and dead vines are still valuable food on the ground.

While the cow pea can never attain in the Middle states the importance it does in the "Sunny South," where it more than takes the place of clover, there are still many ways in which the Middle states' farmer can use the pea at times to great advantage, though it must always be regarded as supplementary to clover, and by no means as a crop that can supplement the hardy perennial legumes like
clover and alfalfa. The oft-repeated talk about clover sickness is usually the neglect of the conditions that are necessary to make clover a success. I once took charge of a field that was reputed clover sick. It was a fertile limestone soil, and tests showed that it was acid. I gave it a liberal dressing of lime and got as fine a growth of clover as I ever saw. Therefore, while I have for the last forty years been an earnest advocate of the cow pea I have never lost sight of the fact that with the conditions in the north clover is the most natural and best recuperative crop. But even in the Middle states there are extensive areas of thin, sandy soil, where clover is always a scanty growth till the soil is improved to a condition to become favorable to it. On such soils the cow pea is a boon. It will make a fair growth on the poorest of soils, but if supplied on these soils with a liberal allowance of phosphoric acid and potash it will make a luxuriant growth and furnish the means for getting the soil into condition for the growing of clover. On the sandy soils of Middle and Southern New Jersey the pea flourishes almost as well as it does in its southern home, and gives the farmers and gardeners there means to improve their soil, which they cannot so well nor so easily or quickly get through clover. On the fertile soils of Southeastern Pennsylvania the pea makes an enormous growth, and is more difficult to cure into hay. But when cut with corn into the silo it will make of the silage a fairly balanced ration and a most valuable food for dairy cows, and can be made, as experiment has shown, to take the place of purchased protein for the dairy. When dairymen come to fully realize that they can grow their protein by the use of crops that improve the soil on which they are grown, the days of exorbitant prices for mill feed will be over, and those who are still compelled to buy protein will get it at a more reasonable price because of the growing of it by those having land suited to the purpose. These facts have been demonstrated by carefully conducted feeding experiments at several stations. The farmers in the mountain country of Pennsylvania may possibly get some pasture from the pea in dry weather, but in clay soil and a region much elevated above the sea with a clay soil it will usually be a waste of effort to attempt its use.

It may be said that I have said nothing about varieties. These, in the South, are almost innumerable. The plant has broken into a great number of varieties differing in the size and color of the seeds and blossoms and in the habit of the plant. Some make long vines running flat on the ground, and, hence, difficult to use as hay. Others are of the habit of the ordinary bush bean and make a smaller amount of forage, though generally a heavy crop of seed. Some ripen in 60 days from planting, others in 70 days and others run nearly to 100 days in maturing. The original species has been
banded about from one genus to another till it is really hard to say what the original species is. A few years ago I made an effort to find out what the original species is. I got from Australia Dolichos catiang, from Ceylon Vigna catiang, from Japan Vigna sinensis and from China Vigna catiang. Each and every one of these was what we know in the South as the Black Eye pea. I assume, then, that the Black Eye is the original species and that Vigna sinensis is probably the correct name. But it is well known in the south that there is no pea that varies less than the Black Eye, for it almost invariably comes true to type in plant and seed. It is, therefore, hard to account for the great number of varieties that have appeared unless there has been some crossing with other species, and this has probably been the case. But whatever the cause there are certainly widely variant classes of the cow pea. There is a group of peas, all having seed of a jet-black color, but in speaking of the Black pea it is well to distinguish between black peas, some being bush-like in habit and others twining freely. What is grown in Virginia and North Carolina as the Large Black is the best type of this class. It is a free climbing variety and makes a large mass of tangled forage which is hard to harvest. It requires fully eighty days of hot weather to mature it. One of the most popular varieties in Illinois and other parts of the Central West is the Whippoorwill. This has red speckled seed, is more dwarf in habit than the Blacks, makes a smaller crop of vines, but a large crop of seed. It ripens in about seventy days from sowing, and hence is adapted to a wider range than the Black. The Clay pea is of about the same character and season as the large Black. The most popular variety in the south is the one long grown there under the name of the Unknown and also as the Quadroon. This has, of late, been renamed the Wonderful. It is the most erect of a grown in its early growth, though it runs freely later and makes an immense crop of vines. But the erect habit of the lower growth makes it easier to harvest than the Black or Clay. It is entirely too late to mature in the north, though it has been accli-
ated to Northern Delaware, but as a pasture plant it is probably the best that can be used. I mowed it twice the past season, the second growth from the stubble giving a fair crop about the first of November. Recently there have been developed several varieties which mature in sixty days, none of them heavy vine makers. I have mentioned the Warren Extra Early, which is a good type of the class. A few years ago I received from Arkansas in early July some large Black Eye peas, which the sender said had been grown that season. I planted them on the 13th of July and gathered them ripe on the 13th of September, showing that the claim as a sixty-day pea was well founded. The New Era is an-
other newly introduced sixty-day pea, which is highly praised by
those who have grown it, but I have not tried it. The Stewart, or
Calico pea, is similar in habit and season to the Black and Clay.
Its seeds are mottled white and pink. There are a host of other
varieties in the south differing mainly in the size and color of the
seeds and the colors of the flowers, some being orange and some
purple. In all the lower tier of counties in Pennsylvania south of
the fortieth parallel I believe that the large Black pea will succeed,
at least east of the mountains. The Whippoorwill will succeed
there and in warm soils further north. For hog lots for feeding
down when the peas are ripe, the Whippoorwill, Warren, New Era
and the Early Black Eye will be the best, and they can be used on
warm soils far north of where the running varieties would succeed.
For pasturage I would use the Wonderful as giving more feed,
but hardly maturing seed in any part of the State. For hay-making
in the warmer locations the Black and Clay are the ones to use.
Perhaps in the extreme southeastern part of the State the Delaware
seed of the Wonderful may succeed, and where it does there is no
hay-making variety equal to it. It must always be remembered
that the cow pea is a hot weather plant and should not be sown till
the ground is well warmed. I have often been asked if cow peas
and oats could be sown together, like the Canada peas and oats
are sown. The question shows how little some realize of the
nature of these plants, for cow peas sown when oats should be would
perish, and oats sown when cow peas should be would not amount
to much. June 1st is as early as any cow pea should be sown. I
trust that I have made my purpose plain. It is to warn against ill-
judged sowing of a plant not suited to the conditions of soil and
climate, and to suggest ways in which a valuable food can be added
to the agriculture of the Middle states.
MARKET GARDENING AND THE MARKETING OF PRODUCE.

BY HON. R. F. SCHWARZ, Anadomink, Pa.

Three conditions must primarily be considered by him who intends to enter the business of market gardening and small fruit growing. They are: First, "Soil," second "A suitable market," and, third, "Physical as well as mental energy of the man behind the gun, or, in other words, the man who carries on the business."

As to soil, while all land used for the market garden and the strawberry bed ought to be smooth enough and sufficiently clear of stones to permit the use of the most improved labor-saving tools and implements, both horse and hand, the market must, to a great extent, influence the selection of soil. If the market requires the production of early vegetables, it is evident that a cold clay soil would be unsuitable, but that a light, sandy loam would be needed; while, again, if the market can most profitably be supplied with later varieties in their most perfect development, a good, strong soil, clay or heavy loam, would be best. That gardener who, with a steady market, can combine these two soils in his land purchased for his garden would naturally have the best equipment.

Soil alone does not, however, make a garden nor must it be supposed that a heavy application of manure and fertilizer will make a garden out of an ordinary farm field in one year. It takes some years of heavy applications of both manure and fertilizer, and constant working and deepening of the soil to produce the ideal condition of soil suitable for the production of ideal and, therefore, most profitable crops. Quantity alone is never an indication of success. Quality, and the best quality at that, must be, or ought always to be, the star toward which the wise business gardener travels.

Few except those long in the business realize the enormous quantities of manure and high-grade fertilizers needed in the successful pursuit of market gardening. Almost all failures of novices in the business, and I have seen the financial death throes of scores of men who entered it with hearts full of hope but with an exag-
gerated idea of its financial results and with no realization of the amount of capital needed, have been caused by the spreading of their store of manure and fertilizer over broad acres, when by applying them to more restricted areas they could have been successful. What success has come to me in my adopted calling I ascribe to the fact that by reason of poor health my start was on a small scale. This was twenty-eight years ago, and I had but one-fourth of an acre in cultivation. On that I learned that the capital needed for the purchase of an acre of ordinary farm land ought to be duplicated and quadrupled for the land's final successful preparation for a market garden, and if I have to-day something over forty acres in cultivation, the increase has come only by slow annual growth and gradual addition to my domain. My advice to all beginners, whether already owning farms or whether ready to invest in land purchase has been and is to start on a small scale. They will then gradually realize the requirements of plant food by the various crops, and learn that fine, juicy, tender, crisp and palatable vegetables can be grown only where the plant finds a never stunted supply of food and is never checked in its growth by hunger or by want of cultivation. Just try it on a beet to convince yourself. Grow a beet under the conditions I specified and grow one on a poor piece of land; you will find the one tender and sweet, the other tough and stringy. The more rapidly vegetables grow, the more high quality they will possess and the greater will be the demand for them where their quality is known.

I have not named "thorough cultivation" as one of the conditions first given, because I believe that to be covered in the subject of "soil." While on land newly devoted to market gardening the owner may, because of the shallowness of the top soil, not be able to plow deeper than six or seven inches, he ought in a very few years, by turning up an additional half inch or inch of the sub-soil per year, or even both in spring and fall, be able to set his plow at ten or twelve inches. Few farmers seem to realize the difference in drought resistance between deeply and shallowly plowed soil.

The plowing should be thorough and the harrowing still more so. Do not think that harrowing the land just once to make the surface level is the kind of harrowing needed to prepare the soil for the hairlike rootlets of the sprouting seed as well as of the growing plant. Pulverize! Pulverize!! Pulverize!!! using, if possible, several varieties of harrow so as to get the soil worked over and over and made fine enough to go through a sieve. Clods have no place in the soil economy of the garden, and where they exist a perfect seed bed does not exist.

No man can afford to invest in quantities of fertilizing material and, after applying this to his land, counteract its beneficial effect by want of judgment or energy in cultivation. From the time the
Sprout bursts through the earth till it is by reason of advanced growth impossible to further go through the rows, beginning with the wheel-hoe of lightest construction and, where possible, ending with the market gardeners' horseshoe, with its various suitable attachments, the soil should never, unless it be too wet for beneficial work because of a rainy spell, be allowed to be without a layer of protecting mulch of fine soil. Those who presevere in this and insist on it will be surprised to find how little need there is for the hand hoe, a tool which, under present conditions of the labor market, is the most expensive implement used in gardening. The development of tools specially fitted for the work at hand has been great, but the necessity for them by reason of labor scarcity and cost is still greater, and no man can afford to be without them in the market garden. As when speaking of harrowing the soil, I would say: Cultivate! Cultivate!! Cultivate!!! Don't wait till the weeds get ahead, and weeds of luxuriant growth will appear where conditions are right for the best growth of vegetables, but kill your weeds by constant cultivation before they get above ground.

Where, then, so much expense is involved in the feeding, preparation and working of the soil it must be the business and the gardener's special endeavor to make his soil produce more than one crop during the season. Where early peas are grown, cabbage, cauliflower or celery ought to follow; the early cabbage patch ought to produce a crop of horseradish, and the second and third early cabbage patches, if not planted in horseradish, should be made to give crops of spinach or turnips. Two years ago I realized $200 clear from one and one-quarter acres of spinach following cabbage. Early beans may be followed by a second crop of beans or by sweet corn or tomatoes for late use or by celery or late cabbage.

The strawberry acres are my early sweet corn field, the same work which keeps the corn in trim also making the clean bed for the strawberry runners. The next spring, as soon as picking is done, the bed is plowed under and used for cabbage or celery, thus virtually making the strawberries a catch crop in between. This has proved particularly profitable and successful.

Where plantations of asparagus or raspberries are made they should, for the first two years, be interplanted with cabbage, beans, peas, potatoes or sweet corn, or in fact with any crop in single or double rows which may be salable. The early celery, after handling, is interplanted with later celery and so on. I have not the space in this paper to enter into the details of these plantings, but simply want to impress on the gardener's mind the idea that while, so to speak, he must gorge the soil's stomach, he must also insist that the soil shall gorge his baskets, crates, barrels and wagons with the largest possible amount of choice produce.
There is where the physical and mental energy of the man behind the gun should make itself felt. The moment one crop is harvested no time should be lost, the weather being all right, in getting in the next crop. If my last picking of peas is done by noon I make the effort, not always successful it is true, to have that piece of land plowed, harrowed, fertilized, furrowed and planted in cabbage, cauliflower or celery before night. Plants set in fresh-plowed soil, even in an ordinarily dry time, will be apt to take root quickly. All this work should, of course, be planned ahead and unless sudden weather changes compel an alteration of your plans, every laborer, when he comes to work in the morning, should have his day's work laid out for him. I employ fifteen hands, but even if I go out in the wagon at three or four in the morning, my foreman can, from my work paper, prepared the evening previous, place every man at the post intended for him. System is necessary as much in a market garden as in a large business house.

As to the marketing of produce, I can give but little advice, because conditions are so vastly different in various localities. Few gardeners can make a profit if they are obliged to ship all their products to commission men, and yet some do make money in this way because of the name they have established for the quality of their produce. They are the people who thoroughly understand that it pays to use nice clean packages, containing the same quality or size of produce all through the package. No topping off with high quality goods to hide the scrubs in the lower layers! Pack cleanly, neatly and honestly and you will find a market. But—and here is why I claim that the gardener must also, or in fact first, be a business man—you can in almost any neighborhood or along the line of any transportation company establish a market for your produce without the aid of commission men.

Where you can reach your market by wagon the question is easily solved, the gardener's main care being the choice of men or kind of men he puts in charge of his wagon or wagons. Running four wagons throughout the summer season, I know this difficulty and the constant watch and care necessary. The only safe way is to go with each of your men once in every week or two and you will soon know from your customers whether a man is a good or bad investment for you. It is, however, only in exceptional cases that you can get the right kind of man without paying the right kind of wages.

Where wagons are run, a system of checking, not always used, but always available, ought to prevail, so that none of the men know just what trip may be checked off. To do this in my business we prepare pads on which is a complete list of all the fruits and
vegetables carried on our wagons at the time. Right after this list come four columns for the various routes, headed, 1, 2, 3, 4. The man running each route puts down the day before the quantity of each article of produce he thinks he can sell, so that looking down his column you can at a glance tell of what his load consisted. After the day's gathering is done one man then divides the loads as nearly as possible in accordance with the list, sometimes adding and sometimes deducting from the given quantity, according to the supply on hand, but always marking the change on the original list, so that this list shows every article on the wagons. The men are required, in their wagon books, to specify sales, and it is then easy, after the wagon's contents, if any, are checked off on its return from the route, to compare the sales in cash and account book with the original list and find out just how much of each article has been sold, and how much is unaccounted for and chargeable to expenses, to carelessness or even to dishonesty. Even this leaves some loopholes, but they are not of great seriousness.

Where shipment by rail is necessary to find the market the gardener should take example of larger business concerns who send out traveling salesman, and should himself go once a year to his possible shipping points and endeavor to get what might be called the store trade. By doing this I have succeeded in establishing a trade from the smallest village to the largest cities in my reach, which keeps me busy filling orders at fair prices and is worth some thousands of dollars annually in my total sales. Of course such trade will not stand overcharging nor the shipment of inferior produce.

Railroad facilities, of course, control this trade but then no business man ought to establish a business in a locality where there is no demand for his goods. In my case I can ship by freight peas picked before 11 A. M. and have them in the grocery stores for next morning's trade. Or I can pick strawberries by noon and have my customers receive them by express by 4 P. M. in time for supper trade, or ship at 7 P. M. for next morning. Yet I do not consider my railroad and express facilities ideal. Some gardeners may have better chances and a good many worse.

In conclusion, I have tried in this short paper not only to warn the novice by pointing out the laborious and arduous task before him, for his work will require, so far as he is personally concerned, not a nine or ten-hour day, but during the season, an eighteen or twenty-hour day, but I have tried to give him some idea of the capital required, and I hope that I have also been able to incorporate some suggestions of value to the older brothers of the fraternity of market gardeners and small fruit growers.
With the new year comes new plans for the future. Air castles they may be, yet, nevertheless, they are important inasmuch as they are periods of inspiration, the times that urge us forward to better endeavors. How many there are among us planning this year, either to better the home surroundings or build an entirely new home, and how many thousands are arranging to leave the crowded cities and find a home in the suburbs, or perhaps build a country home, with its business connected therewith, for the time has come that the farm is no longer run on the slip-shod principles of the past, but now with better understanding as to its requirements a larger profit is obtained therefrom. Can anything be more ideal than such a home when conditions are right? True, it savors of labor, but in what is there more pleasure than in honest labor that we take a daily interest in. Here is the secret of successful poultry raising, for the successful poultryman is the man who loves his business. It needs the spirit of enthusiasm to make the self-made man a successful man of to-day, I care not what his pursuit.

There is nothing that will contribute more to the comforts of a family occupying such a home as I have suggested than its flock of poultry. Village, town and city folks have no business to keep poultry unless they are willing to give them the decent and necessary attention consequent upon keeping poultry in limited areas. As I pass through sections of the country it gives me great pleasure to note the improvement being made everywhere in the matter of thoroughbred poultry. The good work goes on and those who have been giving their fowls the care and attention they merit are beginning to reap the rich reward of time well spent and labor well done. It is an impossibility for any one to get a corner on the chicken market or have an over-production as the result. The breeders who start with good foundation stock, well and carefully mated, properly looked after and cared for are the ones who make

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a success in the business. The man who makes his poultry raising a side issue never sees the importance of the careful attention and many little things that are so very necessary to observe to secure success. The regular poultry raiser who looks after the comforts of his flock doesn't sidetrack his hens, for he knows success hinges on little details, and there are scores of them that combine to form the cog-wheel of success.

One man will keep a large flock in health, and they will be very productive though they are kept in a small space. The owner of the flock is continuous with his attention; he provided conditions that the restricted quarters rendered necessary. He is keen in his observations, in fact gives the occupation intelligent study. If he increases his flocks, he knows he must increase their accommodations. Another man goes in on the trust-to-luck plan. His surroundings may be very favorable for a small flock of thirty or forty hens. They do comparatively well. He is pleased. He increases his flock to double the number, making no change in their accommodations, and soon he is crying "There is nothing in raising poultry." His hens are neglected, so that the larger flock soon becomes unsightly. It can well be seen, therefore, that if a man is not successful in poultry raising the hens should not be blamed.

Select the breed best adapted to your object and market; and there is a wide range. Many advise that each person breed and rear whatever variety they like best, and while we believe every person possesses the inalienable right to do so, yet we also know the sale of fowls is restricted unless one breeds a variety that somebody else wants. Few, if any, continue in a business that is not attended by commercial success, and in order to make a financial success, one certainly must be able to make their income exceed their outgo, therefore, when one is depending upon the purchasing public to aid in their success they must of necessity produce an article or product that is desired by others as well as that to which they incline.

We shall not attempt, except in a general way, to tell how the various foods, appliances, etc., are made. They are generally prepared and for sale by those who have made an exhaustive and sometimes expensive study of that particular phase of the business, and in purchasing from the manufacturer or dealer one is not only saved a great deal of trouble and waste but receives the benefit of years of perhaps costly experiment and the advantage of large capital in the production and preparation, for it must be understood in the very beginning that to produce eggs in winter certain preparation and arrangement is absolutely necessary, that certain foods, aids to digestion, material for the formation of the shell and its contents, as well as the support of the general system must be
provided on the same general principle and for the same reason that the winter gardener provides certain surroundings and artificialities in imitation of the proper seasons, plant foods, etc., with this difference, however, that the preparation to keep hens for winter-laying should not entail anything like the expense incident to winter gardening. The latter requires artificial temperature and light, a constant expense; but heating of this kind is not necessary with winter-layers—in fact, is rather to be rigidly avoided. Many, very many, utter failures in the general poultry business can be laid directly to the use of artificial heat and glass. No greater mistake was ever made as to general principles.

The building of the houses is one of the most important things in the poultry business to make poultry profitable. In my travels among the poultrymen I have seen houses of every shape and kind. I have seen those that cost $5 for each fifty birds and those that cost $500 for the same number, homes that were almost palaces and those that were hovels. There are extremes in everything. We have found, in the inspection of these houses of different make, that the low house, with little head room, is where we find the healthiest and best plumaged birds. We have also found in the inspection of different houses where the most were hooded, the birds have come through the winter of the north in best condition. A very safe and practical house for general purposes, is one 20 feet long and 10 feet wide and 3 1/2 feet at back and 7 feet in front, the ends and back being of single ploughed and grooved pine boards, with a hemlock board roof covered with tared paper. In the front is a board one foot wide on top and bottom, and the balance of the front being frame covered with heavy ducking, and the frame, or door is hinged at the top so as to be opened up on the inside. The nests are at the back of the house and are hooded with heavy ducking, and this hood should be dropped down every night. Do not sell your foundation stock when once you gained a victory and your stock is good; it is unwise to sell or dispose of the seat of success. Do not sell your winning birds unless you are sure you have a better one to take the place.

FERTILE EGGS AND INCUBATORS.

Eggs are seeds; seeds are eggs. Both are propagators of their kind, producing an offspring identical to the parent; for the greater is included in the less. If the parent be strong and healthy the offspring will have the same qualities, provided, in the case of the artificially produced chick, that the conditions are proper for its development. This much is generally known and recognized. But most people fail to recognize the fact that weak, unhealthy parental stock produces weak, unhealthy offspring, regardless of the incubator, should it succeed in hatching, but generally it has not
sufficient inherent strength to develop, and ekes out its supply about hatching time or about the eighteenth day. "Weak stock produces weak eggs." Button-hole that. Some stock produces weak offspring because they were from weak parents themselves; other stock produces weak offspring through improper food, shelter and care, while it is caused in others by disease. In-breeding, when recklessly done, is a sure cause of degeneracy, with its disease and impotency, but when carried on with a point in view it is a good thing. In-breeding simply intensifies characteristics, be they either good or bad. One of the best possible rations for a chick, whether reared under hen or in brooder, is what we call dry ration. It is the nearest approach to the natural diet of a fowl possible to attain. This method calls for all dry food, such as rolled wheat and oats, small broken corn, rice or grain of any kind, small seeds and beef scraps mixed; to this should be added small grit of some kind. The beef scrap should be of good quality, that has been properly prepared and nicely ground. This kind of food can be greatly improved by the addition of some well-broken peas and beans, and a little properly prepared clover. The peas, beans and clover furnish the vegetable and green food, the rest the grain seed and animal portion of their diet, giving them a most perfectly balanced ration. Should it be preferred to add to this a mixed food, it should be thoroughly scalded; if cooked or baked, so much the better, for this takes away the unnaturalness of the food. But little trouble from feeding is experienced when this method is followed. Those who follow this system have but little trouble when care is given to the proper mixing of the food, but when carelessly done and too much of one kind is fed at one time, its good results are lost. Nothing can be more injurious to a chick than too much millet seed; while a little is excellent for them, too much is almost sure destruction; the proper amount of prepared beef is beneficial, too much quite the opposite. All these facts show the necessity of care in feeding. Another fault is in giving sour feed. Some may mix up a lot of raw meal or other ground grain and leave part of it until next meal. The result may be bowel trouble. Don't do it. If you must feed raw stuff, be sure to mix it up fresh every time. Only mix up just enough and not too much. If you leave meal wet it sours very quickly, in the course of a couple of hours. Never feed any meal that is musty or decayed. Any kind of grain or feed not in good condition should never be fed to fowls or chicks. Musty grain or meal has likely lost some or perhaps most of its valuable qualities. Any food not in first-class condition is liable to cause some derangement in the chick's life and bring on disease. The best is none too good. The best alone will favor rapid growth and good development. A good way is to bake the ground feed.
Take a mixture of meal, bran, ground oats, etc., mix it with milk and bake. A very little salt and some soda may be used. The result is something that may be kept a couple of days and does not need to be mixed every time you feed.

Wheat, cracked corn, millet, etc., are good feeds after the chick is older. Begin to feed these after the chick is a week old. The quantity may be gradually increased as the other feed is left out. Never feed too much. A little and often is a good rule to follow when the chicks are young. Feed five times a day when beginning. After three weeks they may be fed only three times a day.

A hen will turn grass into greenbacks if she has the right kind of backing on the part of her owner. She will turn corn into gold if too much is not expected of her, and she is not given too much corn to convert into the yellow metal. This is a growing industry and people are going into and out of it as the years go by. Men and women are seeking their level, and they find it sooner or later. Some have to quit the business to find this level, but in the meantime others will double the capacity of the business. No costly machinery is needed in carrying on the poultry business, and there are no shares of stock that need watering. The hen is the machine, and she needs but little water, and that should be fresh. Trusts that have endeavored to control her output have gone a-glimmering, and she has developed such powers of mixing animal and vegetable matter that she has set even her owner to thinking along this line. The one thing that stands most in the way of profitable poultry production is the failure to fully understand the needs of the hen. We are coming to it slowly, and each year a few more are added to the ranks. The use of clover hay as part of the ration for hens has become quite general. Almost everyone who pays attention to a winter egg yield feeds more or less clover. Ground clover is used as a part of the mixture for the mash. In some cases too much is given in this way, in other instances not enough. When the amount thus made use of is out of proportion it makes a mash that is not enjoyed by the hens, and for this reason it is best to limit the use of ground clover or clover meal to that amount that seems most attractive to the hens. Have the mixture in the mash so that the hens will enjoy it and eat it up readily, and, in addition to this, give them cut clover hay to pick and scratch amongst so they will eat all the clover leaves they need. The hay should be cut quite small in a cutting-box and thrown amongst the straw for them to help themselves. Clover is admitted to be most useful as an egg-producing food; at the same time it is only a portion of a desirable ration. It is quite possible to give too much of it, but not probable; more frequently they have too little of such food, and for this reason we urge a plentiful supply of cut clover hay as above stated.
To keep hens healthy and laying well they must have exercise; and this is best induced by scattering straw or chaff four or five inches deep over the floor of the poultry house, and then throw the whole corn into the straw and let the hens work to get it. This straw should be changed at least once a week or often enough to keep it clean. Feed in the morning a warm mash of one part ground oats and corn and two parts wheat bran. Twice a week add one part buckwheat bran, and once a week add a little oil cake meal and powdered charcoal. At noon feed whole wheat, oats and buckwheat. In the evening give whole corn, about all they will eat. Be sure the fowls have plenty of clean water to drink. If the weather is very cold, warm the water and empty all drinking vessels at night so as not to allow water to freeze in them. Supply plenty of grit and crushed oyster shells, and a dust bath in some sandy corner of your poultry house.

Always feed your hens as regularly as possible. Save the table scraps, mixing these with the morning mash. A little raw beef twice a week should also be fed. For green feed, nothing is better than cut clover, steamed and fed in the morning. When the ground is not covered with snow allow the fowls the run of the yards.

The one great stumbling block that stands in the way of success with poultry, as in everything else, is a lack of application. There is not a season but what some new experience is met with and new ideas are constantly presenting themselves. Hence, only the closest of application will enable one to master the details of his own work and make it that success and to bring those results that we are all searching for. And so it is from mating to the fittting of a good bird for the show room. Hard work and plenty of it, and constant work is necessary to get good results.

No one can jump into success without proper training and schooling. You have got to go through the same experience that others have gone through. You have got to learn the same lessons that they have learned, and must bump up against the same mistakes and difficulties that have taught them what to avoid and what is invariable and must be done. Brilliancy cuts no figure. Hard work and close application on the part of a veritable "chump" will attain a degree of success that inactive brilliancy can never hope for. Look around and note the successful business men in your community. They are the constant workers. There are others in the same line that are more brilliant and had better opportunities, but the persistent and aggressive "hustler" is the man that gets there every time. It may have taken him longer to learn than it would the more brilliant man with the same application, but when the brilliant man stopped to fuss with something outside his business, the "hustler" was making headway and he never stopped.
but kept gaining ground and today he stands in the front in your community as a successful and prosperous man. So it is with the poultry business. If you wish to succeed, go to work with both hands and do not stop or relinquish your effort until you can enjoy the distinction of being at the front. The time to commence is now, and the time to stop is never, for this whole world is progression and there is no limit and no end.
HOW TO MAKE REASONABLY SURE OF A SUCCESSFUL CROP OF POTATOES ON A HEAVY LIMESTONE SOIL.


When I speak of raising a successful crop of potatoes on a heavy limestone soil, it is because I never had an opportunity to grow a crop of any kind on a different soil. I was born and reared in a section of country which is limestone land altogether for miles around, and ever since I had the pleasure of managing a farm had to contend with such. As many of us know, it is naturally rich in plant food, but easily compacted, being underlaid with a clayey and sometimes gravelly or sandy sub-soil. It becomes very hard when dry, frequently forming large cracks when an insufficient supply of moisture is present to keep it from shrinking. All intelligent farmers who have made a special study of potato growing, and who have had experience in this line, are very familiar with the fact that such is not an ideal soil for growing potatoes, and that looseness and richness of soil and a plentiful supply of soil moisture, continuously during the growing season, are absolutely required to insure success. Hence, it is that an abundance of humus or humus-forming material, such as decaying organic matter, becomes such an exceedingly valuable adjunct in the formation of an ideal soil for this purpose.

It has the property of making the soil mellow, porous and permeable to air and water, which aids decomposition of the mineral matters, thus making plant food soluble; it fixes ammonia that would otherwise be carried away by heavy rains, and increases the water-absorbing and moisture-conserving capacity of the soil, all of which are features that will prove to be of the utmost importance when trying to make reasonably sure of a successful crop of potatoes on a heavy limestone soil. With considerable experience of almost twenty years, I am fully convinced that the potato crop should have its place in a rotation where it will immediately follow a crop of clover, or clover and timothy mixed, if you please, cut once for hay.

This should be cut rather high, however, thus leaving much more vitality to the plants, which, under such conditions, will not only
start new growth much quicker, but will become much more luxuriant than if cut too close, in which event, in case of a prolonged drought immediately following, new growth would naturally be very feeble and come along very tardily, or perhaps the plants would perish altogether for want of energy. This second crop should be left to grow uninterruptedly, or if absolutely necessary to be pastured, to be done cautiously and very sparingly, so as to have it grow as rank and form as much top growth as possible, before the end of the growing season. During the early or late fall this amount of vegetable matter should be supplemented by a heavy coating of manure, thus forming a massy cover which will protect the soil from all danger of losing fertility during an open and severe winter. Such a covering will also largely contribute towards still further improving the physical condition of the soil; thus, instead of diminishing, will increase its fertility, not only from this source, but through the plant food contained in the manure as well, and when finally turned under, will, in connection with the myriads of strong and fibrous clover roots already in the soil, produce such a vast amount of humus-forming material that the potato crop following, with proper treatment, can not help but thrive and yield to the highest degree. I have always found it advantageous to plow such sod as early in spring as the proper condition of the soil would permit. This will prevent the stores of soil moisture, which are always present in early spring, from becoming dissipated by evaporation, thus being retained for the future use of the growing plants. Then, again, turning sod and burying vegetable matter when it is still in a dormant condition, causes it to break up, decompose and become available as plant food much more rapidly than if left to green and toughen before being buried, which is another great advantage when a quick-maturing crop is at stake. Potatoes, being deep-rooted plants, and the tubers having to form and develop within the soil itself, special care should be exercised to have the plow run as deep as possible without bringing up too much of the sub-soil, and have it cut as narrow a furrow slice as it is capable or inverting properly.

This will break up and disintegrate the furrow slice to the greatest possible degree. The jointer is a valuable adjunct, and should be brought into service by adjusting it so as to run deep enough to completely bury all trash and vegetable matter and still further improve upon the disintegration of the furrow slice. This will admit of proper surface tillage without disturbing the sod, or being hindered by the buried surface matter, and will require much less work to secure a perfect seed bed. As soon as the plowed land is sufficiently surface-dried to prevent it from packing, the roller should be run over it to level it down, thus closing up crevices
and cavities underneath, which otherwise would tend to cut off the moisture from working up into the surface soil. Such an operation will also make it comparatively easier for the implements of surface tillage to do perfect work, and will increase the water-holding power of the soil. The spring-tooth harrow is a good implement to be used after the roller, and should not be spared until the soil is thoroughly pulverized to almost the depth plowed, and until it has attained the proper tilth and texture necessary for a growing crop of potatoes to do its best. For common field culture, medium early potatoes planted not later than the 25th of April always gave best results for me. A variety that is naturally inclined to grow vigorous, heavy stalks, with such an abundance of leaf surface, when full grown, as to cover and shade the ground between the rows to the greatest possible extent, is the most desirable and will generally produce the heaviest yield. The ground being thus shaded, the hot rays of the sun and the drying winds will be more or less excluded, and prevented from licking up the soil moisture so requisite to transform organic matter into available plant food, and convey the same into the living plants, not to mention the effect it will have in smothering the young weeds that would otherwise be tempted to grow up and rot the potato plants, both of moisture and of plant food.

However, to still further promote my chances of securing a crop attended with such characteristics, I usually apply a complete commercial fertilizer, especially rich in potash and nitrogen, with a fair proportion of available phosphoric acid.

I want to emphasize the fact that you can hardly furnish your potato crop with too large an amount of plant food, providing it consists of the three principal ingredients, balanced in conformity with the requirements of the crop.

For the last five or six years I always had my fertilizer mixed at the factory, according to a formula of my own, furnishing a guaranteed analysis of 1 per cent. nitrogen, $7\frac{1}{2}$ per cent. available phosphoric acid and 10 per cent. actual potash. The nitrogen is equally derived from nitrate of soda and high grade dried blood; the phosphoric acid from dissolved South Carolina rock, and the potash from high grade sulphate. The nitrogen will furnish an ample supply of immediately available plant food to push the growth of the young plants onward until the more slowly acting organic nitrogen, in the form of dried blood, becomes available, and will carry their thrifty growth to the end of the growing season. Sulphate is preferable to muriate of potash, inasmuch that a large percentage of chlorine or common salt is combined with the latter, which exerts a very deleterious effect on potatoes, by impairing quality and uniformity of size.
An application of 400 pounds to the acre is about the minimum quantity that will produce good results, while about 800 pounds will possibly be the most profitable on land prepared as already described. Because of having had a number of miserable failures by the use of small potatoes for seed, I have, for the last ten or twelve years, used nothing but well-formed, large and medium-sized tubers for this purpose, and since then have had not one crop that could be termed a failure. Seed should be cut down to contain not less than two or three eyes, exercising care to divide the seed ends, as far as practicable, without having too little flesh remaining to the seed pieces. They should average not less than an inch in diameter either way, when cut, and a little larger still would, in the majority of cases, prove to be an advantage, as it largely conduces to the vitality and vigor of the starting young plants before the formation of a perfect root system to sustain them by seeking nourishment elsewhere. We should make absolutely sure to keep seed from sprouting before planted, as that will tend to materially weaken its vitality, and if a proper storage room is wanting, where the temperature can be kept down to at least 37 or 38 degrees, the better plan is to shovel them from one place to another with a wire shovel at least once a week from the time they show any signs of starting to grow until taken to the field and planted. Not only have I found by experience that you can restrain them from sprouting by such a treatment, but that the latter will have a quickening influence upon the growth of the potatoes, making them equally as vigorous after being deposited in the soil as would be the case if previously kept in a temperature sufficiently cool to retard growth without the shoveling process. My custom has always been to change seed about every third or fourth year, even if I wanted to use the same variety, as there is no other farm product that will sooner deteriorate or respond more favorably to a change of seed than that of the potato. No matter what precautions have been taken, they will deteriorate in spite of everything. When I change I generally procure my seed from a more northern locality, where the climate is colder and the soil different. Planting single pieces of potatoes, properly cut, about four inches deep and thirteen inches apart in rows thirty-four inches apart, in soil made ideal as per instructions already given, after much experimenting, has proved the most profitable for me, the object being to have just enough between the rows to admit of proper inter-tillage and yet have the rows close enough together to make it possible for the foliage of the growing plants to cover and shade the ground completely, for reasons already stated. When a large acreage of potatoes is to be planted, the planter of the present age can be used with advantage. I have been using it continually for
almost two decades, giving universal satisfaction. It deposits the seed at a uniform depth and in a perfectly straight line in the row, thus admitting of closer cultivation to the young plants and does away with the costly labor of dropping and covering by hand. My planter has two sets of coverers, and the plow, through which the seed is to drop to the bottom of the furrow, is so constructed as to open the upper half of the furrow sufficiently wide to admit of the coverers to run inside, thus utilizing the moist, pulverized soil to the lower half of the furrow for the covering. The front coverers are so adjusted as to cover up the seed with about an inch of this soil, on top of which the fertilizer is evenly distributed through a fertilizer attachment. The rear coverers following add another inch, thus covering up the seed, with only about two inches of this moist, pulverized soil all told, still leaving a depression of several inches in the row when finished. This light covering of the seed admits of air and light putting in their effective work, by forcing the eyes of the seed to send forth strong, stubby sprouts, a feature which means much to the potato crop in its later stage of growth. My method of proceeding after this is to wait until those young shoots have nearly all appeared above ground and are plainly visible through the row, but not of sufficient height to bend over under the pressure of another covering, which generally requires about eighteen or twenty days after planting. The soil that was pushed aside in opening the furrow will then be drawn back and the depression filled in again, thus giving the seed another covering of about two and a half inches, forming slight, broad ridges. If you don't like to do this, I would advise you to do it anyhow, simply shutting your eyes while doing it, then leave the field and never return until seven or eight days have elapsed and you will be surprised at the headway the young plants will have made. They will practically all have again appeared above ground, stalky, strong and thrifty, finely tucked up in a fresh, mellow, finely pulverized soil, entirely freed from the millions of young weed plants which had germinated and surrounded them before their second burial, and of which hardly any will ever reappear to rob them of nourishment and soil moisture thereafter. Another great advantage derived from this second covering is that it lifts the soil in stirring, and after the operation leaves it as clean and mellow as possible in the rows, where the tubers are to form, whereas harrowing, so frequently resorted to by many potato growers, to level down ridges and destroy young weed plants, will continually pack the soil, and should positively be avoided on heavy limestone land. The only thing that remains to do to provide for the comfort of the young growing plants and their ability to spread their fibrous roots and assimilate plant food, as they become in need of it, is to operate
a narrow-tooth cultivator before their tiny roots have spread much—"for root pruning is dangerous"—break up and pulverize the soil between the rows, as well as in the rows, in a practically perfect condition for the young plants to thrive, only an occasional shallow stirring with a weeder or light single cultivator being required thereafter to prevent some straggling weeds from growing and to keep the earth mulch perfect, so as to check the evaporation of soil moisture. This process of cultivation should be continued until it will be utterly impossible to get through without grievously breaking the vines, which is hardly worth considering until the ground between the rows is nearly covered. Level culture may be profitable on a gravelly or sandy loam, where the lower half of the surface soil is not inclined to pack and solidify, but on a heavy soil, such as limestone, slightly ridging is absolutely necessary to maintain its proper texture favorable for the formation and the development of the growing tubers.

If I should happen to fall back and resort to hand planting, I would certainly strive to follow the same system and have all conditions similar to what they are when using the planter. There would be only one danger, which does not exist when using the planter, of which I would have to be mindful; that is, that no cut seed be left uncovered in the row and exposed to the hot rays of the sun for any length of time, as such will impair its vitality if not destroy it altogether. Early and late blight can be kept under control fairly well by applying Bordeaux mixture liberally and frequently. Yet, after having taken under consideration the value of labor involved, wear and tear of the machine, and cost of material, compared with the general increase in crop due to such treatment, I have nearly always found it attended with very little profit, and consequently abandoned its use altogether. Now, for a number of years, I have always made it a point to push my potato crop to its utmost capacity, by practicing what I have already fully explained, in order to induce early maturity and get ahead of the blight as far as possible, in which I have succeeded, I am happy to say, to a considerable extent. My potato crop is generally so far advanced by the time early blight puts in an appearance that its ravages need not be very much dreaded any more thereafter. This usually means a heavier crop with less expense.

Some varieties of potatoes have the power of resisting blight to a greater extent than others, and should have the preference, providing their other qualities are desirable. If potato scab is present on seed, that can be successfully treated by the use of a solution of corrosive sublimate, but can likewise be almost wholly avoided by using a variety that is not subject to the disease, of which there are many.
The potato bugs, which are one of the worst of the enemies of the potato at the present time, should be closely watched and desperately fought, before they are able to put in their pernicious work, as it is of the utmost importance that the foliage of the young growing plants should be unmolested, to enable it to carry on the good work assigned to it. The partial annihilation or puncturing of the leaves by the beetles will often induce blight, and when the young plants are thus affected in their early stage of growth, they will never fully revive, but will die prematurely, without result, often curtailing the crop very materially. For this purpose Paris green is very effective, but should always be used in connection with limewater, which must be well strained, to have it free from sediment and allow its passing through nozzles without clogging them, if sprayer is used. The limewater should always be produced from freshly burnt lime, of equal weight with that of the Paris green with which it is to be united. The lime has the property of neutralizing the caustic power of the Paris green, and thus the mixture has a similar effect upon the foliage of the plants as Bordeaux mixture. It will tend to freshen up, instead of burning and injuring the plants. To keep on the side of safety and make sure of success, I would certainly not venture to apply Paris green without the addition of lime.

To lessen labor and expenses, when growing potatoes, a good potato digger, sorter and light, strong bushel boxes are almost indispensable. When it is necessary to store potatoes in bulk of hundreds or perhaps thousand of bushels, necessitating them to be placed in bins or large heaps of from four to five feet in thickness, they should positively be allowed to remain in the soil at least from ten to fifteen days after the vines are entirely dead before being dug, in order to become fully seasoned and have the skin become hardened, to admit of their handling without bruising and rupturing the same, which would make them subject to decay. Also, the seasoning process in the soil, naturally destroys, to some extent, their power of generating heat when stored, which, if in excess, would likewise induce rot and cause an endless lot of trouble.

For good results, I have found it best to have them stored in a dark, cool and slightly moist place, with conditions somewhat similar to those of the soil itself, from which they were taken. As a money crop, the potato possibly ranks first among the many other common farm crops of the present age and should, for this simple reason if for no other, be, at least to some extent, included in our rotation. With this same purpose in view the very best care and attention should be given it and every means should be employed to make as reasonably sure of a successful crop as possible, even if a heavy limestone soil must necessarily be employed on which to raise it.
PROCEEDINGS

OF THE

FIFTH ANNUAL MEETING

OF

Farmers' Institute Managers and Lecturers,

HELD IN THE

COURT HOUSE, HUNTINGDON, PA.,

JUNE 2, 3 AND 4, 1903.
### FARMERS' INSTITUTES.

#### LIST OF COUNTY CHAIRMEN.

**SEASON OF 1902-1903.**

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LIST OF STATE SPEAKERS ENGAGED IN FARMERS’ INSTITUTE WORK IN PENNSYLVANIA.

DURING SEASON OF 1902-1903.

Dr. H. P. Armsby, State College.
S. F. Barber, Harrisburg.
Dr. Harvey B. Bashore, West Fairview.
R. L. Beardslee, Warrenham.
M. S. Bond, Danville.
C. W. Brodhead, Montrose.
Dr. C. A. Browne, Jr., State College.
A. L. Brubaker, Hogestown.
Prof. W. A. Buckhout, State College.
J. S. Burns, Clinton.
Prof. G. C. Butz, State College.
George Campbell, Green’s Landing.
J. T. Campbell, Hartstown.
M. N. Clark, Claridge.
Dr. M. E. Conard, Westgrove.
Prof. Wells W. Cooke, Washington.

D. C.

John W. Cox, New Wilmington.
Z. T. Cure, Jermyn.
Rev. J. D. Detrich, Flourtown.
F. E. Field, Wellsboro.
John G. Folght, Export.
Dr. William Frear, State College.
J. A. Fries, State College.
D. C. Gillespie, New Castle.
Prof. J. M. Hantz, Merritstown.
Joel A. Herr, Cedar Springs.
Hon. E. S. Hoover, Lancaster.
George E. Hull, Orangeville, O.
G. G. Hutchison, Warriors’ Mark.

W. A. Hutchison, Jeannette.
Hon. A. J. Kahler, Hughesville.
Hon. J. H. Landis, Millersville.
J. H. Lady, Marion.
Amos B. Lehman, Fayetteville.
L. W. Lighty, East Berlin.
John T. McDonald, Delhi, N. Y.
M. S. McDowell, State College.
Prof. Franklin Menges, York.
C. D. Northrop, Elkland.
Henry W. Northup, Glenburn.
M. W. Oliver, Conneautville.
T. E. Orr, Beaver.
James Y. Patton, New Castle.
J. H. Peachy, Belleville.
Hon. Thomas J. Philips, Atglen.
W. H. H. Riddle, Butler.
Oliver D. Schock, Hamburg.
Hon. R. F. Schwarz, Analomink.
R. S. Seeds, Birmingham.
Hon. Jason Sexton, North Wales.
W. H. Stout, Pinegrove.
Dr. I. A. Thayer, New Castle.
F. J. Wagner, Harrison City.
Samuel W. H. Waltz, Williamsport.
Prof. Geo. C. Watson, State College.
Prof. R. L. Watts, Scalp Level.
R. J. Weld, Sugargrove.
Hon. H. V. White, Bloomsburg.

DEPARTMENT LECTURERS.

HON. N. B. CRITCHFIELD, Secretary of Agriculture.
HON. A. L. MARTIN, Deputy Secretary and Director of Institutes.
DR. B. H. WARREN, Dairy and Food Commissioner.
PROF. H. A. SURFACE, Economic Zoologist.
DR. LEONARD PEARSON, State Veterinarian.
ANNUAL MEETING OF INSTITUTE MANAGERS AND LECTURERS. HELD AT HUNTINGDON, PA., JUNE 2, 3 AND 4, 1903.

PROGRAM.

Tuesday Evening, June 2, 1903.

Call to order at 7:30.

G. G. Hutchison, Warriors' Mark, Pa., Chairman.

Introductory Address by Hon. N. B. Critchfield, Secretary of Agriculture.

Reading Minutes of Last Annual Meeting.

A Word of Greeting by Hon. A. L. Martin, Director of Institutes.

PREPARED PAPERS.

1. "CLOVER AS FOOD AND FERTILIZER."
   Dr. I. A. Thayer, New Castle, Pa.

2. "HOW PLANTS FEED AND GROW."
   Prof. R. L. Watts, Scalp Level, Pa.

3. "FEEDING POWERS AND HABITS OF SOME AGRICULTURAL PLANTS."
   Prof. Franklin Menges, York, Pa.

4. "THE MAKING OF A FARMER."
   J. H. Peachy, Belleville, Pa.

GENERAL DISCUSSION.

Wednesday Morning, June 3, 1903.

Call to order at 9.

Samuel McCready, Neshannock Falls, Pa., Chairman.

1. "SOIL MOISTURE."
   M. S. McDowell, State College, Pa.

2. "COMMERCIAL FERTILIZERS, THEIR NATURE AND USE."
   Hon. T. J. Philips, Atglen, Pa.

3. "THE VALUE OF FARM MANURE AND HOW TO RETAIN IT."
   Prof. Wells W. Cooke, Washington, D. C.

4. "THE PRACTICAL SIDE OF MARKET GARDENING."
No. 6. DEPARTMENT OF AGRICULTURE.


GENERAL DISCUSSION.

Wednesday Afternoon, June 3, 1903.

Call to order at 1:30.

W. A. CRAWFORD, Cooperstown, Pa., Chairman.

1. "BREEDING AND FEEDING POULTRY,"
   J. Y. Patton, New Castle, Pa.

2. "POULTRY HOUSES,"
   T. E. Orr, Beaver, Pa.

3. "SHEEP HUSBANDRY,"
   J. S. Burns, Clinton, Pa.

4. "EASIEST AND MOST PROFITABLE WAY TO GROW POTATOES,"
   John W. Cox, New Wilmington, Pa.

GENERAL DISCUSSION.

Wednesday Evening, June 3, 1903.

Call to order at 7:30.

C. B. HEGE, Marion, Pa., Chairman.

1. "PRACTICAL AND PATHOLOGICAL HORSESHOEING,"
   C. W. Brodhead, Montrose, Pa.

2. "HYGIENE OF THE FARM,"
   Dr. Harvey B. Bashore, West Fairview, Pa.

3. "WHAT CONSTITUTES A COUNTRY HOME,"

4. "WHAT CONSTITUTES A PRACTICAL EDUCATION FOR THE FARMER,"

GENERAL DISCUSSION.

Thursday Morning, June 4, 1903.

Call to order at 9.

Dr. M. E. CONARD, Westgrove, Pa., Chairman.

1. "THE RELATION OF BACTERIOLOGY TO DAIRYING,"
   Dr. M. P. Ravenel, Swarthmore, Pa.
ANNUAL REPORT OF THE

2. "MAKING AND SELLING FINE DAIRY BUTTER,"

   Rev. J. D. Detrich, Flourtown, Pa.

4. "GENERAL FRUIT GROWING—HOW TO TAKE CARE OF TREES."
   J. H. Ledy, Marion, Pa.

5. "THE APPLE ORCHARD,"
   Samuel W. H. Waltz, Williamsport, Pa.

GENERAL DISCUSSION.

Thursday Afternoon, June 4, 1903.

Call to order at 1:30.

COL. JOHN A. WOODWARD, Howard, Pa., Chairman.

Session devoted to general discussion of topics relating to Institute work.

QUESTIONS.

1. "IS IT DESIRABLE FOR THE STATE TO SUPPLY MORE THAN TWO SPEAKERS AT AN INSTITUTE?"

GENERAL DISCUSSION.

2. "SHOULD THE INSTITUTE LECTURER USE THE BLACKBOARD TO ILLUSTRATE POINTS IN HIS LECTURE?"
   Opened by S. F. Barber, Harrisburg, Pa.

GENERAL DISCUSSION.

3. "WHAT IS THE BEST WAY TO QUIET A SPEAKER WHO IS USING THE TIME UNPROFITABLY?"
   Opened by W. H. H. Riddle, Butler, Pa.

GENERAL DISCUSSION.

4. "HOW MAY A FARMER OBTAIN COMPENSATION FOR TUBERCULAR CATTLE?"
   Opened by Dr. Leonard Pearson, State Veterinarian.

GENERAL DISCUSSION.
Tuesday, June 2, 1903, 7:30 P. M.

HON. A. L. MARTIN, Deputy Secretary of Agriculture and Director of Institutes, called the meeting to order promptly at the time designated and announced the Chairman for the evening, Mr. George G. Hutchison, of Warriors' Mark, Pa.

ADDRESS OF CHAIRMAN.

My friends, it is a pleasure to welcome you here this evening to Huntingdon county. We are delighted to have you meet with us. It was somewhat uncertain at the last meeting whether we would be favored with your presence, but by solicitation on our part we secured the sanction of the State College to have the meeting in our county. We have been desirous for some years of having you meet with us, but other places seemed to demand the meetings and, as we are modest in this county, we yielded to their desires; but after corresponding with the State College they kindly granted or agreed to withdraw their grant of the meeting at that place and allow us to have it here. You have received a cordial welcome today from the Mayor and he has assured you that the best that this town can afford is yours; but in behalf of the farmers and agriculturists of the county, I would say, we are delighted to have you with us.

In going through the county on the main line of the Pennsylvania Railroad, you are not very much impressed with the agricultural interests of our county, as the railroad leads along the river, and the bluffs and hills are not the best presentation of the section, so far as agriculture is concerned; but I assure you that lying out from the river we have some of the finest agricultural sections in Pennsylvania. That may seem a little egotistic to our friends from Chester, Lancaster, York, Lebanon and other eastern counties; but when I tell you that we have the finest limestone belt in the northern and western end of this county than anywhere in Pennsylvania; that from this county, Blair and Centre, more limestone is taken
than from all the rest of Pennsylvania combined, I do not think I am exaggerating in the least. Lying on top of that limestone is a fine, productive soil, and we are proud of the agricultural interests of this county. One day, as I was riding through the county on a train and we had passed into the section where myself and Mr. Seeds reside, a lady said to a gentleman sitting by her: "My! I believe half the people of this county commit suicide." And the gentleman said: "Why?" She said: "Look at those hills and bluffs; there is nothing to live on." Up on those hills there is as fine land as there is anywhere in Pennsylvania, and I have yet to know of any one committing suicide there.

This county has been devoted to agriculture for one hundred and thirty-five to one hundred and forty years. Our forefathers came here from the eastern sections and settled, and have been following the pursuits of agriculture for that length of time. The farm that I have the pleasure of owning and living on has been cultivated for one hundred and thirty years, and others in this section have been for nearly the same time. We have, besides the agricultural, other interests. We have a county that has produced a number of great men. We have contributed to the welfare and the building up of this Commonwealth. We have had the honor of having a Governor, Potter; a Secretary of Internal Affairs, J. Simpson Africa; an Auditor General, General Gregg; two United States Senators, John Scott and William A. Wallace, two of the lewleest headed men of this Commonwealth and a number of Congressmen. Among others, I might mention R. Milton Spear, whom I consider one of the brightest men Pennsylvania has produced, H. J. Fisher and a host of others.

We have a number of interests here that I would like you to visit, among which are the J. C. Blair Manufacturing Company, the Keystone Manufacturing Company and many others. We have situated in this county the Silica Brick Works at Mt. Union; the coal operations at East Broad Top and other industries. We have also located at the end of town a State Normal School, known as the Juniata College, of which our friend, Prof. M. G. Brumbaugh, is president; and on the outskirts of the town is located the Huntingdon Reformatory, one of the finest institutions of its kind in the State. All of these extend to you a cordial welcome. I know that your coming amongst us will do our agricultural interests good and I hope your stay will be a pleasant one.

We are now ready to proceed with the program of the evening.

HON. A. L. MARTIN: Before starting upon the program proper, it might be well that we have a committee elected or appointed to take charge of what is known as the "question box," to collect ques-
tions that may come into the mind of any auditor during the reading or discussion of papers on this program, and also a committee on resolutions.

The CHAIRMAN: What is your pleasure in regard to a Question Box?

DR. M. E. CONARD: Mr. Chairman, I move that a Committee on Queries be selected to be composed of as follows: S. S. Blyholder, Chairman; A. B. Lehman, J. K. Bird and W. H. H. Riddle.

The motion was agreed to and the Chairman announced as a Committee on Queries the gentlemen named.

MR. ROBERT SEEDS: Mr. Chairman, I move that a Committee on Resolutions be selected to be composed of as follows: J. M. Hantz, Chairman; H. W. Northup, A. J. Kahler, Jason Sexton and George L. Hull.

The motion was agreed to and the Chairman announced as a Committee on Resolutions the gentlemen named.

HON. N. B. CRITCHFIELD, Secretary of Agriculture: Mr. Chairman, I do not know whether Mr. Martin has in his mind any time when this Committee will be called upon to make its report. Possibly the beginning of the morning session would be as good a time as any.

MR. MARTIN. Mr. Chairman, we believe in an audience of this character having this matter largely in its own hands. Probably at the morning session would be a very suitable time to present these questions. However, circumstances ought to direct that matter.

I just want to supplement the remark made by the Secretary; that if at any time during the reading of a paper or in the discussion after it is finished, any lady or gentleman should feel disposed to ask a question relative to that paper or discussion, should feel free to rise in their place and ask the question. We believe in free speech at these meetings. Otherwise, write the question and have it sent in through the Query Committee. We suggest that the Query Committee take these blank papers and at once distribute them through the audience so that they may have paper to write upon.

The CHAIRMAN: The next on the program is an "Introductory Address," by Hon. N. B. Critchfield, Secretary of Agriculture.

I now have the honor and pleasure of introducing to you the Secretary of Agriculture, Hon. N. B. Critchfield.

ADDRESS OF HON. N. B. CRITCHFIELD.

Mr. Chairman and Gentlemen of the Convention: I am sorry that our good Brother Martin has seen fit to dignify what I may have to
say on this occasion by calling it an address. He said to me when he was preparing the program that he would like to have me say something at the opening of the session, and I said "All right," but I expected to say but a very few words.

I am glad that the Chairman for the evening has had as much to say as he had at the beginning, because I do not feel like talking so soon after supper. You all know how hard it is talk when you are too full for utterance.

The Chairman spoke in glowing terms of the agricultural and industrial features of Huntingdon county, casually mentioning Chester, Delaware and Lancaster counties and the northwestern part of the State as possible places where conditions might be especially good, but he did not say a word about the west, as though we were not in it at all. I guess he was never out in our section of the country.

I hardly feel that it would be just for me to take up very much of your time. I see you have a very full program for this even- and, therefore, I shall take but little time. I am glad, however, to have this opportunity of looking you in the face, of renewing my acquaintance with those of you with whom I used to travel up and down this Commonwealth, engaged in Institute work, and to make the acquaintance of others whom I have never met before. I am glad to be here and I am glad to be reckoned as a member of this meeting and still, in some measure, a participant in the Institute work. I do not know that we have any more important work than this, and I think the idea that was suggested or acted upon first of all by the first Director of Institutes, and that has been followed out by Brother Martin, is certainly a good one, that of having this "Round-up Meeting." It is a good thing for the men engaged in this work to come together at a time like this and to compare notes, to talk over disputes in which they have been engaged, and their failures likewise, if any. I have no doubt but that you will be able to carry into your work the succeeding year some of the enthusiasm gathered here. You will be better prepared in consequence of having had this meeting. I take it that any work that has for its end in view, the improvement of our agriculture and the betterment of the condition of those who have taken up farming as their chosen calling, is an important work, and I do not think that there is, as I have said, any more fruitful source of accomplishing these things, helping the farmer, improving agriculture and bettering the condition of the agriculturists of the State than the Farmers' Institute work. I was pleased, at the supper table this evening, to hear some gentlemen telling of what had been achieved in their communities in the counties from which they came. Everywhere over this Commonwealth we can see the improvement made
since the Farmers' Institute work was begun in the State of Pennsylvania. We have better agriculture, better homes. Our farm people are paying more attention, as evidenced in the discussions that took place at the supper table this evening, to the education of their sons and daughters, and very much of this has been brought about through the agency and the instrumentality and the labors of these men who are engaged in this work.

And now, as I said at the outset, I am glad to be here and bid you Godspeed. I am not likely to be able to remain with you until the end of the session, but I want to say, while I have the floor, that I will be glad to have you come to see us at Harrisburg whenever you can. The Department of Agriculture will be doing business with open doors and with the latch-string on the outside. We want your counsel and help. The Department of Agriculture is a great, big Department, and there is very much to do, as Brother Hamilton said to me as he was about turning the keys over to me, and I have found it so, and I cannot hope to succeed in the administration of the affairs of the Department, as well as I would wish to succeed, and as well as you wish it to succeed, without your help; and so, my ears will always be open to take any counsel or advice you will give. I shall be glad to have your assistance.

I do not know that it is necessary that I should detain you any longer. You have a large program for this evening, and when you get through with it I am sure we will all feel that it is time to adjourn. I thank you for your attention.

The CHAIRMAN: The next business in order is the reading of the minutes of the last annual meeting.

A. L. MARTIN, Director of Institutes, read the minutes of the last annual meeting of the Farmers' Institute Managers and Lecturers, held at Gettysburg, Pa., May 28 and 29, 1902.

There being no corrections the minutes were approved.

The CHAIRMAN: The Secretary will now call the roll of County Institute Managers.

The Director of Institutes called the roll of County Chairmen, season of 1902-1903, with the following result:

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<tr>
<td>Westmoreland</td>
<td>M. N. Clark</td>
<td>Claridge</td>
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<td>Wyoming</td>
<td>D. A. Knuppenburg</td>
<td>Lake Carey</td>
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The roll of State Lecturers was then called by Secretary Martin and absentees noted. The following were present:

Dr. H. P. Armsby, State College, S. F. Barber, Harrisburg, Prof. Wells W. Cooke, Washington, D. C.
Dr. Harvey R. Bashore, West Fairview, John W. Cox, New Wilmington, R. L. Beardslee, Warrenham, Z. T. Cure, Jermyn.
M. S. Bond, Danville, John G. Foight, Export, C. W. Brodhead, Montrose, Dr. Wm. Frear, State College.
A. L. Brubaker, Hogestown, Prof. J. M. Hantz, Merrittstown.
J. S. Burns, Clinton, Joel A. Herr, Cedar Springs, Prof. Geo. C. Butz, State College.
Hon. E. S. Hoover, Lancaster.
M. N. Clark, Claridge, W. A. Hutchison, Jeannette.
Dr. M. E. Conard, Westgrove, Hon. A. J. Kahler, Hughesville.
The CHAIRMAN: The next business on the program is "A Word of Greeting," by Hon. A. L. Martin, Director of Institutes.

Gentlemen, it is with great pleasure that I introduce to you this evening, Hon. A. L. Martin, Deputy Secretary of Agriculture and Director of Institutes, who has taken such an active interest in our Institute work.

ADDRESS OF HON. A. L. MARTIN.

Mr. Chairman and Friends: I would be false to my feelings should I fail, in a few words, to express some of the motives which has prompted me to address you for a moment or two this evening. I have a very vivid recollection of the first Annual "Round-up Meeting" of the Farmers' Institute workers, which was held at Bloomsburg. A pretty green looking farmer from Western Pennsylvania was there and he formed the acquaintance of a large number of men who then, as well as now, had local charge of Farmers' Institutes in Pennsylvania. I remember that meeting more especially because of the events which have followed it; realizing as I then did, and I now do, to some degree, the importance of the work in hand: and realizing the warm grip of the hand which you men gave me there and the few words which passed between us that day.

To-day we have the Fifth Annual Meeting of the Institute Managers and Lecturers, and as we look back over the four years past, it is certainly with some degree of satisfaction that we can meet face to face to discuss the great problems with which we have to do. We may look back and learn from the lessons of the past some things by which we may improve in the future. But whatever this may be, my friends, I assure you that had it not been for the wise, considerate and manly counsel which you men gave me from time to time regarding the work, not only in your own county, but throughout the State, many more mistakes would have been made.

In the outset of my remarks I want to say this to you as County Chairmen of Institutes: The success and the advancement that will attend these Farmers' Institutes in Pennsylvania if our lives are
spared for four years, largely depends upon the ways and means that are devised by the County Chairman of institutes in the different counties. I say that to you after four year's experience along that line with all the manliness that I am able to bring to bear, I want you at all times to give me your best and candid advice, whether it might make me feel good or not, I want to know it. By the uniting together of the best thought and the best practice in the different counties and bringing it together at a meeting of this kind, comparing notes in all the greatness and vastness of this work, we can expect to succeed to the greatest extent. This is not my work. I am simply the agency for the time being to join with you in the different counties in carrying on this great work which belongs to the Commonwealth of Pennsylvania.

Now, my friends, a good Providence has very kindly dealt with the farmers of Pennsylvania and this organization during the past four years, when we come to remember that out of this body of men, in the sixty-seven counties of the State, as County Managers, so far as I can recall at this time, there has just occurred five deaths. Shall I recount them? Hon. Gerard F. Brown, of York county, who met with us at Bloomsburg. You remember him. You remember the kindly counsel which he always gave us and the manly man that he was. And then, after him, the Hon. George E. Hepburn, of Delaware county. He, too, was very suddenly taken away. It was my pleasure to serve with him two sessions in the House of Representatives, had a very intimate acquaintance with him, and I bear testimony to his sterling worth. And then, Mr. C. F. Barrett, of McKean county, within the last year. My acquaintance with him was not so intimate, but through years of correspondence I had learned his value as an Institute Manager. Another one was Mr. D. H. Pershing, of Fayette county. Many of you remember him and the great interest he manifested in agricultural matters. He was one of our leading Grange and Farmers' Institute lecturers. He was a man who kept himself well informed and, having always lived a righteous life, filled many positions of trust among his neighbors. And then the other loss I shall name, so far as I can recall, is that of J. L. Schreiber, of Lehigh county, now succeeded by the gentleman on my right. You remember this manly man and his plain counsel and advice. He often came to my office and gave me counsel, when others knew not of it, of the kind that was intended to cement the friendship of man to man and broaden my love for that true manhood which ennobles. These five have been called to join the Great Majority beyond. Their work is finished here, but the fruits of that work, I believe, will continue many years. Now, my friends, I simply recall this thought, bringing to our minds that Providence has been good and kind to us.
During these four years we have noticed, and you have noticed, marked advancement in the manner and the mode of carrying on farm operations in Pennsylvania, in the line of animal industry, in the management of the dairy, in horticultural lines, in the preparation of the soil and the seed bed and in the growing of the leguminous plants intended to draw down fertility from the air and plant it in the soil we cultivate; in all these questions, my friends, what a marked improvement is stamped in every line; and we are egotistical enough to believe that a large portion of that at least was stimulated and brought about by the persistent teaching of those engaged in Farmers’ Institute work.

I want to say just a word to the Lecturers. Most of my remarks have been to the County Managers of Institutes. I want to say to you, my friends, Lecturers at Farmers’ Institutes, that we have come to a time in the history of this work in Pennsylvania in which a man to succeed and do his best must be no novice. He must be a man or woman equipped for this work, capable of imparting the knowledge and the practice which he possesses to the audience which he is to address. It is no child’s play. We have come to a time in the history of agriculture in Pennsylvania, my friends, in which the man who undertakes to address an audience must know whereof he speaks and be of a teachable spirit on all occasions. The reason for this is largely due to the fact that the farmers of Pennsylvania are to-day an educated people. They read and think, and year by year they bring to bear upon their farm operations a better cultivated brain and more accurate knowledge of the principles which underlie the line of farming in which they are engaged, and the Farmers’ Institute Lecturer who succeeds now in Pennsylvania must be, not only abreast of the times, but he must be a little in advance. He must know of the things whereof he speaks; know all these things and know nature. Why, my friends, there are only two ways a successful teacher at the Farmers’ Institute may know. He may have studied agriculture, chemistry or botany and all lines of scientific knowledge; and that is right. He cannot teach them properly unless he has spent time in the study of them. But that is not all. After they have been studied theoretically and learned and pounded into these brains and minds of ours, there is something else. After this is completely studied mentally, when the man has worked it out somewhere in the soil, or the shrub, or the tree, or the plant, or the roots of them, he is the better equipped to impart that knowledge to his neighbor. That is what I mean by this, my fellow lecturers. We come to that time in which, in my judgment, the very best qualifications must be demanded and nothing short of that accepted. So it is for you to decide at these meetings.
The Legislature of the State has dealt with us, also, very kindly. It has increased our fund—not to a great extent—after the first two years. Then we had an increase of $5,000 added, and during the past year the Legislature gave us an increase of $5,000 additional, so that our institutes are equipped with $35,000 for two years or $17,500 per annum. Now we come to the problem. Shall we have more institutes or shall we equip them and make them better? That is a question for you to decide. We want your opinion about that. My judgment is that we ought to make them more effective if we could.

Now, my friends, I shall not inflict any longer talk upon you. It is a pleasure to meet you. It has always been and I hope it will continue so, and I can only say to you what I said four years ago: "I am here to join with you in the various counties for the uplifting of the farmers and the Farmers' Institutes."

COL. JOHN A. WOODWARD: Mr. Chairman, it is customary in our field work in Farmers' Institutes to have the serious and regular work of the institutes interspersed with entertainment of some kind in order that we may keep the interest alive, and for that purpose we frequently introduce music. It may not be known that among our County Institute Managers we have a musical genius who happens to be present to-night, and I propose that we now listen to a song by Mr. Horace H. Hall, the Institute Manager of Potter county, before we proceed to the work of the evening.

Mr. Hall came forward and entertained the audience with a song entitled "Two Kinds of People."

The CHAIRMAN: There is a sentiment in that song that some people who lecture at Farmers' Institutes could get a good lesson from.

We now come to the prepared papers. The first number on the program is "Clover as Food and Fertilizer," by Dr. I. A. Thayer, of New Castle, Pa.

DR. I. A. THAYER presented his paper as follows:
CLOVER AS FOOD AND FERTILIZER.

By Dr. I. A. Thayer, New Castle, Pa.

We will estimate the value of the clovers as food according to our purpose in feeding. If we feed primarily for milk, muscle, wool or eggs we will place one estimate; if for fat, heat and energy, our estimate will be different, since in the first we seek a narrow ration, or a nutritive ratio of about one to six; in the second, a wider one, or a ratio of one to ten or twelve.

The place occupied by the clovers as food may be quickly seen in the following statement:

**FEEDING STUFFS.**

<table>
<thead>
<tr>
<th>Digestible Pounds in a Ton.</th>
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<tr>
<td><strong>Protein.</strong></td>
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</tr>
<tr>
<td>Corn stover.</td>
</tr>
<tr>
<td>Timothy hay.</td>
</tr>
<tr>
<td>Orchard grass.</td>
</tr>
<tr>
<td>Red clover.</td>
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<tr>
<td>Alfalfa.</td>
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<td>Wheat bran.</td>
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Here it is seen that as a muscle or milk maker Red clover has more than two and a half times the value of timothy hay, and more than three times the value of corn stover; while for these purposes alfalfa is worth nearly as much per ton as wheat bran. Red clover would itself constitute a well balanced ration for muscle or milk making, but for the bulk necessary to consume. Alfalfa would constitute too narrow a ration and should be fed with corn stover, silage or corn meal.

While the clovers as protein food are seen to be far richer than timothy hay, why do they not command a higher price in market? Horsemen object to clover hay because it usually contains more dust and hard, indigestible fibre. And this is the fact in the case of
the common red clover usually offered on the market, because improperly made. When grown with timothy, ripening as it does two weeks earlier than does the latter, it is too ripe when harvested. When timothy is at its best, the clover blossom has browned and its stem becomes woody and largely indigestible. Red clover should be cut before many heads are brown, though not all are yet in bloom. If clover and timothy are to be grown together, the variety should be the Mammoth; but the manner of curing clover hay has much to do in producing the objectionable features complained of. It should never be sun-dried, but cured in a mow practically air-tight, or what is more practicable, in a shocks. Thus cured, the leaves containing the larger per cent. of the plant protein, retain their bright green color, and the blossoms, their red. Dark brown clover hay, sun-dried, is unfit for horse feed and has lost half its value for the dairy cow.

At the present prices of concentrated protein foods, the Pennsylvania farmer must seek to produce his own protein, or abandon his hopes of large profits from his dairy. In the clovers we have the most available source of protein. With clover and shredded corn stover or silage for roughage, and corn meal and wheat bran as concentrates, we readily compound a balanced ration for the herd or team; a ration the most healthful that can be produced, and the greater part of which is produced on the farm. Or with alfalfa, corn silage and corn meal with a much smaller proportion of wheat bran, an equally valuable ration may be compounded at a trifling cash outlay.

But so much attention is now being given to rations of the dairy cow especially, that I shall not enter the subject farther, my only purpose having been to point out the important place occupied by the clovers in a well-balanced and healthful ration.

It will be noted that I couple "well-balanced" with "healthful," as modifying rations, for healthfulness must go before the standard ratio. From one point of view the cow is a machine for the manufacture of the raw material into the finished product—milk; but she is far more than a machine; she is a living, sentiment being whose nerves go before her lacteal glands, and whose health and comfort condition her profitable performances. In the selection of her food, therefore, not only the chemist but the physiologist must be consulted. Clover has been proven to possess not only a high per cent. of digestible protein, but other properties that are greatly relished by the flocks, herds and teams, and that contribute to the health of the animal. Physicians prescribe a clover hay infusion for the nervous spasm peculiar to whooping-cough. They also classify it under that vague name "alterative," and administer it successfully in scrofulous affections of the glands and skin.
Dismissing the food feature, we must now give attention to a far more difficult and important phase of the subject; I mean the restoration and maintenance of soil fertility with the use of clovers.

It is beyond question that the supreme need in the soils of our State, as well as in all the older states in the East, is humus rich in the forms of nitrogen. The present superiority of our western empires arises chiefly from the vast stores of humus with which the prairies are covered. When this accumulation of decayed vegetable matter is passed, their soil is found inferior to our own. It has not the mineral element of fertility that ours possesses. Our soil contains large quantities of these mineral elements, unavailable for the most part, but present and needing only such agents as will disintegrate them to become available to our growing crops. Such agents are supplied by decaying vegetable matter in the soil. The acids set free in such decomposition attack the insoluble mineral compounds and reduce them to soluble forms. This action, with the improved mechanical condition of the soil which it produces, is common to all decaying vegetation. The clovers render this service and go much farther; they gather large quantities of nitrogen from the air and add it to the soil as a net gain above the benefits derived from the decay of the non-leguminous plants.

Some years ago the Cornell Experiment Station conducted the following experiment: There were sown three plots, side by side, one to Crimson clover, one to Red clover and one to Mammoth clover. In three months and four days a chemical examination was made, which showed that the Crimson clover roots and tops had gathered at the rate of 155 pounds of nitrogen per acre; the Mammoth, 145 pounds and the Red, 102 pounds. The amount of nitrogen contained in the acre of Crimson clover, after it had been growing but three months and four days, was equal to that contained in 13 tons of average stable manure.

Several years ago I began the production of Crimson clover as a fertilizer by seeding one acre of early potato ground, on the 15th of August. There was a fine stand and a rank growth, the clover averaging thirty inches in height. On the 25th of the following May this was turned under, and in July the ground was set to late cabbage. On the next April this land, with two adjoining acres of the same kind and condition, except the clover, were planted to early potatoes. From the beginning the difference between the two soils was marked. The clover acre remaining spongy and moist throughout the dry summer, while the adjoining ground became very dry and dusty. On digging the tubers, the difference was still more marked, for from the clover acre were picked up 202 bushels of merchantable tubers, the first week in July, that wholesale at 70 cents per bushel, while from the two adjoining acres were secured but 112⅔
bushels per acre. It is true that this difference was not wholly due to the additional elements of fertility derived from the clover, but in a large measure to the mechanical condition of the soil resulting from the addition of this large amount of humus.

Beyond the elements of fertility that the clover gives to the soil, and their value as humus, they aid in soil improvement by perforating the sub-soil with their long roots, thus opening it to the action of the air and pumping up the soluble plant food that had leached beyond plow depth.

The importance of the clovers as fertilizers is being appreciated, but many are discouraged by the difficulty of securing a crop. To this we must now give attention.

I believe that when we understand the demands of the clover plant as well as we understand the demands of our common farm plants, such as corn, oats and potatoes, we will be able to raise as good a crop of clover as we do that of the others. Our poor soil ill worked will raise nothing well. Certain unforeseen conditions of weather may militate against any crop, but no more against clover than against others. Any other crop treated as unwisely as we often treat the clover plant would result in as great a failure as we often experience with this. The fact is that clover is no baby; it is one of our hardiest plants. It takes hold on earth and air and sun, and what it cannot secure from one it draws from the other. Frost and flood and drouth do not affect it as readily as they do most other farm plants. It asks no special favors. It only asks what we concede to other plants; an open field and a fair fight. And this reasonable demand is precisely what we have usually ignored. Who would think of growing a crop of corn and of oats, or of rye and of buckwheat, or of potatoes and of timothy on the same ground at the same time? And yet in the production of clover we have tried to raise three full crops on the same ground at the same time, and we have generally failed. We give the use of a field a year to corn, oats or wheat; but to the clover crop, worth more hard cash than either of the others, we give the chance to steal an existence the best it may in the shadow of the others. We have thought it should have a "nurse crop" to shade it, as though the sunlight were not one of the supreme conditions of its growth. A nurse that consumes the moisture, fertility and sun-light needed by the young plant is not a profitable one. Prof. Thorne, of the Ohio Experiment Station, at Wooster, in a letter to me in which he recited the observations of the Station, concluded by saying: "It is our firm conviction that the so-called 'nurse crop' is the robber crop." True, now and then we may secure a stand of clover in the wheat or rye crop, but it is usually uneven, strong where the grain is weak, and weak where the grain is strong; but a good, even stand is the exception and not the rule.
If the field cannot be given exclusively to the clover, and a fine seed-bed prepared and sown in April, a wheat or rye stubble field may be prepared by burning off the stubble, if necessary, and thoroughly harrowing it, with the chances that not only a better stand will be obtained, but a better root system will be developed than in the feeble plants that have struggled among the grain for a foot-hold and then been suddenly thrown into the scorching sun and drought of mid-summer at harvest time.

Crimson clover, that queen of fertilizers, being an annual, may be sown as an after-crop and turned under near the latter part of May, when in full bloom, for corn or potatoes. It will have acted as a cover-crop of great importance, and will furnish a vast amount of humus and nitrogen. It is better to sow it after early potatoes or on stubble ground prepared as already indicated. It may be sown in corn ahead of the fast working, never later than the first of August, if the corn is a small variety and rowed wide apart, with the rows running north and south, so that sunlight will be freely admitted. Home-grown seed should always be used, not less than fifteen pounds to the acre, and it should be well cultivated in. Unless well covered, the dry, hot weather usual in August and September, will probably destroy most of it. Early seeding and thorough covering is necessary also to secure a root development sufficient to prevent heaving during the winter, though freezing the plant does no harm. My experience shows that under like conditions Crimson clover is as hardy as Red clover.

Scores of unsuccessful attempts to secure a clover stand have been detailed to me during Institute work, and I have usually found that in such cases the chief causes of failure, named in the order of their importance, were the following: Lack of humus and frequently the presence of acid; the ever-present "nurse crop;" imperfect seed-bed and seeding, and imperfect drainage.

I condense the statement of the conditions of clover production into five sentences: Clear the soil interstices of stagnant water; fill the soil with humus by plowing under stable manure or rye and vetch; apply caustic lime, 500 to 1,000 pounds per acre; prepare a deep, fine seed-bed and thoroughly cover the seed; give the field wholly to the clover as early in the season as practicable.

The growth of the clover will be greatly promoted with a top-dressing of well-rotted stable manure. It is a mistake to suppose that, because clover derives much of its nitrogen from the air, it needs no nitrogenous fertilizer to start its growth. But if the soil is dark with humus, a commercial fertilizer containing about eight per cent. of potash and twelve per cent. of phosphoric acid, if on a clay soil; or twelve per cent. of potash and eight per cent. of phosphoric acid, if on sandy ground, drilled at the rate of 150 to 250 pounds per
acre, will be profitable. The addition of lime, which will neutralize the acid and thus favor the work of the soil bacteria, will render the mineral elements of fertility more available, render the soil more friable and feed the plant direct. In many soils lime will be indispensable; in all it will be highly profitable.

The production of alfalfa has greatly interested dairymen since learning its value as a protein food, and the tonnage that can be produced on a given area. So much has recently been written on the subject that I give it the briefest mention. Alfalfa requires a garden soil. The surface must be rich and fine and the subsoil porous, easily permeable by the roots of the plant. The soil need not be sandy nor the subsoil an open gravel. A rich, clay loam, without a dense hard-pan will bring good results. The water level should be at least seven or eight feet below the surface. The seed should be sown as early in the spring as the soil can be put into first class condition. Sow by itself twenty-five pounds to the acre and cover with a light harrow or a weeder worked both ways. If the soil is sandy or quite dry it should be rolled after seeding, following the roller with a weeder. These conditions may all be furnished and a perfect stand secured, and yet a failure result if the subsequent treatment be neglected. In about six weeks from the time of seeding, the young plants will begin to show a blue blossom here and there. Now the mower must be run over it and the plants clipped. In another six weeks the operation must be repeated, and again the third clipping at the end of the same period, and the clippings allowed to remain on the stubble as a mulch. If the young plants are allowed to run up and mature seed the crop will be ruined. The clipping is necessary to prevent this, to give stronger root development, and to check the growth of weeds that are especially destructive of the alfalfa during the first year. The subsequent cuttings of the plant for hay should occur at about the same periods.

Though necessarily too brief to be of the greatest value, I am glad to make this slight contribution to the study of a subject that I find is greatly interesting the farmers of the State; an interest that is full of promise, since it is growing more and more important that, in largely increased quantities, we produce our own protein feed and our nitrogenous fertilizers.

The CHAIRMAN: These papers will all be subjects for discussion after we get through with the numbers on the program, so any questions you may have to ask, just hold them until after the program for the evening is finished.

The next number on the program is "How Plants Feed and Grow," by Prof. R. L. Watts, of Scalp Level, Cambria county, Pa.

Prof. Watts then presented his paper as follows:
HOW PLANTS FEED AND GROW.

By Prof. R. L. Watts, Sulp Level, Pa.

A thorough knowledge of how plants feed and grow, coupled with industry and good management, will insure success for every tiller of the soil. Satisfactory crop production is purely a question of knowledge and its application. Plants must grow and yield bountifully when they receive the proper treatment. As to the right treatment, under existing conditions, each farmer must decide for himself. Books, bulletins and lecturers may instruct and guide, but only experience will settle the perplexing problems that come to the thinking farmer. He must study, observe and experiment to gain that knowledge which will lead to the greatest success.

It is not within the province of this brief paper to discuss technicalities relating to the nutrition and growth of plants. But an attempt will simply be made to bring out some of the more important facts regarding conditions most favorable to the development of plants.

PHYSICAL CONDITION OF SOILS.

In recent years probably too much attention has been given to the use of commercial fertilizers and not enough to the improvement of the mechanical condition of soils. There are thousands of acres of land in Pennsylvania where crop production would be only slightly increased by the most liberal application of commercial fertilizers. It is not our purpose to condemn the use of fertilizers, but we do not hesitate to say that, with most soils, a change in the physical properties is of much greater importance than the application of fertilizers. We have found in our own operations that even the extravagant use of fertilizers fails to give satisfactory results when the texture of the soil is unfavorable. One small plot, distinctly clayey, has been heavily manured and treated with a high grade, home-mixed fertilizer for four successive years, and yet the soil fails to respond in a satisfactory manner because it is not a suitable medium for root development. The soil needs lime to make it loose and friable; and neither manure nor commercial fertilizers will have.
the desired effect until there is a liberal application of lime. Liming should be recommended more for its value in improving the physical condition of very heavy soils than for its action in liberating plant food. Whenever the soil is rendered flocculent by lime and the addition of vegetable matter, then commercial fertilizers will be more effective and the important work of the bacteria of the soil will be greatly augmented.

Again, the physical properties of very sandy or gravelly soils are not conducive to the growth of large crops, and the tiller should consider how he might economically increase the supply of organic matter instead of simply the amount of the various elements of plant food.

HUMUS.

The great problem before the American farmer is, how to maintain and increase the supply of humus in cultivated soils. Were it simply a matter of preserving the supply of available food elements, the question would be greatly simplified. We would then purchase in available forms the food elements needed. We would not need to concern ourselves about manure, clover, cow peas and green crops as means of increasing the fertility of the soil.

The value of humus as a factor of soil fertility is not disputed. Soils rich in decaying vegetable matter are, as a rule, highly productive. It was the enormous supply of humus in the western prairie lands that induced farmers to seek those soils. It is the large store of organic matter still found there that makes it possible to produce such large crops of cereals, and this accounts for the very limited use of commercial fertilizers on western farms.

It is difficult to comprehend the full value of humus in the feeding of plants. All the factors of soil fertility are more or less influenced by the supply of decaying vegetable matter. Soils rich in humus are dark in color, and this means a warm soil, as dark colors absorb more heat than light ones. Chemical changes and bacterial life are more active in warm soils, hence, plants in such soils grow rapidly on account of the available supply of plant food. This fact is especially recognized by market gardeners whose profits are largely determined by the early maturity of their crops. Humus, when added in sufficient quantity, improves the tilth of the soil, making it lighter and more friable, thus decreasing the labor necessary for tillage. Humus renders the particles of stiff soils less resistant to root growth. Humus absorbs and holds water to a greater extent than any other soil ingredient. Humus binds together the loose particles of sandy and gravelly soils, rendering them more retentive of moisture and plant food. Humus aids in the decomposition of the mineral matters of the soil by which nu-
available plant food is converted into available. Humus, because of its retentive power, decreases the loss of nitrates by leaching. Humus fixes and holds ammonia in the soil until it is converted into nitrate nitrogen, a form which can be used by the growing plants. Humus ordinarily contains from 3 to 12 per cent. of nitrogen, making it of inestimable value as a source of this element. Humus also contains potash, lime, phosphoric acid and other essential elements of plant food. Humus is necessary for the life and work of microorganisms which must be present in large numbers to insure a productive soil. So great and varied are the good influences of humus that its importance as a factor of soil fertility cannot be emphasized too highly. When any soil is cropped with grain or plants requiring clean tillage, without manuring or plowing under of green crops, the supply of decaying vegetable matter rapidly decreases and the fertility of the soil diminishes in proportion to the decrease of organic matter. Every possible means should, therefore, be employed to maintain the supply of humus. This may be done by the liberal use of farm manures, green manuring and a proper rotation of crops.

**BACTERIA OF THE SOIL.**

In this age of advanced agricultural science, we hear much of the great work bacteria are doing for the farmer. Even the institute soloists are beginning to sing about microbes in the air, and microbes everywhere. The Experiment Stations and State Departments of Agriculture have taken up a detailed study of the bacteria of the soil, and the literature on the subject is profuse. Our own State Department of Agriculture should be commended for its quite recent bulletin on "Soil Bacteria in their Relation to Agriculture." This treatise should be carefully studied by every farmer of our Commonwealth, for no cultivator can work intelligently without a knowledge of the micro-organisms of the soil.

Not many years ago the soil was regarded as simply dead, inert matter, entirely devoid of life, except the root of the crops which were being produced thereon. But scientific study and research show that the soil is permeated with living beings; that the soil is a veritable workshop or laboratory where myriads of micro-organisms are constantly engaged, when the conditions are favorable, in converting the hard, insoluble, unavailable particles into forms that the plant can use. There is a most intimate relationship existing between the lower and the higher forms of plant life. The lower forms digest the food for the higher so that it can be assimilated and utilized.

The action of bacteria in the formation of nitrates is especially important to growing plants. Plants derive most of their nitro-
gen from nitrates, and the process of converting various organic forms into nitrates is known as nitrification.

As the growth of plants is so largely dependent upon the activity of soil ferments, it is important for the farmer to know the conditions most favorable for their work. A certain amount of humus is necessary, but excessive quantities are unfavorable, as this results in an acid condition which retards the work of the soil ferments. Here we note another reason for the use of lime. The activity of nitrifying organisms is increased by an alkaline environment secured by liming, and it is not improbable that, on many soils, this is the most important use of lime. The ferments flourish best near the surface of the soil, where there is an abundance of atmospheric oxygen. Prof. Frederick D. Chester, of the Delaware Agricultural Experiment Station, found at four inches from the surface, 1,622,000 bacteria per gram. At six inches from the surface, 1,623,000 bacteria per gram. At twelve inches, 73,000 per gram. At eighteen inches 24,000 per gram. At twenty-four inches only 4,000 per gram. We find in these figures an argument against the deep plowing of very heavy, compact soils. For the turning up of soil so deficient in nitrifying organisms we cannot expect the plants to be liberally fed.

The number of bacteria of the soil is largely dependent upon the extent of aeration. It is often necessary to expose to the air for a season or two certain lands, especially pasture fields of long standing, before they will respond satisfactorily to tillage. This necessity arises from the fact that the number of ferments in some soils is too limited to digest the supply of food needed to make a large crop. Last summer the writer thought he would prepare an ideal plot of ground for late cabbage by plowing a small area heavily covered by a blue-grass sod, which had been pastured for a long series of years. After plowing, harrowing and dragging, the soil was loose and friable, and the workmen and the writer were unanimous in their opinion that the yield would be large. But the crop there was a failure. The nitrifying ferments were not present in sufficient number to feed the cabbage and commercial fertilizers alone could not do the work.

As aeration is necessary for the activity of the nitrifying organisms, the advantages of thorough tillage are apparent. From the figures given by Prof. Chester and other investigators regarding the number of bacteria in the soil found at different depths, we learn that good plowing and good harrowing do not consist in the pulverization of only a few inches of surface soil, but we must conclude that thorough tillage to the depth of at least seven or eight inches is necessary to secure the best results. Previous to this time the frequent tillage of cultivated crops has been agitated chiefly be-
cause it conserves soil moisture, and very few have attached sufficient importance to tillage as a means to augment chemical activities by favoring the work of various bacteria. If thorough aeration is so essential to the work of nitrifying ferment, is it not highly probable that farmers would find it profitable to cultivate hoed crops even more frequently than is deemed necessary to simply conserve soil moisture. In this connection the fact should be made prominent, that a reasonable amount of moisture is essential to the greatest activity of bacteria, so that in cultivating, a double purpose is accomplished in conserving the moisture needed by the ferment, and also by the growing crops. When the soil becomes very dry, bacteria cease to increase in number and many of them die.

Barnyard manure, when properly cared for, contains large numbers of nitrifying organisms, and this is one of the reasons why barnyard manure is so valuable as a fertilizer. It not only supplies food elements and improves the mechanical condition of the soil, but it also inoculates the soil with bacteria, which liberate food from unavailable forms.

**NITRATE OF SODA.**

It is not disputed, that of the three elements of fertility frequently deficient in the soil, and hence necessary to be applied in an artificial way, nitrogen is the most important, so far as actual plant growth is concerned. Therefore, in the feeding of plants, we must consider nitrogen as the most important element, just as corn is the most important factor in the production of beef or pork. It is, also, an indisputable fact that the quantities available as plant food in most soils are very limited and that nitrogen is usually the first element to become exhausted. As sodium nitrate is available as plant food without the intervention of nitrifying organisms, which few soils contain in sufficient number, the high value of this fertilizer is readily seen; but there is no doubt that the great mass of cultivators of the soil do not appreciate its full value.

If we are seeking the production of fruits or cereals, there must be a vigorous growth of leaf and wood to insure a satisfactory yield, and, if we are working for distinctively a leaf product, such as lettuce or cabbage, the plants will use, economically, enormous supplies of nitrogen in the form of nitrates. As nitrate of soda is a very powerful and quickly acting fertilizer, it must be used with care, and its properties fully understood. If applied at the usual time of the ripening of any crop the effect will be to stimulate new growth and to retard maturity. Applications should, therefore, be made when the crop is in an active, growing condition, and when
the roots are well distributed throughout the soil, to prevent loss by leaching. With a garden crop, such as tomatoes, about three applications should be made early in the season before the fruit begins to ripen. With oats, wheat, barley and other cereals it should never be used after the plants reach the blooming stage. Both the small and large fruits should receive the applications early in the season when the growth is most active. Leaf crops, such as lettuce and cabbage, are benefited by the use of nitrates during the entire period of growth. The Experiment Stations and private investigators have shown how profits may be materially increased by the use of nitrate of soda. We have found its use highly profitable in our own operations, and to our fellow farmers who have not used this concentrated plant food we would say, try it on a limited scale, and if judiciously used, we are convinced that they will ever after include it in their list of fertilizers.

The CHAIRMAN: As suggested by Col. Woodward, we will intersperse our exercises with something outside of the program. I now call on Mr. McWilliams, of Juniata county, for a song.

Mr. McWilliams came forward and entertained the audience with a song, entitled "The Old Yellow Pumpkin."

The CHAIRMAN: The next paper on the program for the evening is "Feeding Powers and Habits of Some Agricultural Plants," by Prof. Franklin Menges, of York, Pa.

Is the Professor present? He appears not to be here.


Mr. Peachy presented his paper as follows:
Jacob Riis, in his inimitable and characteristic manner most beautifully portrays "The Making of an American." It is the simple story of a European boy, transplanted to American soil, struggling manfully to secure the blessings and privileges accorded to American citizenship. During the various stages of advancement, encouraged by the smile of prosperity, strengthened by the stern realities of active life, there appears that steady under-current of concentration so necessary for the promulgation of thought, or the development of an idea.

Though his idea of "The Making of an American" may differ somewhat from "The Making of a Farmer," the voices of history bear testimony to the thought that the American farmer has ever been the best American. Best, because he pursues the highest calling within the category of man's usefulness, the first and only one given directly by the Creator; best, because of his natural environments, coming in close and daily contact with Nature and nature's laws; best, because his business is productive, not merely distributive, and the basis of all other industries; best, because of the natural life he lives, blest by the energizing sunshine and invigorating air, there comes from the rural home that indomitable spirit, that pure manhood and womanhood, that noble character, that tireless energy, that bundle of possibilities, that has adorned and elevated every profession in life, and without which the great arterial system of the commercial world would soon clog for want of pure blood.

'Tis said that poets are born; not made. And yet poetry is the product of labor. The thought that shall endure the test of time has only been obtained by persistent effort.

Grey's Elegy embraces years of patient toil. Hawthorne's Scarlet Letter, that great American romance, was not written in a day. Daniel Webster, the great constitutional lawyer, after that unanswerable reply to Senator Hayne, was asked how long it took him to prepare that speech, said "thirty years."
Horace Greeley, when asked how he would make a great journalist, replied: "Feed him on printer's ink," meaning by that to start the boy picking type, thereby learning the first principals of the "art preservative of all arts."

When Princeton and West Point were lined up for that cultured and refined American game of football, the referee said: "Princeton are you ready?" The captain answered, "Yep." "West Point, are you ready?" "We are ready, sir," came the well-rounded reply. Notice the difference of the two answers. It means more than can be told in a word or grasped in an idea. It involved a principle of education. West Point had learned to do things right, a very desirable factor in the problem of human life.

But what has this to do with "The Making of a Farmer." Does the successful operation of his business require a vast expenditure of thought and labor? Does he need to do anything more than sow the seed and reap the harvest, and sell the crop, and spend the money? Does he even need to think for himself, or can he continue to allow the other fellow to do the thinking for him? Does he necessarily need to look carefully after the details of his farming operations in order to be successful? Can he afford to spend time in preparation for his life work, or gain the experience of others? Will it pay him to do things right? Can he afford to waste money on a lead pencil and learn to use it intelligently?

On looking back to those good old times before the rattle of the mowing machine was heard in the land, we see those steady mowers swinging the mow-hook so gracefully. All day long they follow their intrepid leader, generally the best mower, who sets the pace for his followers. By virtue of his position, the first in the procession, he must necessarily have the best scythe. At the rear end of the line we see the boy with an old mow-hook, unskilled in the art of whetting the scythe, striving honestly and manfully to keep his place. He is laboring at a disadvantage, from the fact of some one else having used and abused the implement he now employs. It is a "hand-me-down," but sufficiently good for a boy. He might injure a new one, and for all that, he is only learning to mow.

Well do I remember seeing a band of these "jolly haymakers" bending to their work. I also heard, but did not understand "that there is no time lost in whetting." That labor performed in sharpening the steel was economizing strength and rendering more efficient service. That time expended in preparation was the surest means of accomplishing a purpose. That in the economy of labor, thought must devise the means of securing the best results.

The young man enters the service of a railroad company by going into the office and gaining a practical knowledge of the business. The future lawyer spends years of close application in order to be
successful in legal practice, and know what his services are really worth to his client. The physician must likewise gather the accumulated experience of the past in his efforts to keep the human family from going to that "bourne from whence no traveler returns." The minister, also, with an eye single for the good things of this earth, must be prepared to tell the old, old story in a manner pleasing and effective, if he would have the world to stop, keep awake and listen to his message. A college education seems almost necessary in order to become eminently successful in these three professions.

But what of the man that feeds them all. Does he need any special preparation for his life-work? Is he confronted by the intricate problems shared by those engaged in other vocations? If so, then, as in other lines of business, the man is the most important factor. Success in any line of agriculture is measured largely by the accumulated experience of the farmer. Agricultural science compared with that of other lines, is yet very meagre and incomplete. Scientific investigations are solving some of the problems that trouble the agriculturist, but the conditions are so different in the various localities, that every farm must needs be an experiment station. In other words, every farmer must put thought enough into his business to understand his conditions, and adapt himself to the circumstances, carefully choosing a special line of farm operations naturally adapted to his taste and environment. By so doing he gets more enjoyment out of his earthly span, larger profits for his labor, and helps dignify and ennoble the greatest productive industry in the world.

Occasionally we hear uncomplimentary remarks concerning the business of agriculture. A low estimate is put upon the farmer’s vocation, because it does not afford advantages for improvement, that it lacks in affording means for the development of thought; that studying agriculture and burying a talent are synonymous.

Strange, indeed, that such a mistaken idea should find momentary existence. Such characters are better prepared to dream with Rip Van Winkle than to sleep the sleep of the just. Many instances prove the contrary. The development of that wonderful machine, the dairy cow, should satisfy the most critical, to say nothing of that massive product, the beef animal. That spirited thorough-bred and ponderous draft horse are also products of care and selection. The history of the pumpkin seed, beginning with a very insignificant specimen, no larger than an ordinary cucumber, and ending with the old "Yellow Pumpkin," and its relative, exhibited at the fair, produces evidence of thought and labor.

Modern husbandry requires the hardest kind of thinking. From one common centre, the soil, radiates many different lines, each in itself difficult enough for the brightest mind. To restore the former
productivity of that hand-me-down farm, without having to sell, is a question only partially solved. "Uncle Sam" says to the military powers of the world, "hands off," and off they go, but the innumerable hosts of insect foes march grandly on through field, farm, orchard and garden. Greek roots are a source of trouble to the student, but how to grow clover roots continuously is more perplexing to the farmer. During a period of extreme drouth, we consult our most reliable almanac, watch the barometer, compare the never-failing signs with those of the lesser prophets, watching and waiting for the dews of Heaven to descend upon the parched earth, while the lumberman's axe continues to lay waste our beautiful forests, and, in a measure, at least, change the climatic conditions of the country. Under such circumstances we think of the conservation of soil moisture. These are some of the questions that have to do with the making of a farmer. Upon him devolves the task of answering them.

"There are but three resources of wealth—brains, muscle and raw material." Happily the farmer possesses all three. What he needs is a better knowledge of their application. How can this be secured? First, in the farmers' home, made as good and comfortable as the possessor's circumstances will allow, where the child can form habits of industry, learn the value of a dollar, be taught that labor is dignified and honorable, build up a strong physique in observance of the laws of sanitation, and can be taught to learn to love the beautiful and good in Nature, and beyond that, the God who created all things. Second, in the public schools, centralized, graded, supplemented with a practical course in nature study, supplied with some needed apparatus, and equipped with an able corps of teachers, the best one being in the primary department. Third, in the Agricultural College and at the Experiment Station, applying the scientific principles of specialists in the various lines, making them levers of thought, by which the great agricultural interests of the country must ultimately be moved.

But some one says this is impractical. For his benefit allow me to say that not every farmer can secure a college education; but practical and scientific literature is easily obtained, and it is criminal neglect upon the part of parents at this time to allow their children to grow into citizenship without learning to read intelli-gently. Not from books alone must come that knowledge so necessary for the making of a farmer, but it is the cheapest means of getting the other fellow's experience. Our own experience may make a deeper impression upon the memory, and yet not be so valuable. Thought, and not after-thought, must direct the labor and energy upon the farm.

A good housewife having in her employ a Chinese cook, in whom
she was well pleased, visited the kitchen one evening and was amazed to find this cleanly fellow washing his feet in the dish-pan. Having filed her objections to such proceedings, John indignantly replied: “Me feetee welley clean. Me washee, washee, evely night.” In this simple illustration we notice two visible view-points. The same question viewed from two different positions aroused the same feelings in the mind. While we have only touched the fringe on the garment of our subject, the principle remains true, that no one in any calling can do better than he knows.

Thought, then, must precede action. The farmer's movements, to be successful, must be directed by intelligence. As steel sharp-eneth steel, so mind sharp-eneth mind. If the mind is the man, then the making of a farmer depends upon the cultivation of the mind. With increased knowledge will come higher ideals and increasingly responsibilities. By the elevation of the individual a clearer realization of the importance of agriculture will be secured, and the modern husbandman will command the respect which his business so justly merits.

The CHAIRMAN: That we might not go home tired we will have a little entertainment by my friend Seeds, from Warrior's Mark township, who has kept very quiet and been very, very good, and I think he is now ready to perform his little part.

Mr. Seeds came forward and gave a humorous, witty and entertaining talk, illustrating the force and effect of saying the right thing at the right time and place.

MR. MARTIN: Mr. Chairman, we are favored at this meeting with the presence of our former Secretary of Agriculture, Professor John Hamilton, who is now Institute Specialist in the United States Department of Agriculture. I desire to inquire of Professor Hamilton if he will be with us during to-morrow's session. If not, we desire very much to have some remarks from him.

PROF. HAMILTON: Mr. Chairman, I hoped when I came here to have been with your Institute during the entire time of your session, including the three days, but I find it will be necessary for me to go away on the morning of Thursday, so I expect to be here all day to-morrow.

MR. SEEDS: If you please, coming down on the train I knew the ex-Secretary would be here, and knowing the people of Huntingdon county and everyone present would be glad to hear from him. I want to give my time to-morrow night to Prof. Hamilton, and let him have the time that I have on the program.

PROF. HAMILTON: That is contrary to one of the rules of our
Institute work. Every man is published and expected to take the time assigned him; and so there ought not to be anything to interfere with that. If, however, there is a little odd time that is unoccupied I will be glad to say a word.

The CHAIRMAN: We will be glad at some time to-morrow to hear from Professor Hamilton. For years he was Director of Institutes, afterwards for four years Secretary of Agriculture, and is now connected with the United States Department of Agriculture as Institute Specialist, and I know you will be glad to hear from him.

SECRETARY MARTIN: Before adjourning, I desire to call the attention of the audience to our program for to-morrow morning at 9 o'clock, and for to-morrow afternoon and evening. Write out any question that you may want to have taken up and discussed.

The CHAIRMAN: The Committee on Resolutions will meet to-morrow morning at 8 o'clock. Are there any other announcements to make for to-morrow?

MR. S. S. BLYHOLDER, Chairman of the Committee on Queries: I would state that any who have questions to hand in to raise your hands and we will take them up now.

The CHAIRMAN: The Superintendent of the Huntingdon Reformatory desires me to extend to you an invitation to inspect that institution. Promptly at 1 o'clock to-morrow afternoon conveyances will be here at the court house to take you to the Reformatory, and after a tour through the institution will bring you back quickly to the court house.

MR. MARTIN: Just a word. Those who are entitled to renumeration for transportation and hotel expenses I trust will call on me for vouchers. I have them here now. It is important that we have final settlement for this year's expenses made very promptly, and that is the reason why I make this request of each one entitled.

On motion, the meeting adjourned at 10 o'clock P. M., to meet to-morrow (Wednesday) morning, June 3, 1903, at 9.

Wednesday Morning, June 3, 1903.

A. L. MARTIN, Deputy Secretary of Agriculture and Director of Institutes, called the meeting to order at the time designated and announced that the Chairman for the morning would be Mr. Samuel McCreary, of Neshannock Falls, Pa., who thereupon took charge of the meeting.
The CHAIRMAN: We will proceed at once to take up the program as published. The first thing is "Soil Moisture," by Mr. M. S. McDowell, of State College, Pa.

MR. McDOowell: In view of the exceedingly dry weather that we have been experiencing in nearly every part of the State, and in view of the damage which has resulted, it would seem preposterous for us to say that it would be possible to get along without some rain. The majority of us must have some rain, and yet to illustrate what may be done under the most favorable conditions, we meet those here who claim to be getting along with a small amount of it. Mr. Detrich considers summer rains somewhat in the nature of a nuisance, and Professor Watts has been solving the question so that he can get along fairly well with a small amount of rain. These facts go to illustrate what can be done under the most favorable conditions, and that it is possible by study and mastering the principles which underlie them to solve them to a fair degree at least.

Mr. McDowell then presented his paper as follows:
SOIL MOISTURE.

By M. S. McDowell, State College.

Soil moisture, too little and in some cases too much of it, is one of the most oft recurring and perplexing problems which present themselves to the farmer for solution. It is more often than any other the potent factor which influences success or failure in farm operations. In the brief time allotted, it will be our endeavor to enumerate a few of the more salient points which bear directly upon the moisture-content of the soil, and, in addition, to develop a few observations relative to a phase of the moisture question not usually touched upon in considering this subject. We are familiar with the discussions on our farms and in the cities and towns of our State concerning a pure and sufficient water supply for use in the home, and it is a matter which in many quarters requires continual agitation. Pure water in large quantities is a necessity to the human race. Water is just as important a factor in plant life, and is capable of receiving as careful consideration. Notwithstanding the fact that the amount of water required by growing plants has been frequently emphasized, we often fail to realize how large this quantity is under ordinary circumstances. The plant is composed largely of water. From 65 to 95 per cent, or from 65 to 95 pounds, and in some cases as high as 98 pounds, in every 100 pounds is made up of water. When clover hay or grass is first cut, it contains on an average about 71 pounds of water to every 100 pounds of grass; when corn is cut for silage it contains about 79 pounds of water to every 100 pounds of corn; when a bushel of apples is picked, water represents 80 to 85 per cent, of the weight of those apples. So we might go on enumerating the various agricultural plants and indicating the amount of water contained in each. These few incidents, however, will suffice to emphasize the large proportion of water demanded by plants as a necessary part of their structure. And yet this large quantity represents but a fractional part of the total amount of moisture consumed in their development. We eat the food which is placed before us without reference to its solid or liquid condition. The infant, on the other hand, must be supplied with liquid food. It cannot handle solid food. So it is with the plant. The material it
takes from the soil must be in solution, and, of necessity, in very dilute solution. Large quantities of water are required to act as a solvent and carrier of food. It is really a breathing process. The root-hairs take up the water, laden with the plant food elements, from the soil. It is carried upward into the plant, the dissolved material being absorbed and the excess of water being evaporated from the leaves.

Experiments have been conducted which show that for every ton of dry matter of corn produced 310 tons of water are required; for every ton of dry matter of oats 522 tons; and for every ton of dry matter of potatoes 422 tons of water are consumed. In addition to the actual needs of the plant, the presence of water is necessary to accomplish those changes in the soil which render plant food available and which bring about the improvement of the physical properties of the soil.

The source of supply of all this water is, of course, the rainfall. The average rainfall for several years past has been in the neighborhood of 42 inches. An inch of rainfall means that if the water falling during a certain time were evenly and uniformly distributed over the surface of the ground in such a way that if it could not escape it would collect to a dept of one inch. To state it in a more concise way, an inch of rainfall is equivalent to 43 tons of water to the acre, so that in the course of a year every acre receives about 4,500 tons of water. This would be sufficient to supply any crop with an abundance of water were it all available. Much of this water, however, never sinks into the soil, but runs off the surface and is not only lost, so far as its use by the plant is concerned, in many cases carries with it much more soluble plant food. The difficulty arises from the uneven distribution of the rainfall and not from its limited amount. As it is the water which falls during the late fall and early spring and sinks in to the ground, coming to the surface again during a dry season, upon which the plants must chiefly rely for its drink, it is apparent that the first problem to solve is one involving the securing of that soil condition which will permit of a maximum absorption of water. Then if subsequent unnecessary loss of this water by evaporation can be prevented, we will be approaching a solution of the difficulty.

Those years in which natural moisture conditions are most favorable give usually the most abundant harvest. Now if in an unfavorable season these conditions can be controlled within certain limits through artificial means, the individual exhibiting the greatest skill in this direction will reap the greatest reward.

Before proceeding to a discussion of a few of the factors which influence the retentiveness of soils for moisture, it may be desirable to refer, briefly to the way in which water is found in the soil.
Free water is that which moves under the influence of gravity and is the source of supply of our wells and springs. It is not directly useful to plants and its presence too near the surface is injurious to vegetable life. It, however, forms a reserve supply from which capillary water is continually drawn. Capillary water is that which fills the openings between the particles of soil and is the direct source of supply for plants. If a towel be suspended in water the former will gradually become wet a considerable distance above the level of the water. The water rises in the soil in the same manner and this phenomena is what is termed capillary action. This capillary action does not necessarily take place from deep in the soil toward the surface, but rather from the more moist to the dryer portion of the soil. As a rule, of course, the dryer soil is to be found at the surface. Here is where water is being constantly evaporated and the movement is from underneath upward to supply this loss. In a dry time this force is sufficient to raise the water through several feet of earth. So-called hygroscopic water is that held firmly by the soil and freed only when exposed to a temperature equal to that of boiling water. As far as its practical bearing is concerned it may be eliminated from the discussion.

The physical character of the soil fixes in large measure its power to absorb and retain moisture. In general, the finer the soil grains the more water the soil will hold, and when once absorbed the more readily the moisture will respond to the capillary action, and the more tenaciously such a soil will cling to its moisture. Where a clay soil, which is composed of fine particles, under ordinary field conditions contains 34 per cent. of moisture, a sandy soil, under the same conditions, contains only a little over $17\frac{1}{2}$ per cent. On the other hand, the smaller the size of the spaces through which the water must flow passing downward under the influence of gravity, the slower will be the rate at which it will move. That soil, therefore, which will hold the largest volume of water, whose particles are fine clay, is least impervious to water and much loss may occur through surface drainage. In cases of soils having a loose, open texture, as sandy soils, water percolates readily, and may be lost by passing downward beyond the reach of root action.

In the conservation of soil moisture, effort should first be directed toward ameliorating these conditions. The greatest factor in bringing about this improvement is the presence of humus or decayed vegetable matter. It is the humus which imparts a sponge-like condition to the soil. In case of heavy clay soils the small particles of which they are composed will be flocculated, thus tending to open up the pores and admit of the more ready penetration of both water and air. On the other hand, it will affect the loose, open soil by binding the particles more closely together, bringing about in both cases an intermediate condition.
Application of lime for the purpose of bringing about the improvement of these physical conditions have been found in some cases to give excellent results, especially on heavy clay soils. The binding action of lime is well known. Lime will cement the small particles of a clay soil at the surface, forming larger pores, thus rendering such a soil more pervious to water, and in many cases prevent washing.

Again, underdrainage is often an important factor in increasing the ability of the soil to absorb and retain moisture. The fact has already been noted that the presence of free water, within a certain distance of the surface, is injurious to plant life. Underdrainage lowers the level of this free water, where it exists, and prevents the baking and cracking of the surface which occurs when a water-logged soil dries out; it renders the soil above more friable and loose, therefore, more adaptable as a home for plants. The soil that can better absorb water, capillary action can go on more readily and water can reach the rootlets with more ease.

Concerning the losses of moisture, which occur subsequently to its absorption by the soil, evaporation is chiefly responsible. It has already been noted how the particles of soil form capillary tubes through which water is lifted from underneath to the surface. At Syracuse, New York, a test was made by the Government in connection with the salt works in that city to ascertain the rate of evaporation as compared with the amount of rainfall. The evaporation from a water surface in a year was 50.2 inches, while during the same period the rainfall amounted to 41.47 inches. From this it can be readily seen how rapidly, under favorable conditions, evaporation may occur from the soil where there is a much larger surface exposed. To prevent evaporation from a vessel containing water, it is necessary to cover it, and on the same principle to prevent unnecessary evaporation from the soil, it is necessary to place a check at the surface of the ground. Our homes may be supplied with water from a mountain spring or from reservoirs. The water is conveyed by means of pipes into our houses. The supply, however, is controlled by valves. The water is at our very hand; all we have to do is to turn the valve. This prevents the great waste which would occur did the water run continuously. The same principle applies to the feeding of plants with water in the soil. We have the supply or reservoir deep in the soil. Through capillary action it is brought within reach of the rootlets and even to the surface where it escapes by evaporation. Now to prevent this waste it is desirable to put a valve at the surface; to have the moisture come so far and then prevent, so far as possible, its escape. Surface cultivation accomplishes this, breaking the capillary tubes and forming a mulch which arrests evaporation. Now,
as the valves in our water lines become worn they will begin to leak and if not properly packed the size of the leak will increase until the waste will be as large as if no valve were there. So it is in the soil. As the mulch has been formed by cultivation gradually settles, capillarity will again be established and the loss will continue. Frequent cultivation is required to keep the connection at the surface continually broken; to keep the valves at the surface of the soil well packed.

The plough, the harrow, the roller, the cultivator, all serve as conservers of moisture. The plough by breaking up the heavy soil, making it loose, more pervious to water and by developing an open, crumbly condition which checks the rise of capillary water. The harrow and cultivator by breaking the connections and forming the mulch already noted. The relation of the roller to the moisture in the soil is opposite to that of the cultivator. There are certain classes of soils whose particles are not in close proximity to one another, as gravelly soils, and capillary action can not take place so readily. The effect of the roller is to compact these particles, completing the connections between the reservoir and the surface. When the roller is used it should be borne in mind that the soil is then in the best condition possible to part with its moisture, and if the object sought is the fining of the soil and not the bringing of water to the surface to assist in the germination of the seed, a mulch should be placed at the surface by following immediately with the harrow. In general, then, good drainage, humus and thorough cultivation are the great factors which materially influence the ability of soils to retain moisture.

In this connection, it is fitting to refer to the belief entertained in some quarters, that common salt and some fertilizers tend to make soils more moist. This belief is not altogether without warrant. The rate at which capillarity is able to raise water in the soil is influenced by substances dissolved in the soil water. The presence of common salt or land plaster in the soil-water tends to decrease the rate at which water will rise to the surface and hence to decrease the amount of water evaporating from the surface.

Having referred briefly to a few well known principles relative to the conservation of soil moisture, it may be interesting and instructive to trace the relation existing between this question of moisture and that of soil temperature. There are limits beyond which life cannot exist. In the case of our bodies, these limits are quite narrow. A variation of a few degrees means serious consequences. Ninety-eight (98) degrees is the normal temperature of the human body, and should this temperature rise 8 or ten degrees it usually means death; or, on the other hand, the results would be equally fatal should there be a drop in temperature. This prin-
principle applies to all animal life. As there are limits beyond which animal life can not exist, so there are limits of temperature beyond which vegetable life will wither and die; and as there is a so-called normal temperature, which is the best temperature for the particular kind of animal, so there is a temperature at which plant development will take place to the best advantage. The limits in case of the latter are, however, much further apart. Many of the changes which occur in the plant and animal, human or otherwise, are chemical changes. When wood burns or when a lamp is lighted, a chemical change takes place; the oxygen of the air is uniting with it. Before this change can begin to take place, however, the wood must first be ignited; that is, its temperature must be raised to a certain point and when this is once done, other conditions being favorable, the material continues to burn. There is sufficient heat produced by the change taking place to maintain the action.

The germination of a seed partakes of the same nature. It must unite with the oxygen of the air in order that its vital principles may become manifest. It is, therefore, necessary that the temperature of the soil be raised as nearly as possible to the point at which this action will proceed to the best advantage. The minimum temperature at which most seeds will begin growth is about 45 degrees Fahrenheit, but the best results are brought about by a temperature of 68 to 70 degrees. This best temperature will, of course, vary with the particular kind of seed. It has been found by experiment that oats will germinate in three days at a temperature of slightly over 65 degrees, while with the temperature as low as 41 degrees, seven days are required for germination. In the same way, corn which will germinate in three days at 65 degrees, requires eleven days if the temperature is down to 51 degrees. The desirability of having the soil warmed early in the spring is therefore apparent.

While in the animal body, danger is usually to be apprehended from too high a temperature, in the vegetable world the reverse is true. It may seem to many that if a temperature of 65 to 70 degrees is best suited for the germination of seeds that this temperature would not be difficult of attainment and that the soil would easily become this warm. Observation of soil temperature, conducted at the Experiment Station show that the average temperature of the soil at the surface and a depth of one and three inches, and extending through several years was as follows:
It will be seen from these figures that even in July and August the soil temperature is but little above that which is found to give best results.

Aside from the direct effect which a higher temperature has on the ability of seeds to germinate, it greatly influences other processes in the soil. We know that warm water will dissolve more sugar or salt than will cold water. Now, as the plant food taken from the soil must be in solution, and since much of this material is not easily soluble at best, the advance of a higher temperature is obvious.

Again, bacteriology teaches us that there is an optimum, as well as a maximum and minimum, temperature at which germ life will thrive. The higher the soil temperature, therefore, and the earlier it can be increased, the sooner nitrification and other changes will go forward, or in other words, the sooner plant food will become available.

There are yet other actions which will be intensified by an increased temperature. Plants absorb their dissolved food through the rootlets by osmosis. As the temperature is increased this goes on more readily, the dissolved material is removed more quickly, and, as a result, the process of working over plant food is facilitated. The circulation of the air in the soil is also increased as the temperature rises. When a good fire is desired the draught is turned on, in order that there may be a continual supply of oxygen to unite with the wood or coal. It is just as necessary to have good draught in the soil in order that there may always be oxygen present to take the place of that used up by the plant in the soil.

Now, as to the manner in which this question of temperature and moisture are related to each other. Evaporation is a cooling process. Upon this fact is based a physiological process which is made use of by our bodies continuously. When our temperature tends to become too high, perspiration comes to our rescue. Evaporation begins to take place and the cooling effect of this evapora-
tion holds down the temperature of the body. A sandy soil will become warm much more quickly than a heavy, stiff clay. The latter holds water more tenaciously and evaporation continues to take place, holding the temperature down.

Time will not permit nor is it necessary to discuss the way in which control of soil moisture may affect the soil temperature, further than to say, that the thorough preparation of the seed-bed, upon which all good farmers insist, materially aids in preventing the continual escape of water by evaporation and hence in bringing about those conditions of temperature which are found most favorable. The formation of a mulch by cultivation as early in the spring as possible will arrest evaporation and avoid the unnecessary cooling of the soil which accompanies that operation. At the same time, the warmth of the sun instead of being used up in evaporating the water will be absorbed by the soil. It is not necessary to attempt to bring these conditions about to any great depth but merely sufficient to permit of the early warming of a few inches of the surface soil.

The CHAIRMAN: We will deviate a little from the program, as I presume the Committee on Queries have some questions they want answered, and we will have them presented now.

MR. S. S. BLYHOLDER, Chairman of the Committee on Queries: The first question is addressed to Dr. Thayer:

"Is it practical to grow corn year after year, depending on crimson clover as a catch crop to maintain humus in the soil?"

DR. THAYER: As far as the humus is concerned, it is possible; but it is not concerning other elements of fertility, and a rotation is better on that account. Now, it is not possible to raise crimson clover in dense corn fields, where the corn is high and with heavy blades and the ground shaded. You cannot depend upon it as humus for you cannot raise it. There would be humus enough there for the ground if you could get it, but by and by the phosphoric acid would become scarce.

MR. BLYHOLDER: The next question is addressed to Professor Wells W. Cooke:

"How does oats and pea hay compare in feeding value with the ordinary mixed clover and timothy hay?"

PROF. COOKE: As far as the feeding value is concerned there would not be much difference; but, of course, the proportions would be, that is, the pea hay will have the largest proportion of digestibility; the clover will come next, while the oat hay, if cut when the oats are in blossom, would have about the same percentage of digestibility as the ordinary mixed clover and timothy hay we have on our farms.
MR. BLYHOLDER: The next question is:
"Will Dr. Thayer describe his method of curing clover hay in air-tight mows?"

DR. THAYER: Very easily done. If you have an air-tight mow put your hay in and shut it up and I don't care how green it is when you put it in. An ordinary mow will not do. I have put it in a mow where I could close it up and I have put it in so wet that my helper said it would be manure in a short time, but I never had better hay. But it must be practically air-tight. This hay was cut in the evening from four to six o'clock and put into the mow the next morning, and not ten pounds of it ever mildewed.

A Member: Might we ask what the result would be if put in a mow that was not air-tight?

DR. THAYER: The result would be that it generates intense heat, and as the cold air comes in contact with it you would get mildewed hay. When you put your hay in, go away and stay away. Once after three or four days I turned back a board and stuck my head into the mow, and I might just as well stuck it into a bake oven and I shut it down on the hay. There was just one little place where the air had gotten through, perhaps a yard square, and there the hay was mildewed. But aside from that there was not a mildewed spot.

A Member: I would like to ask the Doctor if that hay would not have been better if he had waited until the dew was off it and then put it away?

DR. THAYER: I do not think it would.

A Member: I think it would. There might have been a little fungus on it. I tried it.

DR. THAYER: That is correct.

MR. BLYHOLDER: The next question is addressed to no one particularly:
"How to feed alfalfa so that cattle do not become hoven?"

The CHAIRMAN: Mr. Lighty, will you answer that?

MR. L. W. LIGHTY: I never had any experience in feeding alfalfa. In feeding clover I never had any trouble. The only thing to be watched is to keep the cattle's digestive apparatus in proper condition and you will not have hoven cattle. I presume it would be the same with alfalfa.

A Member: Perhaps Professor Cooke has had more experience in feeding alfalfa and could give us some information on this question.

PROF. COOKE: I feed alfalfa and never found anybody yet who pretended to feed it without producing hoven cattle. It is always
experienced, and you do not necessarily lose animals. I have lost
only one in all my feeding, and that was a cow fed on first class, dry
alfalfa hay; fed in the barn, went down to the spring and drank and
was dead in ten minutes. But there is no such thing as preparing
alfalfa in such a way that it is not dangerous to feed, whether to
sheep or cattle, and the only thing is to keep watch, and if they do
bloat give something to bring it down. We finally settled on am-
monia as producing the best results for reducing the bloat. Keep a
little bottle of ammonia in the stable and on any signs of bloat we
give it at once, and in that way we feed year after year, and have
lost no cattle. But I want to insist on the fact that there is no
way of feeding, or cutting it, no way of curing it, which will put
it in such condition that it is not liable at any time and with any
stock to produce hoven.

A Member: Feed the cows all they will eat until 4 or 5 o'clock
at night. Cut it sometime before you are going to feed it, and give
it in a wilted condition, and it will not be so apt to bloat.

A Member: I would like Professor Cooke to tell us the amount
of ammonia to give an animal.

PROF. COOKE: The ordinary household ammonia reduced to
about one-fourth the strength, and then give about half a pint of
that; giving it in a bottle, forcing it down the cow's mouth.

A Member: I put in that question for the reason that I was in-
fomed it was a dangerous food in that respect. I put out some al-
alfafa, and if this is the case we want to go slow in its use.

PROF. COOKE: It is first rate for hogs. Either sheep or cattle
can be fed safely and the feeding of green alfalfa in the barn is
almost as dangerous as to pasture, although the chances are that
you can feed right along without danger; but always keep in mind
that you are dealing with a risky material.

MR. BLYHOLDER: The next question is:

"When and how to sow the clover on grain stubble so as to keep
up the usual rotation?"

DR. THAYER: I possibly don't quite grasp what is meant by
the usual rotation, but I suppose to follow wheat with corn, and
in that case crimson clover can be sown on the stubble during the
last of May or from that on and corn planted the next year. The
natural time for crimson clover is right after harvest, and it don't
interfere with any rotation if followed by corn or potatoes. Of
course we would not follow with oats or wheat.

A Member: When would he plant his corn if he sows the crimson
clover in May?
DR. THAYER: I said turn it under in May. There is one thing we should be careful about. When you are turning under such a mass of matter soon after the middle of May, you want to roll that ground very thoroughly. There has been a great deal of fear that that would sour the soil. There is not any ground for fear on that score. It is more dangerous to turn under a half developed crop than a crop pretty well matured and up to blossoming. But roll and compact your ground thoroughly, and I will guarantee there will be no acid there to do damage.

MR. BLYHOLDER: The next question is directed to Dr. Leonard Pearson, State Veterinarian. It is:

“What is the cause and the remedy for white scours or cholera in newly dropped calves?”

MR. GEORGE CAMPBELL: This disease is really known as a blood poison of a rapid form that results from the affliction of the calf through the navel at the time it is born. One of the symptoms of the disease is known as white scours. The prevention of the disease depends upon the prevention of the infection. Now, if a calf is born at a place where the organisms of disease do not exist, the calf is not affected, and so we notice that calves born in summer time are usually exempt from this disease. It is chiefly a disease of the winter season when calves are born in infected stables. Last winter I was consulted in reference to this matter in a case where there had been considerable trouble from this cause. There the successful treatment that was followed was to build a separate calving stable, an outside building, to which the cows were moved two or three weeks before calving, and were kept perfectly clean and disinfected frequently and the calves remained exempt from this disease. In parts of Ireland this disease has been a scourge. It has almost ruined the farmers of some large dairying districts because they lost all their calves, and they found they could prevent it by being very careful about the surroundings and by disinfecting the navel of the calf by washing it off with a solution of carbolic acid or a like disinfectant solution, and after that the navel is painted with iodine and covered with collodium in order to protect it from germs, and in that way the disease is avoided.

A Member: In our place we make it a point to raise all the calves we can and we have had trouble with the white scours, and it is conceded that they are caused as has just been stated. We turn our cows into a box stall a week previous to their calving and change a liberal bed every day. If our calves show any disposition to white scours we doctor them at once. We have tried a half dozen remedies. We have lost a good many calves, and I believe the loss of calves in the United States by white scours is
about $4,000,000 per annum. So we made an object of raising calves and wanted to find the best remedy for this disease, and we kept trying until we found this one to be good, and in about three out of four cases it is successful. As soon as it is observed that the calf has the scours, which will be soon after it is born, give it twenty drops of laudanum; in six hours give it twenty drops more, and if no relief is manifest at the end of twelve hours more give it forty drops, and in ten hours more you will have a dead calf or a live one, and in three cases out of four the calf revives. This has been my experience for five years. We raise twenty calves per season.

MR. CAMPBELL: We have been troubled in Bradford county with these white scours in calves for some years back. In making a study of that thing I found out that we have not got the right hold of it yet. As near as I could study it down on our farms I found out that it was a distinct fungus poison that takes place in the cow. When the cow is dry they take any old musty corn stalks or any old grass, or any indifferent feed and think it is good enough for her, as she is not producing an immediate return. If you feed your cows good, pure food you will have healthy cows. If a cow wants good feed at anytime, it is the time when she is dry, and has double demands made upon her. And if you feed a cow poison that works out through her, the calf will be poisoned without a doubt. So the prevention, in a great measure, is to feed good food to her when she is dry. If you feed a poor food when she is milking, that poison is carried off in the milk. So, you will have no trouble if you feed good feed when the cow is dry.

MR. BLYHOLDER: The next question is addressed to Professor Watts, and is:

"How do you apply sodium nitrate to growing cabbage, tomatoes, etc.?"

PROF. R. I. WATTS: Apply it before we put out the plants, and then immediately about the plants a top-dressing is used. With cabbage we make three applications and apply about a teaspoon full at each application. This can be done at a small cost.

MR. R. S. SEEDS: Last Friday a week ago, on the 22d of May, I went out and sowed nitrate of soda over a poor spot and now as far as the eye will carry, or as far as you can go, you can see that spot with the nitrate of soda over it.

MR. M. S. BOND: I could not afford in my market gardening to go to the trouble in applying this application of nitrate of soda by hand. We have a machine to apply it with. We go right through the patch as far as a man can walk and throw the nitrate or any other fertilizer we wish to apply right to the side on each side of
the plants in the row. It is a little waste between the hills, but the waste is not near as much as the cost of labor. You can get a little hand machine to do this, and you can apply it that way just as far as a man can walk through the patch. I can apply nitrate of soda or potash practically with this machine.

MR. BLYHOLDER: The next question is:

"Is it profitable to feed ensilage to beef cattle?"

DR. H. P. ARMSBY: Mr. Chairman, I am not able to answer that question from experience, having never tried the experiment. I see no reason, however, why ensilage would not be a good, cheap food for fattening cattle unless, perhaps, in the finishing stage. I believe it has the reputation of making the cattle, as we term it, soft, and they think it desirable to finish them upon dry feed. So far, around here, it is comparatively a new feed, and as an actual fact I do not know. It is a question which I think needs thorough investigation, but I see no reason why ensilage should not be an excellent food in the early stage of fattening.

PROF. HAMILTON: I happened to see a report made by the Director of the Tennessee Experiment Station on this question. They tried the feeding of cattle upon ensilage, in connection with some dry food to balance the ration. Their ensilage consisted of cow peas and sorghum. The results were to me startling. The several months of feeding averaged between two and two and a half pounds a day gain, I have forgotten the exact figures, but between two and two and a half pounds per day during the period of feeding. And now they are comparing that with pasture and have put in another district with blue-grass pasture, with a view to discover whether the pasture will increase the weight more rapidly than ensilage or whether there will be a falling off. When the experiment is completed I think it will be one of the most interesting to cattle feeders in the country, because I think we must come back to this manner of feeding. I give you this statement as the result of a careful experiment. The animals weighed about 800 pounds apiece, and when all the expenses were figured up it was found much cheaper than animals fed on dry feed or in any other way. The ensilage was carried on in connection with the ordinary way of feeding by dry feed, and the ensilage was not only the cheapest, but the increase the greatest of anything used. You can get the bulletin on this by writing to Dr. Soule, of the Tennessee Experimental Station.

MR. JASON SEXTON: Mr. Chairman, I am much interested in this experiment. I have practical experience on that line, and want to corroborate what Prof. Hamilton has said in the feeding of ensi-
lage for fattening steers or cattle. It is an interesting question, for we of the East must compete more or less with the cattle feeding of the West, and my experience teaches me that there is nothing that the farmers of the East can feed their fattening cattle upon much better than upon good ensilage, now that we have learned how to make it. The question was, how to make ensilage properly and have it in its best possible condition. We have solved that now since away back in 1880, down to the present time. I want to say that a few years ago we started with 100 steers, all in one stable, and fed them upon ensilage for over four months. Those steers were fattened mostly upon ensilage, and the balance ration was the wheat bran and corn meal fed with it. We have never had a stable of cattle do better, and they were sold to Martin & Co., and shipped to Liverpool. We never had animals gain as rapidly as they did upon the ensilage fed them. The corn was nearly glazed as we put it in the silo. It was grown not very thickly. It was a good, strong feed.

Now then, there are many farmers near Philadelphia, in my county, that are attending the markets weekly, that feed and butcher their own cattle, and these cattle now are mostly fed upon their corn crop, grown as you grow your corn crop, and put in the silo with the full cars on, and these steers are butchered and sold in the markets of Philadelphia and fattened mostly upon ensilage for the reason that it is the cheapest food by far we can secure. In this way we think we can compete, in a small measure, with the feeding of cattle in the West.

MR. S. F. BARBER: I have been observing the benefits of feeding ensilage for a good many years and never in this time have I been able to find anything that will put on flesh so rapidly. I have not been feeding beef cattle on a large scale, but I find it the strongest feed I can get. I remember some gentlemen came to my place from the city of Baltimore, who were large feeders, and the question in their minds was whether to build a silo for feeding beef cattle. I told them that my best experience convinced me that they could get nothing that would prove more profitable. Out of the four, one gentleman said: "Mr. Barber, I have made up my mind that I will build a silo." And then I asked him to give me a report of the result when he sold the cattle. Sometime afterward, the gentleman wrote me that in selecting the same cattle out of the same pen that his neighbors had he had been able to put on 150 pounds per head more weight than by any other method.

I notice by the Breeder's Gazette lately that the gentlemen of the West, Iowa and Nebraska, are coming to see the value of silos. One man reported that his cattle had made a gain of three and a half
pounds a day. I am convinced that the day has arrived when the farmer must have a silo to feed beef cows. I am glad to see the interest taken in this because I am satisfied it is only a question of a few years until every farmer in this country must have a silo. He cannot do without it.

A Member: I want to ask Professor Hamilton whether the gentlemen in the eastern sections will have to feed beef cattle in preference to dairying.

PROF. HAMILTON: I believe that the feeding of beef cattle is going to be general all over the East, and while dairying will be maintained and be a great industry, yet in the districts remote from the railroad the feeding of beef cattle will be the industry. As soon as we can do it, as has been suggested, feed in competition with the western grower, then we will come back to this industry that has departed from our midst in recent years. I feel very strongly that the dairying practiced in the eastern part of Pennsylvania has been a disadvantage to that section; that the selling of the milk crop in the cities has positively been a disadvantage to the farmers of the East, and if we come back to the feeding of beef cattle we will keep on our farms everything of value. I believe the time is at hand when we will be able to do that and this ensilage question is the one that will solve that problem.

A Member: I have never had any experience of my own on this subject, but I watched a neighbor this winter feeding ensilage to beef cattle. He kept a dairy, using the silo, and he thought that there was too much that went off the farm in the milk. He put up about twenty steers and fed them ensilage. I feed a great many cattle, but not with ensilage. I have his report for it, and I never saw steers do better than those steers did. He is so converted to the idea that he is now building another silo. He finished them off at the close of the winter. They took on flesh as good as in pasture. We know that if cattle are fed in pasture they grow right along, and this they did on ensilage, and I want to agree with what has been said, that if we use the silo to fatten beef cattle it will be more advantageous to our farm than selling off the milk.

PROF. HAMILTON: I want to call attention particularly to the fact that Professor Waters, of Missouri, who used to be here, is preparing a bulletin for the Department of our State on this very subject of the feeding of beef cattle in Pennsylvania. You want to look out for that when it is published. You know Professor Waters is one of the leading agriculturists in the United States. It will be published by the Department. It was several months ago that the arrangement was made for it. I think the members of this Board and our lecturers will want to study it carefully. It will
be a demonstration of the best method of raising beef cattle in Pennsylvania and of its superiority over any other. It will be a good thing for the majority of our farmers.

DR. ARMSBY: I want to suggest that there are two phases of the subject which, I think, will help us in this matter of returning more or less to the fattening of beef cattle. One is the question under discussion of the more extensive use of ensilage for food; the utilization of the corn crop. The State College for the past three years has been following up a line of investigation in this direction which was suggested by Professor Hamilton, and one thing under consideration is the matter of diminishing the labor cost by feeding in bunches instead of putting up the cattle as has been the practice, and the result of three years' experiment has been that the cattle did just as well, after being dehorned; and in addition to that, there was a considerable saving in the manure over the ordinary method of handling—considerable less loss of the fertilizing material—and that means a considerable economy in production.

During the last winter we have been feeding one lot of cattle in the barn and another lot in an open shed, but otherwise exposed to the weather. We did not succeed in making the conditions quite ideal, but the cattle outdoors did very nearly as well as those in the barn, and gave them a little dryer quarters, and I am convinced from the results of numerous experiments that they would have done equally well. This contradicts the idea about the necessity for shelter, but it seems to be thoroughly established now by trying experiments that the fattening steer is producing more heat than he needs, and that he will be more comfortable and do better if he is exposed to moderately cold weather. So that there is another question, that is to say, we can approximate to the conditions that have maintained in the West, where practically from necessity and carelessness they make the conditions very simple, not much more than enclosing their cattle and giving them lots to eat, making the whole handling very simple. So that, in feeding operations, we are progressing, and our results and those obtained in other states will do a great deal towards rendering the beef cattle in Pennsylvania and the Eastern states generally a more profitable and desirable branch of animal husbandry than it has been heretofore.

MR. BLYHOLDER: The next two questions in my hands are related, and can be discussed at the same time, and I will, therefore, read them both now. The first is:

"Is not timothy cut green for hay not underestimated?"

The other is:

"What is the best substitute for hay when the hay crop is short?"
PROF. COOKE: My experience with early cut timothy was in the State of Vermont, and I think one of the hottest fights I have ever had in an agricultural institute was when I undertook to defend the cutting of timothy, at the usual stage of cutting, before a serious public and an audience of dairymen. From chemical analysis, timothy has the largest percentage of digestible material just when it is in full blossom, and judging from the chemical side, I advocated to that audience that that was the proper time to cut their timothy; and they jumped on me with both feet. The Vermonter has found out by experience that just so many days as he cuts his timothy earlier, just so much more milk and butter is he going to get out of his cows in winter time. If you go up there you will find them depending largely on timothy hay, but cutting it early. They say the stage for cutting is as soon as you can see the first sign of any purple coloring, which really is before the plant begins to blossom. And using that as their hay they are able to get a good flow of milk in the winter time. The time to cut clover is about the time to begin haying; the first Monday after the Fourth of July. Their idea is to begin earlier and celebrate their Fourth of July after.

Chemical analysis shows that the timothy cut in that stage has a much higher digestibility and practically is very much richer in albuminoids. The objection is that by this early cutting you decrease the weight of the crop, and yet you get a much larger increase in the aftermath, and that also has a high digestibility and a high nitrogen content. So, in cutting early, you are getting a first class material for the dairy cow. I am not talking now about selling or feeding any but dairy cows.

One word more with reference to the last question under discussion. I have had some little experience in the line of feeding ensilage to steers, and I agree to everything that has been said about feeding steers in the early stage. I have found, taking steers out of the same bunch, and gradually breaking them off the ensilage the last few weeks, that they kept their condition better than those that had not been rounded off with dry feed, so that I would certainly advise, if the steers are to be shipped from the farm, that the fattening be finished on some dry food.

MR. R. J. WELD: We had some timothy along our line fence and our dairy cows were bothering us by reaching through after this timothy and breaking the fence. I suggested that we cut it as it was and obviate this nuisance. This was just after the heads came in sight, about the middle of June. We cut this and put it in the mow and along in the winter when we came to it I never fed any kind of hay that the cows seemed to relish as much or came as near
their liking of clover hay as that green timothy hay, and from the cows' actions or responses I am satisfied that the majority of the farmers in our State wait at least two or three weeks too long before cutting their timothy hay.

MR. E. S. HOOVER: On this matter of cutting timothy hay, I find by experience, as already stated, that the better time to cut it for milch cows is before it gets into bloom or blossom; for horses or market I think the better time and most profitable is to cut it just before the blossom is off. The objection I have to cutting it when the blossom is on is that it makes the hay dusty. I, therefore, do not cut timothy while in blossom, in order to avoid the dust; I cut before or after, whether for milch cows or horses and market.

MR. BLYHOLDER: You have heard all the questions sent in before this morning's sessions. Those just sent in and any others you may have during the morning we will hold over for our next session.


MR. PHILIPS: Those who are as familiar with this subject as I am will realize that it is a broad subject, and it is not possible to treat it very fully in the time assigned me, and I propose to limit myself to that time.

I think it is proper to you to say that this paper has not been prepared practically for your information, because I presume that most of the men before me are just as familiar with this question as I am, and I have prepared it more particularly to meet the difficulties and queries that I hear in Farmers' Institute work, and to try and help some of the thousands of men who will read it after you and I have forgotten it.

The paper is as follows:
COMMERCIAL FERTILIZERS, THEIR NATURE AND USE.

By Hon. T. J. Philips, Allentown, Pa.

The last quarter of the nineteenth century has done more to utilize the waste than all time gone before. Minerals were lying in the earth around and among us, only waiting for organized capital to mine and prepare them for the use of mankind. Products that always had been considered waste were husbanded and made useful to man.

The time, energy and capital spent in disseminating knowledge of and a market for these products, has been only a little less than that consumed in their preparation for our use. When human labor alone was depended upon to prepare the soil, plant and reap the crops, intensive farming was practicable only upon limited areas.

The Civil War drained the country of one-sixth of its able-bodied men, but the ingenious mechanic supplied the deficiency by building machines to do their work. With the return of peace, business in every line received an impetus before undreamed of. Cities grew as by magic. Mills, factories and shops poured great clouds of smoke skyward. These busy thousands must be fed. The cultivated farms under the most severe and exhaustive cropping showed evidence of failure. The available plant food had been shipped to the towns; its waste was in the river bottom or beyond the sea, and could not be returned to the soil.

Artificial methods were tried to repair the loss. The islands of the sea were denuded of their nitrogen in guano. Ashes from mill and tannery furnished phosphoric acid and potash, but these sources proved inadequate. The rainless desert, deep mines, etc., were required to give up their treasures.

To-day more than five million dollars is expended annually in Pennsylvania alone for these elements, necessary to plant growth. And when we realize that possibly one-fourth of this great sum is wasted because unwisely expended, this question of commercial fertilizers becomes worthy of the attention of any one interested in the growth of plant life. Our lawmakers and executive officers have wisely assumed to regulate the business, and I confidently believe that the sum annually appropriated to the Farmers' Institutes is returned four-fold, in teaching the people who are not chemists,
the nature and use of what are commonly called "fertilizers" alone. And this is only one of several helps that are forcefully illustrated at every one of the more than three hundred institutes held in the State annually. Five weeks ago I visited a locality in which one of those institutes was held last winter, and was told that the information then obtained had saved them eighty dollars ($80) on a single car-load. The narrator himself had profited eight dollars ($8) by listening understandingly to one lecture.

Of the fourteen elements that combine to make a plant, ten are abundant everywhere. And we need concern ourselves with only one, two, three or possibly four. Each of these has a peculiar function, and cannot be substituted.

The perfect plant has roots, stalk and seed, and each member requires food for its development. If all are abundant and available, the plant is vigorous and healthy, but if any one is absent, or available only in insufficient quantity, failure is the result. Our crops differ as to their requirements. A crop of wheat, for instance, requires precisely the same food that makes a paying yield of potatoes or of fruit, but the proportions of nitrogen, phosphoric acid and of potash differ widely, so that profitable culture demands a knowledge of the constituents of each. It may be helpful to some who may read this paper long after you and I have forgotten it, to know that in a general way, nitrogen makes leaf and twig growth, phosphoric acid is indispensable in grains and seeds, while potash predominates in roots and fruits.

An acre of good corn will require twice as many pounds of nitrogen as will a full crop of potatoes, because of the great stalk development, but the potatoes will require double the quantity of potash. The nitrogen of our commercial fertilizers is derived from many sources, but principally from the nitrate of soda, a crude product found in the rainless districts of Western South America. Also from blood and tankage from the slaughter-houses and from bones. The phosphoric acid is the most abundant in the fossil remains of animals and fish found in South Carolina, Florida, Tennessee, Cuba and elsewhere. Bones are also rich in this element. The potash comes almost entirely from very deep mines in Germany. Plants can take their food only in a liquid form, and any material used to build up the structure of a plant is held in solution. The water absorbed by plants is not pure, containing probably two to four pounds of soluble matter from which plants derive their entire supply of solid material, in each ton. If a plant is burned we find in the ashes all the elements derived from the soil, except the nitrogen. These solids will scarcely amount to more than two or three per cent. of the original weight of what was supposed to be dry matter. The great remainder is air and water which passes off
as vapor or gas while burning. The solid matter found in the ashes, is present in all soils, in practically unlimited quantities, except phosphoric acid, potash and sometimes, lime; and the farmer has no need to concern himself about any others, except nitrogen, which it not found in ashes, but is very necessary to plant growth. It too, is taken from the soil, and is the one element most easily depleted, and is at all times the most expensive.

Then we reduce plant growth to the elements. Potassium salts, phosphorus and nitrogen, all combined, forming a very small part of the plant. Yet if any one of them be absent the plant cannot exist. These elements in their crude state are not soluble, and not available to the growing crop. They become available only by the slow process of decay, or by breaking down, which makes them soluble. All soil is a combination of broken-down mineral matter, pulverized rock and vegetable matter; but if the cropping has been severe or continuous, nature cannot supply the soluble material necessary to make plants fast enough, they suffer for food, are hungry and cannot thrive. But the use of commercial fertilizers here affords a way out. In these we can secure the nitrogen, phosphoric acid and potash, in exactly the form nature would have supplied it, if time enough were allowed, and under favorable soil condition we can secure perfectly developed plants.

Then, too, these fertilizing elements can be applied wherever and whenever plants are hungry. The conditions of soil may be perfect as to moisture, heat, fineness, etc., but if any one of these three elements are not present in sufficient quantities the plant suffers. As a chain is not stronger than its weakest link, so a plant is vigorous or otherwise only in proportion to the needed element that is present in most limited quantity and availability. A particular soil might contain enough phosphoric acid and potash to make a crop of wheat, but if nitrogen was lacking, there could be no growth. Again there might be present enough nitrogen and phosphoric acid to produce 200 bushels of potatoes; but if potash was not available, there could be no tubers, and so on through the whole range of plants, from the tiny grasses to the giant tree. It is scarcely necessary for me to argue further that by the continuous use of only one or two of these elements, plant growth must suffer. At first there was enough of the third or other one, but stimulated growth more quickly exhausted it, and growth and profitable cultivation halted. There are soils that seem to contain an abundance of potash, and others lime, for all practical purposes, and upon these to add more would be wasteful. On a feldspar soil, ground bone containing only nitrogen and phosphoric acid gives excellent results, but if that soil was broken-down mica schist it would beg for potash. Often we hear the remark that commercial fertilizers now fail to produce
results when formerly they were very satisfactory. Doubtless this it due to the fact that one-sided mixtures have been used, and one of the essential elements is not present in sufficient quantity. In such cases the crop grows smaller and less abundant each year; failure results, and the fertilizer is charged with having ruined the soil. The application of fertilizers can never be injurious, but they may be so used that no return is obtained. They are simply more or less number of pounds of material that the plants hunger for, mixed through a much larger quantity of material that has no particular value. In the higher grades of goods, no adulterant has been used, but the materials entering into their composition were impure. And to purify or concentrate would be more expensive than to grind, mix, bag and freight the whole. Nitrate of soda contains only about 15 per cent. of nitrogen, and prepared fossil rock 14 to 16 per cent. of phosphoric acid. Hard wood ashes, unleached, carry 5 or 6 pounds of potash, and about half as much phosphoric acid to the hundred, the balance is moisture, lime and several other materials which have no especial value; but it would cost more to extract the two ingredients we want than to freight and apply the whole. I cannot urge too strongly, that a plant's growth is in proportion to the abundance of the smallest ingredient, not to the one in greatest supply.

Before I dismiss this phase of the question, allow me to insist that no farmer has a right to waste the manures of his farm and depend upon the commercial fertilizer, because the elements above dwelt upon, important as they are, be they ever so abundant in the soil, will be of no avail unless humus, decayed vegetable matter, is also present. And I shall insist that barnyard manure, field manurial crops and every such adjunct possible shall first be religiously husbanded and applied.

The most successful and economic use of commercial fertilizer is in conjunction with barnyard manure. Such manures are usually one-sided, being richer in nitrogen than in the other elements desired. Wisdom suggests that we should spread thinner and add a reasonable quantity of the mineral elements to balance up. If such manures are not available, plowing under clover, sod or some other organic matter may supply the necessary nitrogen.

I have taken an interest in classifying the goods put upon the market as commercial fertilizers and find that during the year 1901, 1,066 brands were licensed and sold in Pennsylvania. There were 1,066 different names given, but they represented only 177 different combinations of the three ingredients allowed under our law. Fifty-seven different manufacturers put exactly the same goods upon the market, but under many different names, another, 30, another, 23, and so on down to the special compounds of which
there were found 81 samples, without duplicates in quality. We found a most popular brand of 10 or 12 selling for $8.50 f. o. b. in Chester county, but $17.50 was paid for the same goods in another part of the State, not including freight. One very peculiar instance came under my notice this spring; a dealer had among others two brands by the same manufacturer, guaranteeing precisely the same grade of goods. One was offered for sale in the ordinary 100 lb. bag, and was quoted to me at $21.50, the other was in white muslin bags under another name, but $35.00 per ton was asked for it. These illustrations prove the necessity of the farmers studying the question and familiarizing themselves with the quality of goods they buy. If it is only fairly profitable to pay $8.00 for a certain brand, and that is its commercial value, the party who paid $20.00 for it, parted with his cash, and very likely pronounced commercial fertilizers a humbug. Almost invariably the most progressive and prosperous agricultural communities use the most fertilizers.

Those who make a business of selling them, avoid the less progressive sections. For special crops, where the quantity applied is generous, possibly the farmer can buy the ingredients separately and mix them himself; but for general use, when only two or three hundred pounds per acre are used, and possibly 16 lbs. of nitrogen is expected to fertilize six or seven acres, only the most thorough and complete mixing can be of much use; and this can scarcely be done with a shovel on the barn floor. Last year there were 43 brands of complete goods offered for sale that carried that many pounds or less, and these possibly represented over one-half of the total sales. I am not favorable to the so-called unit system of figuring the value of any given brand, but prefer to reduce all to pounds and cents. To illustrate: 2-10-4 means 40 lbs. of ammonia; 200 lbs. of phosphoric acid and 80 lbs. of potash per ton, and can be bought for $19.00 cash f. o. b. car lots, which represents 18 cents for ammonia, 4 cents for phosphoric acid and 5 cents for potash; and these same prices will fit any brand that came under my notice the past year. These prices cover the cost of raw material, grinding, mixing, bagging and manufacturers' profit. And yet, three-fourths of all the goods sold in this State cost the consumer from 50 to 100 per cent. more, freight not included. And we hear the wail "fertilizers are not good, and farming don’t pay.” A little more knowledge would save great expenditure and vexation.

The CHAIRMAN: The next paper will be "The Value of Farm Manure and How to Retain it,” by Prof. Wells W. Cooke, of Washington, D. C.

Prof. Cooke presented his paper as follows:
THE VALUE OF FARM MANURE AND HOW TO RETAIN IT.

BY PROF. WELLS W. COOKE, Washington, D. C.

Farmers have for years recognized the fact that farm manures have a value as a fertilizer for the plant food they contain, but it is only within a comparatively short time that these same manures have become valued for another quality, which, in many cases, is fully as important as the fertilizing value. The first value is chemical and depends on the chemical elements of plant food, the nitrogen, phosphoric acid and potash that are present; the second is mechanical, and is due to the action of the manure on the soil.

It is true that plants must have food to grow, but they must also have a proper condition of the soil or they cannot use the plant food in that soil. Farm manure is one of the best agents for putting the soil in this correct condition. It loosens and lightens the soil, making it porous, and letting in air and sunlight; farm manures are great absorbers of water, one pound of dry matter holding from four to seven pounds of water, and thus helping to tide the crop over a drouth. When the manure decays, much of it remains in the soil as the black humus, and this has water-holding power in the highest degree. As the stable manure decays it gives off carbonic acid, though one of the weakest of acids, yet is strong enough to act on the insoluble plant food of the soil and set some of it free for the use of the plant.

If soils contained no humus or vegetable matter they would become so compacted that the roots of the plants could not penetrate through them, and the crops would be failures. The air and sunlight are continually acting on the vegetable matter, burning it up and hence it is necessary to renew the supply, or the soil becomes in a bad mechanical condition. The roots of plants, the stubble of the grain, the sod of the meadow, all serve to add vegetable matter to the soil. The plowing in of a green crop is the common method in the South for increasing the supply of vegetable matter, but in the North this is usually too expensive, and farm manures are relied upon to furnish the bulk of the humus needed by the crops.

The heavier a soil is, i.e. the more clay it contains, the greater the need of the lightening and loosening effects of farm manures, and
on such soil the mechanical value of the manure is often greater than its fertilizing value. On sandy soils, the good results are equally apparent, the resulting humus helping to bind the loose particles together and to retain moisture. The high value of farm manure for the vegetable matter it contains has a direct bearing on the methods of handling the manure at the barn and will be treated at greater length later in this paper.

Farm manure is usually thought of as a source of plant food, and its value in this direction depends on the amount of nitrogen, phosphoric acid and potash it contains.

### Average Composition of Farm Manures

Pounds per 1,000.

<table>
<thead>
<tr>
<th></th>
<th>Water</th>
<th>Nitrogen</th>
<th>Phosphoric Acid</th>
<th>Potash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh manure from cattle, solid,</td>
<td>2.9</td>
<td>1.7</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Fresh manure from cattle, liquid,</td>
<td>5.8</td>
<td>0.9</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>Fresh manure from horses, solid,</td>
<td>4.4</td>
<td>1.7</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>Fresh manure from horses, liquid,</td>
<td>15.5</td>
<td>0.6</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td>Fresh manure from sheep, solid,</td>
<td>5.5</td>
<td>2.1</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Fresh manure from sheep, liquid,</td>
<td>19.5</td>
<td>0.1</td>
<td>22.6</td>
<td></td>
</tr>
<tr>
<td>Fresh manure from swine, solid,</td>
<td>6.0</td>
<td>1.1</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Fresh manure from swine, liquid,</td>
<td>4.3</td>
<td>0.7</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>Mixed manure from cattle,</td>
<td>775</td>
<td>3.4</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Mixed manure from horses,</td>
<td>713</td>
<td>5.8</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>Mixed manure from sheep,</td>
<td>646</td>
<td>8.3</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>Mixed manure from swine,</td>
<td>724</td>
<td>4.5</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>Ordinary farm manure, fresh,</td>
<td>750</td>
<td>3.9</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Ordinary farm manure, partly rotted,</td>
<td>750</td>
<td>5.0</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>Ordinary farm manure, well rotted,</td>
<td>750</td>
<td>5.8</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Liquid drainings from manure pile,</td>
<td>982</td>
<td>1.5</td>
<td>4.9</td>
<td></td>
</tr>
</tbody>
</table>

### Manure Produced Per Animal Per Year

<table>
<thead>
<tr>
<th></th>
<th>Solids, lbs</th>
<th>Liquids, lbs</th>
<th>Total, lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow</td>
<td>20,000</td>
<td>8,000</td>
<td>28,000</td>
</tr>
<tr>
<td>Horse</td>
<td>12,000</td>
<td>3,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Sheep</td>
<td>750</td>
<td>300</td>
<td>1,100</td>
</tr>
<tr>
<td>Pig</td>
<td>1,500</td>
<td>1,500</td>
<td>3,000</td>
</tr>
</tbody>
</table>
The preceding figures are, of course, averages and different samples of farm manure may vary quite widely, depending first, on the kind and amount of food consumed, second, on the kind of animal, and last, but not least, on the care of the manure.

Since all of the fertilizing value of the manure is derived from the food, and since the various cattle foods differ widely in the amounts of plant food they contain, the resulting manure is quite variable. Straw and poor hay are among the materials lowest in plant food, often containing hardly a dollar's worth per ton, while the grains are much richer, and some of the by-products, as cottonseed, linseed and gluten meals, contain very large quantities of fertilizing material, often almost equal in value to their selling price. The nitrogen varies most widely, being almost lacking in ripe straw and rising in cottonseed meal to more than six per cent.; the grasses and corn are poor in nitrogen, while all legumes, such as clover, pea, bean, etc., are rich in this element.

The value of the manure also depends on the kind of animal that produces it. A full-grown ox at rest in the stall returns in the manure pile all of the nitrogen, phosphoric acid and potash contained in the food, i.e. the fertilizing values of the food and of the manure are equal. A steer in the last stage of fattening passes on to the manure pile nearly all of the fertilizing value of his food, for he has built up the frame work of his body, and is merely filling out the structure with fat. Fat contains no nitrogen, phosphoric acid or potash, and consequently no matter how much fat he puts on his body, he is not robbing the manure of its plant food.

On the other hand the young, growing animal is building up the bones of the body that are formed from the phosphoric acid of the food, while much nitrogen is needed for the formation of muscle, tendons, skin, hair, horn, hoof, blood, and all the organs and fluids of the body. The cow also abstracts much fertilizing value from her food to produce the casein and albumen of the milk, both of which are rich in nitrogen and phosphoric acid.
The poorer the ration the more completely is its plant food removed, so that, for instance, young stock wintered on straw, would produce manure almost lacking in plant food, while full-grown steers, fattened on ensiled meal, furnish the richest of stable manure. Farm animals return to the manure pile from 60 to 75 per cent. of the fertilizing value of their food. The average of all farm animals is about 80 per cent.

The above figures represent the amount of plant food produced by the animal. How much of this the farmer will actually supply to his crops depends largely on how he takes care of the manure. Some loss is unavoidable and the farmer's problem is how to reduce this loss to a minimum. The largest part of the loss will be in the liquid part of the manure, and the fact cannot be too often or too strongly urged that this loss is one of the worst wastes of the farm. The liquid manure has a high fertilizing value. The figures just given show that a pound of liquid is worth fully two pounds of solid, but as the solid manure produced in a year weighs about twice as much as the liquid, it follows that the yearly value of the two is about equal, and he who allows the liquid part of the manure to run to waste is losing half of the plant food produced on his farm.

Special attention needs to be called to the comparative composition of the liquid and solid parts of the manure. The total nitrogen of the food leaves the body about half in the liquid and half in the solid; the phosphoric acid is found almost entirely in the solid, and the potash as completely in the liquid. These facts have had a profound influence on Pennsylvania agriculture. Nearly all the soils of this State are poorly supplied with phosphoric acid, and if this ingredient was easily lost from the manure, the settled, older portions of the State would years ago have become dependent on the fertilizer bag for their supply of phosphoric acid. But fortunately nearly all the phosphoric acid of the food leaves the body in a form not soluble in water, and is saved in the manure and returned to the land. Nevertheless, these same long cultivated areas have been so robbed of their phosphoric acid by the selling from the farm of wheat, hay, milk and cheese, that there are few farms in the State to-day that are not seriously in need of phosphates.

The fact that the potash of the food leaves the body in the liquid part of the manure has been the most potent factor in producing the present condition of fertility in Pennsylvania farms. Nature was good to the farmer of Pennsylvania. She filled his soil with plant food, and when he cleared off the forest he found a soil of wonderful productiveness. Clover grew luxuriantly and every Pennsylvania farmer knows that when he has a fine growth of clover in the rotation, the success of the other crops is assured.
And what did the original settlers do with these crops? Many of them were sold off the farm, carrying away large quantities of plant food; the rest were fed to stock, and no care whatever was taken to save the liquid part of the manure. Indeed, in many cases special pains were taken to make holes and cracks in the floor to let the supposed worthless material escape. But all this liquid manure was carrying off with it the potash of the food. In other words, the farmer was drawing the potash from the soil and allowing it to run to waste into the streams. Not many years of such a procedure would be required to affect the growth of the clover, for this plant requires a large amount of available potash at its command in order to be a success. At the same time that the clover was being robbed of its potash it was also being injured in another direction. On the removal of the forest the soil was left full of vegetable matter, and consequently light, springy and porous. These are the necessary conditions for a good crop of clover, since the clover plant requires air at its roots, equally as well as at its leaves, to grow vigorously. The system practiced of removing much and returning little soon decreased the vegetable matter or humus of the soil, leaving it more and more compact, increasing the difficulty of securing a stand of clover, decreasing the size of the crop, and adding largely to the chances of the clover freezing and heaving out in the winter or drowning out in the spring. It is scant wonder that we are told in meeting after meeting that the farmers of the vicinity can no longer grow red clover.

To obtain again good crops of clover, it is necessary to restore the original conditions, that is, to fill the soil once more with available potash, and with vegetable matter. The best and cheapest way of doing this is by feeding stock, saving all the manure and returning it to the soil. It is best not to attempt to save the liquid by itself in cisterns, or to apply it to the land in the liquid form. The liquid and the solid portions separately are each a one-sided or unbalanced fertilizer; the solid contains nitrogen and phosphoric acid without potash, while the liquid is well supplied with nitrogen and potash, but lacks phosphoric acid. The best plan is to use some absorbent for taking up the liquid portion, mixing this with the solid and applying both together to the land as a complete fertilizer.

What is used as an absorbent makes but little difference; straw, chaff, sawdust, leaves, muck, all are excellent. One of the best absorbents for the cow stable is the bedding and manure from the horse stable. Horse manure is dry, heating and injuring easily; but put in the gutters behind the cows, it acts as an absorbent and all the manure is thereby improved. A liberal sprinkling of land plaster or finely ground phosphate rock is excellent for the absorption of odors and the decrease in the loss of the nitrogen of the manure.
Stable manure loses its value in two ways, by heating and by leaching. In heating, the nitrogen and the vegetable matter are lost. The phosphoric acid and potash are unaffected even if the heating is carried out to complete combustion.

In leaching, the nitrogen and the potash are the principal ingredients lost. The problem of the preservation of the value of the manure is simply the problem of regulating the amount of moisture in the manure, keeping it wet enough to prevent heating and not so wet that any surplus water will leach away.

The most perfect method of keeping manure is in a water-tight basement manure cellar. Unfortunately many barns will not permit the construction of a basement manure cellar, and owing to the liability of odors, it is hardly advisable to employ a basement manure cellar, even though it is the perfect way of saving all the value of the manure. Next in value comes the covered barnyard with water-tight floor.

One of the common methods and the worst of all, is throwing the manure out by the side of the barn under the eaves. This is the easiest way of cleaning the stable and is used for this reason, and yet this method becomes among the best, if the ground is first hollowed slightly and made water-tight, and then a shed roof is built above to keep off the rain and carry off the water from the eaves. If it becomes necessary to pile the manure in a yard the pile should be rather small with straight sides and a somewhat dishing top to catch and hold all the rain. Manure should never be spread out in a barnyard and mixed with straw in the expectation that the straw will absorb the rain and prevent leaching. Too much moisture falls in Pennsylvania to make such a method advisable. A small barnyard a hundred feet on a side contains about a quarter of an acre, and on such a yard, a thousand tons of water, in rain and snow, fall each year.

On most farms the best way of handling the manure is to haul it to the field as soon as convenient after it is produced and spread it at once broadcast over the land. Most of the manure is produced during the winter season and an excellent method is to begin hauling as soon as the ground freezes in the fall, so that a large load can be hauled without cutting into the soil. Continue hauling all winter long, without regard to snow, since it is perfectly safe to scatter manure on top of deep snow without fear that plant food will be lost.

Attention has been called to the double value of stable manure, i.e., its value as a fertilizer and also its value as an improver of the mechanical condition of the soil. Both these values should be kept in mind in determining the proper treatment of the manure. Whenever the manure pile heats or leaches, some plant food is lost;
when either of these happens or when the pile simply softens and rots, there is an enormous loss of vegetable matter and consequently of the value of the manure as a soil improver. Half rotted manure has usually lost at least a third of its vegetable matter. Carrying directly to the field is the method that saves the largest part of the vegetable matter. During the cool weather of the winter season, when the manure is at or below the freezing point, there is little loss of either plant food or of vegetable matter. When the temperature in spring rises to and above forty-five degrees, the process of decomposition becomes more and more active. No loss of phosphoric acid or potash can occur from the mere action of decay, and if the manure is spread broadcast over the field, the loss of nitrogen will be slight, but the loss of vegetable matter can easily amount to a full half. If, therefore, the soil of the farm is a heavy clay that needs the lightening action of the stable manure, the most perfect way of preserving all the value of the manure is to haul out in the winter, spread broadcast and plow in early in the spring.

If, on the other hand, the manure is wanted for the plant food it contains, then the general rule should be to keep it as near the surface of the soil as possible. In Pennsylvania the amount of rainfall exceeds the amount of evaporation, therefore, the tendency of the ground water is downward, and this carries with it more or less soluble plant food to depths below the reach of most of our common crops. Especially is this true of the grasses, and probably there is no better way of utilizing part of the manure of the farm, than by using it as a top-dressing on the mowing fields. For this purpose the least coarse of the manure should be selected; it should be applied either in the late summer on the stubble immediately after haying or in the early winter, as soon as the ground freezes. The best time in the rotation is on the clover stubble, for the crop of the next year is to be timothy and the roots of timothy more than of any other crop are near the surface and need both the food from the manure and especially its mulching effect to protect the roots in summer from the scorching rays of the sun.

To sum up then, we may say that not enough attention is paid to the value of the vegetable matter in the manure, and to obtaining its full value as a humus-former for the bettering of the mechanical condition of the soil. All rotting or leaching decreases the value of the manure for this purpose. Hence the aim of the farmer should be, first, by the plentiful use of absorbents to catch and retain all of the liquid portions; second, by the use of some sort of covering, to prevent the washing and leaching of the manure, while by trampling or moistening he prevents its heating; third, to get the manure

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to the field as soon as convenient and at once spread it broadcast; fourth, plow in the coarse manure on the heaviest soil to improve the mechanical condition, while the finer portions are used as a top dressing for the mowing fields.


MR. MARTIN: I would just say to the audience that I am in receipt of a letter from Mr. Schwarz, stating that owing to the sickness of Mrs. Schwarz he is prevented from attending this meeting; consequently we will not have the pleasure of listening to his paper at this time.

We have now about ten minutes less than an hour until 12 o'clock, and with us here to-day are a number of visitors from a distance. A gentleman from New Jersey, Mr. McCoy, is with us, and the Master of the State Grange, Mr. W. F. Hill, is present, as is also our former Secretary of Agriculture, Prof. John Hamilton, who is now Institute Specialist in the United States Department of Agriculture, from whom we expect to hear something in regard to his work. Now, let us devote a few minutes before adjourning to hear from these gentlemen. We have a paper by Prof. G. C. Butz yet which we will have first, and then spend half an hour with some of these gentlemen on whatever topics they may choose to present.

The CHAIRMAN: The last paper on the program for this morning's session is "Growing Fruits and Vegetables for Canning Factories," by Prof. G. C. Butz, of State College, Pa.

Prof. Butz presented his paper as follows:
GROWING FRUITS AND VEGETABLES FOR CANNING F Factories.

BY PROF. G. C. BUTZ, State College, Pa.

The business of canning food products is of very modern development. It is true, that in an experimental way, corn was canned in Portland, Me., in 1840; that the first pack of fruit in hermetically sealed tin cans was made in California in 1861; but it is also true that in 1865 the entire pack of all kinds of canned goods in the State of Maryland did not exceed 8,000 cases. In 1880 the total value for vegetables and fruits put up in cans was $17,599,576; in 1890, $29,862,416; in 1900, $56,668,313.

For pickles, preserves and sauces, the value in 1880 was $2,407,342; in 1890, $9,790,855; in 1900, $21,507,046.

Fruits and vegetables share about alike in this new industry, and the list of canned articles includes nearly every kind of fruit and most kinds of vegetables.

Peaches, pears, plums, apricots, apples, pineapples, grapes, cherries and all the different kinds of berries are all canned by tons.

Tomatoes, corn, peas, beans, asparagus, beets, cabbage, sweet potatoes, pumpkins, squashes, spinach and okra, are all put up in great quantities. The growing of these crops for the canning factories is not conducted by the market gardener and fruit grower as we have generally regarded them, but by farmers who have been induced by the prospects of larger profits to devote their best farm land to the extensive culture of a vegetable or fruit crop. In some sections of the country the new order of things has taken such a complete possession of a community that nearly every farmer in a whole county has become a horticultural specialist in the culture of tomatoes, peas, sweet corn or some other canned crop.

It is not an easy matter for farmers, particularly here in the East, to modify their time-honored practices on their farms to the extent indicated, for they are wedded to the customs of their fathers, and regard with suspicion and misgivings all propositions to abolish an old practice to make way for something they have not tried before. The western farmer has been more ready to adopt new suggestions and grow new crops to conform to modern demands, and has
surprised the staid eastern farmer by his progressiveness. The
great centre of the canning business has been in Maryland, New
Jersey, New York and Maine; but it is rapidly passing to Illinois,
Iowa, Indiana and neighboring states.

The comparison between the East and the West is neatly drawn
by the wife of a Kansas farmer, and I quote her words:

"I never before realized how rapidly the western pioneer adapts
himself to conditions as he finds them, and the comparative ease
with which he achieves success with material at hand, until I visited
New England not long ago.

"After less than three days' travel, what a wonderful change. I
had known no home but one on the broad prairies of Kansas, with
great fields of wheat, corn, alfalfa, and open ranges. To alight on
a 'down east' farm, with its little checker-board fields on hillsides
and in hollows, gave an impression I shall never forget. It does not
seem possible that those miniature fields represents hard labor; but
there is a 100-acre farm which stands for four generations of toil.
One day the owner and I walked to the edge of a wooded hill back
of the meadow. He was lamenting that his boys had left the old
farm for the village. 'The boys,' he said, 'got so many new-fangled
notions into their heads while they were at school that I couldn't
run the farm to suit them. They wanted me to plant berries where
I always had the buckwheat; wanted to change the buckwheat field
from where it's always been. They wanted everything changed
around. They wouldn't even call it farming. They talked to me
about agriculture, and thought they know more than their old
father. Why, they had three or four long names for just plain mud,
and talked about rotating crops. I told them there wasn't going
to be any rotating while I owned that buckwheat field. So they
just rotated off to the village.'

"We walked on, and presently came to a piece of waste swamp
land at the foot of a hill, which could easily be tiled and drained.
'What are you going to do with this black muck?' I asked. 'Do with
it? Why, nothing, but just keep out of it,' he replied. 'But,' said I,
it is the richest land on the farm. Can't you grow something on
it? Never tried,' he retorted. 'Your grandpa never did anything
with it, only to watch and see that none of the cows broke out of
the hill pasture and got stuck in the mire.' 'Uncle Timothy,' said I,
'this is ideal celery ground. Make a tile drain through the meadow
to the creek. You can soon drain this bog. Then prepare it for a
celery field, and you will just be an up-to-date farmer.' I was really
enthused, for the black muck seemed to hold such wonderful possi-
bilities. But Uncle Timothy turned and looked me over for a full
minute before he found his speech, and then said: 'I swan, Betsy,
you surprise me. Them's some of your Kansas notions. I don't
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farm out of books; your grandpa never farmed out of books; I won't have no trick farming on this place. Your grandpa raised fourteen children. He always planted his buckwheat up there by the hollow, and he didn't get stuck in the swamp with any fool notions that he could raise celery.' It occurred to me that I saw where the boys were right in 'rotating' to the village."

Although the centre of the canning business is moving westward, as I have said, it does not follow that there is less of it in the East now than formerly. On the contrary there has been a constant increase of business, but the expansion in the West has been so very rapid that the pack of corn especially is in excess of that in the Eastern states.

The great quantity of fruits and vegetables consumed by 20,000 or more canning factories are grown under contract by the farmer in the vicinity of the factories. By such an agreement the farmer is guaranteed a market for his entire crop, and the price at which he sells his merchantable product. He may know, therefore, before he plants his seed, in the case of vegetables, whether it will be profitable to do so. The contract also guarantees to the canner the raw material for his factory and the cost at which he may purchase.

This arrangement is mutually satisfactory and helpful, except in seasons when, because of drouth, blight or some other unexpected disaster, the crop is very light, and the market price of the article is much higher than that named in the contract. A Delaware writer reviewing this matter in a recent number of the American Agriculturist says:

"In 1899 we had an exceptional yield, and the pack was, on account of it, abnormal; the contract price with growers for that year ranged from $4.50 to $6.00 per ton delivered at the factory. Those not contracted for were taken, when packers could use them, at $1.50 to $3.00 per ton. In 1900 contracts were placed at from $4.00 to $6.00 per ton. Owing to the fearful ravages of blight and drouth, the crop for that year was below normal. The non-contract tomatoes found ready sale at $6.00 to $9.00 per ton."

In 1901 the crop was again unusually low both East and West, and the price of tomatoes went as high as $24.00 per ton. This condition of things induced many farmers to jump their contracts, and in consequence the canners suffered great losses by not being able to fill their contracts. This breaking of faith created trouble for future dealings. It is certain that for the present year, the farmers who jumped their contracts will have some difficulty in restoring amicable relations with their canners, and the reliable farmers will demand a higher price for tomatoes than has been contracted for in recent years. In sections where farmers have access to more than one factory, they would not be troubled over the failure to contract
their crop, knowing from past experience that all the tomatoes they can grow will be wanted in the open market. It is probable that in the future, farmers will not seek to contract for their crop, preferring to depend upon the open market for better returns and fairer treatment than they even secured under a contract.

Many farmers experience a measure of independence in the fact that they can speedily provide themselves with facilities for canning their own crop on the farm. They have witnessed enough of the work in the factory to make a success of packing tomatoes, and at a good profit too. This practice, however, cannot be commended. Many losses have been sustained where farmers have canned their own crops, particularly if a limited acreage is available for the experiment. It is a good business to grow crops for the canner; it is another good business to properly and economically pack these crops, and each business is distinct from the other.

The growing of crops for the factory has enough uncertainty about it to give it the zest of speculation. This has been made manifest in the recent experience with tomatoes. The chances of drouth, early autumn frosts, blight and similar adversities greatly affect the yield of fruit per acre. The yield is also influenced largely by the richness and adaptability of the soil to the tomatoes. Therefore, owing to conditions which may and those which may not be controlled by the farmer, the income per acre has varied from $10.00 to $250.00. This makes it possible to lose heavily or make handsomely in growing tomatoes.

The methods employed in growing crops for the canning factory are essentially the same as those practiced by the market gardener and the fruit grower. The preparation of the land must be thorough, the application of fertilizers should be heavy and the constant tilling of the soil with cultivators and hoes, during the growing season, is never to be neglected by the man who labors to reap a good return. This is not a time nor place to discuss the practices of tomato culture, strawberry culture or any special crop, but we may state the fact that the canning industry has greatly modified the gardeners method of growing peas. When peas were first grown extensively for canning purposes, the picking of the pods was an exceedingly expensive task. Anyone who has ever tried to fill a bushel basket with pods from the vines will fully realize the nature of the work and understand why a regular army of men and women was needed to pick the peas. Another force of laborers was needed to carefully remove the tender peas from the pods. Since the invention of some remarkable machines, all this tedious and expensive labor is performed by a most marvelous device—the Chisholm-Scott pea-viner. This machine is placed at the factory, and the pea vines are mowed in the field and hauled to
the factory upon hay ladders. Here they are delivered to the pea viner which picks the pods and shells out the peas, discharging the latter to the proper receptacle and casting the vines to the side. Instead of sowing the seed with drills wide enough to permit cultivation, the peas are planted with a regular wheat seed drill. The vines stand close and hold each other almost erect. No cultivation is possible after the seed is in the ground.

It is probable that there will be no more attempts by farmers to do a canning business by co-operation. It is an enticing proposition to conduct the business in such a way that stockholders may share both the profits of cultivation and the profits of canning; but all the experience of the past 30 years demonstrate clearly, that in practice the profits of co-operative canneries are exceedingly small, if indeed they are not entirely overcome by losses. To properly conduct a canning business requires not only great skill but also a goodly share of business tact and executive ability. The farmer is, therefore, wise if he is content to receive the profits of his crops and will devote his best energies to the improvement of his soil conditions, to perfect the methods of cultivation and prepare to meet the fungous diseases and insect foes of his crops with the proper remedies, and thus swell his profits by increasing the yield of the fruits or vegetables upon his farm.

MR. MARTIN. We have just now one-half hour until 12 o'clock and if Mr. McCoy of New Jersey, is here we will be pleased to hear a word from him.

Mr. McCoy addressed the meeting in reference to Farmers' Institute work in Pennsylvania and New Jersey.

The CHAIRMAN: We would like to hear now from Hon. W. F. Hill, Master of the Pennsylvania State Grange.

Mr. Hill came forward and addressed the meeting on Farmers' Institute Work and the relation of the Grange organization there-to, and what they were doing for the farmer.

The CHAIRMAN: We are now ready to hear from Prof. John Hamilton, ex-Secretary of Agriculture.

Prof. Hamilton then addressed the meeting as follows:

ADDRESS OF PROF. JOHN HAMILTON.

Mr. Chairman and Gentlemen: It is not necessary to say that it is a great pleasure to me to meet with the old State Board of Agriculture of Pennsylvania, and with the Institute Lecturers, who are the leaders in agricultural thought in this great State. I can truthfully say that I appreciate the work of the State Board of Agriculture, and of the lecturers that are associated with the Department
of Agriculture, as much as any man in Pennsylvania. I know, personally, the men who are here, have known them for many years, and have the advantage of understanding what they have been thinking about and doing in the last 25 years, and I am ready to say that a more devoted band of men in the interest of agriculture, for the uplifting of the agriculture of this State, does not exist anywhere in the United States, than we have here in our good old State of Pennsylvania.

You doubtless want to know what is going on down at the headquarters of the agriculture in this country. And when I speak of the headquarters, you ought to understand without my designating it, that it means the Department of Agriculture of the United States. Dr. Atherton in his address yesterday spoke of the wonderful event that took place about 40 years ago in connection with the establishment of the Agricultural Colleges of this country. I do not know whether you have taken the trouble to look into the history of agriculture, so as to really appreciate how much has been done for its development in the last 40 or 50 years. The fact is that agriculture has come to be what it has within this period. I have an inventory of a farmer's property that was sold 50 years ago in Pennsylvania in one of our most fertile valleys on a farm that had 200 acres of land, and that had been cultivated since the time of the Revolutionary War. The implements on that farm at a public sale brought §73.50, and it was a well-kept farm for its day. And now implements on the same farm, or a farm of similar character, will cost anywhere from §800 to §2,500. I do not know of any gauge that shows the progress of an industry with greater accuracy than the implements of that industry. Take your manufacturing establishments and compare them to day, in their machinery and methods of manufacture with the machinery and methods which they used 50 years ago, and you can rate their progress in other respects from the single item of improvement in the machinery that they use. This is also true in agriculture. The agricultural implement business has increased in the last 50 years about 402 per cent. Our population has increased in that same time about 229 per cent., and thus you can see, that the implements of our trade have increased at a rate more than double that of the population of the country.

Mr. Chairman, 50 years ago there was not a man living that knew about many of the things that we talk about in our Institute work in the most familiar way. For instance: Who knew about fertilizers and their uses as we do now, 50 years ago? Who knew about the action of nitrogen, phosphoric acid and potash 50 years ago, and who even knew that there was such a thing as a balanced ration? Who knew anything about agricultural bacteriology 50 year ago? It is only about ten years since we have really come to understand what
bacteria are, and what they are doing in agriculture and in the other affairs of life. I could continue and say: Who understood what it is to have a Babcock milk test 50 years ago? Who understood what it is to separate milk and cream mechanically, and who knew 50 years ago about cutting, threshing and cleaning grain at a single operation out in the field as is done in many parts of our country to-day? Fifty years ago the stroke of the flail was heard through the valleys of Pennsylvania all winter, and the sound of the whetstone sharpening the scythe was heard in every harvest field in the land. It would have been utterly impossible 40 years ago to have held such a meeting as this which we now hold, with such discussions as we have, and will have, here to-day. You see that we have made this progress within so few years, and have lived through the centuries before up to 1850 with such a record as a $73.00 implement outfit for a 200-acre farm. Our progress has come through means that are as natural, and that work as certainly as any of the forces that are in operation in other affairs. It is clear that it did not come through the efforts of the so-called practical men, who were engaged in practical agriculture. Practical men as good as we are had been living in the world, and been engaged in agriculture for thousands of years, and yet it has only been within the last 50, 40 and 30 years, that progress worthy of the name has occurred. If our progress then did not come through the efforts of so-called practical men, how did it come?

Dr. Atherton spoke of an act of Congress that went into operation on the 2d day of July, 1862. I, too, want to call your attention to that same month of July in 1862. It marks an epoch in the history of agriculture of the world.

On the 1st day of July, 1862, there was an institution organized that has had a wonderful influence upon the agriculture of this country and its development since. I refer to the Department of Agriculture that is now organized at Washington, the extent and value of which many even of our most thoughtful and intelligent farmers do not clearly understand. In December, 1861, the Department of Agriculture at Washington had just nine members in its working force. It then was a small and unimportant Division in the Department of the Interior. To-day the last report shows that the Department of Agriculture has a working force of 3,789 men, all engaged in forwarding the interests of farming people in this country. Of these 3,789 men, over 2,000 are trained scientists, scientific investigators, or assistants in scientific investigations, giving their entire attention to scientific work for the development of agriculture both in this and other lands. There is no such university for scientific research of like extent in any other country, and it is officered by men, many of whom, have no superiors in their several
specialties anywhere in the world. The best scientists that this country possesses are engaged in that Department in scientific work along agricultural lines, and the work that they do is respected and quoted as authority by scientific men everywhere throughout the world. That Department in the last 49 years has, as I have stated, developed from nine men to almost 4,000; from an expenditures of $60,000 a year to an expenditure of $5,223,000 a year. The Department has its experts out all over this country, and in foreign lands, searching for plants, animals and methods that will be of use to us in our agriculture here at home. Reports of what they are finding and doing are being published from time to time in bulletins, and these are mailed free of charge to all who are sufficiently interested to send their names, postoffice addresses and make a definite request.

Along with this work that is being done by the National Department of Agriculture, is that of the Agricultural Colleges in this country, which have sent out in this same period about 50,000 graduates, and that of the Experiment Stations that now have over 700 scientific men engaged constantly in endeavoring to solve the mysteries of agriculture, and who are publishing the results of their discoveries for our use.

These are the forces that have raised agriculture from a common calling, into the most scientific and difficult of any that the world has to-day. These are the institutions that have brought us where we are.

The men who made speeches here this morning and yesterday, could not have presented the truths they did if they had not had the facts furnished them by these laborers in these scientific institutions which have been established within the past 50 years. We are indebted to science for what we are, and the great progress of agriculture in these recent years, which is the marvel of the world, has come through the work of scientific men who have directed their attention, not to the professions, but to the development of agriculture, and the effect is that we are becoming informed in regard to the important truths that for so long have been hidden from our view. We are becoming men instead of machines.

It was well said here yesterday "that a man cannot rise above what he knows." We cannot rise above our ideals, and if we do not know, and will not learn, we will remain exactly on that level all our lives. If we do know or have aspirations for knowing more we can at least pursue our ideals and often realize greater success than at the outset we had ever hoped. There are being held up before us to-day in the scientific world great truths which we are endeavoring to understand and to apply, and scientific men are reaching out to us their hands to lift us out of the difficulties that surround us into a
more prosperous and interesting life. By means of these scientific
helps we are making progress such as the world has never seen in all
the centuries that have preceded us, and the development of science-
applied to agricultural pursuits, accounts for what we have accom-
plished in the last 50 years.

And now, if we are to continue to progress in the future, what
must we do? The same principle that has controlled in all the past,
is going to control in all the future. Our advancement is going to be
just in proportion as we ourselves know more of the needs with
which we deal. We will be depending in the future, as we have been
in the past, upon the development of scientific knowledge for pro-
gress in our art. It follows, therefore, that we as teachers of agri-
culture, as leaders in agricultural progress, must be informed.

This brings me to the particular thought that I want to present to
the lecturers, to the directors of the local institutes, to the State
Board and to all of us to-day. We must be students of science.
We must be familiar with the sciences that relate to our calling
or else we are unfit, and shall be unfit for the position that we
occupy as teachers of others, and the moment we cease to be
students of the science of agriculture, we had better resign our posi-
tions and leave our places to those who are willing to study and
inform themselves as to what is needed in the agricultural world.
And so I am thankful to have the opportunity to-day of speaking
to the teachers of agriculture, and to the leaders of agricultural
thought in Pennsylvania, for it is upon these leaders that the
burden of the future must come, and it is to the leaders that the
great public must look for suggestion and help. If agriculture is
to progress, it will be because you progress, and because in an un-
selfish and devoted way you are willing to bestow the results of
your labors, along scientific lines, for the benefit of your fellow-
men.

Whilst in some states the Farmers' Institute work has scarcely
started, in some not at all, nevertheless, the movement has assumed
great proportions. Last year over 2,700 Institutes were held, and
over 800,000 people assembled in institute halls in the United States.
In this work have been engaged some of the most capable men the
country has. Indeed it has come to this, as you well know in Penn-
sylvania, that no common lecturer can stand before an audience,
acceptably, in this State. He must have studied the subject that he
professes to teach, and must be able to present it in a forceful, in-
teresting and applicable way.

And now, you want to know what the Department of Agriculture
at Washington proposes to do for the assistance of those who are
engaged in institute work. In a general way, I can say that the De-
partment proposes "to keep school." It has recognized in the
Farmers' Institute a means for educating agricultural people, possessed of greater possibilities than any other educational movement of modern times. It furnishes a channel of communication between science and practice through which agricultural knowledge, that has hitherto been stored up in metaphorical reservoirs of learning, can be distributed freely among the thousands who need the aid of science. The plan is to place scientific truth in the hands of capable men, and send them out to present it to every needy citizen. The office for conducting this work has just been established. The office itself has no name, but the officer in charge is officially known as Farmers' Institute Specialist.

This is the beginning, or foundation, of what is destined to be the greatest school of agriculture that has ever been established. A University for American farmers, into whose faculty of teachers is to be brought the best talent that the country contains. The farmer must be elevated in his calling. To secure this, he must be educated. Books and pamphlets do not reach those who most need the information which they contain. The working farmer is too old and too occupied to go away from home to school, and has lost the habit of study and disposition to gather information from the printed page.

The Department recognizes these conditions and limitations, and is going to send out teachers to meet these workers face to face, men who have made a study of the needs of agriculture, and are able to give information as to how these needs may best be met.

The first thing that we want to do through the Institute Specialist, is to assist the State Directors. This can be done by collecting and publishing the laws relating to institutes in the several states, and by placing them in the hands of Directors, so that they can compare their systems with those in other states, and adopt such items as seem best adapted to their conditions. We can also assist by collecting the names of all of our Institute Lecturers in the United States, by entering into direct communication with every instructor in the country, and by endeavoring to place these instructors in touch with each other and with the Agricultural College and Experiment Station workers in their own and other states. We can bring these lecturers in contact with latest and best literature upon agricultural subjects and with the leading specialists in their lines of work throughout the country. We hope, in short, to unify the work, and become a reliable bureau of information for the assistance and development of the institute workers of the United States, to assist in placing our agricultural people where, by reason of the importance of this industry, they ought to be, at the head in National affairs, in State affairs, in educational affairs, in all of our affairs,
and so render our people prosperous and happy, and secure to the country the perpetuity of our free institutions for all time to come.

MR. MARTIN: Before adjourning for this morning I wish to remind you that owing to our visit to the Huntingdon Reformatory immediately after dinner, our afternoon session will not begin until 3 o'clock; but promptly at that time, whether there be a dozen, two dozen or three dozen present, we will proceed with our afternoon's program, and I desire especially that those who have papers on program and the chairman for the afternoon be on hand at that time and be ready to proceed.

Upon motion the meeting adjourned to meet at 3.00 this P. M.

Wednesday Afternoon, June 3, 1903.

HON. A. L. MARTIN, called the meeting to order promptly at the time designated and announced that the Chairman for the afternoon would be W. A. Crawford, of Cooperstown, Pa., who, thereupon, took the chair.

The CHAIRMAN: The first thing on the program for this afternoon's meeting is "Breeding and Feeding Poultry," by Mr. J. Y. Patton, of New Castle, Pa.

The paper read by Mr. Patton, is as follows:

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BREEDING AND FEEDING POULTRY.

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By J. Y. Patton, New Castle, Pa.

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Poultry breeding has become one of the great occupations of our day. It has kept pace with, if indeed it has not gone in advance of, all lines of live stock breeding. When we look back half a century and see what the poultry of that time was, and then look at the poultry of to-day, we can readily see what careful and thoughtful breeding has done. From the scrubs and dunghills of the past have been bred our grand, practical and fancy birds of to-day. I will only endeavor to drop a few practical thoughts along the line of poultry breeding and feeding, and not attempt to tell you all about it for two reasons: First, because time will not permit; and, second, because I do not know it all.

Volume after volume has been written upon the subject, and the
half has not been told. I will consider the subject under two heads: First, fancy breeding, and second, practical breeding. There are many different plans for the breeding of fancy poultry which have been followed out by different breeders, all of which have been very successful. Some practice single matings, others double matings and line breeding. I think I see the poultry fancier with his flock of birds before him about to pick out his breeders for the next year's crop. He stands scratching his head, realizing the task he has before him. He selects his best male bird, and studies his merits and defects. From past experience he knows that he must select his females so as to "nich" (as it is called), with the male bird, and by this means overcome, so far as possible, the weak points of one by the strong points of the other, and makes his selection accordingly.

Several instances have come under my observation where breeders, in trying to overcome some defect in their birds, would get something else as bad, if not worse. I have come to believe that the best way to get a strain of birds that will produce a large per cent. of good birds, is in line breeding. But I also think that a breeder must thoroughly understand his business in order to be successful in line breeding, and would caution the amateur breeders to be careful along that line, or he will lose the vitality of his birds.

In regard to the practical side of poultry breeding, we find we have a much larger class to deal with. While traveling in the Institute work, in conversation with practical poultry breeders, I found that one of the greatest mistakes they are making is in the selection of their breeders. A large number do not use select birds at all, but simply gather eggs from the whole flock at the time when they wish to set. This is a very important point which I wish to impress upon our Institute lecturers, that we should show the general poultry raiser the importance of breeding only from the best males (as they are half the flock), and then using only the number of the best females that will give the desired number of eggs. We should select only the early developing birds of standard weight, good, healthy, active vigorous birds, of good form, with well developed comb and wattles, a bright, keen eye, short, stout beak, good, square head and short, stout legs, and to produce the best layers the trap-nest should be used in the selection of our breeder. Use only the best layers for breeding, as like begets like. By this means we may greatly improve our flock from year to year. In this way I succeeded in getting a pen of twelve Silver Wyandotte pullets to lay an average of twenty-one eggs in the month of January and an average of two hundred and thirty-seven for the year.

In the selection of breeders, watch them from the time they are hatched. Give careful attention to their movements, their develop-
ment in feathering, and also in growth and form. The successful breeder must know his birds as individuals. The best birds for breeders are the hustlers; those which are vigorous, active and bright, and good feeders.

The hen is simply a machine, and the better the machine, the larger and better the product will be. In both fancy and practical breeding I believe in keeping the male birds by themselves until ten days or two weeks before wishing to save eggs for hatching, and then as soon as the breeding season is over, separate them again. Good male birds will do well for several years if handled in this way.

**FEEDING.**

In the feeding of poultry, as in the breeding, wonderful developments and discoveries have been made. Successful poultry feeding is certainly a science in itself, and but few of the would-be poultry breeders are, to my mind, successful feeders. If we do not give the proper amount of food, if we do not feed enough, if we feed too much, and if we do not feed in the right manner, there is loss. We begin to feed the chick when we are feeding the hen to produce the egg from which the chick is to be hatched, and we know that successful feeding is to develop the chick to a mature bird as rapidly as possible, keeping it in a strong, healthy condition, at as low a cost as possible. The chick should have nothing to eat for twenty-four hours after it is hatched, as it takes from twenty-four to thirty-six hours for the chick to absorb or use up the yolk of the egg which nature has provided to care for it during that time.

In my opinion more than fifty per cent. of the mortality in chicks is caused by injudicious feeding. We now have the chick thirty-six hours old to care for and feed. The first thing the chick should have to eat is fine grit composed of mica crystal grit, oyster shells and granulated charcoal. This should be kept before them at all times. Chicks should be fed five times a day for two weeks with a variety of foods. They should be fed lightly, just what they will eat up clean in a few minutes, and none should be left lying around.

The most profitable feeding I ever did was to have Wyandotte cockerels weigh three and one-half pounds at twelve weeks old, and pullets laying at five months old. Those birds were fed five times a day for two weeks and three times daily from that time on. The first three days I fed nothing but baked pone, composed of corn meal, brown middlings, buckwheat middlings, coarse bran, gluten meal and meat meal, with a little pulverized charcoal added. This was mixed with sour milk and soda and a little salt, and baked in a hot oven the same as we would bake ordinary corn bread. After being well baked, it was crummed through a fine sieve and fed in
granular form. After three days I fed cracked wheat in the morning, pone at ten o'clock, chick feed at noon, cracked corn at three o'clock and all the pone they would eat at night. After two weeks I fed cracked corn and wheat on alternate mornings, chick feed at noon and mash at night until they were three months old, and from that time I fed wheat in the morning, cracked corn at noon and mash in the evening until yarled for the winter.

Up to this time all birds should have free range where they can get plenty of clover and green food and exercise. Of course it is understood that they must have good, clean, pure water in abundance always before them. When my birds are yarded or housed for winter, I feed three times a day; in the morning grain—one quart to ten or twelve birds—scattering it over the straw and chaff upon the floor, which should be five or six inches deep, the grain being well forked into the litter. It is best to use a variety of grains alternately, such as wheat, oats, barley, buckwheat and cracked corn.

At noon I feed cut clover and vegetables, such as mangels, turnips, potatoes, cabbage, etc., and at night all the mash they will eat. This mash is composed of finely cut clover, corn meal, coarse bran, brown middlings, buckwheat middlings, gluten meal and meat meal. These are all thoroughly mixed together, dry, and then made into a mash with boiling water, with a little salt dissolved in it. The old theory was, to feed mash in the morning and grain at noon and night.

Realizing the need of an abundance of exercise for the birds in the winter time, I saw that by changing the program I could get my birds to do better, and could feed heavier without danger from overfeeding. Feeding the warm mash on a cold morning, the birds would fill up their crops, get up on their perch and sit and shiver, while in feeding the small grain in the morning, they get off the perch, go right to scratching, and hustling for their breakfast, warm up their blood, start circulation and keep themselves strong and healthy. This theory I found would work out all right in practice, as my birds did not get too fat and lazy, as they were apt to do by feeding in the old way. I feed the grain and vegetables to keep the bird, and then at night give them all the mash they can be induced to eat, of foods high in protein, that is easily digested while they are at rest, and it has never failed to produce a good, heavy yield of eggs. I find in this manner of feeding I can force my birds to heavy egg production without overfeeding.

The birds must be watched and care taken that the grain be all cleaned out of the litter each day, and if they do not clean up their usual heavy feed of mash in the evening, cut down on the grain ration next morning so as to have them always hungry for the evening mash.
Be sure that they have some kind of good, sharp grit, such as mica crystals, oyster shells, etc., and good, fresh water always before them in abundance. I believe that much of the poultry on the farms do not lay in the winter because of the lack of good, fresh, warm water. Many of the farmers never stop to think that their poultry needs any water; but when they are led to think and to realize that an egg is two-thirds water, they will soon see that hens cannot lay eggs without water.

By careful experiment it has been found that animal matter is a necessity for poultry. It is well known that when they are allowed to range at will they will eat considerable quantities of animal matter in the form of insects, worms, etc.

How necessary this animal matter is to the health of fowls, and especially ducks, was strikingly brought out by recent experiments at the New York State Experiment Station. Two lots each of chickens and ducks, as nearly alike as possible, were used in the experiment. One lot in each case was fed a ration of mixed grains and skimmed milk or curd, containing no animal matter. The other a ration of mixed grains with animal meal and fresh bones or dried blood. The two rations were about equally balanced. In one ration, two-fifths to one-half the protein, came from animal sources, while in the other it all came from vegetable sources. Two trials were made with chickens. In each trial more food was eaten by the lot receiving animal protein, the gain in weight was more rapid, maturity was reached earlier, less food was required for each pound of gain, and the cost of gain was less. During the first twelve weeks of the first trial, starting with chicks four days old, the chicks on animal meal gained 56 per cent. more than those on the vegetable diet, although they ate only 36 per cent. more. They required half a pound less of dry matter to gain one pound, and each pound of gain cost only 4\% cents as compared with 5 1-5 cents per pound for the grain-fed birds. During the next eight weeks the cost of gain was 7\% cents and 11 1-3 cents respectively. The animal meal chicks reached two pounds in weight more than five weeks before the others. They reached three pounds more than eight weeks sooner, and three pullets of the lot began laying four weeks earlier than any of the grain-fed birds. With the second lot of chicks the results were much the same, showing a quick healthy growth and early maturity with the birds fed on animal matter. The results with the ducklings was strikingly the same.

In conclusion, then, it may be said that rations in which from 40 to 50 per cent. of the protein was supplied by animal food, gave the best results. By careful management and by following the plan
of feeding prescribed in this article, I have succeeded in producing over 27,000 eggs in one year from an average of 200 pullets.

The CHAIRMAN: Owing to the fact that several of those who have papers on this afternoon's program not having yet returned from their visit to the Huntingdon Reformatory, we will now take up the fourth topic on our program, "Easiest and Most Profitable Way to Grow Potatoes," by Mr. John W. Cox, of New Wilmington, Pa.

Mr. Cox presented his paper as follows:

EASIEST AND MOST PROFITABLE WAY TO GROW POTATOES.

BY JOHN W. COX. NEW WILMINGTON, PA.

The easiest way to produce a crop is not always the most profitable, but usually economy in labor, by using the proper machinery, and by doing the work at the proper time, will increase the profits. With the present scarcity of farm hands and the high wages which a farmer is obliged to pay in order to secure them, any crop can be made more profitable by reducing the cost of production by using the best farm machinery.

In order to make potato growing profitable, it is necessary to have a soil that will produce a good yield of marketable potatoes. It is also essential to be located near a good market. With the present high rate of freight it costs too much to place the product on the market if it is necessary to ship a long distance.

The potato crop is one of the most profitable as well as one of the most discouraging crops raised by the general farmer. Amongst the discouraging features can be named the extremes in moisture. It is often either too wet or too dry. A late frost will often seriously injure early planted potatoes. Some years the potato bugs will destroy the crop, unless considerable time and expense is devoted to their destruction, and the blight often strikes them before the tubers are half-grown. Some of these conditions the farmer has under his control, others he has not. He can conserve moisture to a certain extent, by having the soil well filled with humus and by properly preparing the seed-bed before planting, but if it proves to be an excessively wet season he has no way to dispose of the surplus moisture.

The kind of soil in which potatoes are grown has an influence on the quality. On a muck soil they are generally of a poor quality, and usually on moist black soils. A potato of poor quality often
makes a very good eating potato when grown in a different quality of soil. It is important that the soil be well-stocked with decaying organic matter, and that it be rather in an acid than an alkaline condition, as it has been found that the fungus which causes the scabby appearance on the outside of the potato, and thus decreases its marketable value, will not thrive in acid conditions.

The applying of lime to potato ground may increase the yield, but as it counteracts the acid in the soil, it has a tendency to promote the scab disease. A well manured heavy clover sod usually makes a good potato soil. The manure should be applied in the fall or during the early winter to allow it to become assimilated with the soil, as the plant cannot feed upon it in a coarse condition.

If the soil is deficient in vegetable matter, a good plan is to plow under the sod in the fall and sow the ground with rye. Apply manure when the ground is frozen in the winter and plow the rye under in the spring when it is about twenty inches high. If allowed to stand until it gets much higher, the weather is usually warm, and it has a tendency to sour the ground. It also prevents the moisture from rising from the subsoil too near the surface, where it can be used by the plant. It is remarkable how much finer the soil is when treated in this way.

The potato crop is best adapted to a moist, cool climate, but will do well in a warm climate, if all conditions are favorable. The vitality of a potato can be retained longer in a cool than in a warm climate. If the seed is purchased from one of our Northern states, it usually has more vitality than our home-grown seed, and a better crop is usually produced. For best results, seed should be renewed at least every two or three years. If large potatoes are planted every year, the vitality will not deteriorate as rapidly as if small potatoes are planted. A good crop can often be secured by planting small potatoes, but this practice cannot be depended upon to follow indefinitely. We are always advised to select the best corn, the best oats and the best wheat for seed and I think that the same rule will apply equally as well to potatoes. It is very essential that the seed be properly cared for. It should not be allowed to sprout until a short time before planting. If the sprout is permitted to start growth and is broken off, the second growth will have less vitality than the first.

The growing can be retarded by keeping the potatoes covered through the winter with straw and dirt. Cover deep enough, with a liberal quantity of straw and dirt, to keep them from freezing during the severe cold weather. During February or March, while the ground is frozen, the piles should be covered with manure or straw to keep it frozen until near planting time. This will prevent the
sprout from starting to grow. A short time before planting, the potatoes should be removed to a building and spread out to give them an opportunity to start a good, vigorous sprout before planting. If not properly covered while they are buried, there is danger of the eye being frozen enough to reduce the vitality without freezing the potato.

The scab fungus will remain in the ground from one year to another, and if the ground is infested with the scab, or the seed is affected, the seed should be treated with some preventive to insure a crop of clean potatoes. Corrosive sublimate will answer this purpose. It is not expensive and requires very little labor to use it. Dissolve one ounce in eight gallons of water and soak the seed ninety minutes. This should be done before cutting. The seed should be cut with one or two eyes to the piece, depending upon the size of the potato and the number of eyes. I prefer to plant large and medium sized potatoes, and one-eye pieces from the stem end of large potatoes will make large pieces in most varieties. Nearer the seed end the pieces will be smaller and have more eyes.

Where small potatoes are used for seed, either plant whole or cut the pieces a respectable size regardless of the number of eyes. Potatoes should be planted as soon after cutting as possible. It is not safe to cut a large quantity and pile them up, as they may heat and the seed be injured, so that it will not produce a profitable crop. If small quantities are cut a few days before planting, put in bushel crates, set in a cool place and covered from the wind and sun, no damage will result. Medium sized potatoes can be planted whole if desired, and some prefer that way, but it requires more seed to the acre. A large yield can be secured from a very small amount of seed, by separating the eyes into two or three parts and planting in well prepared fertile soil; but this method will not produce as many potatoes to the space of ground occupied as where whole eyes are planted.

To grow potatoes easily the grower should be supplied with all necessary machinery. In addition to the plow, a spring-tooth harrow, roller and two-horse cultivator, with which almost every farmer is supplied should be used; it is also essential to have a planter, digger, weeder, smoothing harrow, low wagon with platform and a number of bushel crates. A four-row barrel sprayer is very useful for spraying potatoes, to prevent blight and to kill bugs, but can be dispensed with, and the work done with cheaper machinery.

The ground should not be plowed until dry in the spring on most soils, and in most latitudes. Wire worms and grubs can be destroyed by fall plowing, but that leaves the ground exposed during the winter allowing more or less fertility to leach away. The ground should be plowed deeper for potatoes than for corn, and if it
has never been plowed deep it should be plowed a little deeper each time until the desired depth is reached. If it is deepened too much at one time, the chances for a good crop are lessened, as too much subsoil would be brought to the surface at one time. The best depth to plow depends upon the depth and condition of the soil. Some soils can be plowed ten or more inches, while it is not best to plow others more than six.

It is usually best to use a drag to pulverize the clods, as a roller has a tendency to pack the ground too much, especially in a wet season, and a loose, mellow soil is desired for best results. A cut-away or spring-tooth harrow should be used to loosen up the soil. Three horses should be used on a spring-tooth harrow, as it can be set deeper and more effective work done, without injury to the horses, than where only two are used. The ground should be harrowed at least once a week from the time that it is plowed until it is planted, in order to pulverize the clods and prevent the escape of moisture. It should be stirred as soon as dry enough, after every rain, not allowing a crust to form. The harrow and roller or drag should be kept going until the ground is thoroughly pulverized and a good seed bed prepared. If the ground is prepared and cultivated properly the crop will not suffer so much during a protracted dry spell, as it will if the work is carelessly done. The ground is not fully prepared for a crop of potatoes until all surface stones, that will in any way interfere with the planting, cultivating or digging of the crop, have been removed.

A good two-horse planter can be operated by one man. It will open the furrow, drop the seed and cover it the desired depth. If desired, commercial fertilizer can be applied with the planter. With the Aspinwall planter, which we use, the seed is dropped in the bottom of the furrow and covered with a small amount of dirt before the fertilizer is distributed, thus preventing the fertilizer coming in direct contact with the seed. The seed should be planted deep enough to prevent the harrow from raking it out, as the ground should be harrowed with a smoothing harrow several times before the potatoes come up. After they appear above the surface they should be harrowed occasionally until they are large enough to work with a two-horse cultivator. The cultivator should be run close and deep at the first cultivation. Follow the cultivator each time with the weeder until the tops are six or eight inches high. The weeder will level off the surface and rake the loose dirt around the stalks and prevent the weeds from starting to grow. If the weeds can be kept from starting to grow, until the tops are six or eight inches high, it is not difficult to keep them under subjection. Some weeder might be too severe on the tops, when they are eight or ten inches high, but we use a Z. Breed weeder with curved teeth, and if the tops are pulled over they will soon straighten up.
Perhaps the best known insect which attacks the potatoes is the Colorado beetle. They do not make their appearance every year, but when they do come in large numbers they must be kept under subjection or serious loss will result. If hand picking is depended upon it is very essential that all the old bugs be caught, as it has been estimated that one female may lay as many as 1,000 eggs in its lifetime, and 1,000 eggs, if not destroyed, usually means 1,000 young bugs. These bugs are most easily killed with poison while young.

There are a number of spraying devices for applying insecticides in a liquid form. For small fields the knapsack sprayer is very convenient, but is not practicable for an extensive acreage. The sprayer which covers four rows at a time, while speedy, does not do as thorough work, on account of not having the spray as well directed as the barrel pump, with two hose, under the direction of two men. The grower of potatoes on a small scale can apply the poison very effectively in a dry form which is preferred by many to the liquid.

Paris green is considered to be the best poison and should be mixed with something that will form a paste when dampened with the first dew; it will then adhere to the vines. If it does not adhere to the vines until all are hatched a second application should be made. Lime or gypsum is often used when applying arsenites in a dry form, but wheat flour is more effective as it adheres to the vines better. One pound of Paris green to fifteen or twenty pounds of flour, is estimated by some to be sufficient for one acre, or more, depending upon the size of the vines, while others advocate using one pound of Paris green to 150 pounds of land plaster. It can be applied by attaching a handle to a can, with a perforated bottom, and jarring the can with a stick, being careful to have the buds of the plant covered, as the young bugs usually feed upon them after leaving the leaf upon which they were hatched.

One of the most serious fungus diseases of the potato is the blight. It often makes its attack when the tubers are not more than half grown, considerably reducing the yield. When seriously attacked the tops die and the tubers stop growing. Some varieties are more subject to blight than others, and for the practical grower the safest plan is to select the varieties that are the most resistant of disease. Strong, vigorous plants have more power to resist the disease than delicate plants have.

A bulletin published by the Ohio Experiment Station says, that growers often confuse the bacterial blight with the early blight, and hence the difference of opinion as to the efficacy of spraying with Bordeaux mixture. The bacterial blight causes the branches, that are attacked to die, quickly turning black, and it is claimed that
no spraying will prevent it. The early blight is a premature spotting and dyeing of the leaves, and spraying with Bordeaux mixture is recommended as a preventive. If the potatoes are sprayed with Paris green to kill bugs, it is advisable to mix it with the Bordeaux mixture, as the one spraying will serve both to kill the bugs and prevent the blight. If the weeds have been permitted to grow, they should be cut and hauled off before digging is commenced, as no digger will work successfully in a weedy field.

Every grower should be supplied with a number of bushel crates, as they save considerable labor in handling. They should be distributed over the part of the field to be dug first. The potatoes can be picked into the crates or picked into buckets and poured into the crates. When the crates are filled, the low platform wagon can be driven along and the crates loaded on from both sides, and hauled to the place of storing, with a small amount of labor. When an early or medium early variety of potatoes are grown they can be dug in time to sow the ground in wheat. If the weeds have been kept under subjection, a good seed-bed can be prepared by harrowing with a spring-tooth harrow.

The CHAIRMAN: The next subject on the program is:

"Poultry Houses," by Mr. T. E. Orr, of Beaver, Pa.

The paper is as follows:

POULTRY HOUSES.

BY T. E. ORR, BEAVER, PA.

The three essentials of poultry management are cleanliness, comfort and convenience. As I can hardly imagine that any of my bearers will start a flock in an old and filthy house, I shall start with the second of these requirements, comfort. An uncomfortable hen does not sing; an uncomfortable hen does not lay eggs. You must have the songs of joy and comfort before you need carry your egg basket out to gather the eggs. Start the singing; raise the tune by giving warm quarters and an abundant and varied diet.

"Biddy" is not a growler. She does not complain if she is uncomfortable; she simply stops doing business. If she has lost a toe, a comb or wattle she does not utter a murmur, but her system sets
about "restoring the waste places," and she cannot digest a sufficient
surplus for egg production until all sores are healed and she is again
comfortable.

The guise of ventilation covers a multitude of sins. "I like plenty
of ventilation," says the fellow who is too lazy and shiftless to bat-
ten the cracks in his horse stable. "I don't want pampered stock.
I want mine to be hardy," says the alleged dairyman whose cow
stable is so open that the snow and frost are on the backs of his
cows in the morning; and then, rather than water them properly,
he turns them out in cold weather to go to the creek and drink ice
water, if indeed he takes the trouble to cut away the ice. This is
the man who thinks "any old thing is good enough for the hens."
He gets no eggs from Thanksgiving till Easter. Look at his hen-
house and you will see the reason. I need not describe this building.
You have all seen it. Ventilation? Bah!

A hen is not an exacting tenant. She does not demand hardwood
doors, mahogany furniture nor Brussels carpets, but she must have
quarters free from draughts. She can endure some cold if her quar-
ters are dry, but she must not have cold draughts down her back.
The house need not be expensive, but it must be tight. For these
reasons we have built our last four houses on the plan here indi-
cated. One of these houses is passing through its third winter. We
have never lost a comb or wattle in it. Our next four houses (and
we are increasing capacity every year) are likely to be on the same
plan. These houses are all 12 feet wide and in length one is 36, an-
other 60, and two others each 120 feet long, all being divided into
compartments 12x12 feet, so the four houses give us a total of 28
pens each 12 feet square.

Our sills are 3x6; all other framing stuff is 2x4 hemlock. The
rafters are three feet apart, so that every fourth pair are supported
by two upright pieces 6\(\frac{1}{2}\) feet long. These help to make a stiff,
strong roof, and to these our partition doors are hinged. The front
of each house, 5\(\frac{1}{2}\) feet high, is covered with finished weatherboarding
and painted; so are the ends. The rear, 4\(\frac{1}{2}\) feet high, likewise the
roof, is sheeted with hemlock boards, the smooth side in. These are
covered with three-ply tared paper of the best quality obtainable,
and immediately treated to a coat of tar. If this tarring is repeated
in six months and once each year thereafter this is a roof that will last a dozen years or longer. It is absolutely impervious to either water or air.

The dropping boards of the best tongued and grooved flooring should fit snugly into the siding at the back of the house so that no air can circulate between them. They are thirty inches from the floor, leaving abundant scratching room beneath. The perches, 2x4 scantling, smoothed and flat side up, are 8 inches above the dropping boards, and are easily removable for cleaning and painting with liquid fice killer occasionally.

On the two perches, each 12 feet long, there is abundant room for 30 hens, but we never allow more than 25 in one flock. If we were keeping 7,000 hens instead of 700 we should simply multiply these four houses tenfold. A house 96 feet long, containing 8 of these 12x12 apartments, is the best sized house we can imagine. The strong feature of this house is its low roof. The hens do not need to heat a large volume of air with their bodies. Their perches being close to the roof, with both roof and dropping board tight, and well removed from the ventilation in front, they can always be comfortable at night.

Allow me to insist that you do not make the house higher. I would prefer to have it one foot lower but for the inconvenience in cleaning it. The short man who will have a care not to bump his head against the rafters may profitably make the rear-posts 3¼ feet high, the front ones 4½ feet, and the tie beam that connects the rafters at each partition 5½ feet, and will gain more in eggs every month than he will save in lumber.

Why is this? I do not know. I can only guess at it. The hen's body is small and she does not need to give off so much heat to warm her house if it is small. The hen ought to have a floor space 2x3 feet in order to get exercise; but this space need be only one foot high, thus giving her a total of 6 cubic feet of air space to place her on equal terms with the 1,000 lb. horse or cow that occupies a box stall 10x14 and 7 feet high. Now in our little sawed-off house that I have suggested, 25 hens have more than five times the cubic air space they really need. So it is only to give them room to scratch and to give the attendant room to get into it that we make the house more than one foot high.

Now, the business hen does not suffer with the cold much in daytime, even in so large a house. Scratching for a living makes her blood circulate rapidly. At night is the trying time, and we find that wise breeders of Leghorns, particularly, are overcoming the difficulty by dropping a muslin curtain from the roof to the front edge of the dropping board at night. This gives them a chance to warm up a smaller volume of air with their bodies even when inac-
tive; it cuts off all draughts of air and they rest comfortably during the night. In fact, many Leghorn breeders throughout New York are shortening the length of the perches so that the hens must roost more compactly together than I have indicated, and thus retain still more heat. Of course in moderate weather these curtains or boards are not dropped. We have never used them on Rocks or Wyandottes and with a house built just as I have indicated they are not needed.

THE FLOOR SPACE.

Let it be remembered that each compartment for 25 hens is 12 feet square. This floor space must not be interfered with in any way, but must all be held sacred as a scratching space. With such a house we do not need any separate scratching shed. The hens may be kept there in a healthy condition from November until April. Remember that the dropping board, 30 to 34 inches wide, is 30 inches above the floor, so the hens can work clear under it. Not a nest box, dust box, feed trough, grit box or water crock is to be on the floor. All these must be attached to the walls so the hens can work under them, except the troughs for soft feed and these are to be hung up to the ceiling as soon as they are empty. The litter may be oat, wheat or buckwheat straw. We prefer the last named because, it does not become impacted, but the grain settles down through, compelling "biddy" to work hard to get it. It should be forked over frequently and renewed before it becomes too foul or broken.

LIGHT AND VENTILATION.

Our windows are in the middle of the front of each house, 2½ feet wide, 3½ feet high, on hinges opening inward. They come down within one foot of the floor and one can step out into the wards through them. In April these glass windows come off and wire screens on hinges take their place until November. About our only ventilation is the exits into the yards, 9x14 inches. These are seldom closed, except in extremely cold weather.

Morris Davenport, of New York, has invented, and Dr. Santee, of the same state, has given much publicity to muslin windows. The claim is that they give the right amount of light and ventilation, and that they prevent the accumulation of moisture about glass windows and on the under side of the roof in very cold weather. Last month we investigated a number of these houses in northern New York, where Leghorns were kept in safety. We are so nearly converted to their merits that we shall try them very carefully in the next houses we build.

We do not advise you to build any house out of new lumber in the
winter time. Colds, roup and all sorts of trouble are quite sure to follow. The right time to build a new house is in June or July. Finish the frame-work, roofing and flooring thoroughly, then put on the three-ply tarred paper and then give it a thorough coating of tar and let it stand and season during July, August and September. Begin to occupy it with your pullets in October. Give it another coat of tar then; an additional coat of tar each year, and the house will last indefinitely. The bath is just as essential to the hen as to the man. She does not need hers in water. Dust is what she wants. If you did not save some fine road dust last summer you can probably secure some fine coal ashes now. Sift them through a fine sieve so that all cinders are taken out. Place at least a bushel of these in a box about 2 ½ feet square and one foot deep, throw in a little grain to get them started. Stir the ashes up from the bottom every few days and the hens will soon learn that these ashes are there for them to use, and they will make everything in that house dusty. The box should be so placed that the sun can shine into it and warm the ashes. Wood ashes are not good. The alkali irritates the skin and discolors the shanks. A little sulphur mixed through the ashes is good. Some are mixing acidulated South Carolina rock-phosphate with the ashes with good effect and some use this exclusively for a dust bath. I have not tried it, but I fear it is too heavy.

No one thing has discouraged so many people as lice. There are a half dozen varieties on our domestic fowls. I have seen three kinds on the same bird at one time. The dust bath will enable "biddy" to rid herself of many of them, but there are enough lazy hens that will not dust themselves to keep up the supply of lice in the house. Besides, some of the most vexatious varieties of lice are not on them in daytime, but at night only. For these the dust bath has no terrors. There are various powders for dusting hens, but except for setting hens the powder business is too slow and too laborious. I formerly made lice powders for myself and my neighbors, but it is no small task to dust a hundred hens thoroughly, even though you have a whirligig machine to help do the work. There are several good liquid lice killers, the fumes of which are death to all insect life, and these can be applied so rapidly and effectually as to make them cheap, even though they cost twice as much as they do. Don't be deluded with the kerosene theory. Lice may not enjoy or thrive on a diet of kerosene, but there are many varieties of lice that will wade through kerosene to do business.

If you are building a new house you can do much in the way of prevention. Spray the cracks and corners with the liquid there, a terror to new lice and of the detestable mites uninhabitable. Paint your dropping boards thoroughly with the liquid when you put them in and you will have the disinfecting odor of the liquid there, a ter-
ror to new lice and a death to the old ones. Once in two weeks we want our 2×4 perches lifted from their sockets and painted with the liquid. In winter this has the appearance of a frost on the perches. The hen seats herself on the flat side of the perch and the heat of her body will send enough of the fumes through her feathers to kill the lice. A house treated in this way occasionally will never be troubled with lice of any kind, and it is only hens that are free from lice that can be profitable. Don't spray the straw of the nests with liquid lice killer. It will taint the eggs. The nest boxes should be taken out occasionally and all litter removed. Then if sprayed and ventilated before the fresh straw is put in there will be no tainting and no lice.

A Member: Mr. Chairman, I would like to ask the gentleman a few questions. If you are to keep 100 chickens would you keep them all in the same house?

MR. ORR: That would be a house four times ten feet long. I would not myself. I am not ready to say that it is wrong, but I have found that whenever you put more than 24 or 30 hens together they don't do so well. I am going to conduct an experiment this year by starting and putting 200 hens together. The trouble is that they will get together at the end of the house or on one perch. But for my own work I found we had better results if we did not keep more than two dozen together.

A Member: How do you break up hens that persist in hatching?

MR. ORR: I will tell you how we do it. We have an extra pen away from our houses and we put our hens in there. In the summer time we have a little park built outside the house and turn them out on that right on the grass. We do not scold or tie a string to her leg, but we give them all the feed they will eat, and good feed that will stimulate them up to egg laying.

A Member: Mr. Orr, if you had 100 hens running around the farm how are you going to separate them?

MR. ORR: The hen is a creature of habit. If you put 25 hens in a house this fall and keep them there a little while, when you let them out they will come back to the same pen; you can train them to come back to the same pens in which you have been feeding them. You can hardly drive them away. On the farm if you can get the hen in the habit of coming back to one place for three or four times you can hardly drive her away from it.

A Member: Mr. Orr, on the average farm don't you think it would be more profitable to keep the hens penned up than running around the farm?
MR. ORR: Yes, sir; if they have average care it is better for the hens to be confined.

A Member: Would it not be better to have the hen-house you described off the ground six or eight inches on locust posts and have a floor in and ventilation thus furnished and so no vermin could get in, and shut up that place with a screen of close wire netting, and so that there would be a draught through in warm weather and that it could be closed up tight in winter?

MR. ORR: If you are going to put a floor in at all I prefer to raise it up. We have one house with a floor in it and another on sloping ground without a floor with perches from one to two feet off the ground. We have it so that they can get under the house and in this warm weather they like that.

A Member: It is only on account of vermin that I would have the floor.

MR. ORR: So would I if the ground about the house had proper drainage. But don’t be too sure on the vermin question. I would have said once I would give you a dollar for every red mite you could find on the place. I was going through one of our houses, which I thought was free from vermin, with a gentleman, but the very first perch we turned up we found a bunch of these red mites. We got out our sprayers and went over every compartment. He was interested in that lice question and he was as glad as I was embarrassed to find that we had lice. So don’t be too certain, as I was, that you haven’t any lice.

A Member: What is the remedy for these lice?

MR. ORR: There are half a dozen of these liquid lice killers that will do the work.

A Member: Crude oil will do it.

MR. ORR: Crude oil is a good thing, but it will not kill all lice; but there are liquid lice killers that will do it; crude carbolic acid will do it. But I want to say this, that I don’t care how good your remedy is, if you don’t use it it is not going to kill them. Remember that.

The CHAIRMAN: The next speaker will be Prof. H. A. Surface, Economic Zoologist.

Prof. Surface addressed the assemblage as follows:

Ladies and Gentlemen: It is not necessary for me to say that it is a pleasure for me to be here and meet the gentlemen whom I know well, and with whom I have been corresponding for some time. It seems that when I come before you or meet with you to-day for the first time in my official capacity as Economic Zoolo-
gist. I should discuss the fundamental principles of the greatest subject with which I have to deal, and that will take us directly, of course, to the subject of Economic Entomology, or the application of insect remedies.

As you know, we are issuing from the Agricultural Department, bulletins discussing the insects of each respective month and the remedies known for them, because that is the important subject in agriculture and horticulture to-day. We have also issued another circular, entitled "The Birds Around the Farm." These are entirely free of charge and will be sent to persons who write for them or return these postal cards. (Holding up cards). If the June number did not reach their destination it is because we are changing our mailing list now; but after this it will be sent regularly the first of every month to the persons whose names we have. We are not spreading them broadcast, however. They will be put into the hands of only those persons who signify their desire to receive them. This is an undertaking on my part, with the permission of Secretary Critchfield, that means much work, but we are gratified with the hearty responses we are already receiving from the people.

I can do little more to-day than to speak to you of the things of which I have already written, for we cannot be successful until we understand the underlying principles of insect warfare. I have sent for a spraying apparatus in order that I could illustrate in a practical manner some of these things. There is just a word of explanation concerning this: If I should show you an apparatus, it is not that I am advertising this machine, at all. This is the apparatus that will best suit my purposes and the company gratuitously sent it to me upon the condition that I place their catalogues in this room, and that I have already done. That is all the advertising I am going to give.

In the first place, we know that the insects that attack our crops are divided into two classes: First, the suctorials insects, or those that feed by sucking the juices from the organisms on which they live, as do the squash bugs, scale insects, plant lice, etc.; the other class is the chewing insects, that chew the tissues of the plants as do the beetles, cut worms, army worms, corn worms, cabbage worms, etc. Now, as a consequence, insecticides are divided into two classes: Those intended to kill by contact (consequently those that must be used for suctorials insects); and secondly, stomach poisons, or those that are intended to be for the chewing insects. You can readily see that if the plants were covered with Paris green or any other poison, a suctorialis insect would not be affected, because its bill would be inserted into the plant, and it, therefore, would not get the poison applied on the surface. These insects must be attacked with the contact poisons which kill every thing with which
they come into contact. The chewing insects are killed by taking into their stomachs the poisonous remedies that are applied to the plants. For example, I received a branch of a cherry tree with the leaves all curled up by the cherry Aphid. It would be absolutely impossible to kill these insects now with contact applications, but had the applications been made at the right time before these insects had caused the leaves to roll and twist into protecting shields, then their bodies could have been reached and they would have been killed. The plant lice are the cause of the leaves thus rolling and twisting. Thy are bad in some parts of the State. After they are in the curl of the leaf there is nothing to do but to cut off the branches affected. When inside a curled leaf you cannot reach them. The remedies must be applied before the leaves curl—just about the time the buds are bursting, especially for the apple Aphid. A man in Crawford county wrote to me before the buds burst and sent me some apple buds, and I found that they were infested with the Aphid. I told him to make the application of whale oil soap, or kerosene mixture or emulsion as soon as the first green leaves began to appear. He did so, and wrote me later that he had destroyed all the pests.

Now, ladies and gentlemen, we have heard a great deal about kerosene emulsion. I have this apparatus here to show you something that has taken its place. We regard the emulsion as difficult to make and unpleasant to apply, and for this reason I could print in these monthly bulletins "use kerosene emulsion." month after month, and the people would not do it. Now, the substance as a contact application that is taking its place is a mixture of kerosene and water. The object in making kerosene emulsion is that the oil will be in fine particles and will be diluted by water. You cannot apply kerosene stronger than 20 per cent, without injuring foliage, and that is too strong for peach and cherry and the American and Japanese plums. Now, taking the place of the kerosene emulsion and water mixture that is made by some apparatus of the kind. I have here. Into this tank the kerosene is placed. (Indicating.) Here is an index showing the percentage of kerosene in proportion to the water. This tank is then placed in a vessel of water and we set the index at the percentage of oil desired. About 15 per cent. is generally used. I will spray a little of this out of the window.

I have here an appliance that I have arranged that is convenient. There are two kinds of nozzles here used; the one is the Bordeaux; the other is the Deming-Vermorel nozzle. This attachment is for spraying the underside of leaves of vines, such as cucumber, melon and the like. You will notice quite a difference in the kind of spray thrown by these two; one goes as a genuine spray or mist, like fog;
the other reaches some distance, but falls in drops, sprinkling like rain. Where we have to reach into the tree tops, by turning this valve (indicating) you will notice we get a different effect. You see that the one is of larger drops than the other; that is, it is doing more sprinkling than spraying. The double nozzle is not generally used by the hand sprayer. The spray is a water mist and does not require much power for that. The man who has an orchard must use a larger apparatus. The point that I wish particularly to make in showing this apparatus is that we add the kerosene in the vessel and at the instant the spray itself is made, and the chemical mixture is effected. For the peach or plum we use from 10 to 15 per cent. of kerosene; for the apple and pear from 15 to 20 per cent. of kerosene; for lice on any animals or in poultry house a 10 to 30 per cent. kerosene mixture is recommended. I have never tried it in that quantity.

A Member: How strong should it be for rose bushes?

PROF. SURFACE: Fifteen per cent. kerosene is the average. I have used that successfully upon rose bushes this year. Another thing that I can recommend instead of the kerosene mixtures is whale oil soap, one pound to six or eight gallons of water. I have used that this year on many kinds of leaves, for the slug, etc., on rose leaves and for plant lice. The only thing is, that when it is used on an extensive scale, it is expensive. If applied to a large orchard it is expensive; but so far a few plants in the orchard or garden I should recommend whale oil soap in most cases. There are two well known manufacturers of this soap, one in New York and the other in Philadelphia. I have used Good’s Caustic Potash Whale Oil Soap (941 Front St., Philadelphia), with the best results. This mixing apparatus does not require any material as expensive as that. For using the whale oil soap, kerosene emulsion, Bordeaux mixture, or Paris green, this pump is all that is needed.

In the first place, the man who does not spray for plant diseases is not up to the times at all. We cannot handle the blights, the mildews, the rusts, black knots, rots, anthracnose and other kinds of plant diseases without spraying apparatus and the proper remedy. For such diseases the Bordeaux mixture is generally used successfully. We can combine the Bordeaux mixture with poisons, such as Paris green and arsenite of lime, and thus produce a mixture that is both an insecticide and a fungicide. The Bordeaux mixture is simply made. Take four pounds of quick lime; dissolve four pounds of sulphate of copper in warm water, but not in the metal vessel; then pour them together slowly in 50 gallons of water, stirring as it is done, and you have Bordeaux mixture. This mixture is not to kill insects. It is excellent to drive off flea beetles or small insects that are putting holes through the leaves of the potato
and other plants. It is the best thing for plant diseases that can be recommended. If to that 50 gallons of Bordeaux mixture you add four ounces of Paris green, you have something that is effective for the chewing insects and for the plant diseases, for the codling moth, etc., but it does not kill the class of insects that are scutiorial. We have tried it for the blight on melons and it has worked perfectly for that, but it is likely to make a stain on the ripened fruit like a thin, bluish white-wash. That can be overcome by using for the last spraying a formula of a colorless remedy that I am giving in the June bulletin of the Division of Zoology, which is being sent out this week. It is the ammoniacal solution of copper carbonate. This is a clear solution and does not leave a stain. For example, take the brown rot of the peach. This must be met by an application just about the time the peach is ripening, and if we apply the Bordeaux mixture at that time our fruit is so stained that it is not marketable; but if we apply a stainless mixture, as described, we have a fungicide or remedy for that disease that will not stain the fruit and is effective. It is good for the cherry and other fruits that may rot; the last spraying made should be the application of the stainless solution. Another point is that when a man is spraying for something like the apple scab, if Paris green is added, it will also kill the codling moth and other chewing insect foes.

A Member: How would you protect the roses from the rose bug?

PROF. SURFACE: There is no man living that can give you an effective remedy for the rose bug. It is recommended to spray with whale oil soap, kerosene mixture, Bordeaux mixture, etc. Shake them off into a cloth that is saturated with kerosene, or into an open umbrella, and burn them. That is about he only thing that can be done. They are poisoned so slowly that it takes two days to kill them.

A Member: What about the San José Scale?

PROF. SURFACE: You who are raising fruit should be intensely interested in this subject. If left alone it would cover this State like leprosy. The San José Scale during this month of June, from the 5th to 20th or later, is in a young and tender stage. It is then we can make the summer applications, but applications made in August or September would not avail. Use whale oil soap, one pound to five gallons of water, from the 10th to the 25th of June, and you will be able to hold the San José Scale in check until fall. Then when the leaves are off the trees trim back as much as advisable and then wash with a strong soap suds or spray with whale oil soap, two pounds to one gallon of water (that is strong); or use the "lime, sulphur and salt wash," to be described in one of our winter bulletins.
A Member: Don't that application hurt the foliage of the tree?

PROF. SURFACE: It will, if continued frequently, but if applied only once or twice in a season, it will not. I have tried it on delicate plants this year; I have tried it one pound to two gallons of water and killed lice on rose bushes this summer.

For the chewing insects, the chief remedy is Paris green, but there is one that is better. This is the arsenite of lime. It is the cheapest and most effective and the easiest to apply, because it does not require stirring. It is the best all around poisonous insecticide. This is made by boiling white arsenic in two parts of water. Take half a pound of white arsenic, two parts of sal-soda and two parts of water and boil until the white arsenic is dissolved; then use only one pint of this solution with 50 gallons of water, and two pounds of freshly shaked lime, and you will find it is more effective than Paris green. It has the advantage of not requiring stirring like other applications that are merely mechanical mixtures instead of solutions.

A Member: Does it stay on the leaf any longer than Paris green?

PROF. SURFACE: I think it does, and has been found more effective for codling moth, etc.

A Member: Can it be used in a dry form?

PROF. SURFACE: It can. I have been thinking of experimenting with it. The Missouri Experiment Station has shown good results from dust spraying. I am able to do some experimental work of that kind, and shall take the pains to make the experiment. I am asked to repeat the formula:

One-half pound of white arsenic and two pounds of sal-soda boiled in two parts of water until the arsenic is dissolved. Then you will have a solution. Whenever you want to use it take one pint of that solution to two pounds of freshly shaked quick lime and 50 gallons of water.

A Member: Have you ever tried a strong solution of lime water and letting it clear?

PROF. SURFACE: No, sir; in all cases where we are to use a spray with lime, we must strain the lime after it is slaked and as it is poured into the water. The clear lime water would not have the effect, but if strained through a cloth like cheese-cloth it will not clog the apparatus.

A Member: Does it make any difference whether the water is hard or soft?

PROF. SURFACE: Yes, sir; in making up most insecticides soft water or rain water is essential.
A Member: Please state once more the best time for spraying for the scale.

PROF. SURFACE: For summer applications of all scale insects the latter half of the month of June. For the plum scale, the San José Scale or any kind of scale, the middle of June in general. The "oyster shell" should be treated in the early part of August.

Scale insects are spread in four ways: 1. By the feet of birds; the young insects creep on their feet and the birds fly away and carry them to other trees. This is proven by the fact that frequently wherever the bird nests the scale starts in that part of the tree where the nest was located. 2. The wind blows them. 3. Another way is where the branches of the trees overlap and they creep from one tree to another; and 4th, they are carried by persons and animals upon which they fall.

A Member: Is this scale white?

PROF. SURFACE: Yes, sir; in its young stage it is first yellow, then white, and finally becomes gray with a dark center. You will know the San José Scale from all others.

After it gets past the light yellow and moving stage it is perfectly circular with a little dark mound right in the centre. Branches infested with it look as though they had been washed with ashes.

A Member: Does it leave a red spot.

PROF. SURFACE: Yes, sir; especially on green fruit and young shoots. We do not realize the importance of that insect, and if any of you suspect its presence send me samples. I have a strong power microscope in my office for this work.

Gentlemen, this is a great question. I think I am the only man in the State of Pennsylvania who is working to-day, professionally, on the subject of Economic Entomology. It is a subject that covers a loss of over $20,000,000 a year in the Keystone State. If you should go to the Legislature and ask for the smallest part of money that we need to experiment or combat with these foes they would hold up their hands in horror.

Gentlemen, there is not a tree in all this region from which I can not at this moment take an insect that is injuring it. There is an average of about six species or kinds of insects on each species of plants, and 271 on the apple tree alone. There are 15,000 kinds of insects in the State of Pennsylvania and the loss that you suffer from their attacks is an actual clear loss just as though it were taken out of your pockets.

A Member: In our barn and the sleepers of the house if anything is laid down it is covered with a white flour. What is that?
PROF. SURFACE: I would suspect you had the white ants boring in the wood. I have received a communication from a gentleman in Philadelphia and samples that brought to my mind a subject of great importance. He has a row of houses and the white ants are working in them. If that is what it is I ought to know, so as to give you the proper remedy. Please send me specimens if any insects are to be found in them. Of course, if you inject pure kerosene into the holes, it will kill them.

A Member: Did you ever have any experience with a citizen who claimed he never took scale although it was on each side of his house, in each yard? A gentleman claimed that Good's No. 3 Caustic Potash Whale Oil Soap would work all right.

PROF. SURFACE: Yes; that will kill the insects in the winter, because it makes the scales turn up and then when the rain, freezing and wind come, they are washed off.

A Member: Do ants on trees do good?

PROF. SURFACE: This is an important question. The ants are there because plant lice or scale insects are there, and not because they are attacking the trees. When you see ants going up and down trees it is a sure indication that these pests are there. It is the sweet juices, secreted by plant lice and scale insects, that the ants are after.

A Member: I would like to ask a question in regard to plum trees. I neglected to spray our trees before they bloomed last year, but after they bloomed I sprayed with Bordeaux mixture, and about 10 days later I gave them a second spraying, but a number of the plums are dropping off. Would a spraying before they came to bloom have prevented this or will all these plums drop off?

PROF. SURFACE: The most of them that are stung by curculio will drop off. Destroy the fallen plums and that will lessen your loss next year. You will still catch the plum curculio by jarring the trees. There is nothing better than jarring for them. The poisons do not kill all the curculios, though they do kill many of them; but poisoning is not satisfactory.

A Member: In regard to Paris green, what is the cost?

PROF. SURFACE: About 17 cents a pound—15 to 20.

A Member: I asked our druggist what he sold Paris green at and he said 40 cents. I asked the price on 8 or 10 pounds, and he said he could not tell me, but would write to the wholesale druggists.

A Member: I think in quantities you can buy it in cans. 14 lb. cans, for 14 cents.

A Member: What would be the cost of London Purple? 
PROF. SURFACE: London Purple is a little less in cost than Paris green, but London Purple varies in composition. You do not know how much arsenic there is in it.

A Member: This San José Scale, can you tell it?

PROF. SURFACE: Yes, sir; the tree has a scurfy appearance. The real bark of the tree is often not visible. It looks as though it were covered with corn meal, bran, ashes or something of that kind, and the scale can be seen, about the size of a pin head.

A Member: Would it not be possible for your Department to publish a bulletin on our insect friends?

PROF. SURFACE: This is an important subject and something we have in mind. We are going to do that very thing shortly.

The Secretary has authorized me to say that whenever anything of this kind comes to your mind, write to us, and if we cannot do it this month we can and shall do it the next or next, or as soon as we can possibly give it attention. If I could not make these bulletins profitable and practical I would not waste a minute on them.

A Member: What can be done for the white lice on the under side of the leaves of the rose bushes, etc.?

PROF. SURFACE: Use whale oil soap; 1 lb. to 5 gallons of water will kill them.

This is the bulletin for May. (Holding it up.) Write for these bulletins. For the first bulletin we sent out we had to use an old mailing list. We put in these cards to be returned (indicating), not intending to send the publications afterwards to the same persons sent before unless the cards are returned. You understand, then, that if anybody does not get the June number it is because he has not returned this card with his address; and the July number will be sent only to those whose names have been received. We must have the name and address sent back to us before the bulletins will be sent, after this.

A Member: If a man can’t spend one cent for a year’s bulletins he certainly would not read them if he gets them.

MR. J. A. HERR: I am greatly pleased with the work of the Economic Zoologist. I am very glad that we have the right man in the right place. He is enthusiastic, but I want to say that he has a tremendous field to cover, and to use a figurative expression, he has “bit off as much as he can chew” at the present time, and we must not expect any unreasonable things from him. I am very glad to receive these bulletins. Our people in the Grange are interested in them. But we must be reasonable people and not expect we can accomplish everything in the course of a couple of months, because we have not received anything practical in that line since Dr. Fernald filled the same position.
MR. CLARK: I intended to speak to the Professor with respect to some trouble we have had in our county the present season. It is this. Through a number of orchards in our county—I have been past two of them and also in one—the foliage has been almost entirely destroyed in the entire orchard by worms. This worm some years ago attacked the foliage of the old trees and stripped them entirely, and this year there are three orchards that I know of, perhaps 5, 7 and 10 acres in the orchards, that the foliage is entirely stripped off the leaves and are as clean as if singed with fire, except the stem or the form of the leaf. It is a matter that evidently must have attention shortly.

PROF. SURFACE: I might surmise that this is the canker worm from the description, but I ought to see it to be sure, and that is the point in writing to me. I should like always to receive a specimen of the insect in question and the work or injury it does. You understand how this is. The insect that chews may be killed by London Purple or other arsenites; the sucking insects must be killed by contact applications.

We have arranged with persons representing societies, granges and organizations of any other kind, that wish a number of our publications, to advise us each month how many they need, and they will then be sent for distribution.

CHAIRMAN CRAWFORD: We have all been interested in Prof. Surface's talk and could spend much more time in this discussion, but we have not the time, and if desirable we will hear from our Committee on Queries and have any questions read and answered that may have been handed to them.

MR. BLYHOLDER, Chairman of the Committee on Queries: The first question is:

“What is the proper material for building a silo?”

A Member: Up to the present time I believe that there has been nothing found cheaper than wood. Last year a number of silos were built in our neighborhood that were lathed inside on studding and then plastered with cement. This silo is cheaper than any other, unless it be wood.

MR. BLYHOLDER: The next question is:

“At what stage in growth will clover ploughed under produce the most plant food?”

PROF. COOKE: Plant food in clover increases proportionately from the time the seed sprouts until it becomes dead ripe. Let the clover grow and let it get as big as possible and you will get the most from it.

MR. BLYHOLDER: The next question is:
“What can you substitute for the shortage of our hay crop?”

MR. PHILIPS: Down in Chester county, which is one of the great dairy counties of the State, it has so far been very dry, until last Friday, and the problem of roughage for winter feed had become very serious, and you will find there that almost every farm has a large acreage devoted to fodder corn, and in some instances the farmers contemplate cutting their oats for hay. Now you understand that with us oats is not a good paying crop. It is only very rarely that we have a good oat crop, which is not true of the northern part of the State; so we realize we will get the greatest return from our oats by cutting it in the immature stage for hay rather than run the risk of its maturing.

A Member: I shall not attempt to tell my farmer friends what to do to help out on the shortage of hay, but a young man, neighbor of mine, started in the dairy business last year, and he didn’t have any clover, and he ploughed about three acres and sowed it in sorghum, and he sowed it thick enough that it grew only two and a half feet high, and he made it that much richer. Last fall, if you will remember, we had a very excellent season for curing anything of that kind. Sorghum I do not think would cure out by cutting in sheaves with the binder, unless we had favorable weather, and we had that last fall. I asked him about the result of his curing it out. He let it stand in small shocks, tying it with the binder in small sheaves, and after it had cured in the shocks for perhaps three weeks he hauled it in. I asked him with regard to its feeding value and he told me it was as good as any clover he had ever fed. I asked him whether he cut it and he said no, he fed it in the sheaf and he didn’t have a particle of loss with it. I have no difficulty to supply my dairy with clover, but if I did I would resort to sorghum as filling out the shortage in clover hay, along with corn. The sorghum will stand more drought than any crop I have ever known. I have raised it for six years, but not with the intention of making hay from it; but if I didn’t have hay I would sow some of it. I feed it just as a sorghum crop to my cows on account of shortage of pasture. When shortage occurs I feed it green. This young man had excellent results from the sorghum hay. I do not know of anything that would take clover’s place any better.

MR. SEXTON: There is no good telling of our country despairing of not accomplishing what we expect to do at the commencement of the season. Now then, we have lots of time yet from now on in the different localities of the State to put in some catch crop between now and July that will take the place in the shortage of hay that certainly will come. Corn produces more than anything else that we can put into the ground. There is not a dairy farm in
the State but can find from three to five acres that can be ploughed up in corn to be cured as fodder. It will help out in an immense manner. And then we have just heard of sorghum which is a catch crop. Our clover crop will be nothing at all this year and we will have to fill out on something else. There is no use of despairing at all. We may yet have a good crop of corn which will help us out.

The CHAIRMAN: We are now ready to adjourn until this evening, whereupon, upon motion duly made, seconded and carried the meeting adjourned to meet at 7:30 o'clock this evening.

Wednesday Evening, June 3, 1903.

HON. A. L. MARTIN called the meeting to order and announced that the Chairman for the evening would be Mr. C. B. Hege, of Marion, Pa., who thereupon took charge of the meeting.

The CHAIRMAN: Are there any questions to be answered? If so, we might take up not longer than twenty minutes with them.

MR. BLYHOLDER: The first question is:

"Can we not get more vegetable matter for our soil by applying barnyard manure on our meadows than by ploughing it under when applied?"

DR. WILLIAM FREAR: I do not believe that the barnyard manure itself, rotting on the surface, can contribute as well to the humus supplied from its straw as it does when ploughed under; and the decay which occurs as the straw rots in the soil is advantageous in helping to make the manure matter accessible. The question, however, is not solely that. We have to consider the secondary effects upon the meadow itself. If the conditions of fertility in the meadow are such that the dressing of barnyard manure may cause a very large development, then the gain in the roots when you come to turn the sod under, may more than compensate for the loss which occurred owing to the rotting of the manure on the surface. If, however, the meadow is highly fertile already and not much increase of root and stubble occurs, then there will be a relative loss by this method. It is not a question which can be answered either in the negative or in the affirmative without qualification.

MR. PATTON: I asked that question for this reason. On moderately rich soil I started an experiment along this line, and I found that by that method I could grow heavy soil, fill the soil up with roots, and after getting good, heavy hay crops, that I had more vegetable matter to plough into the soil, after using the
manures to grow the hay, than I could by ploughing the manure directly into the soil. I found by this method that I am enriching my soil much faster than I was by applying the manure and ploughing it under. I ascertained that the humus was what we needed especially, and in this manner I am getting the humus back into the soil much faster than by ploughing the manure directly into the soil.

DR. FREAR: This has brought out one additional point. That the vegetable matter in the manure will decay in the soil and be destroyed more readily than would an equal weight of sod residue. The humus affecting the sod upon the soil will be longer felt than would that of an equal weight of straw turned under as manure simply because manure will decay more rapidly in the soil. But the case stated by the gentleman is such a one as I contemplated in speaking of where the use of the manure on a moderately fertile land would produce a very much larger growth of the plants.

MR. BLYHOLDER: The next question is:

"Is there any remedy for club-root in cabbage?"

PROF. R. L. WATTS: I can't answer that question from experience, but I can from the experience of others. Some very strong results have been secured in Michigan by the use of lime. I cannot answer as to how much lime should be applied to destroy the germs of the disease which causes the club-root. I know that has been tried to some extent in Pennsylvania and the results are generally very encouraging and I should recommend its use.

A Member: I have learned of a preventive that I find successful. I do not know that it is a cure when the disease has taken hold. If you raise your plants on sod ground and raise your cabbage on fresh ground there will never be any club-roots. Club-root is the same as scab on potatoes. It is a fungus and remains in the ground from year to year. But raise your cabbage on fresh ground every year and you will have no trouble.

PROF. WATTS: I thoroughly agree with the gentleman in his remarks. Prevention is better than cure.

The CHAIRMAN: We have had some experience with regard to club-rooted cabbage in our section. I know of cases where it is affected with club-roots that they pull the cabbage up and destroy it, and put in a pretty liberal application of salt and plant cabbage right back in the same place and grow it.

MR. BLYHOLDER: The next question is addressed to Mr. John W. Cox, of New Wilmington, Pa., and is as follows:
"What method do you recommend to mix Paris green with water so as to make a regular and thorough mixture?"

MR. COX: In my experience with it I put it in the water and used a spray pump to it for a little while and that did the work.

MR. W. H. STOUT: Mr. Chairman, in applying Paris green I think it is better to mix a little lime water with it to avoid burning.

MR. J. H. LEDY: I asked that question myself and I was desirous that Professor Surface should answer it. He does not seem to be here. He knows exactly how to mix the Paris green with water, and I question very much whether there are two men out of every five in the audience that know how. I mixed Paris green for nine or ten years and didn't know how until a year ago. It is a serious matter. We are trying to teach farmers to use sprayers and the various sprays, and nearly all of them have Paris green in them, and there is not one man out of fifty who can tell them how to mix it. The gentleman said you should put the Paris green in water and agitate it with the spray pump. That is not the right way, and it cannot be mixed perfectly in water that way. There is only one way to do it. That is to add a little water to the Paris green and use a paddle and work it well, and add more water until it is like putty and then pour in more water and mix like paint, and then add the full amount of water and it will not settle.

MR. BLYHOLDER: The next question is addressed to Hon. T. J. Philips, and is as follows:

"In high grade dried blood containing 16 per cent. of nitrogen, what per cent. is there of phosphoric acid and potash. Also is it not cheaper and better to pay $1.00 per ton for mixing than to attempt home mixing of fertilizer?"

MR. PHILIPS: I answer that in the affirmative; yes, sir. I question whether any of us, using complete fertilizers in the general way, can afford to mix them ourselves. Perhaps if we were specialists, using them in very large quantities we could do it. I think I referred to that this afternoon. The manufacturers of fertilizers rarely takes his ton of nitrogen from one source. I refer to nitrate of soda as being the chief source. But nitrate of soda is instantly soluble and consequently if applied to the plants other than in full vigor of growth, or when the ground is not full of the vigorously hungry roots there is a danger more or less of that soluble nitrogen being washed through the sub-soil and lost. So that the manufacturers of commercial fertilizers, even though they only put in 82-100 of one per cent., 16 pounds in a ton will take the contents from three sources. They will put in nitrate of soda to be of instant use; a
little dried blood to be available when the nitrate of soda is gone, because of its fine sub-division it will be entirely broken down and available; and then will also take the additional contents from the tankage or ground bone, because it will be later on available. So that the individual who undertakes to make his own fertilizer will probably only use the one content, nitrate of soda, and the probabilities are that he will supply it in such quantities that the larger per cent. is lost to him. So that I thoroughly believe, in our practical needs, we cannot afford to mix the fertilizers ourselves and cannot get as good and cheap results as we do to-day by getting them mixed by machinery running day and night.

PROF. WATTS: I cannot agree with Mr. Philips along the line of home mixing of commercial fertilizers. It seems to me we have reached a stage in Pennsylvania when we ought to feed our farms with intelligence, and I do not believe it is possible to-day to go on the market and buy ready mixed commercial fertilizers that will suit the crops of the farm. It seems to me we can work more intelligently if we mix them right on the barn floor and to suit the crop. We can see if we want more phosphoric acid than some other ingredient and so we can put in more phosphoric acid or any other ingredient in the proportion it is needed, and so far as I am concerned, I find it impossible to buy commercial fertilizers unless I pay from five to seven dollars a ton more than I can buy the ingredients in the raw state and mix them on the barn floor. Last year I mixed some that cost me thirty-seven cents for mixing. I think that is the only advantageous manner of mixing fertilizers.

MR. PHILIPS: I agree entirely with Professor Watts because he is that specialist I referred to. I was answering the question from the standpoint of the general farmer who may buy a blood fertilizer and put on the corn or grass crop. And, by the way, one-half of the fertilizers sold in Pennsylvania I do not think contains more than 16 pounds of nitrogen to the ton. How is it possible with home mixing to distribute that 16 pounds over from seven to ten acres of land so as to be of any benefit? So that it is only the most thorough and complete mixing that can be of any avail whatever. But for special crops, in my own practice, although not a market gardener, I do not have a bag of nitrate of soda to use on cabbage or lettuce; but in special work it is advisable to do as Prof. Watts says, but for the average farmer and corn grower I do not believe it is practical. I visited factories where in the low grade goods they put in marl, but in the high grade goods they carry no adulterant. If it is possible to make a better grade than we can buy of dried blood or muriate of potash and mix them thoroughly it might be well to do so if we know our needs.
MR. WELD: I asked this question. I bought the goods that I wanted in an unmixed state and paid their charges of $1.00 for mixing and then shipped it to my farm. We should know what we want and if we cannot find it in the form in which we need it then why not buy the ingredients and get them mixed, and in that way we can have just what we want, and it is better mixed than you can possibly get it mixed at home, because the nitrate of soda you cannot get fine enough without machinery.

The other part of the question has not been answered, in regard to the dried blood. Suppose that contains 16 per cent. of phosphoric acid, does it not also contain a percentage of nitrogen? Does it not also contain phosphoric acid, and what percentage?

MR. PHILIPS: I cannot answer that question. It contains a slight percentage of both phosphoric acid and potash.

The CHAIRMAN: The time has expired that we have allotted to the questions. We will now take up the first topic on the program for this evening. We have three other topics for the evening and I would ask you to be as brief as possible so that we can hear them.

The first topic on the program is "Practical and Pathological Horseshoeing," by Mr. C. W. Brodhead, of Montrose, Pa.

Mr. Brodhead presented his paper as follows:

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PRACTICAL AND PATHOLOGICAL HORSESHOEING.

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BY C. W. BRODHEAD, MONTROSE, PA.

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SHOEING COLTS.

Colts should be looked to by their owners from birth, and never should be turned out to pasture without having their feet pared off even so as not to let one side or the other break off, and have the foot grow crooked, as a colt having his feet grow crooked can never be brought back to as good a balance as nature made him, and this should be done at least twice a year until it is to be shod for permanent use.

In shoeing colts they should be shod according to the work intended for them to do, if for the road, shoe with plate shoe with a little heel calk on the hind shoes, no toe calk. If the feet are crooked build up with a thick-sided shoe, so as to bring the feet as level as possible. If the colt is to be shod for draft purposes and
needs calks, shoe with as low calks as possible, always setting the toe calk back from the edge of the shoe some distance, that will cause the colt to set his foot down on the ground square to pull, and he will learn that in the start and never climb on his toes as a horse will do if he has the toe calk out on the extreme edge of the shoe, as is the habit of most shoers to-day.

**PREPARING THE FOOT FOR THE SHOE.**

First, before removing the old shoe, examine the foot carefully, so as to see what it needs to get the foot in proper balance. After having this thoroughly fixed in your mind, remove the shoe by carefully cutting the clinches, raising the heels of the shoe gently with a pair of thick jawed pinchers, taking care not to bruise the heel or strain the foot-joint, as I have seen horses made lame by careless pulling the shoes. Then using the dirt hook to clean out all the dirt and any foreign substance that may have collected in the creases alongside of the frog. Then taking the round knife, paring off all the ragged parts of the frog, and then the hoof parers, starting at the heel, going around the foot, paring the hoof as level as possible, finishing up with the rasp, so as to get a perfect level surface for the shoe.

Never under any circumstances put a hot shoe to the foot so as to leave its mark, but fit the shoe perfectly level, punching out the nail holes, slightly slanting in so as to get a good, deep hold in the hoof, never driving the nails higher in the hoof than is absolutely necessary as nails driven high up in the hoof deadens the hoof and causes it to dry out more quickly, causing contraction and many other troubles. In finishing the hoof, never rasp it any above the nails or rasp too deep a crease under the nails, using the clinching tongs to turn the clinch down, not hammering any on top of the hoof, especially on a colt's foot, or a horse that is tender in the feet.

**QUARTER AND TOE CRACKS.**

These come from various causes, such as standing on hard, dry board floors, leaving the shoes on too long, driving at a high rate of speed down hill, not paring the foot properly so as to give the proper elasticity to the bottom of the foot, contracting it, getting the foot out of balance so as to throw too much weight on any particular part of the foot. The following treatment should be observed:

First, level the foot carefully by paring the walls so as to make a perfect bearing for the shoe, cutting out the sole so as to give some elasticity to the bottom of the foot, then using the round knife to cut the edges of the crack in a V shape so as not to leave any place for sand or dirt to work in and keep pressing the crack open from the coronet down to the bottom of the crack. It is some-
times necessary to shoe with a bar shoe, but in most cases an open plate shoe or the centre bearing shoe No. 1 will bring the desired results by setting the shoes as often as once in three or four weeks, at each setting keeping the shoe well back under the heels, shortening the toe as much as possible.

Then take a piece of toe steel 3-8 by \( \frac{1}{2} \) inch to make a hot lance by drawing to a sharp edge about an inch across the point, then heat to almost white heat, taking the foot on the knee as if in the act of clinching the shoe, using the hot lance to cut across the top of the crack just at the edge of the hair in the coronet, cutting through so as to start the blood. Probably you will have to heat the lance the second time to accomplish the result needed, then dress the coronet with veterinary petroleum daily and White Rock Hoof Packing in the bottom so as to keep the bottom moist and soft.

**Corns.**

A corn is an injury to the living horn of the foot, involving at the same time the soft tissues beneath whereby the capillary blood vessels are ruptured and a small amount of blood escapes, which by permeating the corn in the immediate neighborhood, stains it a dark color. If the injury is continuously repeated the horn becomes altered in character, the soft tissues may suppurate, causing the disease to spread, or a horny tumor may develop. Corns always appear in that part of the sole included in the angle between the bar and the outside wall of the hoof. In many cases the laminae of the bar or the wall, or of both, are involved at the same time.

Three kinds of corns are commonly recognized; the dry, the moist and the suppurative, a division based solely on the character of the conditions which follow the primary injury. The forefeet are almost exclusively the subjects of the disease; for two reasons: 1st. Because they support a greater part of the body. 2d. Because the heel of the forefoot during progression is first placed upon the ground whereby it receives much more concussion than the heel of the hindfoot, in which the toe first strikes the ground.

**CAUSES.**

It may be said that all feet are exposed to corns and that even the best feet may suffer from them when the conditions necessary to the production of the peculiar injury are present. The heavier breeds of horses, generally used for heavy work on rough roads and streets, seem to be most liable to this trouble.

Among the causes and conditions which predispose to corns may be named, high heels, which change the natural relative position of the bones of the foot and thereby increase the concussion to which these parts are subject; contracted heels, which in part destroy the
elasticity of the foot, increases the pressure upon the soft tissues of the heel and render lacerations more easy; long feet, which by removing the frog and heels too far from the ground deprive them of necessary moisture, which in turn reduces the elastic properties of the horn, and diminishes the transverse diameter of the heels; weak feet or those in which the horn of the wall is too thin to resist the tendency to spread, and as a result the soft tissues are easily lacerated.

Wide feet with low heels are always accompanied by a flat sole whose posterior wings either rest upon the ground or the shoe, and as a consequence are easily bruised; at the same time the arch of the sole is so broad and flat that it cannot support the weight of the body, and in the displacement which happens when the foot is rested upon the ground the soft tissues are liable to become bruised or torn. It is universally conceded that shoeing of the foot, either as a direct or predisposing cause is most prolific in producing corns.

One of the most serious as well as the most prominent of the errors in shoeing is to be found in the preparation of the foot for the shoe. Instead of seeking to maintain the integrity of the arch, the first thing done is to weaken it by freely paring away the sole; nor does the mutilation end here, for the frog, which is nature's main support to the branches of the sole and the heel, is also largely cut away. This not only permits of an excessive downward movement of the contents of the horny box, but it at the same time removes the one great means by which concussion of the foot is destroyed.

As adjuncts to the foregoing errors, must be added the faults in the construction of the shoe and in the way it is adjusted to the foot. An excess of concavity in the shoe, by extending it too far back on the heels, high calks, thin heels, which permit the shoe to spring, short heels with a calk set under the foot, and a shoe too light for the animal wearing it or for the work required of him, are all to be avoided as causes of corns. A shoe so set as to press upon the sole or one that has been on so long that the hoof has overgrown it until the heels rest upon the sole and bars becomes a direct cause of corns. Indirectly the shoe becomes the cause of corns when small stones, hard earth, or other objects collect between the sole and shoe.

Lastly, a rapid gait and excessive knee-action, especially on hard roads, predispose to this disease of the feet. I have become convinced that in cases of invisible lameness, upon examination where no corns were visible from the bottom of the foot, by cutting in at the angles that I would almost always find corns, and in almost every case examined the heels would be low, the toes high and long, either by improper paring of the foot or too low heels and high toes of old,
new calked shoes, and leaving shoes on too long. And I have come to the conclusion that they were caused by the coffin bone being thrown out of position to such an extent by throwing the lower point up too much, causing the hind wings to break through the tender issues at the heel. Also, when from any cause the heel begins to contract, as the side walls begin to press in against the wings of the coffin bone, the result is the same. the unnatural friction caused by the side pressure causes the bone to wear through the tender tissues at the angles of the heels.

Invisible corns may be detected by the use of the hoof feelers, by pressing on the hoof about half way from the coronet band to the bottom of the heel, if on a higher heeled hoof or about even with the wings of the coffin bone, if the shoer is well enough acquainted with the anatomy of the foot to locate the bone in the various kinds of feet he has to deal with.

Treatment for the three different kinds of corns differ with me very little. In the first place, I always try and find out what causes the trouble. If it is caused by the heels being too high, I lower them by paring properly at the heel; if the toes are too long and high I pare the toe off so as to give the hoof the proper angle for the kind of shaped hoof and leg that it may be, then cutting out the angle between the bars so as to start the serum slightly, filling the cavity with oakum and veterinary petroleum, giving the shoe as level bearing as possible; and if the heels are contracted I fit the shoe slightly convexing, so as to have a natural tendency to press the heel open, not driving the nails very high in the hoof and using as small nails as the work will permit.

In the case of low heels or flat-hoofed horses I use a narrow web bar shoe, carefully fitting them so as not to press too heavy on the frog, equalizing the pressure on both heels and frog as much as possible, dressing the outside of the hoof daily with veterinary petroleum from the coronet down and at night, or when not in use, filling the bottom of the hoof with White Rock Hoof Packing to soften the hoof, if any inflammation may exist. In all cases the shoes want to be reset at least as often as once in four weeks so as to keep the hoof in proper angle.

**Navicular Disease.**

This disease is more common in high, straight-hoofed horses than in low, flat feet. And there are many causes for it. One of the most general causes is letting the foot grow out too long, throwing the heel back too much, causing a constant strain on the heel cord where it is locked to the navicular and coffin bone, causing a deep seated inflammation at the union of the joint.
TREATMENT.

Pare the hoof well down so as to bring the foot in as near perfect balance as possible, at the same time cutting away the frog so as not to have any frog pressure, using a plate shoe with thickened heels or the centre bearing shoe No. 1, clipping the hair off around above the hoof, putting on a Spanish fly blister once in two weeks, following the blister with a dressing of veterinary petroleum to soften and hasten the growth of the hoof, filling the bottom of the hoof every night with White Rock Hoof Packing, which helps to reduce inflammation.

INTERFERING.

An animal is said to interfere when one foot strikes the opposite leg as it passes by, during locomotion. The inner surface of the fetlock joint is the part most subject to this injury, although under certain conditions, it may happen to any part of the ankle. It is seen more often in the hind than in the forelegs. Interfering causes a bruise of the skin and deeper tissues, generally accompanied by an abrasion of the surface. It may cause lameness, dangerous tripping and thickening of the injured parts.

CAUSES.

Faulty conformation is the most prolific cause of interfering. When the bones of the leg are so united that the toe of the foot turns in (pigeon toed) or when the fetlock joints are close together and the toe turns out, when the leg is so deformed that the whole foot and ankle turn either in or out, interfering is almost sure to follow.

It may happen, also, when the feet grow too long; from defective shoeing; rough or slippery roads; from the exhaustion of labor or sickness; swelling of the leg; high knee-action; fast work, and because the chest or hips are too narrow.

SYMPTOMS.

Generally, the evidence of interfering are easily detected, for the parts are tender, swollen and the skin broken.

But very often, especially in trotters, the flat surface of the hoof strikes the fetlock without evident injury, and attention is directed to these parts only by the occasional tripping and unsteady gait. In such cases, proof of the cause may be had by walking and trotting the animal, after first painting the inside toe and quarter of the suspected foot with a thin coating of chalk, charcoal or paint.
TREATMENT.

When the trouble is due to deformity or faulty conformation, it may not be possible to overcome the defect. In such cases, and as well in those due to exhaustion or fatigue, the fetlock or ankle boot must be used. In many instances interfering may be prevented by proper shoeing. The outside heel and quarter of the foot on the injured leg should be lowered sufficiently to change the relative position of the fetlock joint by bringing it further away from the centre plane of the body, thereby permitting the other foot to pass by without striking.

Shoeing to prevent interfering is an easy matter if one understands the anatomy of the leg of the horse well enough to tell when he is out of balance, and that is the primary cause for all troubles of like character, such as knee-knocking, overreaching, forging, clicking, etc. If the horse "toes out," pare off the inside as much as possible, putting on a shoe with a long outside, so as to bring the toe of the foot in a straight line with the body. If the foot cannot be brought up level by paring, put on a thick-sided shoe, so as to make the foot look straight when standing down on the floor.

I wish here to call the attention of both owner and shoer to two things that causes horses to interfere, when otherwise they would not, and that is the adjusting of the breeching, not getting it too low; also I have known many horses to interfere from the cause of the teeth being bad, causing the horse to side-line or become restless when driven, throwing them out of balance.

OVER REACHING.

An overreach is where the shoe of the hindfoot strikes and injures the heel or quarter of the forefoot. It rarely happens except when the animal is going fast, hence is most common in trotting and running horses. In trotters, the accident generally happens when the animal breaks from a trot to a run. The outside heels and quarters are most liable to injury.

SYMPTOMS.

The coronet at the heel or quarter is bruised or cut, the injury in some instances involving the horn as well. Where the hindfoot strikes well back on the heel of the forefoot an accident known among horsemen as "grabbing," the shoe may be torn from the forefoot or the animal fall on his knees. Horses accustomed to overreaching are often bad "breakers," for the reason that the pain of the injury so excites them that they cannot be readily brought back to the trotting gait.
To shoe for overreaching, pare all four feet down as much as possible, giving them as an even bearing as can be done, then putting on shoes to correspond with the work intended. If the shoes are to have calks, shoe the front feet with low toes, with slightly elevated heels, letting the shoes run well back behind the foot. The hindshoes with the toe calk set back from the toe of the shoe as much as can be, letting the hoof project over the shoe at least one-fourth of an inch, with the heels running back behind, with heels higher than toe.

Side weighting on the hindfeet, letting the outside heel be longer than the inside, helps to spread the legs when in motion throwing the hind feet outside of the front ones. This mode of shoeing applies to road and general purpose horses.

FOUNDER.

This disease may come from various causes, such as letting a horse stand in a draught when warm, watering or feeding when too warm, and it will show itself in this way: The horse will be very nervous, shifting from one foot to the other, feet in a high state of fever, being very hot and sensitive to the touch of the hammer or hoof tester, and will lay down in great pain.

TREATMENT.

Remove the shoes as carefully as possible, paring the foot well down with hoof parers and rasp them, taking the round knife and cutting in at the toe directly opposite the point of the frog, just where the sole joins on the outside wall, cutting back until you start the blood well, and at the same time rubbing the leg downward towards the hoof, making the blood to run freely to the amount of a quart, then filling the opening with oakum, putting on a leather sole, tacking on an old plate shoe with about four nails, putting the foot in a flaxseed poultice, keeping it well moistened for forty-eight hours, feeding mashes to loosen the bowels.

If this treatment is followed closely, there is not much danger of drop sole or seedy toe; but if the case has become chronic, shoe with a bar shoe or the centre bearing shoe No. 1, taking care not to leave the shoe on too long, so as to let the shoe loose, using small nails as the work will permit, rubbing the coronet every two or three weeks with a Spanish fly blister, following with veterinary petroleum to toughen and make the hoof grow faster, filling the bottom, when not in use, with White Rock Hoof Packing, to help allay inflammation that may exist.
HOT-FITTING.

The practice of hot-fitting is very destructive. Burning the sole will, in time, partially destroy the sensitive laminae, and impairs the membraneous lining underneath the coffin bone, as well as closing the pores of the horn, causing the hoof to become hard, dry and brittle. It also impedes, to a certain extent, as a necessary consequence, the healthy growth of the hoof.

The advocates of the hot-fitting present many reasons for the furtherance of the practice. It is alleged that shoes cannot be fitted so rapidly nor so closely by any means other than that of hot-fitting; and this is generally true, for by this means, the hoof is burned to correspond with the inequalities which occur on the surface of the shoe, until the latter is thoroughly imbedded in the horn. On the other hand, however, this fusing of the horn is in opposition to its right growth and operation, and is the prolific source of many evils and abuses. Horn being a non-conductor of heat, is slowly affected by it, and it is said that three minutes burning of the lower face of the sole is necessary to produce any indication of increase of temperature on its upper surface.

This is a fallacy, as I have proven many times, by operating upon green specimens, with soles of varied thickness, in which case, the soles of ordinary depth were penetrated by the heat, when heated shoes were applied for the time specified, and the sensitive sole was found to be scorched as well as the laminae, in its connections with the sole, burned and charred.

In the living subject these effects would have wrought serious results. They have convinced me that the foot of a horse may in no sense be compared to an inanimate block of wood, which may be charred or carved as caprice may dictate. And because it is not, and because it it filled with life and feeling, the necessity which there is of thought, care and skill to be exercised in regard to it, is pointed out to us. The economy of labor attained in the process of hot-fitting, will, I am sure, never counter-balance its evil effects. While it is true that more shoes can be fitted in a given time by hot-fitting than by cold, that is no argument against the expediency of the latter, as much or more might be said of any other part of the work.

The CHAIRMAN: The next topic is "Hygiene of the Farm," by Dr. Harvey B. Bashore, of West Fairview, Pa., whereupon Dr. Bashore presented his paper as follows:
HYGIENE OF THE FARM.

BY DR. HARVEY B. BASHORE, WEST FAIRVIEW.

We have all gotten the idea, or at least we used to have, that farm and country life was just about the ideal thing, and that farming was the ideal business. In some respects it is, but it does not quite come up to the sanitary standard, and for this reason it is worthy of attention, for we want to make it as healthy as possible, since on the farming population depends the stability of the country.

Then again, both in town and country, we are apt to get a little careless about human life and to think that disease is the gift of an all-wise Providence, instead of the result of our own carelessness. It has been said that a dead cow will attract the attention of any government on earth quicker than five dead men or fifteen dead children. Perhaps this is so, and if it is, it has a very good explanation in the fact that cattle are readily convertible into cash, whereas human life is not so, and anything which affects us in a matter of dollars and cents is very quickly noticed. This is human nature, at present, at least. A very interesting example on this line came to my attention at one of the institutes last year. A certain farmer had four of his family in bed with typhoid fever and the doctor advised closing the well and getting water elsewhere. This he refused to do. Finally his cows became sick and the veterinarian, taking his cue from the physician, recommended closing the well to save the rest of his stock, and the well was closed.

It is absurd to think that this man cared less for his family than he did for his stock, but the fact that dollars and cents were slipping away quickened his perception.

"But is the country really unhealthy?" somebody asks. Here are some facts: Though the death rate is lower, as a rule, both in town and country than ever before, the greatest lessening has been in the cities. In Connecticut, for example, during the last ten years, the city mortality has dropped from 20 to 17 per 1,000, while the rural only from 17 to 16 per 1,000. In Massachusetts the difference has been still less, and in New York State the rural mortality rate has actually increased.

Pennsylvania statistics are incomplete, yet in the beautiful Cumberland county, just across the river from Harrisburg, with a rural
population of only 100 to a square mile, there was last year just as much typhoid fever as in the Capital city itself, with a population of 10,000 to a square mile. This is very poor showing indeed for the country, but Michigan beats it with a record in some districts of twenty times as much typhoid in the county as in the neighboring cities. This is the kind of a story that figures tell about rural hygiene, and this is the reason why we have been asking our legislators for better sanitary laws.

Taking these conditions, then, as they exist to-day, we shall have to admit that there must be much room for sanitary improvement about the ordinary farm, and in the absence of State or county supervision we have to do all this ourselves. On the individual farmer, in this State at least, rests the question whether he is to live in a healthy place or not.

When we come to take a sanitary view of the farm, the first point of interest, of course, is the house itself. This, like any other house, should have a clean, dry cellar, and the rooms should have plenty of air and sunlight. Sunlight fades carpets, but faded children are worse. The abundant fresh air of the country will not compensate for faulty house construction.

The heating of country houses should be looked after more carefully than is customary. The method of heating, which is almost always that of stoves, is in itself defective and little can be done to remedy it, unless the rooms have open fire-places. If these are kept open and not closed, as I have frequently seen, you will get much more effective heating and much better ventilation.

The next point which attracts attention, and the one in which occurs the greatest defect, too, is the water supply, though it comes from a well or spring. This may seem very strange to you, yet it is a proved fact that fifty per cent. at least of all farm wells are grossly polluted and unfit for drinking purposes. It is hard to give up our sentimental ideas about the “moss-covered well,” and the “old oaken bucket,” harder yet to give up our ideas of purity about the old spring, but the fact that we have so many epidemics of typhoid fever occurring in isolated farm houses, three, four and five cases, sometimes in one family, goes far to uphold the bad character of the water.

Frequently, people have said to me: “Why, doctor; this is such good water, and nobody ever got sick from it.” Only a few years ago I came across just such a well. Three generations drank of that water, and true, nobody did get sick from it, but at last the spell was broken and four of that family went down with typhoid, and the dear, old family well showed, on examination, the grossest pollution.

But you will say: “Granted that our wells and springs are pol-
luted, what are we going to do about it? We must have water and there is no other way to get it." One way to remedy this is to use rain water collected in a carefully made cistern; but a better way to my mind is to remove the source of pollution, and this source, in the country, is almost always one thing—the old-fashioned country privy. This should be abolished—the pit filled up and a dry closet substituted. A dry closet consists, as is seen by the drawing, of a pail, a seat and a receptacle for dry earth or sifted coal ashes. When the pail is filled the contents should be emptied on cultivated land, if near the house, earth should be raked over the pile, but if at all distant this is not actually necessary. Sunlight and the germs in the upper layers of the soil—the nitrifying bacteria they call them—soon dispose of all filth.

A Modern Dry Closet—An arrangement that should be in every farmhouse.

Some one will complain that a dry closet takes time; so it does, just one and one-half minutes per day is the actual record of an earth closet in a family of five. Surely any one can afford that much time. Another way is to have a cemented pit, throw earth into this every day and every month or so, remove the contents to the fields. All privies and earth closets must, of course, have tightly fitting covers, so as to exclude flies.

Another thing to be gotten rid of, is the slop and waste water. In
the city this goes into the sewer, but in the country it generally goes on the kitchen door and helps to pollute the surrounding soil, and this country soil-pollution is a disturbing factor in health, not only from poisoned water, but also from the poisoned air surrounding the house.

In the absence of sewers the proper way to dispose of slop waters, is by some form of a surface or subsoil drain, allowing the filthy waters to drain over or under cultivated land. Cultivated land, by the way, is the great sewer in the country, yet it is even better than a sewer, for it not only removes filth but actually destroys it.

The garbage or solid waste from the kitchen, if not fed to the pigs, should be put in a furrow in a field or a hole in the garden bed. The sum and substance of the sanitary disposal of all putrescible waste about a country house, is its speedy removal to cultivated land.

When we come to the "out buildings" on the farm, the pigpen, the barnyard and the cow stable are the attractive, rather I suppose I ought to say, the unattractive points from a sanitary view.

Pigpens should have a water-tight floor, with an air space of at least a foot underneath; and to keep them in proper condition, so as not to become a nuisance or prejudicial to health, they should be cleaned every day and the filth carted away to the field.

The filthy barnyard—an eyesore to many an otherwise fine farm—is a great point for improvement, not only on account of its unsightliness, but on account of the adjacent soil pollution, and the fact that stable refuse is a breeder of flies, and flies you know, have been accused of carrying disease.

At the Agricultural Department at Washington, they made some experiments on screening manure piles, and found that flies diminished very rapidly in the immediate locality; but such a procedure is not feasible on the farm. A better way, and the only way, is to cart the manure immediately to the field, as my friend Mr. Stout, of Pinegrove, has been doing for the last fifteen years. This is its proper place, and the sooner it is gotten there the better, not only in a sanitary sense, but for economic reasons, for the nitrogen instead of being wasted, gets into the soil where it is needed.

However much we desire to rid our homes of flies, the removal of mosquitoes is vastly more desirable, for one family of mosquitoes, and the family that especially breeds in the country and suburban places, carries the germ of malaria, and malaria though not especially dangerous in this part of the world is, nevertheless, a disease to be prevented. The rain barrel, the cistern and the country privy are the great mosquito breeding-place, although the malarial variety quite often prefers the roadside puddle and the pools of little streams. To diminish the mosquitoes, then, of a locality, it
is necessary to drain or fill all swampy places, to screen the cistern and rain barrel and to put two or three ounces of kerosene in the privy every few weeks. Inasmuch as mosquitoes do not stray far from home, but are "born and bred" where they are, it becomes a very easy thing to eliminate them in an isolated place; in a town unless everybody falls in line, it is a different story.

The cow stable is another point which directly affects the farm people, and sometimes other people who don't live on the farm. Cows are very prone to tuberculosis, and although there has been much discussion lately as to the interchangeableness of bovine and human tuberculosis, the weight of opinion at present favors the idea of the transmission of tuberculosis from cattle to man.

Damp, dark and filthy stables are predisposed to the disease, and to avoid this, cleanliness should be enforced and there should be plenty of fresh air and sunlight. Some other diseases, such as typhoid fever, diphtheria and scarlet fever, have been traced to polluted milk, and in the great cities the terrible infant mortality of summer has been charged to the same cause. So even if we eliminate tuberculosis as one of the results of filthy milk, there is still enough danger left to stimulate us to use every precaution.

In order then to have good, pure and healthy milk, we must of course, have good cows to start with, and they must be housed in clean, airy stables, and after this the whole secret is cleanliness. The milkers should be clean, but they do not necessarily need to be dressed in white duck. There are only three things necessary, by the way, for cleanliness, and these are soap, water and inclination, and the greatest of the three is inclination.

The milking utensils must of course be clean, plain open pails and a new cheese cloth strainer, which is thrown away after use.

Cooling the milk is the next most important thing—the whole future of the milk depending upon it, especially if it is intended for transportation. The great difficulty about this is, that the chilling to be effective must get to 45 degrees, whereas the spring which are generally used for this purpose, do not get below fifty, consequently ordinary milk "turns" very readily.

These points about milk which I have called attention to, are the recommendations of the New York Milk Commission, and milk is now sold in New York which has been prepared according to their directions; and the time is fast coming when the people everywhere will demand better and purer milk, but of course the price will be proportionately higher—high enough at least, to pay for the extra care.

One other subject I wish to speak about and that is the spread of contagious diseases from farmhouses. Inasmuch as our laws for the rural districts are very lax in this regard we should ourselves
use every endeavor to prevent the spread of these diseases. Those who sell milk should use special precaution for they may otherwise scatter disease far and wide, and although there may be no compulsion in the matter, we should follow the Golden Rule and save others unnecessary trouble.

Such are some of the methods that are necessary if the farmer or the isolated rural dweller would live in a sanitary home. But some one asks: "Does it pay? Is it worth while to go to all this trouble?" Suppose you yourself get typhoid fever because you have been drinking from a polluted well. Suppose your own wife gets tuberculosis because she has been drinking milk from a sick cow. Suppose your own child gets diphtheria because somebody else is careless. If all of these happen, or if any one of them happen, I think you will agree with me that it does pay, and vastly pays, to have hygiene on the farm.

A Member: The gentleman speaks of the danger of pollution of wells. Up in our country we pride ourselves on our excellent springs. Two weeks ago a physician was called to attend a family that was taken sick. He diagnosed the case, but could not find what the trouble was, but he finally said, "Examine your spring." It was done last Saturday. It was not done quite soon enough, as a few days ago we buried his wife, a very excellent lady. We found three snakes in the well.

The CHAIRMAN: We are now ready to hear the next topic on the program, "What Constitutes a Country Home," by Mr. R. S. Seeds, of Birmingham, Pa.

Mr. Seeds presented his paper as follows:

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WHAT CONSTITUTES A COUNTRY HOME.

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By R. S. Seeds, Birmingham, Pa.

There is no name so sweet or place so dear as home. I have 350 acres of land, but there is one-half acre more dear to me than all the world; on that half acre stands my home. I have traveled from Boston to Dakota, stopped at some of the best hotels in the land, but the "Seed's House" beats them all. If any one should ask me what was the height of my ambition, I would not know what to say, unless it was to live for my home.
Some years ago Jenny Lind came to this country to sing for $1,000 a night for P. T. Barnum. When she landed in New York, 20,000 people gathered in old Castle Garden to hear her sing, as no other songstress had ever sung. At length the Swedish nightingale thought of her home; she paused and seemed to fold her wings for a higher flight, and with a deep emotion began to pour forth "Home, Sweet Home." The audience could not stand it, an uproar of applause stopped the music, and tears of joy gushed from their eyes like rain drops. At length the music came again, almost angelic, seemingly from Heaven, "Home!" That was the word that seemed to cement, as by magic, 20,000 souls.

When you can't go anywhere else you can go home. The prodigal son only realized this when he came to himself, like the poor fellow who was out one night and got gloriously drunk, came home near morning and when at the foot of the stairs his wife called down to him: "What's bringing you home this time in the morning?" He straightened up and said: "Every place else (hic) is shut up."

While the world was laid at Solomon's feet, I often think that he did not have a home, or he would not have said "all is vanity." So many people when they see a beautiful house say "What a fine home!" when it may be anything else but a home.

"A house is built of bricks and stones,
Of sills and posts and piers,
But a home is built of lovely deeds,
That stands a thousand years.

A house though but an humble cot within its walls may hold,
A home of priceless beauty rich in loves eternal gold,
The men of earth build houses, halls, chambers, roofs and domes,
But the women of the earth, God knows, the women build the homes."

Brown stones and pressed brick will not make a home. You must have love and sunshine in the summer time, and love and coal oil in the winter time. I have seen thousands of dollars spent to build a home, and the parties did not get anything but a beautiful house.

We should strive to beautify the surroundings of our home. I think there is nothing so beautiful to the farm as a field of clover in full bloom, covered with the morning dew and sparkling like millions of diamonds when kissed by the morning sun. So is the lawn to the home, and to think I never saw a lawn till I was thirty-five years of age. I had often looked at them, but never saw one till I stood in the streets of Boston a few years ago, and I thought I never saw anything so beautiful as they were. I said to myself, God would make the grass grow for the poorest man as well as the rich, and I came home determined to have a lawn about my home. The next spring the two boys and I started out to move the flowers and flower beds from the middle of the yard, and put the flowers around the
outside, and used the earth in the beds to level up the lawn. After we had it graded, I sent to Peter Henderson Co. for $1.50 worth of lawn grass seed, same as he used at Chicago World's Fair, bought a lawn-mower for $3.00; expense without our labor $4.50. I never put wheat in the garner or sold a fatted steer and made more money than I did producing that lawn. A man will stand in front of my place and give more for my property on account of the lawn than he would without it. But money is not all in this world. On this lawn, in the summer time is where we entertain our company. They are using it for that purpose as I am writing these lines. The family spends their idle moments on it, and it seems to me the shade of the old apple tree is cooler than any shade I ever sat in, and sitting upon that lawn, it seems to me the smoke from my chimney curls more beautiful than any I ever looked at. For a background to this house and lawn, I have planted 50 grape vines, vining on 50 poles. They not only add beauty, but there is nothing about the place we enjoy more than those grapes, and when ripe, it is astonishing how friends will drop in to see us.

I want to go into the inside of this home for a short time and speak of a room in it, I call the living room, where the family meet to spend their evenings. In this room in our home we have a desk in the centre; this desk has a flat top 3½x5½ feet, and there is more business done and less money made on it than any desk in Huntington county. It has twelve drawers and two cupboards. On this desk sets a Miller lamp, a sixty-horse power; there are always pens and ink, paper and pencils on it, and around this desk we gather from Monday to Monday, and there is not a piece of furniture in the home that would be missed more if taken out than this desk. At this desk is where I try to get my children up against the real things in life as soon as possible.

There are many things that can be written about the home, but space will not permit; but I want to mention the most essential, and that is a good mother; her influence is something marvelous.

A lady in Bucks county one time asked me why it was that the mother had more influence in the home than the father had. I never thought of this before, but it is true. I have a little boy. I can take him and play with him, and his mother can not coax him away from me; but let him hit his finger, bump his head, or hurt himself in any way, and he can not see me. He will run right past me, hunting his mother, for he knows that in the touch of her hand there is a magic panacea, in the press of her cheek there is a balm in Gilead, and in her kiss a benediction he can not find elsewhere. Sometimes I feel a little jealous of this influence and look in the glass and say to myself "You're a dandy, ain't you?" and think sometimes I am like the husband I heard of once. His wife got
awake in the morning and said: "John, I had a dream last night." "What did you dream, my dear," said John. "I dreamed that I was at a public sale where they were selling husbands, and do you know some of them brought $8.00, some $12.00 and $16.00, and one or two went as high as $2,000." John said: "Is that so?" And after thinking the matter over for awhile said: 'And my dear, what did husbands bring like I am?' And she said: "Oh, they were tied up in bunches like asparagus and sold for fifteen cents a bunch."

The influence of the home is wonderful. I think this is a great country, because it is a country of homes. A man will shoulder the musket on account of his home, when he would not do it for a boarding-house.

There is no reason why the country home should not be beautified as well as the home in town. This is why I paint my house only one coat at a time and oftener, so as to have it look better and more attractive, so the outside world will like it as well as myself and family.

The CHAIRMAN: We are now ready to hear the last subject on the program for this evening: "What Constitutes a Practical Education for the Farmer?" by T. D. Harman, of the National Stockman and Farmer, of Pittsburg, Pa.

Mr. Harman's paper is as follows:

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WHAT CONSTITUTES A PRACTICAL EDUCATION FOR A FARMER?

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A question of the most vital importance. A question that the best scholars are unable to answer definitely. A question which would take more time to answer than could possibly be allowed for one speaker at a gathering like this. I shall, therefore, only attempt to skim a little of the cream off the top, churn it into butter, avoid any adulteration, and pass it out to those who know how to breed, feed and milk the cow, skim the milk, churn the butter and digest it better than the speaker.

It never occurred to me that I was to speak to an assemblage of educators, when I accepted the invitation to talk on this topic, or you would find a vacant chair on this platform to-night. Believing in the old adage that "Wise men can sometimes learn from a fool," I shall offer the suggestions which follow, hoping that a few grains of wheat may be found among the chaff.
Webster tells us briefly that education is "the act or process of training by a prescribed or customary course of study or discipline." Although I do not always agree with Mr. Webster, I presume he is right. The object, however, in discussing this topic at this time is to avoid all technicalities and get right down to the practical. From the very nature of their work farmers not only need the most practical education but they have the best way of obtaining it. They are scientists of the higher order if they are farmers of the first class. They are the only set of men which are following the original occupation given to man by the Creator. The infinite wisdom of Him who gave us this beautiful earth as a birthright would not permit of the withholding of knowledge from those who follow the injunction to replenish it, if that knowledge is diligently sought. The trouble comes in the obstinate nature of man in not trying to obtain the necessary knowledge to enable him to work out the problems set before him. The environments of the farmer are favorable for the most practical education. We are leaving out now the meaning of the term as applied to what may be learned in our schools, colleges and universities. It is understood that the more liberal the education, in the common acceptance of the term, the better; but the practical part of it all is in applying it to every surrounding and gathering more of it at every opportunity. No class of workers can follow out a line of thought and arrive at as positive conclusions as those whose minds are unobstructed by the views and opinions of others. And right here are where the advantages of the quiet farm life comes. Do you wonder why the brightest men of the world come from the farm. I'll tell you. They learned to think and act for themselves. They carried their point when they were following the plow or splitting the rails, with none to molest or make them afraid, and when they entered the business circles, the court rooms or our legislative halls, they did the same thing. They were in the habit of doing it, and it is not a bad habit if a man is right.

A point which should not be overlooked is that great big little thing of *being right*. It swells us with pride to reflect on the fact that the most of our great men come from the farm. Let us turn the picture over. It may be true that most of our meanest men come from the same source. I have never investigated that part of it. It might be best not to do so. One thing is sure, there are men who came from the farm, or are still there, that are neither good or bad, and that is the worst situation of all. God intended every man to be something and that he should do something. Isn't it natural to suppose that He would prefer that a man, made after his own image, would do something a little out of the regular order rather than do nothing? I do not refer to men who toil with their
hands, but to those who neglect to elevate themselves by educating their minds along practical lines. After all the mind is the whole of man. The Scriptures tell us, "As a man thinketh in his heart, so is he."

But to get right down to the solution of the question involved in the topic, let us suppose that every farmer has gone so far as to have mastered Reading, Writing and Arithmetic, before he is turned loose on Mother Earth to tear from her face a good living and something for his posterity to fight about after he is dead. Is this enough? Yes, if he is the right kind of a man and has a good, big allowance of horse sense. The first, reading, is enough in itself to make him successful, if he has the right judgment, which is another name for common sense. A Pennsylvania farmer, a few years ago, read an item of less than ten lines in an agricultural paper that was worth more than $5,200 to him inside of six months. The circumstances are these: A dry season had ruined the hay crop in his section of the county. A subscriber to that paper in Missouri in reporting the agricultural conditions, stated that they had an abundant hay crop, and that prices were low. The man in Pennsylvania had learned to think as well as read. The result was a trade relation was established between a Pennsylvania "hayseed" and a Missouri "Reuben" which netted a neat little sum for the one, helped the other to get rid of his produce at a better price than he could at home and scores of others were made happy because they got what they wanted cheaper than they could in any other way.

A Lancaster county farmer a year or two ago was feeding a bunch of good cattle. Buyers were trying to get them at the market price, which was then low. He could read. He had enterprise enough to take a good market paper. He noticed that cattle were scarce in the cattle-producing states. He had faith in the future and in the opinions of men who ought to understand the situation. Result, a short time afterward he sold his cattle at an advance that netted him between three and four hundred dollars. A common everyday farmer in Ohio, a few years ago was feeding a bunch of hogs. Up to that time hog prices had been low, country prices varying from $4.00 to $5.40 per cwt. Prices began to go up. His neighbors jumped at the first offer of $5.00 per cwt. But our friend had been reading. He knew that hogs were scarce in the West. Instead of selling what he had he bought more. Result, a clean profit of $2,125 within a year, and no harm done. The evidence in regard to these specific circumstances can be produced, if necessary. There are thousands of other cases like them all over the country.

Men who can read like these men need not worry much about the classics and higher mathematics. They have a practical education if all other branches have been barred. But we must not forget
that there are other kinds of readers. Some lack the common sense necessary to size up a situation, or worse still, they form wrong opinions. Such things are dangerous. They not only lead to a waste of time and money, but they are discouraging.

As an example: A farmer living in Western Pennsylvania may read of the big profit made on the fertile farms of Lancaster county in raising tobacco. He jumps at the conclusion he can do the same thing. He tries it, fails, and pays for his folly of not using his brain as well as his eyes. He may read these reports but he lacks that useful little article called judgment. Again, everybody is more or less prejudiced when they read. They only remember the things that suit their own ideas and forget all else. They set down all writers as fools who do not say things the way they think it ought to be. Such men need a severe training in the art of reading. They generally get it and pay dearly for it. That is why so many men are poor and don't know why. They are always paying for mistakes that they never knew they had made.

But it isn't the reading of books or papers alone that educate a man. Some of our very successful farmers never learned their alphabet. They never had an opportunity to learn to read. They got their education from the hard school of experience. They learned by hard knocks and bitter trials what would work and what would not. The secret of success with such men, as well as with men who could read, lies in the fact that they carry a large amount of gray matter under their hats. They are the kind that see "sermons in stones, books in the running brooks and good in everything."

Take the second, in the curriculum suggested, writing. This seems to be a lost art to many farmers. They find no time for it, have no occasion to use it, except, perhaps, to sign notes for gold bricks or lightning rod contracts. Pity the man who neglects this important part of his education. If the first man referred to who made over $5,000 on hay had not had the courage to write a few letters he never could have done what he did. With our cheap postage, our free rural delivery routes and our telephone systems all over the country, there is no way of preventing the practically educated farmer from doing business with as great dispatch and in as systematic a way as do our railroad magnates or our iron kings. I am speaking of the art of writing and not of penmanship. The man who can express his ideas clearly, pointedly and forcibly on paper has an education at his command that can be made invaluable to him. The experience of handling from 200 to 1,500 letters per day from farmers leads me to believe that I know this statement is true. Very few, even among those classed as highly educated, know how to write a good letter. The business among rural residents could
be increased many fold if all farmers were inclined to write more, and would take more interest in this method of doing business. A proper education along this line will provide for each man writing material that will command respect and attention. Printed letter heads and envelopes are one of the requisites in this direction. Well do I remember how the first farmers' letter head, which in bold letters read, "John Doe, Farmer, Dayton, Ohio," impressed me. Although it came in a bunch of 50 or 100 of other letters it was carefully laid aside and preserved. Inquiry disclosed that this man was one of the most successful, broad-minded men in the country in which he lived. He was proud of his profession, and was not ashamed to let the world know his business. A man with a supply of stationery of this kind at hand is more apt to keep up his correspondence than one who hasn't. Let a man go into any kind of manufacturing or merchandising, involving a capital of $500 or $1,000 or more, and the first thing he does is to have his printed letter heads, bill heads, envelopes, etc., etc. It is business to do so, because it is an advertisement and a recommendation combined. Probably 50 per cent. of the business of this country is done by correspondence. Why should not the farmer do his share?

A farmer should not only use his knowledge for the purpose of correspondence. In his daily labors he is working out serious problems that bear on future successes or failures. Careful notes should be made of each. They may save doing the same things over next year. The man with the note-book is the man that avoids many costly mistakes. The matter of book-keeping enters into the success of farming more than many imagine. Every man with the capacity of earning or spending a dollar ought to be a book-keeper. He ought to keep a record of every cent, both going out and coming in. He ought to know the full meaning of "debit" and "credit" and know what goes under each. He ought to be able to balance his books at the end of the year, and thus know whether he is gaining or losing. His success depends upon this as much as it does on his planning and scheming. This is not all. A man who can express himself well on paper can be a great benefactor to his fellow laborers. Suppose he experiments on certain lines and discovers some truth that is worth money to him. He is miserly indeed if he is not willing to impart this knowledge to his struggling neighbor. Let him write it out and publish it to the world and thousands may be benefited—and he is not injured. This is education, practical education, that stands for something.

*Arithmetic*, while last, is by no means least in the make-up of the farmers' education. Look out for the man that "figgers." He's going to get there with both feet. A stub of a lead pencil, properly used, is worth more on the farm than a yoke of oxen. Do you antici
pate trying something new? Sit down and figure it out and see where you are going to land. It may aid you in avoiding more troubles and disappointments than you ever dreamed of. When manufacturers contemplate a new scheme they first figure out the cost. They call in architects to get up plans. They get estimates on the outlay. They know about where they are going to land before they jump. The same thing can be done in farming operations or business enterprises connected with them. One of the most successful farmers I know has a complete survey of his farm. Each field is measured, mapped and numbered. This cost him something, but it has been worth every cent it cost each year since it has been done. Besides this he has figured out just what rotations are best to keep up the fertility of his farm and produce the best crops. If field No. 1 had a good coat of manure last year No. 2 gets it this year. If No. 3 has recuperated under a good coat of grass for three or four years it goes into corn and No. 4 takes the rest cure. His rotations are figured out definitely, recorded carefully and carried out to a nicety. With him it is corn, oats, wheat and grass, with enough improved live stock on the place to consume it all and keep all the fertility, and there isn't a manufacturer or merchant in the United States that is making a larger per cent, on capital invested than this man, and none of them are having a happier, pleasanter life.

Illustrations showing how figures on the farm pay well might be carried on indefinitely. I am aware of the fact that I am speaking to men who know all about it, and probably are carrying it out successfully.

I cannot overlook the fact that the great majority of the farmers of this grand old Commonwealth do not attend these meetings. They believe that to make a success at farming they must "live like a hermit and work like a horse." How to reach them and lift them up, God only knows, I don't. Farmers' Institutes are doing most excellent work, but the audiences attending these meetings are made up by men who are wide-awake and often do not need the knowledge imparted. The Agricultural Press of the country is doing its full share to help spread the gospel of better methods, but they fall into the hands of the better and more enlightened classes. It is the mediocre and lower classes that need the help. When the problem of reaching the struggling masses who are striving to better their condition and do not know how it is solved, when the latent spirits of the men and women of Pennsylvania is awakened and fanned into new life, then, and not until then, will the problem of "What Constitutes a Practical Education for the Farmer?" be answered. You who are leaders in the profession which you have chosen, you who are teachers and preachers among your brethren must remember that you cannot get away from the question pronounced by the first tiller of the soil: "Am I my brother's keeper?"
No. 6. DEPARTMENT OF AGRICULTURE. 435

The CHAIRMAN: We are now through with the program for the evening. Is there any other business?

PROF. HAMILTON: Mr. Chairman, I would like to make an announcement. There is a matter that I want to bring to the attention of the Board and the Institute workers, too, that I think is important. There is a meeting to be held in the city of Toronto, Canada, on the 23d, 24th, 25th and 26th of this month, which every man who can go should attend. It is the meeting of the American Association of Farmers' Institute Workers. It is going to be the greatest meeting of its kind ever held in this country. Our Canadian friends are doing a wonderful work up in their region on these lines on which we have been talking here. It is proposed to take the visitors all through the Agricultural College and Experimental Station and show what Canada is doing in this line of work. Canada has taken from us our foreign butter export trade. Canada is one of our great competitors in agriculture to-day. We are accustomed to think of that country as one inferior in agricultural respects by reason of the long, cold winters. and yet with all of that, Canada is forging ahead in this agricultural world, and now these Institute workers of the United States are going up there. The last meeting was held in the City of Washington, and it is believed that this one is going to surpass that, so I am sure those who can go will be well repaid for their visit, and you will have an opportunity to talk with men from all over the United States who are leaders in this great practice in this great country. I advise you all to arrange to go up to Canada, particularly the members of the State Board and the lecturers here. Inasmuch as we are not going to take any of this money we are accumulating along with us to the other side, I think it would be to your interest and pleasure to go up and see this country of which we know so little, and that borders right on our own State of Pennsylvania.

SECRETARY MARTIN: Before we close, I desire to call your attention to our program for to-morrow at 9.00 o'clock. Professor Franklin Menges of York, has arrived and is with us this evening and to-morrow morning the first order on the program will be the paper of Dr. Leonard Pearson. By request, Dr. Pearson presents his paper to-morrow morning on account of a number of the members of this Institute having to leave before his paper would be reached on the program of to-morrow afternoon, and then Prof. Menges will follow with his paper, which was not presented on Tuesday evening, the time set, on account of his absence.

Any questions that may be ready will be taken up upon the opening of the session to-morrow morning at 9.00 o'clock.

Upon motion, the meeting adjourned at 10.10 P. M.
Thursday Morning, June 4, 1903.

DEPUTY SECRETARY MARTIN called the meeting to order, and announced that the Chairman for the morning would be Dr. M. E. Conard, of Westgrove, Pa.

The CHAIRMAN: We will take up the questions to be answered.

MR. BLYHOLDER: The first question is addressed to Professor Cooke who is not present, I believe. Some one else will please answer it. It is:

“What causes the dark green, rank spots of grass from one to two feet in diameter in our grass fields?”

MR. SEXTON: It would be from the surroundings, I should judge. It might be from the dropping of some old cow.

MR. CAMPBELL: I think it is fungus. You will find in these dark spots that mushrooms will grow there, and there is a fungus. The spawn of them is under it and has some connection with the feeding of the grass plant and you will always find that much fungus will grow there.

A Member: You will not find any mushrooms growing excepting it is very rich soil.

MR. CAMPBELL: I have raised mushrooms all my life. I have raised them for sixty years, and in fact, if you had been in Scotland, there we would go out sometimes and take ten bushels, and would invariably get them on the dark green spots. I don't think the cattle took the time to go here and there wherever the mushrooms were.

A Member: I suppose, Mr. Chairman, that that has reference to the small green spots you will see this time of the year in the meadow. I do not think they are hard to account for. If you mowed a field last year and let is grow up and did not pasture on it you will not see any of those dark green spots this spring, but if you had pastured it wherever there was a dropping you will see a large green spot. It comes from the droppings of the cattle put on the field while pasturing.

MR. BLYHOLDER: The next question is:

“Would it be policy and profitable in building a silo to put uncut corn in where a cutter could not be produced to cut it at the proper time in the case of a person keeping from three to five cows stabled the year round for milk in town, having a small farm outside?”

MR. LIGHTY: I am a silo advocate. If anybody wants to feed milk cows, and I will include beef cattle, I do not believe he can begin to feed them profitably unless he makes use of the silo. The
silo is an absolute necessity for the feeding of cattle for any purpose whatever, whether for milk, butter or beef, or any other purpose. We have found in this way we can utilize the corn crop anywhere from 25 to 50 per cent. more out of it. I contend that under any circumstances, where you can grow corn you don't want to be without a silo.

MR. BRODHEAD: With a silo, where the corn could not be cut by a cutter, could it not be put in a silo whole and taken out with a cutting spade or something of that kind. Would that not keep all right the same as when cut upon taking from the field?

MR. LIGHTY: Does not the question relate to one cow? This would be a very peculiar world if you could not get a cutter, and if you had five cows, it would pay you to get a cutter in a few weeks time. You can store the corn whole if you want to, but it is hard work. You can buy a cutter so cheaply and build a silo so cheaply that it will pay you if you have only three to five cows.

MR. HALL: The universal testimony in small-sized silos is that the pressure on the outside next to the foot is not great enough, so that in the small silo you do not receive the same benefit as from the larger ones after they get over ten feet. The pressure on the outside prevents the setting of the ensilage to some extent.

MR. BLYHOLDER: The next question is:

"Is there any evident increase in the value of farm land in this State?"

MR. NORTHUP: I want to say just a few words in reference to that. There is an increase in our farm value. There is an increase up in Lackawanna county, in the northeastern part of this State. And do you know our farm land is going right up there and our farms are getting more in touch with the thickly settled communities, and a trolley line, first one we have ever had, is coming from Scranton and coming right through our section of the country and going up into Susquehanna county and into Wyoming county, and it is going to help us all. It is a great big thing, my friends, and we cannot afford to live in this world without being prepared to do our work, too, on these farms and show to our friends in the city that it is worth while to live in the country. Brother Seeds said there is no home like the Seeds' home, and there is no place to me, in my knowledge, like northeastern Pennsylvania, where we have the finest landscape, most hills and the most beautiful scenery. There is a farmer's daughter from up there who married a man from New Jersey and she came up home and she turned around there and looked over the country and said: "I never half appreciated this home when I lived here among the hills."
I was proud when I heard Secretary Hamilton's speech, and I felt prouder than ever I felt before because I was a farmer. I felt that way when they asked Brother Seeds whether he was a farmer or a gentleman when he came here to tell about those great springs and those great roots of alfalfa and I am glad I belong to this organization.

MR. BLYHOLDER: The next question is:

"What degree of success have you had with fly repellent in the dairy?"

MR. McDONALD: I will say I never had any particular success. During the season of flies, when we are bothered the most, we go through the dairy twice a day with kerosene and that will relieve them some for the present. I have never had anything that is any better remedy.

A Member: I am not afraid to say that I used it with great success. Our cows were tied in the barn and we sprayed them at milking time and when they came in. It would take but a small sprayer, and it only takes but a minute for each one.

MR. BOND: We pasture our cattle along the foot of the mountain and it is almost impossible for them to live up along there on account of the flies, and we use this preparation on the market. We spray our cows every morning with it and turn them off and they are just as contented as they can be until four o'clock in the afternoon. It is a success. I would not be without it if it cost $10 a gallon. A gallon will spray ten cows for two months every day. There are exceptions. We have a stream of water running through our pasture. If the cows stand in there sometimes it will lose its effect sooner, but under ordinary circumstances it will last during the day. We do not take our horses out of the stable without spraying them around the neck and ears, and we have no trouble with it. It costs seventy-five cents a gallon or $1.50 a gallon and the sprayer with it. It is a success, but it won't last two or three days. Put it on every morning and thoroughly.

MR. THOMPSON: If you have a pair of scales in your barn and some "shoo-fly" you will soon discover the value of "shoo-fly."

DR. CONARD: It is my mission to travel a good little bit through some parts of New Jersey, and there it seems to me the flies are worse than anywhere I know of, and the mosquitoes too. I do not know why it is so without it is that in the hot weather the drainage is imperfect, and every barn has more or less of a pool around it, where the mosquitoes and flies originate. They almost to a man use the fly repellent and they think they cannot do without it. It is a success and pays for itself many times over.
There is one thing to guard against in its use. It should not be used in the stable just before milking because it will laden the air with the odor, which is liable to be taken up by the milk. It should be used a short time before, or just before turning them out to give them a dose; and then a great many of these people milk about two o'clock in the afternoon and early in the morning, and that application they get in the morning lasts over the noon milking and, consequently, they don't get but one spraying a day, and there is no odor in the stable at or near the times of milking. That is the only objection to the application of the repellant just before milking; unless it is, as one man told me, that he had gone away and left some of this material there for the use of his men, and they applied it so heavily that they killed two of the cows by shutting up the pores and preventing perspiration, and the animals died from sunstroke. This is a thing that should not happen in the case of an intelligent man.

A Member: Is there any danger of affecting the eyes?

DR. CONARD: I don't know that there is. It is not generally applied in the face. I think it might, if driven right directly into the eyes.

MR. STOUT: I use just the common coal oil. I have a sprayer at the cow stable and just before we want to go to milk we spray the cows all over. By spraying the cows with that misty crude coal oil it drives the flies away and kills them. It is economical and convenient.

The CHAIRMAN: Those are all the questions we have and the time has arrived to take up the regular program of the morning.

The DEPUTY SECRETARY: Secretary Critchfield requests me to say that he owes you an apology for his having to leave before this meeting adjourns. The Live Stock Sanitary Board convenes in Harisburg this morning and the Secretary, being a member of that Board, having immediate business to transact, was necessarily called away. This same apology answers for Dr. Leonard Pearson, the State Veterinarian, who is a member of the same Board, and will account for his not taking part in the program.

The CHAIRMAN: Since this program was made, Dr. M. P. Ravenel, of Swarthmore, Pa., who was to have had the first topic on the program for this morning, "The Relation of Bacteriology to Dairying," has gone abroad and not yet returned. We will, therefore, take up the paper of Prof. Franklin Menges, of York, Pa., on "Feeding Powers and Habits of Some Agricultural Plants."

The paper of Prof. Menges is as follows:
FEEDING POWERS AND HABITS OF SOME AGRICULTURAL PLANTS.

By Prof. Franklin Menges, York, Pa.

We know that there is such a thing as the struggle for existence among plants as well as animals, and that in that struggle plants, like animals, have acquired certain powers by means of which they have been able to conquer in the race of life until the stages of advancement in which we have them, these acquired powers having become habits, which we can use in agriculture to obtain the best results for labor and money expended.

In furnishing plant food to plants we should think of these acquired capacities and should apply only such foods for the procuring of which the plant has only slight powers; for if we give the plant what it can get by its own exertion in so far we do it an injury.

We know that if the growth of trees and vines is strong and rapid in the more fertile soils, that everything is going to wood at the expense of fruit, and that if we desire the best fruit we must check the growth by making the plant exert itself to obtain the mineral foods it needs.

The sugar beet will not produce the high percentage of sugar in soils in which it can get nitrogen without much exertion. The same is true of wheat, potatoes and other crops. We used to think that the amount of plant food plants removed from the soil was a sure test and indication of their manurial requirements; and to discover this we analyzed the ashes of plants to find the proportions of the various mineral elements they used, and then applied just what we thought they needed, and awaited the hundred-fold yield without misgivings. We soon discovered that these analysis revealed what the ashes of the plant contained, but did not tell us that most plants do not need silicon and sodium; neither did they tell us during what stages of growth they used and needed the largest amount of phosphoric acid, potash, nitrogen, lime, magnesium, iron, chlorin, etc., nor what particular functions these elements performed in the plant. They did not show, as Loew expresses it: "That every plant absolutely requires a certain minimum of each mineral nutrient, and if a plant fails to obtain this minimum it can not produce a normal crop and may even prematurely die."
These analyses did not reveal to us the acquired powers of plants to get a minimum of nutrients even when not in an available condition to produce a normal crop. Normally, an acre of wheat needs about 35 lbs. of nitrogen, which it has certain, though in limited powers of obtaining. An acre of corn needs about seventy pounds of nitrogen, which it has acquired strong power to obtain. An acre of mangels needs 150 lbs. of potash, while an acre of flax needs only 27 lbs.; an acre of corn needs 20 lbs. of phosphoric acid, while an acre of mangels needs 35 lbs. We see here that different plants require various minimum quantities of mineral nutrients to produce normal crops, and that they must have the capacity to get these nutrients from sources not in the available state.

This has been demonstrated by Liebig and many other experimenters since his day. Liebig raised barley in boxes so constructed that all the water soluble plant food in the soil would be drained off. He analyzed the drain water and determined the soluble plant food it contained, and also weighed and analyzed the crop of barley and found that 92 per cent. of the potash in the crop was obtained from forms insoluble in water. This experiment shows that barley has strong feeding powers for potash, or that it can get potash from sources not soluble in water. Similar experiments have been made to determine the capacities of our various agricultural plants to obtain potash, phosphoric acid, nitrogen, lime, magnesium, etc.

Plants do not only have various capacities of rendering plant food soluble, but they have the power of selecting what they need and rejecting what they do not need. Experiments made at the Rhode Island Experiment Station, with plants to which potash and soda, two elements very similar in their chemical properties, were applied; even when the soda which the plant was supposed to use instead of the potash, was increased to such an extent that the potash was only in minute quantity in comparison, yet the plant selected and incorporated the potash and rejected the soda. It has been demonstrated through long and tedious experiments that plants have strong feeding powers for some elements of plant food and weak for others; that during certain stages of development the organism will need certain minerals, such as magnesia, in the formation of seeds and will then take up more of this element than at any time during the stages of growth, and that they can select what they need and reject what is not necessary. In a general way the feeding powers of the cereal crops are quite similar, with the exception of their capacity of assimilating nitrogen. To obtain the potash and other basic elements for food they seem to have the power to decompose the simpler silicates of the soil, deposit the silica in the leaves and feed on the potash.

Wheat seems to be the weakest feeding crop among the cereals.
and, therefore, to raise wheat successfully, the soil should be in a high state of cultivation, or should be peculiarly adapted for the culture of wheat. The experiments of Loew and Gilbert illustrate the weak feeding powers of wheat, especially in regard to nitrogen, as the following table will show:

No manure applied for 40 years, 14 bushels per acre.
Mineral fertilizer alone for 32 years, 15½ bushels per acre.
Nitrogen fertilizer alone for 32 years, 23½ bushels per acre.
Barnyard manure for 32 years, 32½ bushels per acre.
Minerals and nitrogen alone for 32 years, 36½ bushels per acre.

Wheat, therefore, should be grown on soils especially adapted and should be placed in such a position in the rotation when the soil is in the highest state of cultivation to assist its weak feeding powers. Barley belongs to the same class of cereals, but differs from wheat in that it has a stronger root development, can use plant food as Liebig has shown in a less available form, which is true of potash, nitrogen and phosphoric acid. This has been well illustrated in some of the Western states where wheat has been grown for years in succession, and no longer yields satisfactory crops, whereas, barley gives excellent results.

This is due to a condition of the soil produced by the long cultivation of wheat rendering the plant food less available, the soil more porous, creating a condition to which barley can adapt itself better than wheat, because of its stronger feeding powers. Barley, however, is greatly benefited by manuring, especially by those containing nitrogen, as experiments by Loew and Gilbert have shown:

No manure for 34 years, averaged per acre 23½.
No manure for 34 years, averaged per acre 17½.
Super-phosphate alone for 34 years, averaged per acre 23½.
Mixed minerals for 34 years, averaged per acre 24½.
Nitrogen alone for 34 years, averaged 30½.
Nitrogen and super-phosphate for 34 years, averaged per acre 45.
Barnyard manure for 34 years, averaged per acre 49½.

Barley, like wheat, derives the greatest benefit from nitrogen, showing that it has special difficulty in getting this element. The feeding powers and habits of oats are such that they can obtain food when it is less available than the barley, and they will thrive in an acid or alkaline condition of soil where either wheat or barley would perish. But nitrogenous fertilizers benefit them greatly, even to such an extent as to double the yield. Corn seems to be an exception to the general weakness of the cereal crops, because it seems to able to feed on the nitrogen of the organic matter of the soil as it passes through the stages of nitrification, but has especial difficulty in getting phosphoric acid. Corn will thrive when the fertility in the soil is in a crude condition, and will utilize a large
quantity of it, and at the same time leave the soil and the fertility in better condition for weaker feeding crops. Corn is not injured by the excessive application of fertilizer like wheat, barley and oats would be. Buckwheat has strong feeding powers, and will usually thrive under favorable climatic conditions where few other crops will grow, and is not infrequently used as a manurial crop, by plowing down after it has extracted and rendered available soil fertility for weaker feeders. The surface feeding habits of potatoes and their limited power of obtaining potash and lime causes a more rapid decrease in yield per acre than any other farm crop, if planted successively on the same soil.

Leguminous crops have a special weakness in getting potash and lime, and, therefore, should be placed in such a position in a rotation where these fertilizers can be applied directly or where they are most available, if already in the soil. Legumes even with the application of potash and lime, when grown too frequently on the same soil, will often fail because of the production of organic substances which destroy them. Hay and grass crops mostly have shorter roots than the cereal grains, and are, therefore, by habit surface feeders, and can not obtain mineral foods at any depth; therefore, in order to raise hay crops the fertilizer should be applied directly on the surface, so that it is within easy reach of the roots of the plants. No manure is better adapted for raising grasses than common farm manure.

These plants then have the power to break up molecular structures in the soil which otherwise can only be broken by the most powerful chemical agents or which will only yield their hold on each other by the decomposing agency of temperatures measured by hundreds of degrees or by the immeasurable heat of the electrical furnace. They have the power to obtain water from the soil, and must obtain it under these conditions; when that soil is so dry that no pressure on the earth beneath could express from it a drop of water, and at such a rate too that an acre of corn under ordinary conditions will have sufficient to consume 244 tons in 13 days. We see here the importance of water to the growing plant, not only for circulation and transportation, but to help it in forming the substances by means of which it will be enabled to render available the plant food it needs. Not only must the soil contain a large quantity of water, but it must be well aerated, for oxygen is just as necessary as any of the plant foods, because, as we well know, that when a soil is super-saturated with water, or when it is baked so hard that no air can get in, plants will die, not for want of plant food or water, but for want of air or oxygen. Furthermore, we should consider the adaptability of the soil to the crops that we cultivate, so that soils and crops would work together to produce the best results.
The Agricultural Department at Washington has inaugurated a soil survey in order to study the adaptability of soils to crops. The Department seeks to present as clearly and as forcibly as possible the conditions of an area in such a manner as to make it possible for prospective settlers to take up lands suited for certain crops, and to enable present owners of land to learn from the experiences of other localities what crops are best adapted to their own soils and climatic conditions.

In the present struggle for commercial supremacy, the importance of such accurate knowledge is becoming daily more evident. No community and no nation can afford to waste its time and energies in pursuit of interests to which its conditions are unsuited; nor on the other hand can it afford to lose any chance of inaugurating and developing those interests for which it is peculiarly adapted. The soil survey aims to eliminate to some extent such waste in the line of agriculture. Its most valuable function is, undoubtedly, the improvement of existing methods, so that larger yields of our staple crops can be secured. The success of the Bureau in introducing Sumatra tobacco in certain soils in the Connecticut Valley, the extension of the grape and other fruit areas in the Piedmont and mountain sections of the Atlantic States, the improvement of the irrigable lands of the West, of the rice lands of the Gulf Coast, and of the sugar beet soils wherever they may be found. The solution of these and similar problems will prove invaluable and be the safest guide for future agricultural development. A cursory review of what has been done along this line will show more clearly what can be learned of the relations of the different types of soils to various crops.

During the survey of 1901, seventeen different classes of soils were surveyed, each of which is divided into a number of types, each type distinguished by marked differences affecting the character and yield of crops. Of the 385,660 acres of stony loam, about 57 per cent. is considered unproductive under present methods of agriculture, 34 per cent. is adapted to wheat, 20 per cent. to dairying, 14 per cent. to tobacco, 9 per cent. to peaches. Of the 209,000 acres of gravel surveyed, 98 per cent. have been classed as unproductive, and on 2 per cent. grapes are a leading and important crop. It is important to note that peaches are adapted to 7 per cent. of the stony loams, 24 per cent. of sand, 55 per cent. of fine sand, 12 per cent. of sandy loam and are not reported as an important crop on any of the other classes of soils. Wheat is reported as an important crop on 34 per cent. of stony loam, 47 per cent. of gravelly loam, 20 per cent. of sandy loam, 5 per cent. of fine sandy loam, 74 per cent. of loam, 89 per cent. of shale loam, 38 per cent. of silt loam, 69 per cent. of clay loam, 41 per cent. of clay and 87 per cent. of adobe.

* Field operations of the Bureau of Soils 1901. 5d report, page 25, Milton Whitney, Chief.
Tobacco is also reported as an important crop on a wide range of soils. Light, sandy soils for the wrapper leaf of Connecticut and the bright, yellow tobacco of Virginia. The sandy loams of Maryland produce a smoking tobacco; of Virginia a manufacturing tobacco; of Connecticut a cigar wrapper leaf, and those of Pennsylvania a cigar filler.

It is probable that if the wheat industry were as highly specialized as the tobacco industry, different grades of wheat would be recognized, as in fact is the case with the wheat grown in Kansas, Nebraska, Oklahoma and Indian Territory by foreign millers. It is not unlikely that most of our crops would show a variation on different types of soils to such an extent as to throw them into a different commercial grade if every one of these agricultural industries should ever be as highly specialized as the tobacco and some other minor industries now are. It is evident from this that plants, like the child, desire to do for themselves what they can, that they do not like to be fed with a spoon all the time, that when the cereals need potash they will get it if it can be gotten; that corn will get nitrogen and potash if it can be gotten; that buckwheat will usually get all kinds of plant food; that potatoes and beets like to struggle for nitrogen, and that the soils and crops should be adapted to each other to produce the best results.


Mr. Lighty presented his paper as follows:

MAKING AND SELLING FINE DAIRY BUTTER.

BY L. W. LIGHTY, EAST BERLIN, PA.

Butter made on the farm or in the private dairy has been the target for jeers and jibes and lots of wholesale condemnation.

I can hardly blame people for expressing themselves emphatically about some butter that comes from the farm and finds its way to the restaurant or village hotel table. How it is made I can hardly conceive. Texture it never had. In color, it resembles old brindle who produced the milk, and in odor it seems to be somewhat related with Limburger. But it is strong, extremely strong in flavor. It seems to be a cross between Roquefort cheese and tobasco sauce.
I am told Roquefort is made in France from goat’s milk. After it is made it is put in solitary confinement until its whiskers turn gray and gangrene sets in, when it is taken out and chained to a post. Before it is served it is chloroformed or knocked on the head with an axe.

It is then brought to the table in small cubes about the size of a domino. I have seen limburger strong enough to shoulder a three bushel sack of wheat, but a piece of Roquefort the size of a dice can carry on election. To this add the strength of XX tobasco sauce and then you will get a faint idea of the butter that is occasionally served to the institute workers. My friend Agee says the State pays for it, but the State need not eat it. The man who makes this kind of butter is not only his own greatest enemy, but I do not blame all mankind if they feel enmity towards him. I do, emphatically. He fills the tubs of the butter renovators who are thereby enabled to place a pretention on the market that undermines the price of honest goods, and the digestion of the consumer.

But I am to speak of fine butter, how to make it and how to sell it. To make good butter we must begin in the beginning, and that is at the cow and her feed. Some cows are bred to be producers of good butter as well as good butter producers, others are good beefers, and still others are good for nothing, and they will all be true to their nature and tendencies. Therefore, if you wish to make good butter, select a cow bred up to the capability of making a profitable quantity of good, honest yellow butter. Give that cow good shelter, warm in winter, cool in summer and well lighted and ventilated; as you must see to keep her and her stable perfectly clean, and she must have plenty of pure air to breathe. Have a supply of pure fresh water within her reach so she can take what she wants at all times. All this and much more to keep the cow in perfect health, as otherwise she can not give milk wholesome enough to make fine butter.

THE FEED.

This is the raw material out of which the cow manufactures the butter fat. Does feed have any effect on the butter? Did you ever turn the cows into a pasture where there was a lot of garlic? Or feed them a lot of cabbage or turnips before milking? Surely, feed has a very decided effect on butter. Some makes it hard and crumbly, some soft and salvy, some gives it a musty flavor. Therefore, it is quite essential that we should study to discover such combinations of feeds as will nourish the animal most completely and produce the finest butter at the least cost. This is an important and complicated problem, that can generally be best worked out individually with the feeds that are available in a given locality. After the feeding problem the next great question to consider is:
DAIRY BACTERIOLOGY.

Now don't get frightened. I don't mean that you shall learn the names of the various bacteria. Why bacteriologists can not call these organisms by decent Christian names is truly a mystery to me. Just think of calling an organism, a pigmy so small that ten thousand could easily roost on the point of a pin, I say, think of naming such a mite Granulobacillus saccharobutyroscus immobilis liquefaciens. I will not attempt to pronounce it. I asked an authority to pronounce it for me, but he, declined, stating that the last time he tried he dislocated his jaw, while another volunteered a trial but got only half way through when his tongue tied itself into a knot, and of course I never learned how to pronounce it. The bacteria that tries to fight its way through the world, and especially through our butter, with this awful name attached is merely the organism that develops the strength of the butter spoken about in the beginning of this paper. Reasoning from analogy, it doubtless is strong enough to carry its name, had we only a Russian tongue to pronounce it. As a matter of self-defence, I would move and second the motion and declare it carried, that any bacteriologist, who in the future gives any common every day bacteria such an abominable name, be promptly tried and executed.

From the time the milk leaves the udder until the butter is used by the consumer, we must constantly be on the lookout to avoid the deleterious bacteria, and encourage those that are helpful to us. The chief source of troublesome bacteria is uncleanliness. The stable is foul, the cows have a lot of filth and manure adhering to their bodies. The milker’s hands are not overly clean and then he will declare he can not milk dry and dips his hands into the milk pail with the dirt dripping into the milk. Sometimes the milking coat has not been washed for some months or years, and that contains bacteria enough to contaminate all the milk drawn in the United States. If we would make good butter, it is absolutely necessary to keep the stable clean. Clean it out daily and disinfect it frequently. The cows should be groomed regularly, and before milking, every cow’s udder and flanks should be brushed, wiped and moistened.

The milker should be clean and tidy, and the dairy utensils must be kept absolutely clean and sweet. During the summer when our cows go to pasture they often look clean, and we become careless, but frequently we have more trouble during this season of the year than any other time. If the cows have access to watery or swampy places, their udders often become coated with material that carries the worst kinds of bacteria. Then, too, the temperature is so favorable for their development. Just as soon as the
milk is drawn it should be removed from the stable to the dairy house and run through the separator. No dairyman would attempt to make good butter in our day without the use of the centrifugal separator: first, because it at once reduces the bulk by about 87 per cent., relieving us from handling and caring for all that bulk, and second, the separator is a cleanser. It removes from the cream quite an amount of albuminous matter, and with it many impurities and numberless bacteria. We have learned that the fewer bacteria of any kind we have in the cream to start with the more easily can we make a number one butter.

As soon as the cream is separated it should be cooled down to 50 degrees, still better 40 degrees, and held at that temperature until we are ready to ripen it preparatory to churning. The lower the temperature at which we can hold the cream, the better it will remain. At 40 degrees or below, bacteria develop very slow, if at all, and the cream will keep perfectly for the few days we desire to hold it, and cream should not be held more than three or four days at most. If our methods were correct and cleanly up to this point, a good part of the battle is won.

RIPENING OF THE CREAM.

We now wish to ripen the cream, or, in other words, we want to develop the proper flavor for our butter. It is true we can make butter from sweet cream, and only a few years ago sweet cream butter was a fad, but very few people liked it, and now very little is made. The philosophy of cream ripening is fairly well understood, thanks to the work of our bacteriologists during the last few years.

If our cream is in a good condition and contains a minimum of bacteria, especially the kind conveyed by dirt or filth of various kinds, it is almost sure to develop a good flavor when warmed up to about 68 or 70 degrees, and held at that temperature for some hours, but if we would make a perfectly uniform product, and fastidious customers want every pound just like every other pound, it is best to use a starter.

In this way we introduce just at the right time a large number of strong, active, correct flavor-producing bacteria, and they will put in their work before the other kinds, that have apparently been chilled and rendered dormant to a certain extent, have time to develop and do any harm. It is true that many species of bacteria have no effect on the flavor of our butter, but there are others that will develop "bitter," "tainted," "insipid," "putrid," and other very undesirable flavors, if present in abundance, and as a rule all these are introduced by unclean methods and unclean utensils. In the private dairy where everything is under the immediate and personal control of the proprietor, and all operations can be overseen
and, possibly, partly performed by the proprietor or manager, there should exist no occasion for pasteurizing. If the dairy be large and many persons are employed, the supervising must be very strict, or the result will be like that of a public creamery, where many patrons contribute milk of all grades, when pasteurizing is absolutely necessary to destroy the numberless hosts of undesirable bacteria, and give the ones introduced by the starter an opportunity to perform their function. To know when the cream is properly ripened the acid test is sometimes used, but the experienced buttermaker generally uses his eyes and nose to determine the proper degree of ripening. The odor is a mild, aromatic acid. The cream is thick, velvety, with a satin gloss on top, runs off the paddle in a smooth layer instead of streaks, makes and momentarily leaves little dents in the cream, if allowed to drip into the cream vessel from the paddle. The rapidity of ripening can be controlled to a certain extent by raising or lowering the temperature.

CHURNING.

For churning we prefer a simple revolving barrel or box with no inside fixings. Stop the churn when the butter granules are the size of half a grain of wheat. If you get the granules too large you will have trouble to drain out the buttermilk and incorporate the salt. If the temperature is low enough to make the granules rather hard, the buttermilk will drain out more completely. Should we have trouble to get the butter to float, a little water with a few handfuls of salt will bring the butter on top. After draining off the buttermilk put a weak brine into the churn, using about a cup of salt to 10 quarts of water, turn the churn a few revolutions and drain again, when all the buttermilk will be removed that we wish to remove. Now place the butter on the worker carefully so as not to destroy its granular condition. Now sift over it, at about the rate of one ounce of salt to the pound of butter, the best dairy salt you can procure. Work it lightly so as to mix the salt with the butter, but do not work it enough to mass it completely. Now let it stand until the salt is completely dissolved, when working should be completed. No rule will tell you when it is worked enough, but the salt must be properly incorporated, and it must not be worked into a grease. If the salt is not properly incorporated, you will find streaks and mottles in it in a day or two, and if the texture is destroyed you will at once recognize it and know it was overworked. A number of these operations require not only quite a little practice, but a whole lot of good judgment. Putting it in pound or half pound prints, wrapped in parchment paper is generally the most desirable form to market it.
SELLING THE BUTTER.

Now for the selling. It makes me tired to hear farmers say there is no sale for their produce, when they don’t even let any one know that they have some commodities for sale. Last summer I visited neighbor S———. I noticed he had a few trees of summer rambo apples as fine as they grow, going to waste. I asked him why he did not sell them. “No one wants them,” he replied. I told him such apples were in big demand in York at more than one dollar per bushel. “Well, John,” he said, speaking to his son, “I guess you will have to take them down and sell them, and you can have half the money.” So John put the apples nicely on straw in the wagon box and covered them all up with blankets and started to York to sell the apples. He drove up town about a mile, those apples nicely covered up all the time, expecting no doubt that some telepathist or mind-reader would divine what he had, come out on the street, stop him and buy apples, but he was not so fortunate. By mere accident, a grocer discovered that he had apples, and on sight bought them all at about half what he could have sold them for had he only left people know that he had apples for sale. Think of a merchant closing all his show windows, taking down his sign and absolutely stop all advertising; how much business do you suppose he would do? Make as good butter as the best and then let no one know that you have any butter, where would you expect to find sale for it.

The whole story is advertise. Speak about your good butter and don’t be so modest. Get circulars printed explaining the superiority of your product, and the thought and work you apply to it to make it thus superior. Advertise in the newspapers. Canvass your goods, if you please. Do anything to make a noise about it, so buyers will know what you have for sale. Persist along this line a little while and you will be surprised to see how many people will think your butter absolutely necessary to their existence and the demand will soon be greater than the supply, then you will be in a position to dictate terms. But keep on advertising, making a noise; people like to hear a noise about the things they swear by. But whatever you do, make such good butter that it is a standing advertisement in itself.

MR. HALL: I am a dairyman, and I want to say that is a good paper, and if we all follow those rules and regulations in the manufacture of butter it would beat all the lawful restrictions for the manufacture and sale of oleomargarine.

The CHAIRMAN: The next topic on the program is:

“Feed, Breed and Care of the Dairy Animal,” by Rev. J. D. Detrich, of Flourtown, Pa.; but in his absence we will have a paper that we
have skipped in one of our earlier sessions, "Sheep Husbandry," by Mr. J. S. Burns, of Clinton, Pa.

MR. SEXTON: I saw Mr. Detrich only a few days ago, and he really expected to be here. I am sorry that he is not coming. I consider his method in the dairy one of the most practical exhibitions of its kind, and those of you who have not visited his farm will wonder how on that little farm of fifteen acres from twenty to thirty cows are kept the year round, and all the fodder and feed raised on which those cows are kept, pure bred Jerseys, excepting the bran that he buys to balance the ration. I am sorry he is not here, for you would begin to think that it is not acres you needed so much as intelligence in conducting the dairy.

MR. MARTIN: Mr. Detrich, being a minister, we are aware that there are times that he is called by special cases, sickness, funerals and marriages, so that we must make allowances for his not being in attendance. We will say, however, that it is our hope to publish these papers in pamphlet form, and I am quite certain that Mr. Detrich will furnish us his paper on the topic assigned him and that you will be able to get it in the printed form later on.

(Since the adjournment of the meeting, Mr. Detrich's paper has been received and is presented, as follows:)

**FEED: BREED AND CARE OF THE DAIRY ANIMAL.**

*By Rev. J. D. Detrich, Fourtown, Pa.*

During one of the institutes held in the State of Pennsylvania last winter, three competent statesmen were engaged in an intelligent conversation on breeding and the dairy points in certain renowned animals; in the same room sat an apparently quiet listener, but taking no active part in the conversation until a certain point was raised, when the quiet observer joined in the discussion, and delivered himself after the following manner: "I have heard all you gentlemen have been saying and have been very much interested, but I will bet any of you a handsome sum that you can pick out 40 dairy cows and put them at work in the dairy and one-half of them will turn out failures."
One of the three gentlemen spoke and said: "No, they won't, if you allow me to select the feeders, the milkers and the care-takers." The challenger immediately withdrew his banter and said: "Now you are talking, and I will agree with you in all that you have said."

The writer of this article simply cites this conversation and challenges to show that dairying does not depend on any one thing but on all the details connected with the dairy business.

The progress made in animal industry the last twenty-five years has given a new impetus to dairy interests. The milk, butter, cheese and cream supply for consumers in cities and towns are no longer doubtful problems, but are actual facts, laying a broad foundation for a profitable business. And it is here that the factors of success lay in the production of those articles for which there is now a great market and a still greater one in the future.

To meet the demands of the public's needs, it is plain that the feed, breed and care of the dairy animal go very far towards insuring the success of the undertaking for the producer. It is an actual practice that the author of this paper is willing to record for the benefit of his readers, and is persauded by years of experience and actual results, that the success and failure of the dairy business depends entirely upon feed, breed and care.

It is true there is a business side to the marketing of the product, but it is almost a truism that good goods always find a market or make one. The writer at this time has inquiries and offers for his milk production, because of the known uniform quality of the milk. The one offer is from a restaurant in Philadelphia that pay $3,500 a year rent. The other is a large retailer of milk in the same city.

The writer is aware of the reply that the farmer in general is ready to make to such statements, that his milk is just as good as anybody's and that he has been a farmer all his life and his father before him. But he could say the same thing of his mother as a butter maker, that her mother made butter before her. But if either were to compare the butter made fifty years ago with the butter today, there would be a great sacrifice of points as compared with the standard to-day.

What is true in the progress of butter-making is equally true in the production of milk. Hence the subject resolves itself again into feed, breed and care. The writer would not emphasize these three requisites so much if they had not been the potent factors in his own actual experience, and knows personally whereof he speaks.

It is not accidental but intentional that feed stands first as the prerequisite for successful dairying. Any cow of any breed, or no breed, intelligently fed, will do better than a good cow poorly fed. The common cow, as she is familiarly called, will do much better when she is fed on such foods as she can most easily digest and convert into milk.
There is no reason why any dairyman should remain ignorant of the foods, especially adapted to making milk. Literature, bulletins and experiments are published by the different Agricultural Colleges and Experiment Stations, and can be had only for the asking—besides a number of excellent dairy papers, published weekly, varying in price from one to two cents per week. The writer owes his success to printer's ink and not to main strength and awkwardness, and to that much abused word, experience. There is not one out of a thousand who is an experimenter, anymore than there is one man out of a million who is a discoverer. And the sooner a man knows where he stands, intellectually, as a dairyman, will determine largely his success.

Trickery and low cunning in the dairy business are as despicable as in any other trade or calling in life. Accuracy and honesty should be standard virtues of the dairyman. To offer unwholesome food or water to a dairy animal is just as dishonest as to serve an adulterated article of milk to a customer.

An honest cow can't remain so with a dishonest owner. She will either go to the butcher's block or to a better home. He is nearly a bad man who abuses a cow; abuse will not make her better, but food and human kindness have helped many a poor animal naturally to become a better one.

There is a registered cow in the writer's herd that a good judge of a dairy animal would gladly hang a ribbon on with pride. But if she were to be measured by her milking one year ago she would have been sold for bologna. The circumstances are these: She was bred in the silk, her size, dairy type, barrel, udder, front and back suggestive of Golden Lads, everything to commend her, and a most excellent heifer she was with her first calf. No better breeder than she in the dairy. Yet for two years she was really what would be called an unprofitable cow. What was the cause, and whose fault was it? The feeder tried to excuse himself in all manner of excuses. The owner insisted that the trouble lay in the feed and the care. The time to renew a cow is when she is dry and unfortunate is the dairyman who does not know this. When the period of lactation entirely ceased for Daisy Hillie Cream she was fed and cared for as the owner directed. She was developing splendidly for motherhood, udder began to distend nicely, all four quarters evenly filling and swung a ponderous udder when she walked; calved all right and is milking at this writing 33 to 40 pounds of milk a day. Had this valuable cow been dealt with as thousands of her sisters in this country she would have been ground into sausage long before this, while to-day she is milking almost 6 quarts of milk.

It is high time to start a new breed of dairymen if it is not possible to improve the old ones. The motto of modern dairying is, choose
your breed suitable to your taste if you are rich, for business if you want to make a living, then feed and care must be daily handmaids to the business.

Balance the ration for the cow’s stomach, not according to the whim or flea in your brain. There is a difference between a cow’s stomach and the chemist’s crucible, but it is surprising how close they do agree after all. The arithmetic of the balanced ration may be a little too large for our particular dairy and not large enough for the other. The ratio of the ration is all right but the bulk may be more than the one cow can consume and not quite enough for the other.

It is pretty generally known that this paper has not much to say in favor of pasturing dairy cattle. The soiling system has so much in its favor, that a brief description of the practice at Flourtown will not be out of place.

Cut hay is fed three times a day to every animal on the 15 acre farm that is old enough to eat it throughout the year. To feed green roughage, either from the field or silo exclusively, is recommended by some, and especially in summer time, is supposed to be the proper food for a dairy cow; and June is generally brought forward in argument for the practice as being the best month in all the year for a great flow of milk.

But the modern dairy is as different from the old time custom of keeping cows as the modern steel mill is from the old time blacksmith shop. The dairy business of to-day is a factory. The cows are as artificial as the looms, and they are harder worked than any looms in the world, making twenty-four hours in a day for over three hundred days in a year, Sundays not excepted.

Hay by practice seems to be as essential for a dairy animal as coal is for the monstrous boilers to run the looms in a mill.

Clean stalls, clean cows and clean dairy barns can only be kept clean by keeping the cows’ droppings just right. Green feed alone keeps the bowels too loose and has disgusted many who wish to adopt the soiling system. Hay, and the proper use of concentrated foods, when fed with judgment, keep the cows’ droppings just right, and consequently the animals are clean and the dairy barn is clean in summer as well as in winter.

The Agrostologist from Washington, D. C., an official of the U. S. Government, recently visited the farm and dairy at Flourtown, intending to remain from one train to another, but instead of doing the small farm and dairy in so short time, spent a day and a half observing the methods in use.

The manure gutter was of particular interest, so much so that a photograph of the manure was taken because of the uniformity of the droppings. It was a revelation, as the Agrostologist expressed
himself, to see such cleanliness of stable and cattle in such a continuous system of soiling. The feeding and mixing of feed was watched closely and commented upon as being the best all-around feeding that had come under the visitor's observation. The manure at Flourtown is cared for only second to the milk and cattle themselves; so valuable a product is the manure in the estimation of the owner. And the daily carting of this manure to the land instead of to the barnyard is the most probable explanation of the crops growing and gathering. The watering is as regular three times a day as the feeding. The ventilation, light and grooming enter into the soiling system as well as salting and providing the dairy animals with clay once or twice a week, of which they are very fond of licking and eating.

Broom, brush, fork, hoe, shovel and push stick for gutter are in every stable. Make everything so convenient that it is easier to do it than neglect it; it is one of the arts of the soiling system. In this method of the dairy business the dairyman has all his animals directly under his eye. Waste is impossible, because so easily prevented.

As for the health of the herd, the animals, old and young, could not be better. The veterinary bill is small because of the regularity in feeding, and the other essentials pertaining to the system that has been presented in this paper.

The CHAIRMAN: Ladies and Gentlemen, I have the pleasure of presenting to you Mr. J. S. Burns, of Clinton, Pa.

Mr. Burns presented his paper as follows:

SHEEP HUSBANDRY.

By J. S. Burns, Clinton, Pa.

Almost ever since the foundation of the world, sheep husbandry has been one of the leading industries of the earth. We need only come down to the second generation of which we have any history, and we read that "Abel was a keeper of sheep." And each succeeding generation which has come and gone has furnished men who were noted for their skill in the breeding and management of sheep. And we believe that in the breeding and development of the sheep there has been as much advancement as in any other line of domestic animals. Personal observation justifies the assertion that there
is as much contrast between the modern up-to-date sheep of to-day and his ancestors of less than half a century ago as there is between the old-time razor-back and our modern swine.

But those engaged in sheep husbandry have encountered obstacles, which in many cases has been of a very discouraging nature, and the first we will mention, is the dog nuisance. With the rapid increase of population, and the springing up of railroad towns and country villages, there has been a corresponding increase of the canine family; and there is as much enmity between the dog and the sheep, as there is between the seed of the woman and the serpent. And a dog—yes, we had better use the plural and say dogs—are a very necessary adjunct to a village home. And their depredations either sooner or later become so far reaching and extensive, as to cause farmers to abandon this industry entirely; and for this reason many localities which was once the home of the sheep has been given over to other industries. Of course our State laws afford some relief to the farmer in making good the price of his sheep; but they are not radical enough to reduce the number of worthless curs. A dog that is only worth 50 cents a year for the pleasure of his company, may not be much credit to the family. But if the tax was $5.00, most men would see that he was a worthy animal, or else dispense with him, and we believe in many cases a number of children would be allowed the full enjoyment of what they now have to divide with the canine members of the family. It has been shown "that the dogs of Ohio cost the State more than $100,000 annually in sheep killed." And we believe the loss in Pennsylvania is proportionately as great, but we don't have the data from which to deduce figures. In Wayne county the sheep destroyed by dogs in 1902, amounted to $1,572.

Another discouraging feature in connection with sheep husbandry, has been the low price for wool which has prevailed for a number of years. But, personally, this has never given us half the concern that the dogs have done. But this depression has been so pronounced and continued as to cause quite a number to dispose of their flocks and turn their attention to the mutton breeds, and the growing of mutton lambs; and it is along this line that we will direct our thoughts more particularly. And to some this may seem somewhat out of season, as a reaction has taken place, and wool has been very slowly advancing in price from year to year, thus giving encouragement to farmers to again turn their attention to the breeding of fine sheep.

But let this be as it may, the American people have become so partial to this toothsome morsel that there is no time in sight when mutton, and especially lamb, will not command paying prices. In fact, more farmers who turn their attention to the production
of wool, the greater will be the opening for the growing of mutton lambs.

I have never been an extensive breeder of sheep, but have never been without them, and have never known a time when a few sheep could not be made profitable. And my life experience has not been confined to either the mutton or the wool breeds; and I am free to say, that very much depends on circumstances whether it be better to grow mutton or wool breeds. Where a man has a large farm, and can afford extensive range to sheep, or where he desires to keep them in large flocks, we are convinced that the fine wools are the better adapted to his wants. But on a small farm, where the numbers must necessarily be limited, we feel justified in recommending the mutton breeds. They can be got into market at any age from three months of age upward, and thus avoid the liability of becoming overstocked, as is the case with fine sheep on a small farm.

It is possible, however, to use fine ewes for the production of mutton lambs, and it can be done quite successfully. In fact some men have a preference for fine ewes, and even agree that they produce lambs equally as good, as ewes from the mutton breeds. But personally, our experience does not justify this conclusion. We prefer at least a good infusion of blood from the mutton breeds, and thereby increase the milk production which is very essential in growing mutton lambs. And in this connection we would say, it does not justify us to raise ewes for breeding purposes. As a rule a lamb 3 months old will bring more money than it costs to procure an ewe old enough to breed. And we prefer to allow some one less favorably located to produce our breeder; and we save the expense of her keeping for a year before she is old enough to breed.

In order to raise market lambs successfully, it is necessary to have an abundance of stable room for the flock; indeed about twice as much as would be necessary for wintering stock sheep, and should be so arranged as to be made quite comfortable in cold weather. The flock should be in fine condition when winter begins. And if the lambs were marketed before harvest the previous season, and the ewes have had good pasture, they are likely to be in good flesh by breeding time. And without these favorable conditions we had better not try to raise lambs before spring time.

The proper time to mate for market lambs depends on circumstances. We have had them dropped in almost every month from early winter until spring; and have concluded that from Feb. 20th to March 1st for most farmers will give the best returns for the feed consumed. A good healthy ewe, well cared for, should produce enough of milk to grow her lamb from 4 to 6 weeks without pasture. And when more nourishment is needed, it can be produced more cheaply on pasture than in any other way.
While on the other hand, if a ewe of good milking qualities is not allowed to drop her lamb until after being turned on pasture, she will have an over-supply of milk to begin with, more than the lamb can take, and acting upon the same principle of a cow with which the calf is allowed to run, or is being milked by a careless milker, she will readily accommodate the flow of milk to the amount required; and by the time the lamb needs more nourishment, her milk flow is partially dried up.

It is a decided advantage to have a few hurdles made of light material, and so constructed as to form small pens in which to place the ewes having two lambs for a few hours after parturition. And it is a good practice, when it is known that this period is about at hand, to place the ewe in one of these pens, thus keeping her from being disturbed by the older lambs.

It is also a good practice to separate those having twins from those having single lambs, keeping each in a flock by themselves. The single lambs are likely to grow more rapidly and be the stronger and more able to crowd out the twins when old enough to be fed alone.

The lambs should be taught to eat dry food as early in life as possible, and they will do so more readily before than after they have been turned to pasture. This should be provided in an apartment to which the ewes cannot have access. And when it can be done, a place for feeding hay should be in the same place, and choice bunches placed there for them. Second crop clover, if cut when in bloom and nicely cured, is excellent for this purpose. But they should never be expected to eat it up clean, but the racks should be cleaned at each feeding and given to the ewes, or to cattle, and fresh things placed for the lambs. This will in a great measure obviate their crawling into the racks, and trampling over the hay placed for the ewes. They prefer to eat, and even lie by themselves when there is a convenient place to do so. Their feed at first should be bran and middlings, with a small amount of oil meal added. As the lambs grow older, whole oats should be added, and the amount gradually increased, and by the time they are 2 months old, they should be receiving all they will eat clean twice per day; and if at anytime some is left, it should be removed before another feed is given. When turned to pasture the grain ration should be continued, adding some cracked corn and whole wheat. In this way they can be made ready for the butcher at 3 months old, weighing on an average from 50 to 60 lbs. live weight; and we believe there is no other animal that can be placed on the market at so near a clear profit. I should say that these figures are not extravagant. We have been having them weigh even above this. We have them reach this weight at a younger age. The facts are, from experience,
of our own, we have been disposing of our lambs when less than three months of age. Last week I marketed lambs, the age of which were two months and ten days. We have found in our experience that the quicker we can get them ready for market the better.

If, however, we wish to raise regular hot-house lambs and dispose of them in February and March, the method of management and feeding would be practically the same, but we must then look out for a special market for them. And the demand is for a lighter weight, say 40 lbs. average. But during that season of the year good, fleshy lambs can be sold in our large cities at extravagant prices.

The care of the ewes during the time they are raising their lambs is all important. They should not only have such food as will produce a good flow of milk, but the strength and vigor of the ewes should be considered as well; and they should have enough of carbonaceous food to aid in this direction. A ration composed of corn, oats and bran, equal parts by measure, we have found very satisfactory. For roughage we prefer nicely cured clover, provided it is fine in the stem. Sheep do not like coarse hay of any kind, and for this reason mammoth clover is not a desirable feed. But clover and timothy may be made a desirable feed if cut when green. In fact we have many times been able to produce better sheep hay from clover and timothy than from clover alone, because the two together grew more thickly and finer than the clover alone, but too many destroy its good qualities by allowing it to become too ripe and by overdrying. Previous to the lambing season, corn stover is a good feed, to be fed during the day, provided the weather, and the ground is suitable to feed it on a sod. But we have not had very satisfactory results from feeding cut fodder in the mangers; and to feed whole fodder in the sheds is not worthy of consideration. Further, by feeding it on a sod has the advantage of giving exercise to the ewes which is very desirable during pregnancy. In fact, in our practice we keep the ewes confined as little as possible up to the lambing season, after which they are housed very closely. They should have succulent food of some kind for a month previous to the lambing season, until pasture is ready. And for this purpose roots are very desirable. Almost any kind may be utilized, but mangels are preferable on account of their good keeping qualities, but in practice we also use a great many turnips.

It is all important to have good, fresh spring water convenient, and so arranged that they may get it easily. If they have to put their front feet in the water in order to reach it, the chances are they will do without, otherwise they will consume a great amount while being fed on dry feed. During a severe cold spell we often
water in the stable while the lamb is very young, and under these conditions we can better determine the amount they will consume. During recent years it has been our practice to clip our ewes as soon as possible after the lambing season, and we have been well satisfied with the result. The wool presents a much better appearance and is free from weak spots. It is well known that it is difficult to keep a good milking ewe from going down in flesh, and this is sure to weaken the strength of the staple. The ewes must necessarily be stabled much of the time, and the lambs soon begin to tramp over them when lying, which soils and injures the wool. We clip without washing, and select a mild spell of weather for doing it, and when they have been clipped for a few days a cold flurry does not seem to affect them; but if out when a rain comes, they rapidly gather to the shed, and this is a decided advantage to the lambs, as they will often remain out, if not clipped, until the lambs are very cold. After clipping, both the ewes and lambs seem to improve more rapidly.

In the foregoing we have no thought of having touched upon all the important points connected with this subject, neither indeed, any considerable number of them, for such an attempt would not be practicable under present conditions; and will only say further, that successful sheep husbandry, like everything else, depends largely upon strict attention to little details. It is just as essential how we feed, as what we feed, and the utmost regularity should be observed. Sheep are sensitive creatures, and will announce their observance of irregularity by restlessness, which means wear on their system and loss of flesh. And the more regular and systematic we are in their management the less food it will take to keep them in good condition, and the shepherd be the better able to realize the full benefit from turning it into growth and high priced mutton of early maturity.

MR. MARTIN: What did you get a pound for those lambs?

MR. BURNS: I marketed lambs last week that I received seven and a half cents a pound for; the week before I received eight and a half cents. Now, of course, we have reached the pasture time, when lambs are coming into market rapidly. We have a special market for all the produce we raise on the farm, and for the lambs also, but we do not consider this an extravagant price. We have a neighbor who raised market lambs, and he disposed of his lambs at prices ranging from 12½ to 15 cents a pound. If you raise lambs earlier than the regular season, you should look for a better price.

MR. HALL: What market did you place them in?

MR. BURNS: I sold them to the butcher located midway between
Carnegie and Sewickley. My practice has been for years to market my lambs in Sewickley, the people of which do business in Pittsburgh and do not care much for the price just so they get what they want.

**MR. CAMPBELL**: Are you bothered with the parasites?

**MR. BURNS**: Not to any considerable extent. We cultivate our farm over in regular order, and we give our sheep different pastures as nearly as possible, and in this way we think we overcome that to a considerable extent, and our experience coincides with that of others who have written on the subject. We do not keep our lambs; only raise them to marketable age.

**MR. CAMPBELL**: These parasites are one of the particular points on this question. One of the worst things to contend with in sheep husbandry is the internal parasites. They drove me out of the business. It is very discouraging to go out in the morning and pick up a lamb from 80 to 100 pounds in weight, killed by tape worms. I had to do it.

**MR. BURNS**: Have you ever lost any lambs by the tape worms at two or three month of age?

**MR. CAMPBELL**: Not so much as when at 60 or 80 pounds in weight.

**MR. BURNS**: We want to get rid of our lambs as quickly as possible and therefore sell them as soon as they get the proper age and weight, and so we have had no trouble in this direction.

**MR. COX**: What breed of sheep did the gentleman have that he lost so many lambs?

**MR. CAMPBELL**: Shropshire.

**MR. COX**: I think if he would introduce or mix the blood that he probably would not have so much trouble. I know we have had the thoroughbred Shropshire, and we found that this trouble was greater with the thoroughbreds than with the grade sheep, and we have introduced some fine blood into the sheep and lambs, and do not have any trouble of that kind.

The **CHAIRMAN**: The next topic will be:

"General Fruit Growing—How to Take Care of Trees," by J. H. Ledy, of Marion, Pa.

Mr. Ledy presented his paper as follows:
GENERAL FRUIT GROWING—HOW TO TAKE CARE OF TREES.

BY J. H. Ledy, Marion, Pa.

This topic embraces so much that I scarcely know what to say in the time that is allotted me, in order to bring out the most that the topic suggests.

While fruit culture in Pennsylvania is as yet practically in its infancy, and while it is true that we must depend largely upon commercial orchards, because of the numerous and various insect pests with which we must contend, and to make orcharding a complete success, the grower must devote his entire time and attention to the business to make it profitable; yet it seems to me that every farmer in Pennsylvania should grow at least enough fruit of all kinds, or nearly all kinds, to provide this luxury for his family during the entire year. I shall not take up your time going over varieties in particular, but will suggest that every farmer have an orchard, commencing with strawberries and following up with the different varieties of raspberries, blackberries, plums, peaches, pears and apples. By a careful selection of these fruits, which are adapted to his soil and climate, he should have fruit for the table from May 15th to May 15th. Plant the trees that do well in your locality, follow the man who has succeeded with certain varieties, and to a very great extent leave experiments with new varieties to the other fellow. Every farmer should experiment in a modest way, of course, but not plant many trees which are uncertain and which has not been tried in his locality.

To get back to my topic, I will start with planting an orchard of one acre, composed of trees filled in with small fruits. First, plow the ground deep and cultivate it thoroughly, then mark it out, starting at a given point, running a straight line along one side of your plot, and mark it with parallel lines every fifteen feet, then cross mark it every eighteen feet; this will make your plot marked out fifteen by eighteen feet. Commence to plant where you commenced to mark, first planting an apple tree, eighteen feet farther on at the crossing, plant a plum or a dwarf pear, whichever is best suited to your taste, then eighteen feet farther, in the same furrow, plant another apple, and so on until you have completed this row
of trees. Start the second row and plant peach in the entire furrow; the third furrow start with a plum or dwarf pear, and the second tree plant an apple, plant alternately to the end of the row; the fourth furrow should be planted exactly as the second, the fifth row exactly as the first, and by this plan we have an orchard composed of apples, plums or dwarf pear or both, and peach. The small fruits can be planted in between every meeting three or four rows, the fifteen foot and four or five the eighteen foot way, and still allow room for thorough cultivation; we only miss three where the tree stands. The plan is to eventually have, after the peach and plum or dwarf pear have ceased to be profitable, a permanent apple orchard, with trees 36 feet between the trunks, and the ground upon which it stands has been profitable almost from the beginning, or at least from the time it was one year old.

The care of trees can hardly be explained fully unless it be in the midst of the orchard; however, the kind of tree to be selected for planting the orchard, in my opinion, for apple, should at all times be two or three years old, never older than three years, and preferably a good, vigorous two year old. The roots should be cut back to a uniform length, and all broken and bruised parts removed. The top should be cut away, leaving only three or four limbs to make the top; should these be bruised and broken, I would cut back to the main stem, in a two year old, and depend upon new wood for the top. As a rule the habits of the tree should be considered, and where a tree has a tendency to grow upward and compact, they should be pruned accordingly, leaving the bud which is to make the future limb on the inside or outside, entirely according to the habits of the tree. No man can lay down a systematic rule for pruning by itself, and the operator must see it several years hence, before he is able to prune intelligently.

After the tree is once well started it should be thoroughly cultivated and intelligently pruned every year until it is six years old at least. Indeed, I believe it should be thoroughly cultivated and pruned more or less during its natural life. The young tree should be dug around and carefully examined for borers every spring and fall, and then washed with caustic potash or whale oil soap, every spring. If this advice is carried out the trees will be perfectly healthy and smooth in the bark, unless they should be attacked by the worst of all insect pests, the San José Scale. Fruit men differ very much with the proper treatment for this pest. My experience has taught me that crude oil will kill the scale beyond all question, but if the buds are the least bit advanced it may kill the limb, and possibly the tree. With one year’s experience, I should not hesitate to recommend for this pest the lime, sulphur and salt treatment, which I am well satisfied if properly applied
will eradicate the scale, if such a thing be possible, and do much less injury to the tree than crude petroleum. This is the remedy we use: Ten pounds of sulphur; ten pounds of quick lime; ten pounds of salt. Boil together for two hours, and then put into a cask and add enough boiling water to make fifty gallons.

There is an insect that is more or less injurious to us just now, and that is the aphis or green louse. I think the question was asked Professor Surface yesterday, and I think he forgot one thing I regard as important. I am satisfied that he knows this, because the man who knows more about bugs in Pennsylvania don't exist. The aphis or green louse can be killed without any injury to the foliage at all without much trouble. Take one-fourth pound of epsom salts, dissolve it in one gallon of water and apply with an ordinary spray pump, a broom or sprinkling can. Professor Surface told you yesterday that once the aphis has gone on so long that it has curled itself into the leaf you cannot reach it with anything.

Taking into consideration the scale, and the numerous insect pests with which we have to contend, I believe that in the future the markets of the world will be dependent upon the commercial fruit grower, who devotes his time, his brain, and his muscle to his business for their supply of fruit; yet I see no good reason why every farmer and every man, who owns land, should not be able to produce enough fruit of almost every kind for the use of himself and family, and some to sell.

The location of the orchard is important, in a measure, and it is very hard to give exact direction as to where it should be planted to bring the best results; the general principles, however, that should be followed are established by experience. There are a number of points to be considered in the selection of your location, which will apply to all fruits. All fruit trees require a deep soil, and a sub-soil which has complete drainage. The most important thing then to be considered is an open sub-soil that will allow complete drainage.

Opinions differ very much as to exposure. For my part I do not believe there is much difference in this particular; of course, if we had the making of our farm we might change the lay of the land which we intended for the orchard somewhat. A northern exposure is certainly preferable, if there is any difference, for the reason that the buds are kept back later in the spring, and are not so liable to be frozen. Most people make the mistake of planting too many varieties, as I said in the beginning; plant the tree that your neighbor has succeeded with, has made money out of, the man who has the same soil practically that you have, the same, climate, etc., follow him, plant the same varieties, and leave experimental fruit.
growing to the good old State of Pennsylvania and the other fellow.

Up in my home, good old Franklin county, I believe that we are able to grow as good, if not the best fruit in Pennsylvania. I feel like making that broader. I believe we are able to grow the best apples and peaches in the United States; indeed broader still, there is no location with which I am familiar that can surpass our natural conditions, and if this meeting would not accuse me for boasting, I should not hesitate to say, that we are able to grow the best apples in the world. We are unquestionably growing the best Crawford, Smock, Champion, Geary's Hold On and Bileyenus peach, and the best York Imperial, Grimes' Golden and Maiden's Blush apples, and Kieffer and Lawrence pear to-day that reach our eastern market.

If the farmer of to-day will carry out the suggestions which I have given, namely: Select a good piece of ground, plow, harrow and cultivate it thoroughly and completely, select good trees of the proper varieties, which are suited to his locality, prune them and plant them carefully, then again prune them and cultivate them carefully, look after the insect pests, and treat the trees before the pests have injured them, and success, I am sure, awaits him. And with such men as the peerless Martin as Chief Director, and such a tireless and persistent worker as Prof. Surface right amongst us, whose advice at all times is as free as water, dear old Pennsylvania will soon be the leading fruit growing state in the United States.

A Member: How about that formula for rose bushes?

MR. LEDY: I am not familiar with the rose bush question, but do know that epsom salts will kill the green louse on the apple tree.

A Member: Is it the same louse?

MR. LEDY: I think not.

A Member: Professor Heiges gave us that receipt a number of years ago.

MR. LEDY: This will do it. It costs from a cent to a cent and a half wholesale. It is the cheapest and simplest, and won't hurt anything.

MR. JAEKEL: I am sorry that I have to differ in some respects with the gentleman. This paper might leave perhaps a wrong impression on the minds of some of our farmers. I agree with the gentleman that the orchard on the average farm is just in about the same condition as the chicken-yard; that the orchards are not looked upon as a productive element in farming.

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What I am going to say is based on forty some years' continued experiments, with the exception only of during '63 to '65. I have made all kinds of experiments and the results are shown there in Blair county. I do not advocate for any farmer to have a mixed orchard. It is injurious to the orchard and it is so to the tree. You cannot profitably raise apples and plums together, nor can you raise a few plum trees by themselves. I have at different parts in this State seen German Prunes growing which will not bear at all. You must have a number of different plum trees together or else they don't fertilize. I would not advocate or would not say under any circumstances you should have a mixture in the orchard. I have had orchards with apples and peaches and they did not do well. I have had orchards with dwarfed pears and apples and they did not do well. I have had apples and peaches and pears alone and they did well. This was my experience. Two didn't do well on all different kinds of ground. We are trying now different experiments on the mountains, and I have planted all kinds of trees. There are two experimental orchards on the farm of seventy-two acres, with two different kinds of pears and 42 kinds of plums, and I can only say that about five different kinds of pears are good and about four different kinds of plums are good. The balance are not worth anything.

MR. LEDY: If the gentleman who just left the floor will come to Franklin county I will convince him, if he can be convinced, that it is possible to grow plums and apples and peaches and apples in the same orchard, and do it to perfection. We have done away with the kind of plums that don't bear and planted the kind that do bear.

The CHAIRMAN: The next paper on the program is on the same line as the one we have just heard, and the same discussion will probably apply to both papers. We will now have "The Apple Orchard," by Samuel W. H. Waltz, of Williamsport, Pa.

The paper of Mr. Waltz is as follows:

THE APPLE ORCHARD.

BY SAMUEL W. H. WALTZ, WILLIAMSPORT, PA.

This paper is not intended for the expert orchardist or tree planter. He has no need of it—his own study and experience being sufficient to guide him intelligently. It is rather addressed to the
inexperienced and the busy farmer with his many cares. Those who have also given this subject but little if any study are likewise included among its audience and are very kindly admonished to plant apple trees, even though it be but half a dozen, on the village lot or a few more in the old orchard of the homestead:

"Set out trees! yes, plant an orchard,
Dear, good farmer do you know
Of the wealth there is in fruit trees,
For the labor you bestow?

"Let the home be so attractive
That the boy that is to-day,
When he shall arrive at manhood
And in foreign lands will stray,

"May turn with longing heart and loving
To his home these hills among,
Thinking how the trees are thriving
Which he helped to plant when young.

"Have the children's playground shaded,
And the public walks as well,
And the joys from these arising
Coming ages glad will tell.

"These shall live and grow and gladden,
While we moulder 'neath their leaves,—
Let us then improve the present,
Leave behind us priceless trees."

To some it may seem somewhat surprising, but nevertheless it is true, to find farmers—and so-called successful farmers too—who do not raise apples enough for use in their own homes, and thus depriving themselves and their families of one of the best and most healthful luxuries of the land. There is not a farmer in Pennsylvania, though small his possessions, but what should grow apples sufficient, at least, for use in his own family, and the product of which, in some form or other, should be found on his table every day of the year. There is probably no section in this great State of ours—at least none of any comparative importance—in which apples will not grow. While it is true, no doubt, there are localities that produce crops of greater abundance and fruit of higher perfection than others, yet in speaking of the farmer in general, the prediction can be safely ventured, that to him an apple orchard, at least for home or family purposes, would be a timely and profitable investment. The family orchard and the commercial orchard must be viewed from different standpoints, the former being a branch or adjunct of mixed or general farming, while the latter represents the business or vocation of the specialist. While it may be a fact,
perhaps, there are sections in which commercial orcharding could not be safely and profitably undertaken, yet this does not reasonably imply that there is a single farm in this entire Commonwealth that will not produce apples, sufficient at least, for use in the home. Therefore, it is not the purpose of this paper to speak to the exper; commercial orchardist, but more directly to the everyday farmer, and if these words may inspire some one to plant but a single tree and properly nourish and protect it, their mission will have been accomplished.

SOIL.

The mistake commonly made in locating an orchard is in selecting a poor piece of ground. Land that is thin, rocky and too steep to cultivate and very much unsuited in every way for growing the ordinary farm crops, in fact the roughest piece of ground on the farm is very often selected as the site for the young apple orchard. By this procedure the farmer is often led to conclude that he is wisely practicing economy in appropriating his rough and partly valueless land to apple growing. No soil is too good for growing apples, and he that expects to receive anything like paying results from his orchard must give his trees a soil fully as productive and a treatment fully as generous as that bestowed upon any other crop from which remunerative results are expected. A soil that will produce any good farm crop, will also produce good apples, if the necessary precautions are taken to keep it in proper tilth. This can be very readily ascertained by planting the ground to some annual crop, such as corn or potatoes. If a good yield is obtained, it may be taken as a good indication that the soil is in proper condition for the trees; if not, it should be cultivated and fertilized until it may have reached the required standard of fertility. On loamy soils the wood growth is strong and vigorous, but is not always sufficiently mature to withstand the rigor of our Pennsylvania winters. Clay lands are naturally not such heavy producers of wood growth, but trees grown on these soils are hardier as to winter-kill ing than on loamy or sandy soils. The objection urged against sandy soils is that they are often lacking in some of the requisite plant food, but soils and subsoils of this character also possess their points of merit in that the ground never becomes hard and compact, and the trees are permitted to readily and deeply penetrate their roots in every direction. The typical soil for growing apples seems to be one that is rather open and porous and overlying a like subsoil or one not too compact in texture. A loamy soil, with a mixture of clay and sand or gravel, would, therefore, apparently possess the proper physical combination for apple culture. These qualities permit an easy and unobstructed penetration of the roots and a healthy circulation of air and water.
There seems to a considerable diversity of opinion as to the proper location or exposure of the orchard. Some claim that the best results are derived from a northern slope, some from a southern, some from an eastern and some even from a western. These different exposures all have their merits, and the most intelligent and experienced orchardist is often given considerable difficulty in knowing just what is the best location to select. Orchards located on an eastern or northern slope perhaps suffer less from the effects of heat and drouth than on any other location, consequently the trees will retain their vigor and longevity better than if inclined to the south or southwest. The advocates of a northern slope contend that an orchard with such an exposure is not so quickly influenced by changes of temperature in winter; besides, such soils do not warm up so rapidly in spring as one with a southern exposure, which receives the direct rays of the sun, consequently lessening the danger of loss to buds and blossoms.

The site, if possible, should have an elevation above its immediate surroundings, thus affording a free circulation of air. A situation like this will also be less subject to late spring frosts, which are very often so fatal to young fruit at this period of growth. When setting out an orchard for commercial purposes, select the best location on the farm, but when planting, especially for family use, a site in a remote and out-of-the-way place should be largely avoided. The proper place for the family orchard is near the home, if even a more favorable situation must be sacrificed. While the orchards of our grandfathers perhaps did not always receive the care and cultivation necessary to beneficial results, yet they were always, comparatively speaking, located near the house, and to succeeding generations grandfather’s old apple orchard, though sometimes with rude but ever happy surroundings, has sung itself into cheerful homes and pleasant memories:

"My grandfather’s orchard! Ah, would I could see it
As when in my childhood I climbed its dear trees,
And tasted its treasures so fragrant and luscious,
And fitted each fancy to certainly please.
In springtime its branches with flowers were laden,
And promised each palate exactly to suit.
When old Time had wrought, with his wonderful magic,
The strange transformation from flower to fruit.

"The Yellow June Eatings, so mellow and juicy,
The Redstreaks, so pungently acid, for pies,
Seek-no-Furthers, and Russets, and Pearmains, and Greenings,
Spice Sweetings and Spies, I in memory prize.
Each name calls up visions, both pleasant and tender,
Of scenes that have forever passed from my sight,
Of fair summer days and long evenings of winter,
Of tasks done by day and of frolics by night."
"In autumn we gathered the apples with gladness,
And stored them in boxes and barrels away.
We buried our teeth in their fresh juicy crispness;
And thought their fruit harvest was nothing but play.
Dear trees! That they loved us we never could doubt it:
They ministered both to our fancies and needs,
Their beauty rejoiced us; we ate of their apples,
Our fortunes we told with the parings and seeds.

"Hesperides' gardens could not have been fairer,
Nor sweeter to taste their famed apples of gold:
Fond love grants a charm to whatever it touches,
That safe from Time's withering touch doth enfold.
So grows in my heart my loved grandfather's orchard.
With blossoms and fruits ever fragrant and gay.
While birds in the branches are caroling sweetly,
And beneath them are children forever at play."

DRAINAGE.

If the natural formation of the land does not afford ready drainage, it must be provided by artificial means. No orchard will thrive and endure long with stagnant water either on the surface of the soil or within it, and unless the land drains naturally or good drainage can be secured by an artificial process, it will in all probability be a loss of time and money for any one to attempt to grow an orchard on such land, and at the same time look for a reward of many beneficial results. Ditches or furrows on the surface afford only temporary drainage, and on account of this and many other objectionable features they are not to be recommended. An orchard thus drained is very difficult to cultivate and properly care for, as well as in gathering and handling the fruit. Sub-drainage is the only proper drainage for an orchard.

PREPARATION OF SOIL.

Having once decided upon a location for the orchard, the next step is to get the ground in proper condition for the trees. The soil should be in a productive state of cultivation for planting before the trees are set out, as it becomes very difficult after this to correct any evils which may then be existing. The planting of an orchard is not unlike the building of a house, the latter can not stand well on a foundation of unsupporting stability, neither can the former long thrive and endure on a ground-bed of insufficient preparation. The work of preparing the soil for planting consists in thorough tilth. A crop that requires deep and continuous cultivation is desirable to grow for a year or two previous to planting the trees. If the soil should be heavy, extra precautions should be taken to thoroughly break up and loosen the subsoil. There is nothing that
will bring about a more favorable and productive condition of the soil for planting trees than a liberal application of barnyard manure, which produces the necessary humus, so important to the orchard, and then by following for a year or two with deep sub-soiling, a state of fertility shall have been attained by the soil for a fine and healthy growth of trees.

SELECTING TREES.

It would not be advisable for the average farmer and orchardist to raise their own trees, but more economy and convenience could be practiced in buying them from the nursery. It might be preferable, in some cases, for the more extensive planters of commercial orchards to grow their own stock; but, as a rule, it is better to buy them, especially so if it can be done at a local nursery. There are many advantages in purchasing of the local nurserymen, provided, of course, he is responsible and perfectly familiar with his business. The local dealer will understand better the demands of his home customers and will naturally grow the varieties best suited to his section of country, and if he is honest, more reliance can be placed on the correctness of his nomenclature. Considerable difficulty is often experienced by purchasing of agents representing nurseries located at a distance, that their trees are not true to name. By securing trees of the near-by nursery, the danger of damage resulting from long transit can be practically obviated, as well as the injurious effects of sunshine and frost.

The selection of trees is a very important feature in orchard growing, for upon care and good judgment in this particular depends largely the future life and profits of our investment. Trees with a strong, stocky, vigorous trunk, abundant root system, well formed top and medium in size are the only ones that should be given a place in the young orchard. It is better to pay twenty cents for a tree of this description than ten cents for one of inferior quality. The age of a tree is not so important as a vigorous and hardy growth, and a stock make-up. The best trees are not always those of largest size. A two-year old tree, such as already described, all things considered, will give the best satisfaction. Although there are those who prefer a tree of even only one year's growth, while there are some that have a preference for stock three years old. If these directions in buying apple trees are followed and specimens of this type and age are selected, much will be gained in cost, transportation and transplanting and more satisfactory and profitable results attained in the end.
WHEN TO PLANT.

The time for planting is governed, to some extent, by circumstances, and both spring and fall planting have their advantages. From the experience and observation of the writer, it would be somewhat of a difficult question to state his preference on this point, as some very plausible arguments can be advanced on either side. One objection urged against fall planting is "that the roots of a tree do not take hold of the ground sufficiently to supply enough moisture to maintain a healthy, active circulation of the sap which is required to prevent shriveling of the branches during winter's extreme cold and exhaustive evaporation from drying winds." On the other hand we quote from Prof. Bailey in favor of fall planting: "That the trees become established during the open weather of the fall and they usually make a start in spring before the ground is dry enough to allow of spring planting. This early start not only means a better growth the first season, but, what is more important, trees which get a very early hold upon the soil endure the drouth of midsummer much better than the trees planted in spring." It will not be very safe, however, to plant in the fall unless the trees are thoroughly well-matured. It is quite evident that from a choice of unfavorable conditions of either season, spring planting would perhaps be the safer course to follow.

DISTANCE TO PLANT.

The proper distance apart to plant trees in the orchard is a subject of much controversy among apple growers. There seems to be a tendency rather toward close setting and severe pruning. This does not seem to be nature's way and rather the reverse should be the rule. The error of close planting is almost universally committed. The trees are usually set so close that the branches interlock in a few years; but there are those, however, whom experience has taught the impracticability of this custom. An apple orchard of a forest like appearance is not to be desired, for it shuts out sunlight and keeps the ground damp, conditions very favorable for the breeding and harboring of injurious insects and disease. Close setting also very naturally hinders in the cultivation and spraying of the orchard and in the production and gathering of the fruit. The fruit grown on trees that are set too close, unless severely pruned, which always has an effect of more or less injury, does not produce a growth as perfect or a color as rich as that upon trees set at a greater distance.

In planting trees, the land should be laid off in perfectly straight rows and the exact location for every tree determined before digging
the holes. Straight rows add much to the beauty of the orchard—
for nothing is really complete without beauty in some form or other,
and also greatly facilitates cultivation and harvesting of fruit. The
distance to plant should be somewhat regulated by the productive
ability of the soil. On strong soil, where the tendency is toward a
rapid and large wood growth, the trees should be set at a greater
distance than on light soils, where the productive capacity depends
somewhat on the generosity of the orchardist.

There is also another feature that should be taken into con-
sideration—the habit and life of the tree. Long-lived varieties
usually attain a size of larger dimensions, while those of a shorter
existence are more diminutive. On good soil, forty feet apart is
not too far and in the end will give better results than when set
at a closer distance. Where the land is lighter and not such a heavy
top likely to be formed, from thirty to thirty-five feet would be a
sufficient distance. On poor hillsides, so commonly selected as
orchard sites, twenty-five feet would probably be sufficient for any
variety, but such locations, if good results are looked for, should be
readily discarded. Varieties like the Baldwin and Rhode Island
Greening will extend nearly, if not quite, forty feet in diameter,
while varieties like the Northern Spy, Ben Davis and York Imperial,
with less spreading heads, may be planted at a somewhat shorter
distance. Do not crowd, but provide ample room for every tree, and
let in plenty of sunshine and fresh air.

VARIETIES.

The choice of varieties should be made more according to loca-
tion than according to the fancy of the planter. The principle "that
a variety is largely an expression of the condition in which it exists" should be clearly comprehended. "The variety, as an entity, retains
its general varietal characters under widely diverse conditions, but
its form, size, color, quality, texture, time of ripening, form of tree
and root system are profoundly modified by the particular environ-
ment to which the variety is subjected." The planter should make
his immediate environments a thorough study and those of his
neighbors who have had practical experience in growing varieties
on soils and exposure similar to his own, should be taken into
counsel, and the benefits thus derived from their knowledge and ob-
servation, will be a safe guide for the planter to follow. It is not
found convenient or profitable to select too many varieties, and in
making up a list, the orchardist should aim to cover the entire
fruiting or ripening period of his section. Plant a few trees of the
very earliest bearing varieties, and so on down through a regular
series of maturity, until the winter varieties are reached, of which
variety the bulk of the trees should principally be composed.
CULTIVATION.

During the first year of its life, the young apple orchard should receive thorough tillage. The object of cultivation is threefold: "First, to increase the active food in the soil by making available to the tree what is otherwise inert; second, to prevent loss of moisture by producing a loose mulch upon the surface, and third, the destruction of weeds." Cultivation will also "prevent the establishment of a system of surface roots, and to form a deep-rooted habit in the tree." With this method only the main roots, which have a downward tendency, will survive, as the horizontal roots of the surface will be broken. The young orchard should be plowed every spring as soon as a team can get on it and the ground is in proper condition for plowing. It should be well stirred with a two-horse plow five or six inches deep, except near the trees, using a short singletree next to the row to avoid the danger of injuring the trunks of the trees. Cultivation with a harrow or cultivator once in about every two weeks should be continued until the middle of June or the first of July. At the last cultivation of the season, seed the orchard with clover, rye, buckwheat, or the trailing varieties of cow peas, which serve as a cover crop which puts the trees in excellent condition to go into winterquarters. The surface should be kept as nearly level as possible and the furrows should be alternately turned toward and from the trees, and the cultivation should be continued from year to year, at least until the trees come into full bearing. If the orchard is not cultivated early in its life, as already mentioned, the roots establish themselves near the surface, in which case it would be better not to cultivate the soil and permit the orchard to remain in sod. Orchards of this nature when showing a lack of thrift, should be fed heavily on the surface with soluble food.

TREES NEED TO BE FED.

The modern apple is the product of a fertile soil, and regular crops of large and fair fruit should only be expected from trees that are regularly fed. Because apple trees will exist and occasionally bear a partial crop of fruit if they are utterly neglected, it is too often assumed that they require no care after they are planted; but poorly fed apple trees can only be regarded from the fruit-grower's standpoint as unprofitable possessions.

Plant food may be supplied from the following sources:

1. By top-dressing the soil beneath and about the trees with barn-yard manure, at the rate of one cord to from five to ten trees, depending somewhat upon their size. This may sometimes be sub-
stituted by an application of equal value of unleached wood ashes. One ton of the latter being about equal in value to five tons of the former.

2. By the use of manufactured fertilizers. Just what the necessary ingredients should be without knowing what elements are lacking in the soil, is a very difficult question to determine, but the substances most commonly deficient are nitrogen, potash and phosphoric acid. A mixture containing from 1 1/2 to 2 per cent. of nitrogen; 7 to 9 per cent. of available phosphoric acid and 10 to 12 per cent. of potash, will give excellent results when applied to orchard land in quantities ranging from 400 to 600 pounds.

3. By the growth of nitrogen-gathering crops in the orchard and the application of a small amount of fertilizing materials consisting mainly of potash and phosphoric acid. This seems to be the cheapest way of maintaining the fertility of an apple orchard, as it returns to the soil more plant food than it takes from it, thereby permanently appropriating its surplus fertilizing constituents to supply the deficiency caused by the growth of a fruit crop. Sow the orchard to some corn crop immediately after the last cultivation, using clover, if nitrogen is needed, and rye, buckwheat or any other plant that will furnish a winter cover where a non-leguminous crop is wanted. This cover crop will catch the soluble nitrates; subtract the available plant food from the trees; open the soil; give it fibre and increase its moisture-holding capacity.

It should be stated that the addition of humus to apple lands must be practiced judiciously, as it can easily be over-done, if the nitrogen is not properly balanced by other fertilizers. The effect of crimson clover and cultivation is shown by a very large, deep green, late hanging foliage, and a strong, annual wood growth. The effect of the injudicious use of the clover will be apparent in the fruit, before it shows any injurious effect on the trees. It may keep the apples growing so late in the fall that the red varieties do not develop their color pigments before it is time to harvest them, and a yellowish color predominates. The light colored fruit is probably due to the addition of too much humus to the soil, to the moisture always present, to a lack of potash, and especially of phosphoric acid, which has as one of its distinct functions the maturing of fruits and wood. It is also aggravated by the greater shade made by the dense mass of foliage.

**TREES NEED WATER.**

If the supply of water in the soil in an orchard is deficient when the fruit is maturing, as it frequently is, the tree cannot produce a full crop of apples, however well they may have been fed and otherwise cared for. The lack of a sufficient amount of water in
the soil in orchards often is the cause of apples dropping prematurely, and the ripening of winter fruit during the fall months. While it may be impracticable to attempt to supply water artificially, in most cases at least, to orchards in this State, yet much can be done by good management to prevent the needless escape of the natural supply, and in this way large quantities of water may be retained in the soil for the use of the trees when it is needed by them.

As stated before, at the last cultivation, the land should be seeded to some cover crop to protect it during the winter and to retain its water-holding and retentive capacity. By the time winter sets in the ground should be covered by a heavy mat of herbage. Plow the orchard as nearly in the spring as conditions will admit in order to hold the winter rains in the ground, and to give the trees a vigorous early start. The addition of this vegetable matter to the soil greatly prolongs the wood-growing period and pumps out tons of water in its growth.

The great problem in orcharding of the present day is to save moisture. We can not afford to leave weeds and grass use up food and moisture, so much needed by the trees. During a season, a sod of timothy, making two tons of hay per acre, will pump out of the soil five inches of water, equal to more than four thousand barrels of water per acre. Imagine the time it would take to replace this amount of water. It would require a man and team an entire month, even though the haul was only one-fourth of a mile. The trees need all this moisture and if we leave nature alone, she will plant weeds and grass, which takes the breath out of the leaves and the blush from the fruit. Cultivation saves moisture. A mulch on the surface prevents the wind and sun drying the soil.

It has been demonstrated by experiment that orchard soil with a clover top turned under and good cultivation retains twice the amount of moisture as that conserved by orchard soil which had no humus and no cultivation. For practical irrigation a harrow beats a sprinkling cart ten to one. A suitable orchard soil that has been tilled from early spring until the middle of June, and which contains considerable humus, will retain enough of the rains, caught during the winter, to keep the apple orchard growing vigorously the entire season, in spite of the most severe summer droughts, while an adjoining orchard in sod, or in fallow, may lose its foliage and ripen its fruits when half grown.

**TREES USE SUNLIGHT.**

The amount of work done in a year by an apple tree is a study and a wonder. It is no small task to collect the material required to mature fruit and in manufacturing it into such refined products
as York Imperials, Baldwins and Spies. Sunlight is the most important factor from which the apple tree derives power to run its machinery. The amount of this power that a tree can use largely determines the amount of fruit the tree can bear. It is, therefore, evident that the surface area of the top of an apple tree should be as large and as well exposed to the sunlight as possible. The practice of cutting off the lower limbs of an apple tree is entirely too common. In a well developed tree this would amount to from four hundred to eight hundred square feet of the normal bearing surface of the tree. This custom also results in permanent injury to the tree, whose natural habit is to form a rounded top and bend its branches low to catch every ray of sunlight it can appropriate. It has been demonstrated by experiment that the limbs of apple trees exposed to strong light produce more fruit buds than those which are in partial shade.

The CHAIRMAN: We have heard four solid papers, each and everyone giving us a large amount of food to choose, and as we have about half an hour of the morning session yet we will consume as much of that time in discussing these papers as may be necessary. I will ask you, however, to make your speeches as short and to the point as possible, because there may be a great many who wish to speak. I will not designate what papers shall be discussed first.

MR. JAEKEL: Some of the papers have said something about choosing the land for the orchard. There is not a piece of ground in the State of Pennsylvanina in which you can readily stick a spade which would not be fit to plant some trees. It is true that the pear wants clay soil and the cherry tree a lighter, dry soil. It is understood that all trees want to have dry feet on well drained ground. But trees will grow on any ground. Some years ago the idea was that apple trees would not grow after apple trees. I made an experiment. I had a Maiden Blush that broke down, and I dug a large hole and I put several cart loads of street ground in and I planted a Smokehouse in it and that is just twice the size now, and has been bearing nearly as much as the other tree and is twice as large. So you can plant apple after apple if you provide food for it. There is not a piece of ground in Pennsylvania in which you can stick a spade which is not fit for some tree or other, and it is very wrong in farmers not supplying their homes and their people with the luscious fruit from the strawberry to the late pear and the Russet apple.

SECRETARY MARTIN: I would like to bring a question before the convention regarding this program. Certainly you ought to
be commended as institute workers for the punctuality and promptness with which you have responded to this program. Now we have come to a time in this convention and the day in which we are approaching its last session, and there have a number of suggestions come to me regarding this last session. Trains leave during certain hours this afternoon which will carry us to our homes, and in preparing this program I regarded the topics to be discussed, miscellaneous, as possibly of the most importance to the advancement of the work in many ways, and I sincerely trust that whether this session is continued for a length of time longer than is marked by its numbers, that these questions have a place somewhere to be discussed.

Now, we want to get the voice of this convention as to the time for final adjournment. As stated in the foot-note to the program, this meeting is yours. If you desire to hold this session this afternoon and one to-night, that meets my approval, I assure you. We will then not have to enter upon the discussion of these topics now. We want your voice upon this point. Shall we hold this afternoon's session and a night session as well?

(After considerable discussion it was decided to hold an afternoon session to take up the questions set for general discussion upon the program for Thursday afternoon.)

MR. HERR: We have just closed one interesting subject here which has not received the attention that it should. The subject of fruit culture is a very important one. It was demonstrated by our last year's crop of apples, and our State is a great fruit growing country. We are just developing into one of the greatest fruit states in the United States, and we can get something that is worth money to us out of the discussion of fruits. There has been great advancement made in fruit culture. I remember a few years ago a man planted a very large orchard in our county, and the one consideration that we have recently developed was lost sight of simply because he planted his varieties in great blocks. While he took great care in planting and culture and growth of the trees, he waited years and years without a crop of apples because he neglected the idea that some varieties of apples needed polarization. The orchard went into other hands and run down and finally some of the trees were taken out and other varieties planted in, and last year they had an immense crop of apples. There is no acre on the farm to-day that produces as well as an acre of fruit. The apple acre is the most valuable of the farm.

We are gradually developing on some other lines. We find some varieties of fruit run out sooner than others. I had a nice lot of York Imperial apples damaged last fall. I would like to see these
matters discussed. I cannot agree with all that was said by the gentlemen who prepared those papers, but they are worthy papers and have brought out many good thoughts. I am like my friend Mr. Jackel, I have not had much success in growing all varieties on one piece of ground.

MR. HOOVER: I want to make a few remarks in regard to apple orchards. As some people know, I have been a tree planter for a number of years. I wish to point out a few errors in regard to the matter of planting and taking care of trees. One of the greatest mistakes made by many of our people in my section is in selecting trees. They take in the branches of the top more than the roots. And then the other, particularly, that we heard here so well and ably discussed, we cannot have too much loose soil to let the young roots grow. We must start right.

In cutting back, there is a great deal of trouble to impress people that the cutting back of the top of the tree is the very thing to do in the start. The more top there is, the greater effort the tree must make to push forward and grow. The top should be very small; in peach trees none at all; in other varieties, I cut back severely apples and pears; not so much for cherries. My experience is that cherry will not bear as severe pruning or cutting back as other trees; but the peach, by experience, succeeds best by cutting back, cutting the top away altogether. But it is difficult to make the people believe and only by experience can you convince them.

Another difficulty or trouble with our tree growers is they don't carry out what we heard in these papers, and that is to take care of the tree after planting, and the result is the same as if you planted corn and left it to itself.

There is one other thing, and that is in the form of the top of the tree. Never allow a fork to grow at the top. If it should have two branches at the top cut out the lighter one or some day a storm will come along and down goes your split in half.

There is a great deal of practical information in those papers and in fact I myself, although I have been trying for years to get the best results, got a few things that I shall take home with me not only for myself but for others. I shall do so in not only this but everything else. Whatever benefits I have received I will take home to my neighbors and friends.

MR. MILLER (Somerset county): I have been sitting in this convention of almost three days and did not have a word to say; but the idea struck me that most of these papers are from specialists; they are not from the general farmer. If we want to do what you have said we should do on a farm of 200 acres, where there is but one man and a boy, and you have heaped three years into one at least. If
we are to do the common farming, the raising of cereals or potatoes or clover hay and attend to our dairies besides and then go into these large orchards and cultivate them and raise the fruit for the whole year to sell and to fill the markets, you will kill us with work. I have been on the farm ever since they have brought me into this country, fifty-four years and more ago, and I have had the practice of farming, and in this time I discovered there is not any man can do all this work. Men don't have the time or muscle; don't have the brains to do it. It is too much. It will do for a man to plant an orchard and cultivate it and pick and sell the fruit, but that is all he can do for the whole year. If he has to raise any cereals, if he has a dairy, or raises his potatoes, hay and grain for the winter, it is about all he can do if he can do that. Every farmer ought to have a little orchard, but it will be neglected. It cannot be cultivated or brought up to perfection as it ought to be, but I say he ought to have it, and he will have a little fruit, but the orchard will be neglected in a way. So I say, don't heap too much on us.

Upon motion, the meeting adjourned at 12 o'clock noon to convene this afternoon at 1:15 o'clock.

Thursday Afternoon, June 4, 1903.

SECRETARY MARTIN called the meeting to order, and in the absence of the chairman for the afternoon designated on the program, Col. John A. Woodward, of Howard, Pa., took charge of the meeting.

MR. MARTIN: Before starting in on the work proper for this afternoon we deem it best to state some arrangements which probably ought to be carried out. This will undoubtedly be a very busy and interesting session. Every gentleman who is present and desires to express an opinion, a thought or a sentiment, ought to have that privilege. In order to facilitate this work, if it is agreeable, we will rule that every gentleman shall have the privilege of speaking twice upon any topic, but the first time for not longer than five minutes and the second time not longer than three minutes, following each discussion. We do this in order to save confusion in this work and that we may understand fully and be ready to condense our thoughts into direct language as we move along in this work. If there are no objections this ruling will stand.

The CHAIRMAN: The first topic on the program which will now be taken up is:

"Is it Desirable for the State to supply more than Two Speakers at an Institute?" To be opened by Mr. J. A. Eschbach, of Milton, Northumberland county, Pa.
MR. ESCHBACH: Mr. Chairman and Gentlemen: After listening to such able papers as we have had during this "Round-Up," I feel as if my little talk would be out of place; yet as this session is set apart for increasing the interest in our local institutes I feel as though it were in place to express my opinion of them.

As for myself and my county, I feel that two State speakers would be sufficient, provided I was furnished the money to secure other help myself. I would be responsible for the dispensing of the other portion of the money. For this reason, succeeding as I do, men who have had the most successful institutes in the State, in the county of Northumberland, I feel that that interest should not be lacking in my county as long as I can prevent it. And I have been doing part of this work out of my own funds, as it were, taking what was left after I paid all expenses.

In my county this is to be considered; that we have diversified industries. At one end of the county are the coal regions and the farmers surrounding them are interested in market gardening. I would use the funds I speak of in securing somebody who was especially adapted and a successful market gardener for that end of the county. The other end of the county, in which I reside, is a general farming district in which we raise horses, cattle, hogs, sheep, poultry and have other industries.

Now, I can in my county or some of the adjoining counties, find men who will be glad to attend our institutes if I could say to them, I will pay your car fare, your horse hire, your dinner, for which you give me a talk on your particular line of work. The money, as I say, I would divide. The objection was offered by some member here to-day, in speaking upon this matter. What if one of the State speakers should fail to appear? I would divide that money among three or four of these local men, and still have enough men. It is no trouble to find men, but you cannot ask a good man to leave his business and come ten or twelve miles and not be recompensed in some way for it.

The CHAIRMAN: Now this question is open to you for discussion.

MR. MATTHEW RODGERS, of Juniata county: Mr. Chairman, I am the gentleman who spoke to the last speaker in regard to the probability of one speaker not being there, and sometimes we have missed two of them in our county. I think there should be plenty, and all under the care of the Department of Agriculture or the management of the Director of Farmers' Institutes, and let him furnish these speakers. We have enterprising men through our county and the adjoining counties who often come to our Institutes, and other men from Perry county—Perry county lies near to it—and
they come and help us. Sometimes we have to pay their boarding; sometimes they have friends, and that is all that it costs. They are good workers.

I say, keep everything under the Department of Agriculture, or State Board, and let them send us men and be responsible. The Department would have to see that we did not get the same men at each succeeding institute; and then again the Department would be responsible and this would throw the blame off the chairman of the institute work at home and if anything is wrong they would have to growl at somebody away off.

I think, Mr. Chairman, it would be far better for us to have this matter entirely under the care of the Department and let them furnish as many speakers as they have the means through the different parts of the State.

MR. CHARLES G. McCLAIN: I wish to endorse what Mr. Rodgers has said in reference to keeping the speakers under the management of the State Board; also that it would be folly for any Agricultural Society to desire a less number of speakers than we have been having. I know in our county we have never had too many. Last winter we had four; before that we had three, and we did not have any surplus to give away, I know. I think that three men is few enough at any rate to send out, with the different branches of industry. We have everything and we need general purpose men.

MR. HEGE: I favor the State sending out three men as we have been doing. We have in our county some very good local people, and I have known of cases when they were on the program, and if it happened to be bad weather, they did not show up and we would be left. We should be left if we did not have the State speakers. The local men know there is very little recompense in it for them. I pay their dinners when I have local material, but if we depended upon them and the weather was bad, we would be left in the hole.

MR. A. T. HOLMAN. There is one thing I would like to mention with regard to the number of men, and that is something about the kind of men sent out. I think it would be proper and right for the Department to know something about the districts around the place in which the institute is to be held. I think the Director should ask the County Chairman what kind of material he would like to have there. If it is a dairying district, they should have a practical dairyman, and if a fruit district, they should have a practical fruit man. It is not only perplexing to the County Chairman, but to the audience if the speaker should be a dairyman and would have to speak in a fruit district. He is out of place and he will go away dissatisfied, as well as the people and the chairman, not because there is any question on account of his ability, but because he has been misplaced.
MR. MILLER: I think very much depends upon the place; but I do not think that it is practical for the Manager of Institutes to send these different lecturers to the different locations in which their work would be most suitable; that is, have them prepared to lecture on the different vocations that may predominate in certain agricultural districts because they have a tier of counties that must be visited by certain men, or the traveling expenses would run too high.

I believe that some counties are well supplied with two speakers while others are not. Where you have local material that is able and willing to take hold, two speakers will do more good than three or four; that is, for the amount of money spent, two speakers will do more. Use the five dollar bills on local material and you will do more with two speakers than with three or four. I know some counties where the local material is very willing and would like to have some chance to speak. They would like to advance their ideas of their practice. In such places two speakers would be sufficient.

MR. HALL, of Potter county, speaking for his county, favored not less than three State speakers, because on account of the bad weather they had there, they could not depend on local material filling their part on the program.

MR. CLARK, of Westmoreland county: I understand this is a family affair. I would like to ask a question that it seems to me would almost dispense with this subject. Is it the intention of the Department to furnish the chairman of the county with some money provided they reduce the number of speakers? Will the amount of money be divided and will the chairman get more money provided they refuse the number of speakers? You need not answer the question unless it is suitable.

SECRETARY MARTIN: There has been no understanding on that point. It does not enter into the discussion, really. The question for discussion is: "Should there be more than two speakers?"

MR. CLARK: My reason for asking the question is this. That if the chairman is not furnished with more funds, it would not be within his province to get an additional number of speakers; but if he was furnished with more funds then he would be able to furnish the number of speakers additional as reduced by the Department. That is the way I look at it and understand it in that light; otherwise I do not see that it would make much difference as to who furnished the speakers, so that the requisite number of speakers were furnished, and in some of our large counties it is almost impossible to get two men to go out through a county and take entire charge of the district work.
A member from Clearfield county stated that they desired six days of institute instead of four as at present allotted them, and they would be pleased to reduce their force of speakers from three or four to two speakers, if they could have the six days institute, as that additional time would enable them to reach more people.

MR. STOUT, of Schuylkill county, said that his county with three speakers did not have enough, and that they should have at least four speakers, as they could not always depend on local help.

MR. NORTHUP, of Lackawanna county, said that while the Department only allotted them four days, that they ran twelve days of Farmers' Institute and would like to have half a dozen speakers; that they did not want more money from the Department, but that the trouble was to get the right men, and the only place he know where to get them was from the Department.

MR. SEEDS, of Huntingdon county, said he had been up in Mr. Northup's county, and that the two men who took turn about talking for twelve days had to talk too much; that there should have been at least four or five speakers; that the local help was all right, but could not be relied upon and as they were not paid, could not be expected to work when circumstances were anywise unfavorable.

MR. BLYHOLDER, of Armstrong county, thought it was not right that the speakers who were allowed but four days by the Department should have to work through a twelve days institute; that this was an imposition on the Department and that the speakers would be worn out and would not be worth anything wherever they went next. He did not think that three speakers were too many and said there should not be less than three, and cited an instance in his county last year where the three speakers were not enough because one was called away, another became sick, and he was left with but one to go on with the institute.

MR. KNUPPENBURG, of Wyoming county, said that while they had good and willing local help, he wanted whatever State speakers the Department could send him, as he then felt secure and satisfied that he would have successful institutes, as the local help could not always be depended upon. He was well pleased with the help sent him by the Department and asked for the same kind of help under the guidance of the Department, which he thought the proper way.

MR. BRODHEAD, of Susquehanna county, did not want the force reduced, but wanted at least three good men for his county.

MR. NELSON, of Clearfield county, was opposed to reducing their force of speakers, and wanted more institutes for his county.
MR. WILLIAMS, of Mercer county, said that local talent could not be depended upon and that notwithstanding they knew the needs of their localities better than the State speakers possibly could, and while they might know them very well and be able to instruct on the subjects undertaken, they were, like the prophet, without honor or credit at home, and were not given the consideration that the State speakers received.

MR. WEIDNER, of Adams county, said his county would be pleased to have at least three men; that they did not have the right kind of local help, as plenty as they had in some other districts and that they all preferred to hear the experts sent out by the State; that as they had diversified farming interests, fruit growing and dairying, they would be pleased to have specialists on each of those lines.

MR. BEARDSLEE, of Bradford county, said that there might be a misapprehension about the extra days of institute held in Lackawanna and Clearfield counties; that the Department only paid for four days and that the expenses of the other days of institute was paid by the local management.

He said the County Chairman should not assume the running of the whole institute, but that if he had a dairying session he should select some wide-awake dairymen of his locality to preside over that session; if an educational session was to be held he should select as chairman for that session a local man interested in educational matters. He had seen this experiment tried with very excellent results, and that more interest was manifested in the institute work thereby.

MR. McCREARY, of Lawrence county, said they did not want less than three men in their county. He wanted plenty of State help and wanted it to be as good as it could be. He had tried the experiment of having a new and suitable chairman at each session and found it to be a good thing. He said it was a good way for the County Chairman to get rid of monopolizing the whole thing; that they had a ladies' session and allowed them to run it themselves.

MR. HOOVER, of Lancaster county, said that while they had plenty of good local talent, for different reasons they could not get them to come forward and give their help, and they found that they had to rely on State aid. He thought in selecting the State speakers it should be ascertained what the people of each locality are most interested in, and that men who are specialists along those particular lines should be sent into the respective sections. In
making up the program of their institutes they put on the subjects most acceptable to their people and then tried to get the best men they could to talk on the respective subjects.

MR. PHILIPS, of Chester county, said the practice in his county was to hold more days of institute than the Department provided for, and the additional expenses were paid by local contributions; that they held two-day institutes with one day service of the State speakers, leaving the local people to run the institute the second day, when the topics discussed by the State speakers were fresh in their minds and they then agreed or disagreed with the ideas and theories advanced the day before.

Speaking from the standpoint of a State speaker, he said he never knew of one failing to keep his appointment unless detained by a wreck or sudden sickness, and that most of their failures to be on hand was caused by the thoughtlessness of the County Chairman on the day before; that they were frequently kept at the meetings until midnight and were unable to reach their destination for the next day; that through the same thoughtlessness they were compelled to work night and day, as well as travel with little time to rest in between; that they should be given the opportunity of presenting their subjects early in the evening and then pass quietly out of the meeting, and thus be enabled to keep their engagement for the next day.

MR. ORR, of Beaver county, concurred in what was said by Mr. Philips regarding the treatment sometimes accorded the State speakers and protested against the divisions of the sections; that it was very hard to keep in touch with the leaders of the section to find out where they were to be next day, and this was another drawback to the State speakers in keeping up their work.

SECRETARY MARTIN: We have been very much interested in this discussion. I have noted the points and regard them all of great advantage to me in devising ways and means for the betterment of the service.

MR. HERR: I would like to have a word to say. I have been looking over the program, but do not see any other topic coming up on the thought I have in mind.

There ought to be uniformity of practice among the State speakers. I have had considerable experience in traveling over the State, and I believe in using the greatest economy in connection with our institutes and letting the money go as far as it will. I am in favor of more than two speakers. I am in favor of three speakers and in some counties we have to divide the institute force in order to satisfy the people. In order to secure economy in traveling we
ought to be provided with mileage books and we ought not charge so as to make our expenses any more than they must necessarily be. I think our agreement is to work for so much per diem and our necessary and actual traveling expenses. I have in mind some instances in which I think this has been abused. If I choose to go into a hotel and live at one dollar a day, I do not believe I have any right to charge the Department two dollars. If I travel at two cents a mile on my mileage book I do not believe I have any right to charge the State three cents, because I have that mileage book in my possession. It is not an actual expense. If I have to advance the money for my lodging and hotel bills, I do not think it right to ask a little premium off the State for advancing that money. I think the State can save from one to two hundred dollars simply by correcting this practice in traveling over the State. It may be all done thoughtlessly, and I dont say it is wrong, but let us have an understanding about it. I think the State Secretary should furnish the principal speakers with a mileage book at the expense of the State, and save at least one hundred dollars a year in this way.

MR. MARTIN: This is all very interesting. It is really a question as to whether the Department, possibly with the regular lecturers, should not supply a mileage book. That is one of the questions we have under consideration.

I want to say just a word on one other point. In a few counties in Pennsylvania the Department believes that it should supply more than the ordinary number of institutes where they use just two men, then add two additional men for the extra days of institute. We believe we ought to do that in certain sections, and you will find the Director very amenable where the surroundings justify it.

The CHAIRMAN: The next question for general discussion is:

"Should the Institute Lecturer use the Blackboard to Illustrate Points in His Lecture?" To be opened by S. F. Barber, of Harrisburg, Pa.

MR. BARBER: Mr. Chairman and Ladies and Gentlemen: I think this is a very important topic. "Should the Institute Lecturer use the Blackboard to Illustrate Points in his Lecture?" I say, yes; by all means. He should use the blackboard to illustrate every single point that it is possible to make use of it. The average farmer will gain more knowledge in that way and he can carry it home with him. Besides that, we are not sent out, as I understand it, by the Board to entertain anybody. We are not sent out to give a lecture, but we are sent out just as the school teacher is employed to teach public school, to teach, and if it is not necessary, if the
agricultural people did not require that knowledge, I am quite certain that the Department would not waste money for the sake of entertaining anybody.

I know that it is a very easy matter to get up and tell this one and that one how to formulate rations, how to compute actual value of fertilizers, how to reckon the amount of plant food extracted by growing crops, and all that, and how much those crops take up from the soil, but it is entirely different to illustrate that on the blackboard. They will say they understand it when really ninety per cent. of the class of people that we are sent out to teach do not understand what we say, and by the time they go out the door do not know any more than when they come in unless we take the time to explain that on the board.

I was talking at a certain institute in this State about dairy ration. I made it just as plain as possible by speaking. I told them how to get at this nutritive ration and it seemed easy, and I thought I made it so clear any child could understand it; but after the institute was over a gentleman came to me and said, "Barber, you are the second man I heard speak on that subject and explain the point you explained, and I must confess I do not understand it." He pulled out a little piece of paper and said, "suppose you do that question for me." I did it as I told it. I demonstrated the problem complete until he said, "give me the paper," and he took the paper and put it in his pocket and went home saying he could do it now. I am thoroughly convinced that the successful man of to-day is the man who makes a specialty in any one line of business, and if we can teach them one point thoroughly, it is better to do that one thing right than to tell them how to do a half dozen things they do not understand. I believe in taking time. As a general thing, our programs are overcrowded. By that I do not mean to say we should go to the trouble to formulate a complete dairy ration or give average percentage of digestibility of foods, etc., but we want to teach them how to use the material at hand. We have got that material and it is within the knowledge of every agricultural man in this State. The State Departments are issuing bulletins every month and have been doing that for several years, and our Experimental Stations are issuing bulletins which will interest any farmer in this State, but the trouble is that the large per cent. of the farmers do not know how to use them. It is our duty to teach them how to do it, and do a little less work and do it thoroughly. We should simply show them how to do one problem and the rest are pretty much the same, and I think they can follow it out. It will give them the idea and they will go home and work it out.

By the way, I think the greatest trouble of the people to-day is that they do not know how to use the lead pencil. That is the
greatest drawback, and we have got to teach them, but we cannot teach them by talking; we must have a blackboard and do the problem for them, and then they will be able to carry it with them and whenever they are able to do that then you will create an interest which will hold them, and they will go right to work in a business way.

I was interested the other day in reading an article on the great performance of a dairy cow. It stated how much food she consumed and how much butter she produced in seven days. It stated it was the record-breaker, making over 30 pounds in seven days, breaking the 30-day record and also the 60-day record. I found the experiment was made at the New York Experimental Station. I was anxious to know how that cow was fed and all about it, what was the profit, and I simply took my lead pencil out of the desk and I calculated the problem and found, after making a careful calculation, just what per cent. of ration was used in feeding that famous cow, just how much each pound of butter cost, how much dry matter was consumed and all about it, and I discovered that lots of Pennsylvania farmers have got cattle more profitable than she is; while a record-breaker she is not a money coiner.

I just simply want to say that I am heartily in favor of the blackboard, and that it should be used ten times more than it has been. I think one reason that it has not been used is that it takes more time and that the program is crowded. It is very much easier for the lecturer to tell a person how to do it than to work the problem out. These are my views about this question.

MR. MILLER: I would just like to have a few minutes on this subject. I was very much impressed at one of our institutes with the illustrations given on the blackboard and there it was shown in fifteen minutes what most of the speakers could not explain in sixty minutes. The lecturers will talk for hours, and after they are done, ninety per cent. of the farmers will go out and not know anything about it. These facts I have observed; but after the illustration on the blackboard and explanation of the question, they take hold of it and put in their diaries and papers and pocket it, and afterwards talk about it.

Then there was another thing besides a blackboard, and that is the chalk, the colored chalk used in illustrating the way of teaching, and it came into my mind that this State Board of Agriculture or the Secretary of Institutes or Managers of Institutes, if they would have published these charts and distributed them to the interested farmers of our county, it would have done more good than all the agricultural books published ever since the publication of these agricultural reports is in vogue, because there is a lesson
that the eye can take in. Let the farmer hang them in the kitchen or living room and he will see what is the use of food or fertilizer for his advantage. If the Agricultural Board insists upon the publication of these charts instead of these reports in large books, I think they will do tenfold more good.

MR. BARBER: Now, that is the opinion of a great many who have looked at these charts, that if they could simply have those charts at home it would be all they wanted. I beg leave to differ with the gentleman. Anyone who thoroughly understands the computation of rations will not give a snap of the finger for the chart. Take the bulletin received from the Experiment Station, and that gives it to you a great deal more quickly than the charts. If these problems are once worked out and solved for them so that the farmer can pick them up and work them out, he don’t want the chart. He will refer to the bulletin and work them out himself. It is simply a question of multiplication, subtraction and division. Any boy 12 years old can do it. The most impressive way of accomplishing that object is to take the bulletin and take the amount necessary to make the ration, go and get the ingredients for the whole week and mix them, and at the end of the week see what the results are.

MR. LIGHTY: I wish to say that I endorse the use of the blackboard, but I believe that the institute speaker should use the blackboard with a little care. In my experience I have seen where the blackboard and the chart were used very injudiciously by some speakers. I believe when the institute speaker or teacher comes before the institute he should first of all try to get the attention of everybody in the room and then hold their close attention until he has said what he has to say. They should reason the question out with him as he goes along, and by the use of the chart and blackboard sometimes he will get them off the question. While he continues to talk they will study the chart or the problem he has been doing on the board, and they will miss some of the instructions he is giving. I believe that the lecturer and teacher should have a chart and blackboard with him, but he should use them with caution; otherwise we will sometimes get our audience to lose themselves by the use of these charts and not get our reasoning, and they will not come to the conclusions we have arrived at.

Further, in regard to charts, I would say, it may not be the best to continue the same kind of charts too long at a time in the same place. I have noticed where you hang up these charts for the fifth or sixth time, some old farmers would say: “I guess we will go home, it is the same old show.” We should not use the old ones too long. They become old to the eye, and will not be attractive.
Bring new things, new talks and new ideas, and if you have occasion to illustrate them on the board, see that you hold the attention of the audience.

MR. WALTZ: I have had some experience in teaching, and I found that while the blackboard and chart are excellent aids sometimes to teach arithmetic, that if each person has a pencil and paper and figures it down by the aid of the instructor, they understand the problem better, and I suppose it would be so with these lecturers in imparting the lessons. There seems to be something in doing the work with the hand. I believe the use of the blackboard is a most important factor in our institutes when it is in the hands of a man who can make figures and letters, who can explain matters, but in the hands of a man who cannot write or make figures it is not very valuable; but to demonstrate the value of fertilizers, I think the lecturer can save the farmers who buy them blindly, hundreds of dollars a year, by simply eliminating unknown quantities and getting at the correct valuation of the fertilizers. I believe it is the best thing to use in these discussions.

PROF. WATTS: I think the value of the blackboard depends on the man behind the chalk. I do not often use the blackboard in my institute work, because I do not know how to use it effectively. Mr. Stout does know how. I have seen him treat the subject of commercial fertilizers by the use of the blackboard. If I could come before an audience and draw a large fine head of cabbage, I would do it; but I cannot. And just as Mr. Lighty has said, the blackboard with a great many lecturers is a nuisance more than a help. They will get the people looking at the blackboard and then go on with their speech, and the people will lose the most important part of the talk.

MR. SEEDS, of Huntingdon county, thought the blackboard was a good thing, but should be in the hands of a man who knew how to use it effectively.

MR. CURE, of Lackawanna county, thought the blackboard was a good thing for institute workers, as it gave the eye the opportunity of helping to learn the lessons by seeing how it was done, but the speaker should be skillful in its use.

MR. KAHLER, of Lycoming county, endorsed the thought expressed by Mr. Cure, and thought that the speaker who called for a blackboard was generally the one who knew how to use it.

SECRETARY MARTIN, Director of Institutes: You will pardon me for just a word on this topic. There is no one point probably of greater interest to the farmers of the State than the manner by
which the institute instructor shall impart the lesson. This is vital. I have said to all the leading institute lecturers: We will equip you with a blackboard; we will equip you with such maps and illustrations as you yourself will devise, and of such kind as you desire to use in your individual work and manner of imparting instructions. I say that now; if any of those lecturers who are in the field the entire time, and a number of them are thus engaged, are planning a kind of chart, which they want to use in illustrating, in their own manner, their lectures, these charts we will have prepared after they have the outline, and will put them into their hands. That ought to be the implement which they could use the most effectively. Thus far we intend to go. I believe, my friends, that no institute in Pennsylvania is complete unless sometime during the session some lecturer will give an object lesson upon a chart or blackboard, impressing not only through the mental function, but through the eye, object lessons. I believe that, because I am a kind of a student myself and have studied a great many things, and I have learned that the lessons which are the most knotty and the most difficult for the mind to grasp come much more easily when I can see them before me.

I want to say a word to these lecturers. These lessons are not always impressed by the real fine design of the artist, but is one of the lessons which these figures convey. It may be an awkward one, but if true will leave a lasting impression. I am in favor of the object lessons as far as they can be imparted, but every individual knows his strength and his effort and the means by which he may become the greatest power in imparting instructions. This is the kind of influence he should use and we want to equip these institute lecturers with just such implements, blackboards and charts of their own device, that which they can use to their own advantage, and I trust these lecturers will prepare these outlines and we will equip them for such use during the coming season.

MR. GEORGE CAMPBELL, of Bradford county, favored the use of the blackboard and said that much depended on the man behind the chalk. It should be used skilfully and accurately.

The CHAIRMAN: The next topic, if we are through with the discussion of this one, and probably the last topic on the program is:

“What is the Best Way to Quiet a Speaker who is Using the Time Unprofitably?”

This discussion was to have been opened by Mr. W. H. H. Riddle, of Butler, Pa., but as he has gone home we will be glad to have it opened by any other gentleman.

MR. HALL: This is one of the questions that stand right at the
base of the success or the failure of an institute or of almost any other meeting where the thoughts are to be exchanged and gathered. Now, I believe that the best way to quiet a man who is taking the time that he is not using profitably is for the presiding officer to call time on him. In our county—I know you will excuse me for talking about that I know best—there was years ago a good system of local farmer's institutes and they were talked to death by certain men, and I think it is in the province of the chairman of institute work for the county to either preside at every session of the institute himself or delegate some man who has backbone enough to know that the State has furnished men who are able to instruct the people to come there and if anybody uses time unprofitably, to use his prerogative to stop it, and that is what the chairman ought to be for. He will make enemies, but will save time and money to the State, and that ought to be his reward.

MR. McCREARY: I think it is a good plan to have it published in the program that the talk shall be for 15 or 20 minutes, or whatever time may be set, and then the chairman can call time on a party of that kind. We had a ladies' session and one of these fellows was on that program and we had a lady for chairman. Now, I said, these speeches are limited to 20 minutes, and as soon as he has gone 15 or 18 minutes you call him down. She said she did not like to do it, and I said if she listened to him that long she would be only too glad to do it, and she did it, and we got rid of him. On the first lecturer there was no time limit, and he talked for over an hour and didn't say much either.

MR. HERR: I think it is the duty of the manager of the institute to know who is on the program, and if he has a bore on he should use him just as civilly and politely as he can, and inform him that he will have 20 minutes on his topic, or whatever time he may think proper, and when he has a man who is worth more than 20 minutes he should allow him all the time he can. It is the business of the manager to control the institute himself or elect somebody else who can. It is his business to speak out and assert his authority there, not haughtily, but as courteously as possible, and make it emphatic and positive, and when you do that you are not going to be troubled with bores. In my experience I had one or two and knew them and got along with them very nicely, and did it in such a way that it left them feeling good.

MR. ORR: I believe that this prerogative of regulating the program belongs to the leader of the section; otherwise it might place the County Chairman in an embarrassing position. He may have exerted a great deal of influence in getting the people to come
there and it puts him in a delicate position to feel that he must call them down or curtail their remarks, and I believe if he has the leader for each section set out the work for the State speakers, he is the one who can do that with the least trouble to everyone.

MR. SEEDS thought that the chairman of the institute would go to the speakers on the program and tell them how much time they could have and no more, that they would seldom be bothered with bores. He thought the chairman should know the local speakers, and if there was one among them inclined to talk too long, go to him beforehand and put a limit upon him.

MR. BURNS thought the section man and the local manager should size up the program and have it so arranged that there could be no trouble of this kind, and that they should go to the speakers, both local and State, and tell them that they could have just so much time and then there could be no trouble of this kind.

MR. NELSON thought that the chairman should allow the speakers such time as he thought their talk was proving profitable; he should cut down bad men and give ample time to those who were valuable.

MR. HALL: In regard to a long essay, it could be managed as I saw it managed in a teacher's institute. We got up and moved that the paper be published at the expense of the institute and read at home.

SECRETARY MARTIN: This subject, together with the other subjects, have been of great interest to me. It may not be out of place to remark, and this applies to all institute lecturers, local and State; that we are living in a time in which it is proper and right, especially during the coming institute year, for every institute lecturer to consider well one or two things which, to my mind, are of vital importance. The one is to concentrate your thoughts into the most direct language possible that will convey those thoughts clearly; that is one thing. The other, is to present to the audiences the lessons which seem to apply to the special localities. This applies very directly to the corps of lecturers sent out by the State. No two counties, or not many consecutive counties in Pennsylvania have just the same practice and mode of operation on any line of work; differing as to soil or latitude and the habits on different farms as we find them. Now, talk good hard common sense, and above everything use sufficient brevity to be well understood and after you have done that, my advice to you lecturers is just to quit at that time. That is the time to quit on any topic. The American people have gone by and outlived the time in which they want these
topics pounded in too much. We are learning to think intelligently, very rapidly, and I believe possibly if our lecturers make one mistake greater than another it is that they underestimate their audience believing that possibly they do not understand just right and hence they go over it again. But let the other fellow go over it the next time and use the blackboard or chart, and be concise and concentrated in your thoughts, in your lessons be in earnest, speak the truth always, and impress on your audiences in a concise practical manner the lessons you have to impart.

This session of the institute has been to the greatest inspiration of any session. Looking over the past and listening to these remarks, differing as many of you do upon local questions in your different counties, and that oneness of sentiment that has run through everything connected with this meeting for the past three days, is an inspiration and encouragement to me in the devising of ways and means for the bettering, uplifting and advancement of this great work. As I said in the outstart, gentlemen, I regard each and every one of you in these different counties of the State as my right hand man, to advise and counsel by letter and in person, to inform me at all times as to the conditions and as to the needs of your county, and in so far as the acts under which I am governed will permit me, I will go a long ways in meeting these conditions. Now, as we go away from this meeting, certainly it will be with an exalted and a broadened and elevated conception of the great work before us the coming year, with hearts filled with the kindliest of feelings towards one another and a better understanding of each other. That is well. That is what these meetings are for, largely, and I commend you for the kindly forbearance which you have extended to each other in all these discussions, and I thank you for the kindly and generous support which you have rendered and extended to me. You have upheld my hands in such a way that I cannot find words to express my feelings toward you in this matter, and as we separate very soon, I shall carry with me many days the recollection of the warm grasp of the hand which I have received from every member, from every county manager, and from every lecturer who has been present at this very large meeting.

PROF. HANTZ: Mr. Chairman, the Committee on Resolutions is ready to report at any time.

The CHAIRMAN: If there are no objections we will receive the report now.

PROF. HANTZ read the report as follows:

"Resolved, That the members of the Department of Agriculture, the Members of the State Board of Agriculture, Managers of Farm-
er's Institutes, the Lecturers for the same, hereby express their thanks and appreciation to the citizens of the borough and county of Huntingdon for the generous welcome and kind reception and treatment accorded them during their sojourn among this people.

"Resolved. That we tender our thanks to the Mayor of Huntingdon for his cordial greeting to our body and for the freedom of the city.

"We thank the County Commissioners for the use of the court house during this meeting.

"We also tender our thanks to the officials of the Huntingdon Reformatory for the pains and kindness taken in conveying our body to the Reformatory.

"We also thank the county press for their kindness in advertising this meeting so extensively.

"We also thank W. F. Hill, Grand Master of the Grange, Hon. John T. Cox, Vice President of the State Board of Agriculture of New Jersey, and the Hon. John Hamilton, Farmers' Institute Specialist, for the instructive remarks made before our body.

"Our thanks are specially due to George G. Hutchison for his untiring efforts to make this institute the success it has proved to be.

(Signed)

"J. M. HANTZ,
"H. W. NORTHUP,
"A. J. KAHLER,
"JASON SEXTON,
"GEORGE E. HULL,

"Committee on Resolutions."

Upon motion, the report of the Committee on Resolutions was unanimously adopted.

SECRETARY MARTIN: Now, gentlemen, we have a few minutes to spend yet. If any one has a word to say the opportunity is given before we adjourn.

MR. CURE, of Lackawanna county, said that he thought the institute work and the different institute meetings this winter should be properly advertised and that this work should be put in the hands of a man experienced in advertising and that he should give his whole time and be furnished the means to do this work thoroughly.

He also advised that more work be done during the institute meetings of the coming winter in getting the farmers, and particularly the younger element, to take up the correspondence courses offered free by the Pennsylvania State College to all who would simply make application for this instruction, and said he knew very much good had been accomplished by this correspondence course, and that much more good could be done by it if the matter was only brought properly before the farming element.
MR. HERR, of Clinton county, said that he knew it was a difficult task for the Director of Institutes to send the right men to the right places in all parts of the State, where the agricultural industries are varied, and that it was their duty to help him in this matter by suggesting to him the topics they wanted discussed, and the men they wanted to discuss those topics. That he knew, with this information at hand, the Director of Institutes would carry out their wishes as far as he was able and that this would also show who the institute workers were that were appreciated and did good work.

He also thought they should be experimenting and working out some problem all the time so that when they went before the people they could tell them something that they wanted to know from actual experience.

He also thought there was too much repetition in the work of some of the lecturers; that they should endeavor to work out new thoughts and present them in a new light.

He also thought that some of the institute lecturers bored them with long speeches a great deal more than their ordinary workers have; that while their papers were pretty good, they were too long.

PROF. HANTZ said that there was a limit to science; that man could not go beyond that which he knew; and he thought they should experiment themselves and see what was right of the things advanced by scientific men and they would then know what it was safe to teach to the people along agricultural lines.

MR. CLARK, of Westmoreland county, said it was very surprising how far ahead the farmers of to-day were getting in the acquisition of knowledge, and that if there ever was a time when the institute workers must be better informed and equipped to go before the people and instruct them, that time was to-day.

On motion, the meeting adjourned sine die at 4.30 P. M.

A. L. MARTIN,
Secretary.
PROCEEDINGS

OF THE

TWENTY-SEVENTH ANNUAL MEETING

OF THE

Pennsylvania State Board of Agriculture,

HELD IN THE

BOARD OF TRADE ROOMS, HARRISBURG, PA.,

JANUARY 27 AND 28, 1904.
MEMBERS

OF THE

PENNSYLVANIA STATE BOARD OF AGRICULTURE,

FOR THE YEAR 1904.

Members Ex-Officio.

HON. SAMUEL W. PENNYPACKER, Governor.
MAJ. I. B. BROWN, Secretary of Internal Affairs.
DR. N. C. SCHAEFFER, Superintendent of Public Instruction.
DR. G. W. ATHERTON, President of The State College.
HON. WM. P. SNYDER, Auditor General.
HON. N. B. CRITCHFIELD, Secretary of Agriculture.

Appointed by the Governor.

R. I. Young, Middletown, Dauphin county, .................. Term expires 1905
Col. R. H. Thomas, Mechanicsburg, Cumberland county, ... Term expires 1906
Gen. James A. Beaver, Centre county, ...................... Term expires 1907

Appointed by the State Poultry Association.

Norris G. Temple, Pocopson, Pa., ......................... Term expires 1906

Elected by County Agricultural Societies.

Allegheny, .......... J. S. Burns, .......... Imperial, R. F. D. No. 1, .......... 1906
Beaver, .......... A. L. McKibben, .......... New Sheffield, .......... 1905
Blair, .......... F. Jaekel, .......... Hollidaysburg, .......... 1907
Bucks, .......... W. T. Davis, .......... Ivyland, .......... 1905
Cameron, .......... W. K. Howard, .......... Emporium, .......... 1906
Carbon, .......... .......... ......... ..........  .......... .......... ...
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OFFICERS.

PRESIDENT.
Hon. Samuel W. Pennypacker, Governor, Harrisburg.

VICE PRESIDENTS.
Jason Sexton, North Wales.
H. W. Northup, Glenburn.
M. N. Clark, Claridge.

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H. C. Snavely, Lebanon.
Matthew Rodgers, Mexico.
S. X. McClellan, Knox.
N. G. Temple, Pocopson.
S. M. McHenry, Indiana.
R. F. Schwarz, Analomink.
J. Newton Glover, Vicksburg.
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Prof. C. B. Cochran, West Chester.
Entomologists, Dr. H. Skinner, Philadelphia.
Prof. Franklin Menges, York.
Ornithologist, Prof. H. A. Surface, Harrisburg.
J. L. Heacock, Quakertown.
Mineralogist, Col. Henry C. Demming, Harrisburg.
Apiarist, Prof. Geo. C. Butz, State College.
Geologists, Dr. M. E. Wadsworth, State College.
Col. Henry C. Demming, Harrisburg.
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Hon. Jason Sexton, .......................................... North Wales.
A. J. Kahler, ............................................. Hughesville.
G. G. Hutchison, ........................................... Warriors' Mark:
S. M. McHenry, ............................................. Indiana.

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A. T. Holman, ............................................. Nekoda.

ROADS AND ROAD LAWS.
P. S. Fenstemaker, .......................................... Lanark.

FRUIT AND FRUIT CULTURE.
John F. Boyer, ............................................. Mt. Pleasant Mills.

DAIRY AND DAIRY PRODUCTS.
Dr. M. E. Conard, .......................................... Westgrove.

FERTILIZERS.

WOOL AND TEXTILE FIBRES.
Samuel McCreary, Chairman, .............................. Neshannock Falls.

LIVE STOCK.
D. A. Knuppenburg, Chairman, ............................ Lake Carey.

POULTRY.
Norris G. Temple, Chairman, ............................... Pocopson.

FORESTS AND FORESTRY.
Dr. J. T. Rothrock, Chairman, ............................. Harrisburg.

APIARY.
J. W. Nelson, Chairman, ................................. Shawville.

FLORICULTURE.
Edwin Lonsdale, Chairman, ............................... Wyndmoor.
TWENTY-SEVENTH ANNUAL MEETING OF THE STATE BOARD OF AGRICULTURE.

HELD IN THE BOARD OF TRADE ROOMS, HARRISBURG, PA., JANUARY 27 AND 28, 1904.

PROGRAM.

Wednesday Morning, January 27, 1904.

Call to order at 9.00.

1. Roll-call of Members.
2. Reading of Minutes.
3. Appointment of Committee on Credentials.
4. Reception of Credentials of Members-elect and Delegates.
5. Reports of Standing Committees.
7. Election of Officers.
8. Unfinished Business.
10. Miscellaneous Business.

Wednesday Afternoon.

Call to order at 1.30.

Official Report of Pomologist of the Board, after which the remainder of this session will be devoted to the subject of fruit culture, with special reference to the San José Scale and other hindrances to fruit production. Papers will be read or addresses delivered by the following named gentlemen, which will be followed by a general discussion of the subject:

1. Prof. H. A. Surface, Economic Zoologist, Harrisburg.
2. Prof. Geo. G. Atwood, Albany, N. Y.
3. Dr. J. H. Funk, Boyertown, Pa.
5. Prof. R. C. Scheidt, Lancaster, Pa.
Wednesday Evening.

Call to order at 7.30.

2. Official Reports of Specialists of Board.
3. "ECONOMY IN FEEDING THE FARMER'S FAMILY."
   Jacob S. Miller, Friedens, Pa.
4. "THE RELATION OF ELECTRIC RAILROADS, TELEPHONE COMPANIES, ETC., TO THE AGRICULTURAL INTERESTS OF THE STATE."
   MATTHEW RODGERS, Mexico, Pa.

Thursday Morning, Jan. 28, 1904.

Call to order at 9.00.

1. Official Reports of Specialists of Board, Continued.
2. "A BROADER VIEW."
   H. V. White, Bloomsburg, Pa.
3. "SPECIALTIES IN FARMING."
   Henry W. Northup, Glenburn, Pa.
4. "OUR NEW ROAD LAW."
   Hon. Joseph W. Hunter, State Highway Commissioner, Harrisburg.

Thursday Afternoon.

Call to order at 1.30.

1. Official Reports of Specialists of Board, Continued.
2. "THE MAN BEHIND THE PLOW."
3. "RELATION OF THE STATE BOARD OF AGRICULTURE TO FARMERS' ORGANIZATIONS AND THE FARMER."
MINUTES OF THE MEETING OF THE STATE BOARD OF AGRICULTURE, HELD AT HARRISBURG, PA., JANUARY 27 AND 28, 1904.

Wednesday, January 24, 1904, 9. A. M.

The Board met in the Board of Trade Rooms at Harrisburg, January 27th, at 9 o'clock A. M., Vice President J. A. Herr in the chair.


The Minutes of the last meeting were read and approved.


The chairman of the Committee on Dairy and Dairy Products, Mr. H. W. Northup, read the following paper:

REPORT OF THE COMMITTEE ON DAIRY AND DAIRY PRODUCTS.

BY H. W. NORTHUP, Chairman.

The Committee on Dairy and Dairy Products make the following report:

The United States Secretary of Agriculture, Hon. James Wilson, December 20, 1902, reported to Congress 5,740,000 farms in the United States. The aggregate value of the annual dairy products of the United States (says Henry E. Alvord, Chief of the Dairy Division), considerably exceeds 500,000,000 of dollars; and according to some estimates it is placed at 600,000,000 of dollars. Taken
at a medium between these two estimates, the value is greater than the yearly hay crop, greater than the crops of wheat and oats combined, and much greater than the combined crops of cotton, tobacco and rice. The only staple farm crop which exceeds the dairy in annual value, is the corn crop. Hence we say, and can do so with good authority, corn is king. This dairy branch of the country's food supply is even relatively greater than shown by comparative figures; first, because the nutritive value of milk is exceptionally high, and second, because milk and its products are directly available as food, without any expense in cooking, or other preparation, and almost entirely free from waste. All dairy statistics must be based upon the number of cows contributing to the milk supply.

The whole number of what may be considered dairy cows, in the United States in 1900 is given as 18,112,707. The estimate given for 1902 on the above number is, that we had at that time 18,200,000 cows. The average yield of milk per cow, was estimated to be 3,560 pounds per year, which seems not to be a large estimate. The total value of dairy products in the United States in 1900, being the last census, was $600,000,000 of dollars. This great country of ours is not only supplying its own people with dairy products, but is quite largely exporting to other countries. The exports of butter and cheese for the calendar year 1901, amounted to $3,906,344 of dollars.

Now we will consider the dairy and its products in our own State. The latest figures obtainable report the farm value of dairy products in Pennsylvania are exceeded by but one state in the Union. In 1900, the Twelfth United States Census, we had 943,773 cows on farms, and 78,301 that were not on farms, making an aggregate of 1,022,074 cows in Pennsylvania. The correct products of these cows seems quite difficult to obtain, because it has not been fully ascertained. The total number of farms in the State at the last census was 224,248. Butter made on farms, 74,221,083 pounds. Cheese made on farms, 857,167 pounds. Cheese made at factories, 10,267,443 pounds. Milk produced, 487,033,848 pounds. Butter made in urban establishments 36,720 pounds, and this does not include the 78,301 cows not on farms. We have a total valuation given of $35,860,686 of dollars, but that does not by any means express the full amount. These figures at once reveal the somewhat startling evolution that has been effected from a simple and crude beginning, to the high standard of dairying that prevails to-day throughout this State.

I cannot close this report without speaking of the little county of Lackawanna, the youngest in the sisterhood of the sixty-seven counties of the State, and is not considered an agricultural county, but a mining and manufacturing one; yet our farmers, having only
1,585 farms, are alive to the great dairy interests. About 8,000 dairy cows are owned in this county. A large amount of the milk produced is taken into the city of Scranton; a city containing over 100,000 population. This product is principally taken on large milk wagons, carrying as many as thirty ten-gallon cans. They are set off at the various milk stations, and also left on the premises of the milk dealers. The business is increasing each year.

Silos are standing on nearly every farm, and fresh dairy cows are worth from 40 to 50 dollars per cow. Some of the dairies in this county are averaging at this time from ten to eleven quarts of milk per cow, each day. Dairying is one of the chief agricultural interests in the northeastern part of our State, and returns an income to the farmer that is encouraging in his business.

The following report of the chairman on Forests and Forestry was read by the Secretary:

REPORT OF THE COMMITTEE ON FORESTRY.

By Dr. J. T. Rothrock, Chairman.

Your Committee on Forestry would respectfully report continued progress in State Forestry during the year elapsing since we last met. It may be safely said now that the future forest policy of Pennsylvania will, in all probability, be but an extension of what already exists. We have purchased and are continuing to purchase large portions of land which are to form part of the permanent State Forestry Reservation. We have not only established successfully, nurseries for the propagation of forest seedlings, but we have already made a considerable start in the work of transplanting these seedlings from our own nurseries into the ground where they are to permanently remain—at least until removed by the axe of the lumbermen—it may be a century hence.

We have a well organized fire guard established which needs but to be extended to all the State holdings. We have inaugurated also, (and I think that the State may look upon this with some pride) the first public sanatorium probably in the world, which is to be regarded as associated with, and as an integral part of the forestry reservation system. This Commonwealth has not been content to disregard all other utilities of its forest holdings, and to consider the production of lumber as the only element in the broad problem before it; it has adopted a wider standard and, notwithstanding the
criticisms to which it may be subjected by some of the more conserva-
tive forestry folk, will adhere to its present purpose of recog-
nizing that the land which was purchased by the people and which, 
therefore, belong to the people should never close a single avenue
of good which rightfully belongs to the owners.

Tuberculosis has well been spoken of as the "white plague," a
plague which is perhaps, in many instances, as dangerous in its ulti-
mate results, to those associated with the sufferer as it is to him.
Its contagiousness is beyond doubt. The hope of restoration to
health from this disease in our crowded centres of population has
but a minimum basis of support. The most promising which the
invalid can do (providing he does it early enough) is to seek an
outdoor life. Already the most desirable locations in the State
are being purchased by wealthy citizens, or wealthy clubs, and these
are jealously guarded against all intrusion from outsiders. The
most desirable summer resorts are to-day as thoroughly closed
against a consumptive as if the sufferer were afflicted with leprosy.
He must go somewhere. He has the same divine right to life and
liberty and pursuit of happiness and health that any other of God's
children has, providing he has done nothing to eliminate that
right. No mere pecuniary interests, not mere social claim for
selfish isolation can rob the sufferer of this right. The air, the
earth and the water should be, and by divine right are as free to
him as to any other living being. At this juncture the State steps
in and says: "We are the owners of this land, it was purchased by
you and is for you and for your children and it is the part of a wise
public policy to invite you on these outing grounds where you may
be restored to health, and become again a productive member of
society rather than remain a perpetual charge upon the bounty of
the Commonwealth." This is the work which has grown out of the
Forestry Reservation system, and I hope that it may be regarded
by the citizens of this Commonwealth with just and proper pride.

The act of the last General Assembly provided the sum of $8,-
000.00 for the establishment of a sanatorium for poor consumptives,
in the South Mountain, twelve miles southwest of Chambersburg.
Long before we were ready to receive patients, they came flocking
into us. It was in vain to say: "We are not ready; come when our
buildings are prepared," the answer too frequently was, "Where may
I be when these buildings are ready?" The only thing we could
do was to accept the most promising patients and place them in
plain board cabins, erected with the money furnished by a few
generous friends. At present there are on the ground one large
assembly building, six cottages for the reception of female patients,
and ten cabins, giving us altogether power to receive at most thirty-
one patients. Since last March there have been on the ground
The ease as we and are hitherto of water, more out the both infancy; Pennsylvania.

The importance of this movement to the thousands of tuberculosis patients in this Commonwealth, who are unable to visit distant health resorts, is unspeakable. This work is in but its infancy; every consideration of statesmanship and of humanity, both to the sufferer and to those to whom he might communicate the disease, demands that this work, so auspiciously inaugurated, should go on and be extended, until in every county of the State there will be found some place where those afflicted with the disease may go, entertaining a reasonable hope of restoration to health.

It has seemed to the chairman of your forestry committee, without any disparagement to the good colleges and schools of forestry which are already in existence, that there remained room for one more upon somewhat different lines. Presenting his views to the last General Assembly in the form of a bill, he was authorized to purchase, or erect, suitable buildings for the purpose of training State foresters. It is unfortunate that so little attention has hitherto been given to what may be called practical woodcraft.

It is, of all acquirements in connection with forestry, the one most difficult to obtain. Whilst it is true that the real, good woodsman is a creation possessed of innate comprehension of woods and water, science and experience, may to a certain extent, supplement natural shortcomings. It is, nevertheless, equally true that there are thousands of our estimable citizens who never can become gifted as woodsmen. Forestry, without woodcraft possesses but one arm. The object of our humble educational effort is, first of all, to make men at home in the woods; second, to instruct them, not only in their duties as foresters, but enable them to do, themselves, an honest, whole day's work in any branch of forestry. No man can be adjudged a fit person to place in charge of a gang of working men unless he himself knows what a day's work is and how to do it. The object of the school then is to train men to do any branch of forestry work, and to furnish them with an education sufficient to enable them to do this successfully, as judged by the standard of a scientific forester. It is estimated that about one-half the time of our fifteen students is devoted to study, and one-half to actual work.

thirty-seven patients of whom eight have been discharged, cured; and there remain seven more so positively benefited that they may practically be considered as cured or, at least, so nearly cured as to be able to earn their living by some outdoor vocation. We have had our disappointments. No location, no system of medical treatment, no hygienic rules will forever and in all cases produce beneficial results. The primal fact remains that men are born to die. We may, however, claim, and this is our only contention, that whatever is possible in the way of restoration of health of an invalid in the mountains of Colorado, is possible also in the mountains of Pennsylvania.
These young men are, for the most part, mounted, they furnishing their own horses, saddles and bridles, and the State furnishing the forage. Fifty thousand acres is not a small farm. It represents seventy-eight square miles. The whole of this ground has to be policed in order to keep trespassers off. During the fire seasons of spring and autumn it is necessary that a constant guard should be maintained, and these young men do duty as sentinels to convey information as early as possible, of any existing fire and to hurry a fire fighting force on to the ground. There is just one other idea connected with this, and it may not be amiss to allude to it in this connection. These young men are under the law eligible to taking the oath of office which invests them with constabulary powers. They are not only mounted but they are uniformed and armed, let me add, without any expense whatever to the State. This is the first mounted State guard that any Commonwealth, so far as I know, in this Union, possesses for its rural districts. If the increase in crime which is now sweeping over our thickly populated rural districts should continue in the future as in the past, there will be no safety in the home of the farmer or the isolated citizen, unless it is furnished by the mounted police force. This may be regarded as the settled opinion of a large number of our most intelligent citizens. It is, therefore, a matter of some pride that this coming movement should find its heralds in the Forestry Department of Pennsylvania. It is useless for me to discuss again before your body the general relations of forestry to the public weal. That has been done over and over until you are all familiar with them. I would simply add that it is a matter of great personal gratification to me to be able to announce that Pennsylvania has come to be regarded as the pioneer in forestry thought and action, and best fitted to be an example to the other states.

The report of the Committee on Apiary having been called for, Mr. J. W. Nelson made the following statement:

MR. NELSON: I was going to prepare a report on this subject and when I received my program and did not see my name on it I did not think it was expected of me to prepare a paper. However, since I am called upon I will make a few remarks and write out a report later.

MR. NORTHUP: How are the colonies wintered this cold and fearful winter?

MR. NELSON: They are not protected as they should be, but I have found that outdoor wintering is as good as inside, if not better, because in the spring it will be more injurious to put them out if they have not been accustomed to being out of doors. There are a
few things along this line that it is necessary to know. The first requisite in the wintering of bees is to have pure honey and in order to do that it is necessary to have sufficient granulated sugar to winter them on. If you could take away all bee-bread and fix them on a granulated sugar diet they will stand a long winter much better. My bees were not able to put their head out of the hive until last week one day, during all the winter, and that is too long. If there is any honey dew and the bees eat that during the winter they have to get out of doors and fly or they will get the dysentery and will die. If they don't get the dysentery they will stand it quite a long while. The main thing is to prevent a draft in the hive, that is, leaving your hive in the top part open, so that the cold air passing through is carried off from the hive. Cold is the worst thing you can add. They winter better in a tree than in a hive; but the question is with reference to our patent hives. You will allow a draft to pass through unless you put in a cushion.

The SECRETARY: I am sure we are glad to have this verbal report from the committee, and I know this report will be appreciated if it is in some more tangible form; therefore, I move that the chairman be requested to prepare a written report for the files of the Board.

(The following written report was forwarded by Mr. Nelson to the Secretary:)

REPORT OF THE COMMITTEE ON APIARY.

BY J. W. NELSON, Chairman.

In making this, my first annual report as chairman of the Committee on Apiary, I will have to be brief, as the pressure of other work has prevented me from giving the industry the attention it deserves.

I do not think the Department gives this branch of agriculture the recognition its importance demands. Aside from the very important office of the pollination of plants and flowers, the industry represents an outlay of many million dollars, and if properly managed is probably the best paying of any of the branches of agriculture, either as a side issue or a specialty, in ordinary years paying as high as 100 per cent. on capital invested. In the twenty-four years I have been in the business there has been but

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one complete failure. Owing to the dry season of 1881 no honey was produced in this section and most colonies had to be fed. In all other years a reasonable surplus has been obtained.

Not many people seem to make a success of the business. Owing to a lack of attention or the idea that luck or some other fallacy has something to do with it, they fail. The real reason is lack of attention at the proper time, followed, of course, by disaster, and the blame is laid on the bees or the one who advised them to invest. The business can be carried on by young or old, and especially ladies, and only requires, first of all, a love for the work (the most interesting of all branches of farming). A knowledge of the bee, its habits, its methods, its diseases, its management and its language is necessary.

First, its habits. A colony of bees consists of a queen and from forty to eighty thousand workers, and as few drones as possible. The queen and workers are hatched from the same eggs, the difference being produced by different food and position while hatching. The drone or male bee is hatched in larger cells and all drone-comb should be removed from the brood chamber. The swarming habit should be controlled, and there are many methods too numerous to mention, in this report. If natural swarming is allowed, the bees should not be disturbed till settled and then given a frame of brood or some old combs to clean up. This will keep them busy and they will forget to abscond.

The bees gather from the fields propolis or pitch to stop up cracks or fasten frames and pollen to feed its young, in which operation they fertilize your fruits and flowers and help to increase your crops; and last and best of all, nectar or honey, one of the two primary foods recommended by the Scripture as making man wise. Wax is a by-product and is the most expensive, for the bees consume large amount of honey in its production, and the wise bee keeper will save all his comb possible and use it from year to year, and that is why extracted honey can be produced so much cheaper than comb honey and is much easier handled and is just as good to eat, and when candied can be brought back to a liquid form by exposure to a warm temperature for about forty-eight hours; but should not be exposed to direct heat as it is easily spoiled by direct contact with heat or exposure, either comb or extracted, to moisture. It should always be kept in a warm, dry room where it will keep indefinitely. The methods of the life of the bee never change and are easily understood if carefully studied, and probably no domestic animal or insect yields more readily to intelligent management than the honey bee.

Its diseases are one of the most common causes of failure, from the fact that the bee is subject to at least four specific diseases, one
of which—bee paralysis—attacks the old bees but does very little harm, for a change of queens seems to settle the matter generally. The other three are more serious and are bacterial in form and attacks the larve or undeveloped brood.

No certain remedy has as yet been found although much progress has been made by private individuals; but the State should take up this matter just as it has done with tuberculosis in cattle and the San José Scale in orchards; for we know Foul Brood, Clack Brood and Pickled Brood exist to an alarming extent in the State and should be exterminated by law, and we ask the Department to bring this matter to the attention of the next Legislature. There are in the State 161,670 colonies of bees, which produce 2,526,202 pounds of honey annually, which it is safe to say can easily be quadrupled without crowding. During the year I purchased some empty hives from a neighbor and now have some well developed cases of some bee disease which can only be determined by examination in the spring, with the danger of having all the rest exposed to the disease, hence the necessity of some protection becomes apparent.

Next, its management. This is the most important point of all. The honey-bee has a language of its own easily understood when you get used to it. The past season has been unfavorable in many respects. The fine weather in March stimulated brood-rearing only to be followed by cold in April and part of May. The summer was generally cool and not favorable for the secretion of nectar in flowers, which process requires warm nights with moist but not wet weather. If I get two weeks of good warm nights in buckwheat bloom I count the season a success, as in my section we get very little surplus early in the season. Buckwheat, though plenty and full of bloom, did not produce much surplus this year; but a warm September made up in part by giving us a fine flow of mountain or wild honey; fine white in color and No. 1 in flavor, its only fault, its liability to granulate, which it will do either extracted or in the comb.

The report of the Committee on Floriculture having been called for, was read by Mr. Engle for Mr. Edwin Lonsdale, chairman, which is as follows:
REPORT OF COMMITTEE ON FLORICULTURE.

BY EDWIN LONSDALE, Chairman.

Mr Chairman and Members of the Pennsylvania State Board of Agriculture:

In the report of the Committee on Floriculture last year, mention was made that two flowers had been revived that were popular twenty-five and more years ago. The Richardia Aethiopica, commonly called the Calla or Lily of the Nile—though it does not belong to the lily family, but is an Arum—and the Poinsettia Pulcherima, and they are still holding their own during the present season. And there is another old favorite coming to the fore, namely, the Camellia Japonica, or, as it was called in the heyday of its popularity, simply "Japonica," along in the late "sixties" and early "seventies," is now called for principally on sentimental grounds on account of bygone associations. Thousands of dollars' worth of these plants were destroyed some years ago because the flowers were a drug, and at the present time enough flowers cannot be secured sometimes to fill orders. Camellia plants grow slowly, whereas roses, for winter blooming, under present improved cultural methods, may be grown to full maturity in less than one year.

To go back for a moment to the Calla. Seed of it is now being offered by enterprising seedsmen, and if it proves to grow as quickly and produce flowers as freely as it is claimed for it, an oversupply of Calla flowers may very soon be looked for.

Carnations are steadily being improved by the raising of seedlings, and an improvement in cultural methods is quite noticeable. At one time, and not very long ago, carnations were planted in the poorest greenhouses on the place; now the very best with all the latest improvements in appliances are not a bit too good for them. Prices for the very best were higher last Christmas than ever before.

Among roses, the three old standbys, namely: American Beauty, cerise, The Bride, white, and The Bridesmaid, pink, are holding their own against all comers. Meteor, crimson, is being displaced by the newer Liberty, which produces a brighter colored and more shapely flower, besides being more fragrant. Three new roses for
winter blooming are so far in sight to be disseminated during the present year, namely, the much advertised La Detroit, the color of which is pink, and the crimson General McArthur. This is said to produce flowers very abundantly and with less heat than is required by other crimson roses. Uncle John is a sport from Golden Gate. It has more pink coloring than has the variety from which it is a sport.

Violets have been in oversupply, especially during the holidays just past, principally on account of growers holding them back in the hope of securing higher prices. Holding flowers back, on general principles, is a mistake. There is a limit to the length of time flowers may be held and yet give satisfaction.

Palms for home adornment have not sold so freely during the past year as formerly, nor has the Rubber Plant, it having receded somewhat from its one time great popularity, not that either Palms or the Rubber Plants are less suitable than formerly, for there are no plants better suited for the purpose indicated. The recent financial troubles are believed to be at the bottom of the lack of demand in this branch of the trade.

Planting hardy plants for permanent effect is decidedly on the increase, especially in the hardy flower garden. At one establishment where five acres were devoted five years ago to the cultivation of the hardy perennial herbaceous flowering plants, thirty acres are now in use for that purpose, showing more than anything else could do how the demand for this class of flowering plants has increased in so short a time.

The old Peony has lately taken a jump into popularity, and it deserves to do so. It is not at all particular as to soil. All that it needs is an open situation where it can get lots of air and sunshine. It delights in a rich soil, though it will thrive under neglect more than any other plant I know of.

A National Peony Society has been organized and a Peony Committee has been appointed by the Society of American Florists to look after its interests. The former organization has a trial ground in Rochester, N. Y., and the latter in Fairmount Park, Philadelphia. Much benefit to the Peony is likely to accrue between the work of the two bodies in straightening out the nomenclature of this somewhat neglected hardy flowering plant. To keep the varieties true to name is not an easy task on account of the herbaceous character of the plant as labels cannot very well be attached thereto, and labels driven into the ground are easily misplaced by the lifting process by frost and careless workmen. Unlike any other flowers that I know of, some Peonies may be kept several weeks in cold storage. To do this successfully, however, they must be cut at a certain stage in the bud state, which can only be known
exactly by experimenting, some varieties being more amenable to this process than others. A movement is afoot to hold a grand exhibition to be national in its character at a date when Peonies are ready to flower at the latest date at points north, so that those which flower in the earlier part of the country could be held in cold storage awaiting those which flower later, thus bringing them together at a convenient point for the purposes of comparison and, where necessary, for correction as to naming.

Taking floriculture from a financial viewpoint, it has not been so successful as some years immediately preceding the years 1903-1904.

Dr. Schaeffer in the chair.

The CHAIRMAN: What shall be done with this report?

On motion it was ordered to be accepted and filed.

The report of the Committee on Live Stock was called for.

DR. M. E. CONARD: I was not aware that I was on that committee. I have been on it for three or four years and I thought there was a change at the last annual meeting and consequently I have not prepared a report. I don't know that I could cover any new ground in a further discussion of it, or any ground that I have not covered in former years, except to encourage the raising of more stock on account of the high prices which prevail in our State, and I would therefore suggest a re-reading of our old reports. I am very sorry there was a misunderstanding on my part or I would have prepared a paper.

The CHAIRMAN: I want to say for these reports that I have found them interesting. I had intended to go off to my own special work but I thought that they were so interesting that I would stay.

The SECRETARY: We have reports from two of the Specialists of the Board, which have been sent to me. If it be the will of the Board we will have them read now.

The CHAIRMAN: I think the Committee on Legislation is about ready to report:

MR. Sexton: The Committee on Legislation has not had time to confer and if there are no objections we would ask to put off our report until afternoon.

Mr. HERR in the chair.

The CHAIRMAN: I see Professor Hamilton is present and we would be glad to have some remarks from him.

PROFESSOR HAMILTON: I am very glad to meet the members of the old State Board. It is unnecessary for me to say that for
I have no doubt you will agree with me that these annual reunions delight us all.

My duties have taken me over fourteen or fifteen different states in the last nine months. I find one sentiment that prevails everywhere. The people of the country generally are coming to recognize agriculture as the greatest industry that we have and, I think, there has never been a time in the history of the country when there was more interest taken, by intelligent people, than there is just now in agriculture. In order to give you some idea of what is going on I will state, that I was down in Knoxville, Tennessee, last summer and attended a meeting there in which there were twelve hundred farmers who had come up to the University at Knoxville. They were about the finest looking people I ever saw. They remained four days and had meetings each forenoon and evening and visited the Experiment Station. The business of the University was suspended and the professors devoted themselves to entertaining the visitors. Papers were read and discussed at the regular sessions, and they had a series of very enjoyable and profitable meetings.

I was down in Mississippi a little later, and there four hundred farmers came up to a meeting at their University and spent four days there. The University turned its buildings open and the visitors lived in the University building and boarded in the University halls.

I was also in South Carolina, and there two thousand farmers came up to their University and staid three days, showing how much they are interested in the work of agriculture.

I have been out in Wyoming, at Sheridan. There were men present who traveled fifteen hundred miles to come to the meeting. They had a display of agricultural products. Some of those exhibits were carried over the country one hundred and fifty miles before they came to a railroad. So the work is going on everywhere.

Last week I was out in Nebraska and saw a sight that did me good. I had been invited to talk to a company of students connected with the University. I supposed that they had a small agricultural organization among their students, such as we find in Eastern colleges. When I came into the hall there were four hundred young men; two hundred out of them belonged to the University in the regular course, and two hundred were graduates of the institution who had come back to this meeting. It was a great sight! The next evening the hall of the University in Lincoln was filled. There were anywhere from twelve hundred to two thousand people present. So everywhere—in Ohio, West Virginia and other states, there is this great interest manifested in the development of the agriculture of this country. As I said, there has never been a time
in the history of the country when there has been such a marked interest on the part of intelligent people in the development of the farmer's work. The farmers' institutes have done a great deal towards stimulating this interest, and I think also that the agricultural colleges and experiment stations have had a great deal to do with the great improvement in the condition of the farmer which have so recently taken place.

I am glad to hear that the institutes are doing so well in Pennsylvania and that they are being attended as of old, the attendance being limited by the capacity of the halls.

The State Board used to feel, I don't know how it is now, that they did not have very much on hand. As I think over the work that they are now doing in the farmers' institutes, I feel that if they never do anything more than that, they will be of grand service to the citizens of this State. The time consumed in the discussion of the great educational farming subjects has been well-spent. It is certainly a great work that you are doing in carrying on the institutes, and no more valuable service can be performed than just that service. Information in agriculture is needed and this institute movement is doing more good than any other one thing that is now being done for the elevation of agriculture.

It has seemed to me that there is another line of work that this Board might take up to advantage, which would certainly give full occupation for the balance of its existence and that is, the betterment of the agricultural societies of our several counties. This Board is made up of the representatives of the agricultural districts of the State, and I cannot help but feel that the old State Board of Agriculture has not done for the little agricultural societies, in the several counties, all that it ought to have done; that we have neglected our home agricultural organizations. The Board is a representative body and these county organizations in the several localities send you as representatives.

I suppose I am stating the exact truth when I say, that these agricultural societies have been deteriorating in Pennsylvania. They have been getting a little worse every year. Many of them are no longer agricultural societies in any proper sense, but are contributing their time to exhibiting fake shows that are disreputable, which ought not to have a place in any decent entertainment. We have looked on and allowed this deterioration to take place. Don't you think it is time that the Board should take up the question of the improvement of the county agricultural societies of Pennsylvania? I have seen something of what has been done elsewhere, particularly in the Province of Ontario, Canada. They are making a great deal of these local exhibitions and societies, in their ridings, which correspond to our counties, and they are making them educa-
tional. They are cutting out all this fake show business and are utilizing their local exhibitions for the benefit of the agricultural people in the communities in which they are held and are making them strictly agricultural shows. For instance, in the fair ground there is a set of experiment plots, conducted by experts. The plots are located on vacant land within the fence that surrounds the fair ground, so that when visitors come to the summer or autumn fairs, there are demonstrated a number of interesting field experiments right before them; experiments in grains, in grasses, fruit crops, fertilizers. There is somebody there to show the visitors precisely what these things mean. A great deal of improvement has come to their agriculture through the use of these experiment plots that are in the fair grounds of the agricultural societies in Ontario.

Then they have expert judges, who are thoroughly capable to come and take animals into the arena and there show what constitutes superiority in animals for breeding, or for draught or for driving, as well as what constitutes superiority in animals for milk and the characteristics of breed swine. So that the exhibition of each is an educational feature of their fair. These demonstrations by experts are held at different periods of the time during which the fair is held. They also have a cooking school for the ladies going on all the time. Here are given demonstrations of how things are done according to modern scientific ways with reference to the preparation and cooking of food. They also have lectures on hygiene.

Then, in addition to the instructive features of the fair, the samples that are placed on exhibition are not merely for the purpose of showing the superiority of the particular product, but the person that is exhibiting it has an opportunity to sell it, and if you want to purchase ten bushels or one hundred bushels, of the grain of which this is a sample, you have an opportunity to do so. It makes it convenient for the owner to be able to sell his entire product at the fair, whatever it may be. So that it is a great advantage to persons, who are interested in agriculture, to attend the fair.

It seems to me that our county societies could be so organized as to furnish a stock farm and keep one or two well-bred stallions, one or two well-bred bulls, perhaps several swine and several bucks, and so on through the list, in every county of the State. The result would be of great benefit to our farming industry. The service might, first of all, be for the members of the association at a nominal rate and then allow the general public to have the use of these animals at a reasonable price. This method there is no doubt would result in having a better class of animals bred. I believe we might not only improve the animal industry of our State in a very few years, if we had such a breeding establishment in every county, but
that in a great many other directions it would be possible to make these fairs educational instead of fake shows, that not only benefit no one, but are a disgrace to the communities in which they are held. They are called agricultural fairs, but are like Josh Billings’ discourse on milk, which referred to everything else but milk. At the so-called agricultural fair the managers put on exhibition a few bushels of wheat and a few pumpkins and other products, but they are not at all typical of the agriculture of this great State. I believe this Board could take an entire session, not only a half a day, but that it could take the entire meeting of two or three days, with great profit to the agriculturists of the State, and have fifteen, twenty or thirty papers read and discuss this subject. There would be work enough, in connection with the farmers’ institutes, to keep the Board busy and it would be profitable work. If the members of the Board would give their attention to this subject it would be a great benefit to the people all over the State.

Then there is another thing in this connection, and that is, we ought to have one great fair in Pennsylvania, annually. These summer fair societies in the different counties, and this Board, are interested in this annual State fair which we should have and I do not see why the State Board might not take up the subject and take such action as would result in getting up a State Fair in Pennsylvania that will be something like the kind of fair that our neighboring state, New York, has each year and which now has become the resort of those of advanced thought in agricultural subjects and an annual assembling place for agricultural people who are interested in all that goes to make the farming industry a success. This State Board can do a great deal to effect this. If the State Board will continue its improvement of the summer exhibits by the county associations and make them what they ought to be, and then to crown all get up one great exhibition for the State, it would be a great benefactor to the agriculture of Pennsylvania.

I believe the Board could profitably take an entire session in the discussion of the subject I am now talking about and in that way come to some conclusion as to the practicability of carrying out the suggestions that I have rather crudely stated.

MR. HERR: I see General Beaver is in the audience. Will he step forward and assume his position in the chair?

GENERAL BEAVER: You keep the chair. I would just as soon sit here.

The report of the Committee on Credentials was read, and the following persons were recommended to be admitted to membership in the Board:
No. 6  DEPARTMENT OF AGRICULTURE.

M. X. Clark, Claridge, Westmoreland county, 1907.
H. C. McGowan, Geiger's Mills, Berks county, 1907.
F. Jackel, Hollidaysburg, Blair county, 1907.
W. H. Brosius, Drumore, Lancaster county, 1907.
Edwin Lonsdale, Wyndmoor, Philadelphia county, 1907.
W. E. Perham, Niagara, Wayne county, 1907.
S. M. McHenry, Indiana, Indiana county, 1907.
A. T. Holman, Nekoda, Perry county, 1907.
N. M. Biddle, Carmichaels, Greene county, 1907.
E. E. Tower, Hop Bottom, Susquehanna county, 1907.
D. A. Knuppenburg, Lake Carey, Wyoming county, 1907.
E. E. Chubbuck, Rome, Bradford county, 1907.
B. F. Koller, Shrewsbury, York county, 1907.
R. M. Kendall, McConnellsburg, Fulton county, 1907.
H. C. Snavely, Lebanon, Lebanon county, 1907.
M. M. Naginey, Milroy, Mifflin county, 1907.
S. X. McClellan, Knox, Jefferson county, 1907.
W. C. Black, Mercer, Mercer county, 1905.

The Committee recommended that J. W. Nelson, of Shawville, Clearfield county, be admitted and that his certificate be referred to the president of the Clearfield Society, for recognition.

The following persons representing agricultural organizations, were recommended by the Committee to be admitted as advisory members:

Cyrus T. Fox, Reading, Berks County Agricultural and Horticultural Association.
H. Seidel Thorn, Reading, Berks County Agricultural and Horticultural Association.
Gabriel Hiester, Harrisburg, Pa., State Horticultural Association.
W. F. McSparran, Furniss, State Horticultural Association.
W. T. Creasy, Catawissa, State Horticultural Association.
Enos B. Engle, Waynesboro, State Horticultural Association.

The SECRETARY: I move that the report be amended by instructing the Secretary to communicate with the Jefferson county people asking whether there is a vacancy, and if there is, that the Secretary be instructed to place Mr. McCracken's name on the roll.

The motion being seconded, it was agreed to.

MR. HUTCHISON: I move that the persons named in the report be elected as members of the Board.

A Member: This Board does not elect its members. They are selected by county organizations.
MR. WOODWARD: It recommends that the members, however, be elected. They are elected by the county societies.

The motion being seconded, it was agreed to.

MR. McGOVERN: I move that John G. Sheeler be admitted as a delegate.

MR. CLARK: I would like to include the names of Mr. B. F. Koller, who represents poultry; also Dr. Armsby, of State College.

DR. ARMSBY: The State College has a representative.

MR. CLARK: I also move that Deputy Secretary Martin and ex-Secretary Hamilton be included.

The motion being seconded, it was agreed to.

The report of the Committee on Fertilizers was read by the chairman, Mr. McGowan, and is as follows:

REPORT OF COMMITTEE ON FERTILIZERS.

BY H. G. McGOWAN, Chairman.

Fertilizers are used very extensively in Pennsylvania. They have found their way among the farmers in every section of the State. Suffice it to say that more are sold in eastern Pennsylvania than in the northern and western portions. We believe, however, that a more economical use of commercial fertilizers should be practiced. The practice to enrich the soil through the fertilizer bag is commonly practiced, which, in some cases, is a loss to many farmers. A more judicious use and care of the barnyard manure on the majority of the farms in Pennsylvania would be wise. An illustration of this was seen in several cases where the barnyard manure was wasting, being exposed to sun and rain, freeing the most valuable elements of the manure by letting the liquid run away wastefully. Last year this was seen where the agent resided who sold and used fertilizer by car-load lots and left much of his barnyard manure go to waste.

Again, the farmers of Pennsylvania should acquaint themselves better and become more expert in calculating values from off the bogs and not be forced to accept the sermons of the different fertilizers agents as they come along. A complete fertilizer contains three elements; nitrogen, phosphoric acid and potash. A growing
tendency among many of our farmers is to use only potash and phosphoric acid and spending money for nitrogen, which is the most expensive ingredient, and which can be obtained through leguminous plants.

It is estimated that our farmers sustained a loss last year of a million dollars in the United States in neglecting to properly care for barnyard manure. Let it be suggested as a means of preventing the escape of one of the most valuable elements (nitrogen), that our farmers resort to hauling out barnyard manure daily and that ½ pounds per animal of land plaster be used as an absorbent to prevent the escape of the nitrogen. Phosphoric acid is also used to good advantage during the season, spreading it over the manure. It is very much more to the advantage of the farmer to use land plaster and thus save the escaping ammonia, than to buy commercial fertilizers on the market. Commercial fertilizers are very helpful to increase crops when judiciously used, but too much money is unwisely spent by the farmers of our own State. We spend annually in the United States over $50,000,000 for commercial fertilizers.

Home mixing of commercial fertilizers is practiced to some extent, but not as much in Pennsylvania as in New Jersey. The annual saving to the farmers in New Jersey in one year by home mixing of fertilizers is estimated at nearly $500,000. This is an item too large to be overlooked and it would be well for the farmers of Pennsylvania to experiment a little more along the line of home mixed fertilizers.

Our Department of Agriculture or Experiment Station might, with advantage, co-operate with farmers along the line of home-mixed fertilizers and prove thereby to be a saving to the farmers. In New Jersey the truckers and farmers saved from 25 to 40 per cent, in the purchase of commercial fertilizer plant food. Farmers are beginning to more closely follow the advice of our Experiment Stations relative to values of feeding stuffs and commercial fertilizers. Too much reliance ought not be placed upon commercial fertilizers to the extent as to neglect to use fallow crops and animal manure.

We commend the Department of Agriculture for the efficient methods of having commercial fertilizers analyzed by the Experiment Station, thus enabling the farmer to intelligently understand just what the value per ton of all brands of fertilizers purchased. No better money-saving act was ever passed for the benefit of the farmer, than was the "Act regulating the manufacture and sale of commercial fertilizers" in our State. This act is self-sustaining through the license paid by the manufacturer. However, be it said, that the enforcement of the violation of the requirements of said
act might be more rigidly enforced, when goods do not come up to the requirements of the law.

During last year in Pennsylvania there have been received from sampling agents 1,126 samples of commercial fertilizers, and 542 analyzed; 365 were complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 82 furnishing rock and potash; 56 acidulated rock; 27 ground bone, furnishing phosphoric acid and nitrogen. Be it said to the credit of the manufacturers, that over two-thirds of the samples subjected for analyses were found running over guarantee. The general tendency of the fertilizer trade is to use complete fertilizer, which is correct; but where farmers will take judicious care of all farm manure the omission of nitrogen may be heeded and with advantage buy fertilizer containing only potash and phosphoric acid.

MR. WOODWARD: I move that the report be accepted and filed, and the motion being seconded, it was agreed to.

MR. TEMPLE: If I am not mistaken it has been the custom to appoint a committee to wait upon the Governor, and I, therefore, move that such a committee be appointed.

MR. SEXTON: I second the motion and say, that we would like to have him present.

It was agreed to.

The CHAIRMAN: I appoint Messrs. Temple, Sexton and Schwarz as such committee.

The CHAIRMAN: I omitted to call for the report of the chairman of the Committee on Poultry.

MR. TEMPLE: I have my report at the hotel and neglected to bring it with me this forenoon. I will bring it with me at the next session.

The CHAIRMAN: The next order of business will be the election of officers for the ensuing year. I appoint Messrs. White and Hutchison to conduct the election. We are now ready to receive nominations for vice presidents.

MR. CLARK: I nominate Hon. Jason Sexton, of Montgomery county.

MR. MARTIN: I nominate Henry W. Northup, of Lackawanna county.

A Member: I nominate M. N. Clark, of Westmoreland county.

MR. TEMPLE: I move that the nominations close and that the Secretary cast the ballot.
No. 6. DEPARTMENT OF AGRICULTURE

The motion being seconded, it was agreed to.

The SECRETARY: I cast the ballot, as directed, for Messrs. Northup, Sexton and Clark to fill the office of vice president.

The CHAIRMAN: The next in order will be the election of the Executive Committee. There are nine members to be elected.

MR. TEMPLE: I nominate Mr. A. J. Kahler, of Hughesville, Lycoming county.

MR. McGOWAN: I nominate Mr. Matthew Rodgers, of Juniata county.

A Member: I nominate Mr. N. G. Temple.

MR. NORTHUP: I nominate Mr. R. F. Schwarz, of Monroe county.

MR. HUTCHISON: I nominate Mr. S. M. McHenry, of Indiana county.

A Member: I nominate Mr. H. C. Snawely, of Lebanon county.

A Member: I nominate Mr. H. G. McGowan, of Berks county.

A Member: I nominate Col. John A. Woodward, of Centre county.

MR. WOODWARD: I have been whispering and been whispered to and was not paying strict attention to what was being done. I understand I have been nominated on the executive committee I would respectfully decline on account of having other duties to perform.

A Member: I nominate S. X. McClellan, of Clarion county.

MR. McGOWAN: I nominate Mr. Glover, of Union county.

MR. HUTCHISON: I move that the nominations close and that the Secretary be directed to cast the ballot for the gentlemen who have been nominated.

The motion being seconded, it was agreed to.

The SECRETARY: In accordance with the instructions, I cast the ballot for the following named persons to serve on the executive committee: Messrs. Kahler, Rodgers, Temple, Schwarz, McHenry, Snawely, McGowan, McClellan and Glover.

The CHAIRMAN: Unfinished business.

The SECRETARY: There is none.

The CHAIRMAN: New business.

MR. WOODWARD: The selection of place for the next meeting. I suppose, would come properly under that head?

The CHAIRMAN: I think so.
MR. WOODWARD: I request that the meeting be held at Bellefonte. It was at one time thought last year you would meet at State College, but for certain reasons it was abandoned. Our most important hotel, the University Inn, was destroyed by fire. It will be with difficulty that we can make our friends as comfortable as we would like to have them and we ask them to make their meeting at Bellefonte, where there is fine accommodations and where you will be in the center of Pennsylvania and of the universe and have the best water in the United States, and be in company with the best ex-Governor in the United States. The proposition is to ask you to meet at Bellefonte and then we want you to give us one day at the State College. We propose to have a special train and feed you once at the college and bring you back to Bellefonte for the evening meeting. We invite you to come to Bellefonte and we will come down and meet you there. I hope, Mr. Chairman, this will be accepted in the best faith and accepted so thoroughly that nobody else will think of making mention of any other place.

MR. HUTCHISON: I wish to second that request and state that Bellefonte is one of the nicest towns to visit in Pennsylvania. The hotel accommodations are ample and the water, which is one of the requisites to a pleasant and successful meeting, is abundant and as good people as live on the face of this earth live there; I say this because it is only twenty-one miles to Warriors’ Mark.

MR. NELSON: I would like to suggest that this Board meeting be held at Clearfield. I believe we have as good hotel and railroad facilities there as anywhere else. We handled the State Grange last year. I assure you that you will secure a good welcome for yourselves and the cause of agriculture.

GENERAL BEAVER: I also add my recommendation for the meeting of the Board to be held at Bellefonte rather than at the State College. I know the members will be interested in the question why we ask you to come to Bellefonte rather than to the State College. I believe there is not a place in that town, or in the college, that is not occupied by students or professors. They are overtaxed for accommodations and that is the reason why the invitation does not come from the college, for there is a special reason for going to the college on account of its close relationship with agriculture. Colonel Woodward told me that he had met the representative of A. A. Reed & Company, the largest manufacturers of dairy implements in this country, or at least one of the largest, and that industry had gone into other states and he was told that we had the best dairy building, at the State College, in the United States. There is only one that approaches it and that is in
Massachusetts. That building will be finished at the time you visit there. If it is not the first of the agricultural group which is to be completed, it comes second in the group, and the third will be the main agricultural building, which is practically provided for by the Legislature. But whether this meeting will come at the time of the dedication, and the throwing open of that building for use, or not, you will all have the opportunity of viewing it and that is worth a day's visit on a special train which will not cost the Board or the State a cent. I think we can get the railroad company to run a special train there and at the college they will give you a good dinner in the armory. I hope my friend from Clearfield will come to us this time and help us along in our efforts to have this next meeting held in Bellefonte.

MR. CLARK: I think as the Deputy Secretary has more to do with that meeting than anybody else, he ought to be heard on this subject.

MR. MARTIN: Mr. Chairman and Gentlemen of the Board of Agriculture: I have listened with a great deal of pleasure to the kind invitation which you have received from Bellefonte, by those representing that location, as well as from the gentleman from Clearfield county. My association and connection with the State Board of Agriculture, as you are well aware, is arranged by your having charge of farmers' institutes, county and local, in the different counties of the State. This relationship has been very pleasant in the last five years. I have found you ever willing and ready to take up this work in a cheerful and most efficient manner.

As to the selection of a place for holding your semi-annual meeting, I beg to say, I have no personal preference. Any locality of easy access by railroad, having abundant hotel accommodations, I assure you, will be acceptable to me. But, my friends, there are other considerations which, if it were in place and this were the proper time, I would like to suggest. We have come to the time, in the history of the educational part of the farmer's institutes in Pennsylvania, in which those who impart instruction to the farmers of the State must be equipped for that work. We have held a number of what are known as annual or "round up" meetings in Pennsylvania, continuing about two days in duration. We have been exceedingly hurried in all this work, to such an extent that I am impressed with the idea that our next meeting should be one in which greater deliberation should be exercised in the preparation of the program and in the instruction to be there given. This deliberation should consist in instruction and adjusted conditions relative to the normal institute lecturer, who goes out in the field the coming year. It was in my mind, and I want to be frank with you, as institute chairman, to suggest that we make this annual meeting of

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institute lecturers and directors one of normal instruction and continue it for five days in which it should be sub-divided, by drawing from the Experiment Station the very best instructors along the lines of soil fertility, of animal industry, and also of farm operations, and have the farmers' institute lecturers there, as a class, digesting the subjects discussed along certain lines with reference to the most approved and scientific methods in order that they be fully equipped for the work in hand.

Now, my friends of the State Board of Agriculture, you know that plants feed upon the fertility of the soil by solution and so we expect, as institute lecturers and directors, that we will draw from these Experiment Stations and scientists these facts and figures and conditions and digest them as they are taught to us. It is my opinion that when we go out we should have these facts so considered and investigated as to give to the farmers of the State much important instruction on the various topics outlined. This illustrates my thought with reference to the direction of these farmers' institutes.

My suggestion then is that when we meet it shall be as directors of institutes, county chairmen of institutes and lecturers, and draw from the Experiment Station at State College the very best instructors—let each take their turn along with the scientists which we may secure from other places and spend that week in actual normal exercises giving and imparting mutual instruction. I throw out these thoughts that we may better understand each other. I would like to have the co-operation of the gentlemen, who are chairmen of institutes and who feel disposed to spend five days at Bellefonte or Clearfield, or wherever you go. In taking up this work, I feel we have approached a time in normal institute work when the man or woman who attempts to instruct others, must be well informed and versed along the lines which he or she proposes to give instruction, and the stimulating power ought to be this normal work which we should supply, fitting us more directly and perfectly for the work.

Just another thought. The usual time for holding the semi-annual meeting has been about the first or second week in June, which, in my judgment, is a very inopportune time. Institutes close about the first of March and begin about the first of December. This annual meeting ought to occur about the latter part of October, or a month before we begin institute work, thereby affording inspiration and equipment to carry forward the work. I present these thoughts, and if they are not acceptable, and the members of the Board think it is not the right thing for the upbuilding of institutes I want you to say so; but I sincerely believe that the date at which they have been formerly held is an inopportune time because it is on the threshold of the harvest season. As I stated before, I think
that about a month before we begin to hold our institutes would be a more appropriate time for the annual normal institute.

MR. WOODWARD: I want to say that I have not had the pleasure to call on Mr. Martin, my friend, the Deputy Secretary. So I have not inspired him with that speech, but I desire to thank him for stating so ably the splendid opportunities afforded in meeting at the State College. The other subject, with reference to the time of meeting, I have not had opportunity to take up but I am heartily in accord with that side of the question. The selection of the place of meeting is one question. You are just as welcome in Bellefonte in October as in June. Perhaps those questions should be voted on separately.

MR. SEXTON: I move that we accept the invitation extended by Mr. Woodward and General Beaver.

MR. NELSON: I desire to say that we accept ex-Governor Beaver's proposition with the understanding that he will say that we have the next best chance. While I have the floor I wish to thank Mr. Martin very much for the opinion that he has expressed because we want something more along that line. We want something a little more definite and a little more in advance than our institute lecturers give us to-day because we can get a great deal of what they teach us from our papers. I also think that the remarks of Professor Hamilton are well put and that he has certainly advanced good ideas with reference to the interests of the farmers.

MR. WOODWARD: If you should conclude to spend a week at Bellefonte we could take you to the State College every morning and bring you back to Bellefonte in the evening, and I have no doubt that lecturers would be provided such as has been suggested by Deputy Secretary Martin. It may be if you postpone your meeting until October we might be able to provide accommodations at the college. The arrangement could be very easily made so that the evenings could be given to the members of the Board. I think Mr. Martin has very aptly called it the normal class in the institute work, and if our professors there knew it in advance they could prepare lectures that would be especially adapted to the mature mind and mature experience of the men who represent this Board. It is an admirable idea and would tell immensely for good, not only in the institutes next year, but for years to come. I am sure that the college authorities would be very glad to make this a great success. I am sorry to say that Dr. Atherton is suffering from inflammatory rheumatism and was not able to get around to this meeting; but Dr. Armsby is here and I have no doubt he will carry out my declara-
tion that the college will do all in its power to carry out the suggestions of Mr. Martin.

The SECRETARY: If the members of the Board think that October would be the best time for the meeting to be held and that it should be held in Centre county, a motion that a committee be appointed composed of Messrs. Beaver and Woodward, to determine whether it shall be held at State College or Bellefonte, would fix the whole thing in one motion.

MR. CLARK: I move to amend as follows: That this meeting shall take place in October at such time as the Deputy Secretary shall fix.

MR. WOODWARD: I accept the amendment, that the meeting be in October and held at Bellefonte or at the State College.

MR. MARTIN: I have pretty thoroughly gone over the situation. We find that the fairs, which are held in the different counties of the State, have nearly all been held by the latter part of October, with a very few exceptions, and it seems that either the latter part of October or the beginning of November would be a most suitable time.

The CHAIRMAN: I think we ought to give that a good deal of consideration and I think we ought to vote on the first proposition first, that is, as to the selection of a place.

MR. WOODWARD: The change from June to October or November, has my hearty approval.

MR. McHENRY: It strikes me that we have only one question before this body, that is, that we hold the meeting at Bellefonte. Question was put and it was agreed to meet at Bellefonte.

MR. FENSTEMAKER: Wouldn't the lateness of the season for the holding of the meeting be against the seeing of the crops growing on the experimental farm and wouldn't that be a great disadvantage?

DR. ARMSBY: There is not any one time that you can see everything growing there. In the latter part of October a great deal of the plot work would not be in condition to be seen direct in the field, but with the class of materials we could have there I don't think that would be necessary. The plots are there and you can see the matter of making experiments. Of course, it would not be quite the same as to see the plots actually growing, but some would be visible.
MR. McHENRY: I think that the main part of this whole question is in the hands of the Deputy Secretary. The institute work comes under the charge of the Deputy Secretary and it does seem to me that it would be proper to leave this question to him and the executive committee of the State Board. I want to say that I am very much pleased and gratified with Mr. Martin's remarks in regard to that meeting. I am very well satisfied that many—I will say some—of the chairmen of institutes of the different counties, could bear a little bit, or little more learning along the line of holding county institutes. I am sometimes inclined to think that even some of those sent to the different counties to tell us what to do might be a little better acquainted with some of the subjects about which they try to instruct us. I would like to see about a week's instruction imparted to institute managers, because I believe they are the persons who must make county institutes a success, therefore, I am very much in favor of the remarks of our worthy Deputy Secretary, Mr. Martin.

The CHAIRMAN: A very good thing would be to get an expression from every manager in the State, because an expression from them would result in finding out whether they could take that instruction during that week. My only objection would be that it is a very busy time and when farmers are so busy it is hardly possible to get them to attend the institute. Normal instruction is a splendid idea. I was present in Ohio at a meeting about the beginning of September, and they decided on very much such a course, in which the institute workers would have training under scientific instruction, and I think that would be all right, but whether you can get the institute managers from all over the State to spend a week in that kind of work, I have my serious doubts.

MR. BLYHOLDER: I move that this meeting endorse and favor a week's instruction as indicated, sometime in October, the time to be fixed by the Deputy Secretary of Agriculture.

Motion seconded.

PROFESSOR HAMILTON: I had opportunity this last year to attend a meeting of this character, held one week at the Geneva Experiment Station, in the State of New York, and the following week down at the Cornell University. There were meetings such as has been outlined by Mr. Martin. There were present at the Cornell University thirty-seven workers of the New York state institute force. The meetings were held morning, afternoon and evening. There were lectures delivered by officers of the Experiment Station during the meetings up at Geneva, and time was given to make an ex-
planation of the experiment work. Some of the lecturers had reference to the scope of the experiment work, what it was doing. Each lecturer provided a syllabus of his lecture, and there was thus placed in our hands an outline of what he was to talk about before he began. There was little necessity to take notes because the syllabus was quite full. I went there as a spectator and, listening as a scholar, was very much interested and instructed. I made it my business to inquire as to the impression the lecturers received from this instruction and they said they regarded it as of very great value; it helped to fix in their minds the truths of science as understood by our leading scientific people as far as it related to agriculture and furnished those who went out to instruct others with such information as was needed and gave them a better idea of what they should teach and how they should teach it. The general opinion was that the meetings had been of very great service and the convention is to be continued during the succeeding years. All were quite interested and while the visit to the University was of great service to the University, it was also an eye-opener to the many institute lecturers. I think the lecturers from this out will have greater respect for the officers of the Experiment Station as to their capability than they ever had before. I believe that a similar feeling will result in these meetings which you propose to conduct along the same line, and I believe that the movement for the education of the lecturer is a necessity. No educational institution can rise above the qualifications of its teachers, and if the institutes are to be improved the first thing is to improve its lecturers.

When I went to Washington to take charge of this work, which I am now engaged in, in looking over the field I found the first thing to do was to get into touch with the teaching force and secure a list of the men and women who were employed as state institute directors all over the United States. After securing the names and addresses of these men and women, I sent out a circular asking for data respecting their personal history, their ages, their educational qualifications, their life work, what they are now engaged in and the subjects they profess to teach. Immediately upon getting that information I made arrangements with the Department of Agriculture, by which the scientific publications of that Department should be sent out to these men for their information, and also entered into communication with the Directors of the Experiment Stations of the United States and requested them to send, to this list of names, which amounted to over nine hundred, their literature. This has been done and there come to me letters and personal statements from institute workers showing their appreciation of this service, and I believe that the next great work for the building up of farmers' institutes must be in the direction of the education of the
teachers. This is a move that you are making in the right direction, and I am glad that my old home State is starting in this work of educating her lecturers.

The CHAIRMAN: Was there a bulletin published of the list of institute workers?

PROFESSOR HAMILTON: Yes, sir; such a bulletin was published and sent to all the Experiment Stations and to all the institute directors of the State.

MR. NORTHP: I desire to make a statement in reference to myself in respect to what has been done by the efforts put forth by Secretary Hamilton in connection with those bulletins. I appreciate very highly those bulletins and pamphlets which have been sent to me, and I can say that they have helped me wonderfully. I don't know what I would have done as chairman of the institutes without having the benefit of them. I have used a great deal of oil in the perusal of these papers. I appreciate the work of Secretary Hamilton and I am glad that he was engaged in the State Board of Agriculture and that he is connected with this work to-day. I am sent out sometimes to talk to the institutes, and I dislike to talk nonsense. I have had my own experience on the farm, and when I come to examine these bulletins and pamphlets I know I am right and know it by experience and it bracés a man up wonderfully, and he is able to do the work better not only for his country but for his God.

DR. ARMSBY: I simply arise to confirm what the gentlemen before me say with reference to the school of instruction. I think there has been no more important step taken than the one proposed for improving the condition of the farmers in this State; and I want to say to Secretary Martin that we shall consider it not only our pleasure but our duty as servants of the State to serve the institute workers in this way, and I very sincerely hope that the State Board of Agriculture will pass this resolution that is before them, leaving the details to be worked out by the Deputy Secretary of Agriculture.

MR. McHENRY: I am heartily in favor of this resolution now, but I think we are making a mistake in fixing the time. There are so many things to be done in October. It is the busiest time we have in our country, from the first of September until the last of October. I can't see why, after a thorough examination, this time cannot be left to the Deputy Secretary. Another thought that strikes me. I am not certain but that the information which the Deputy Secretary intends to give us ought to be a little earlier than that. I
think it would be beneficial to me, up in Indiana county, if I had it a little sooner. Some of us are a little slow and I would have a little more time to consider what I ought to know and do at the coming institute. If you don't let me have this information until October, on account of having lots to do at this time, I will have very little time to prepare myself for my duty, and, besides, do all that I should do in connection with my work.

The CHAIRMAN: The question is to have the meeting sometime in October, at the call of the Secretary, and to be for one week.

It was agreed to.

On motion, adjourned at 12 o'clock M.

AFTERNOON SESSION.

The Board met at 1.30 P. M., with Mr. Jason Sexton in the chair.

The CHAIRMAN: The first subject for the afternoon is the Report of the Pomologist, Mr. Fox.

The report is as follows:

REPORT OF THE STATE POMOLOGIST.

BY CYRUS T. FOX, POMOLOGIST.

Gentlemen: As pomologist of your honorable body, it becomes my duty to present a report at this annual meeting in regard to the fruit results of the past season, and any matters of interest which may have arisen during the year.

In the first place, it may be stated that the year, as a whole, was unfavorable for fruit in Pennsylvania. The season was early, owing to a comparatively mild winter, and fruit trees blossomed from ten days to two weeks sooner than usual. While they were in full bloom there occurred a rainy period which washed off the pollen of the blossoms, rendering them unfertile. Following the rain came a period of drought, which extended throughout a season of 50 days, and was, to a large extent, obstructive to the fertilization of the blossoms which had escaped the effects of the heavy rains of the latter part of March and beginning of April.
APPLES.

Notwithstanding these adverse conditions, there was a fair crop of apples throughout the State, especially in the counties bordering on the New York line, where, in fact, the yield was large. In other sections the crop was below the average. A severe storm in the early part of October was very destructive just at the time when winter varieties of apples were to be picked, and there was a heavy loss in consequence. Some growers in Pennsylvania, having regular customers for apples, were compelled to go to northern Pennsylvania to obtain supplies of fruit.

PEARS.

The season was favorable for pears in most parts of the State, especially for the Kieffer, which seems to have all seasons as its own. Every grower had Kieffer pears, but the price realized was so small as to scarcely pay for the picking. The fall varieties, such as the Bartlett and Seckel, did not do as well as usual. It appeared to be an off-season for the Bartlett, and the pears of this variety which were marketed commanded a good price. Pear trees in a number of sections of the State suffered from blight more than in previous seasons.

PEACHES.

There were very few peaches. The same conditions which interfered with the success of the apple crop, injured the peach crop, viz: An early starting of the buds and then a succession of rain storms just as the trees were in bloom. One grower, for instance, who in the previous year had 10,000 baskets of peaches, did not have over 200 baskets to send to market in the season of 1903. The outlook for 1904 is very uncertain. The severe cold experienced this winter, especially during this month, when the temperature was at different times under ten degrees below zero, makes the problem very uncertain.

PLUMS.

The Japanese varieties of plums seem to be the salvation of the plum crop. Where orchards of the approved Japanese varieties have been planted there have been fair crops and the plums have been marketed at prices which have paid the growers. Not much more can be said in regard to the plum crop, except that sprayings with the Bordeaux mixture have proved quite effectual,
QUINCES.

This is a fruit which is very much neglected. Nevertheless, it is one of the most important in the entire list; important, because there is not a housewife who does not look for it in the fall of the year when fruit is being "done up," as the family saying goes; important, because it is one of the finest of all fruits for jellies, preserves and marmalades; important, because there is no other fruit, in its green state, so thoroughly advantageous to the stomach and liver, particularly acceptable to the latter on account of its known presence of phosphoric acid. The quince, besides, is a highly profitable fruit, selling at a higher price than any other; not by the measure, but, most frequently, by the dozen specimens, bringing from 50 cents to $1.00 per dozen. Unfortunately, the quince is more subject to the ravages of the San José Scale and codling moth than any other fruit.

CHERRIES.

Cherries did well in some sections of the State, but were scarce in the southeastern counties. Sour cherries brought higher prices than in a number of years, selling for 10 to 12 cents per quart, showing the great popularity of this fruit. While no particular attention is paid in Pennsylvania to new varieties of cherries, it would be well to foster every new kind presented, particularly such as are earlier than those now commonly sent to market.

GRAPES.

It was hoped that the dry weather experienced during May and June would be favorable for the grape crop; but the wet weather of July, which was general throughout the State, resulted in considerable rot. Nevertheless, there was a good crop, almost equal to that of the previous year, which was, in certain respects, a phenomenal one. Considerable wine was made, especially where the Clinton and Ives' seedling yielded well. As for table use, the Concord still holds its own as being the most popular variety.

SMALL FRUITS.

Strawberries, raspberries, blackberries and other small fruits were greatly cut off in their yield by the June drought. The fruit was of excellent quality and commanded good prices.

NUT CULTURE.

More attention than ever is being devoted to nut culture. Chestnut trees are being grafted with the new varieties, which bear in from two to three years after being grafted, and the fine, large
nuts are very salable. English walnut trees are also found to succeed in most sections of Pennsylvania, especially in the southern counties. In some parts of the State walnut groves have been planted, owing to the demand for walnut lumber in the trades.

- THE SAN JOSE SCALE.

The greatest menace to the fruit interests of Pennsylvania is the San José Scale. I expect to say very little in regard to this pest, because we now have an efficient Economic Zoologist, who has been giving this pernicious insect his thorough investigation, and will have much to report in regard thereto at this meeting; but it is so important a subject that I do not know when I shall stop. Suffice it to say, at this time, that unless some very vigorous, and what may appear drastic, methods are employed, there may be no fruit in Pennsylvania, of any consequence, in a few years.

It was on the 23d of January, 1895, that your pomologist sounded the first note of alarm in regard to the appearance of the San José Scale in Pennsylvania. At that time it had appeared in but one county, brought on trees obtained from a nursery in an adjoining state. The same month, however, it was reported in two other counties from trees obtained from the nursery above mentioned. Before the end of 1895 it was in twelve counties. Thus it continued its progress until by this time almost every county in Pennsylvania has been visited. The Economic Zoologist will be able to tell you in regard to its advancement year after year.

Such being the case, it is plainly to be seen that unless something is done there will be no fruit trees in Pennsylvania within a short time. Take the example of two of my intimate friends in my own county. They are professional men, who have been successful each in his own line, the one in medicine and the other in dentistry. They concluded to embark in fruit growing in a commercial way, securing efficient help and paying the price. The farm which they purchased, near the city of Reading, was planted with the most approved varieties of trees—apples, pears, peaches, plums and quinces. Not much attention was given to cherries, and nothing to small fruits. But thousands of dollars were invested in other fruits, especially such as would bring early returns—peaches and plums.

After a year or two the farm seemed to be a success. Choice peaches and plums were sold in the Reading market at remunerative prices, and there was a demand for all that were put on sale. The apple and pear trees throve, and soon a fine orchard of Kieffer pear trees commenced to bear. Then the San José Scale made its appearance. Where it came from, the owners of the orchard were unable to learn, nevertheless, it was there, and soon had possession of every tree. No worse blight ever came over any orchard. The trees
in a short time were ruined. Instead of trying the known remedies, the owners of the orchard, thoroughly discouraged, concluded to destroy the trees, and so they gave orders to their employes to root out and burn them. This was done at a loss of thousands of dollars.

Now this is one case. What are we going to do to-day in regard to the thousands of other cases in Pennsylvania? In reports which your pomologist has received within the past month he has found that the San José Scale is distributed generally throughout the State. In several counties it is only in isolated districts, but it will not be long before each and every district in the county will be infested.

It needs but little influence to aid in the dissemination (if that is the right word to use) of the San José Scale. For whether disseminated, as is the case with the sowing of the seed of the ox-eye daisy or other wild weeds, or whether transported by the winds or carried by the birds, and thus fastened upon the twigs of the trees which are to become its prey, it is certainly a most grievous pest, the worst which the fruit growers of this or any other country have experienced.

At the outset your pomologist stated that he would not have much to say in regard to the San José Scale, but as these lines have been written, he feels that there is a certain duty which he should perform, and that, while it is true, another more able than he (the Economic Zoologist) is to follow, there are many of his friends who would be glad to know his views. Shall we have Pennsylvania fruits on exhibition at the World’s Fair at St. Louis, for instance? Yes, if our fruit trees are, meanwhile, not destroyed by the San José Scale. Why so pessimistic? Because it is known that trees have been destroyed in three months from the time that they have been attacked.

What, then, shall we do to combat this dreadful pest? The Economic Zoologist will tell you what to do. He favors the lime, sulphur and salt solution, to be sprayed upon the trees. The disadvantage of this is that it is disagreeable to handle and requires prolonged boiling. The more difficult that it appears to farmers to prepare a remedy, especially in the busy season—the spring of the year—the less likely they are to make use of it.

The lime, sulphur and salt solution is prepared as follows: Lime, unslaked, 40 pounds; sulphur, ground, 20 pounds; salt, 15 pounds; water, 60 gallons. This is known as the California wash and has proven very effective wherever used. It is recommended by the Experiment Stations of nearly all the states and by the leading horticultural societies.

A cheaper and, perhaps, more effective wash was discovered by your pomologist in a sojourn of two months last fall in Virginia.
There, large orchards have been established, some of them hundreds of acres in extent. Of course, all the known remedies for the San José Scale have been tried in that state, for the Virginia orchardist has gone into the business of fruit-growing for profit and not for pleasure. The products of his orchard are now on sale we might say, without exaggeration, all over the world. Take the case of one grower near the city of Roanoke, Va., who recently marketed a crop of apples, realizing from 25 acres the snug sum of $5,500, with what we know as the "culls," bruised and imperfect apples, left for cider and vinegar. There are companies in the same neighborhood having hundreds of acres in apple trees. One of these companies sold the crop of Albemarle pippins of the season of 1903 for $16,000. Apples exported to Europe, carefully packed, have brought $11 per barrel in the Liverpool markets. Under the circumstances, is it any wonder that the apple growers of Virginia have been on the alert in regard to the San José Scale.

The wash which has been found very effective in Virginia, and in the successful use of which there is corroborative evidence from Western New York, is known as the caustic soda wash. This, being to a considerable extent corrosive, should be applied to the trees early in the winter, after the leaves have fallen, and again in the spring, before the foliage has developed. It must be applied with skill and, hence, the necessity of observing carefully every detail. Otherwise it is as safe to use as the lime, sulphur and salt wash, and is much more effective.

The formula is easy to remember, because it starts with certain figures, and then drops to one-half, and then use the figures mentioned at the beginning, as follows: Lime, 34 pounds; sulphur, 17 pounds; caustic soda, 3 or 4 pounds (according to strength desired); water, 1 barrel. This can be mixed without boiling, and can be sprayed through a Vermorel nozzle, care being observed to use a clear quality of lime, that which has little grit, so that the solution will not clog the nozzle of the sprayer.

Whale oil soap and crude petroleum, it might be mentioned here, are very effective for the subjection of the San José Scale. These are the remedies mentioned by your pomologist in his report of January 23, 1895. The whale oil soap solution should be sprayed on the trees in winter, when they are dormant. It is destructive of the foliage.

The kerosene emulsion is prepared as follows: Hard soap, shaved fine, half pound; soft water, one gallon; kerosene, two gallons. Dissolve the soap in boiling water. Add the kerosene, and churn with a force pump until a smooth, white butter-like mass is formed which adheres to glass without oiliness. For application to trees infested with the scale, dilute the above with five parts of water.
But here we have been giving remedies for the scale without having any intention of doing so. We would still say, look to your Economic Zoologist. He is testing all the remedies, and doing it on scientific principles. He sticks to the lime, sulphur and salt wash, and, barring the trouble of its preparation, it is, no doubt, still the best. He will tell you to-day how to prepare and how to use it.

But what shall we say in regard to a law to prevent the spread of the San José Scale, one which will compel a person having trees infested with the pernicious insect to take steps to rid himself of the pest and prevent his neighbors' trees from becoming infested? Here is where comes in the necessity of a drastic law—one which will enable a duly authorized person to enter upon the premises, inspect the trees and order such as are infested to be treated or destroyed. And who shall be this “duly authorized person?” He must be one who knows; one who can discriminate between the San José Scale and an ordinary bark louse. And where are we to get such persons? In truth, they are scarce. The nurseries cannot even furnish them. But we can establish schools of instruction. Where? At the Pennsylvania State College, for instance. Young men can be instructed there in a few weeks' time. In one year we can send out hundreds of young men fully competent to enforce any San José Scale law which the next Legislature, in its wisdom, may see fit to pass. See what has been done by the dairy school of the same institution.

Action is about being taken in the South for the passage of laws to prevent the spread of the boll weevil—an insect which threatens the annihilation of the cotton crop of this country. A loss of millions of dollars resulted to the cotton growers of this country in the last season through the ravages of the boll weevil. Can it not also be said that the fruit growers of this country have lost millions of dollars through the ravages of the San José Scale?

If it is necessary to pass laws for the suppression of the cotton weevil, just as much is it necessary to adopt stringent measures, and pass proper laws, to prevent the spread of the San José Scale.

But why the necessity of all these laws? Do we not have now a law on the statute books relative to the peach yellows which is not enforced? Yes, there is such a law, and a very good law it is. It is one which can be enforced, but, unfortunately, but little attention is paid to it. It also, to a certain extent, covers the San José Scale. The law, however, should be broadened; its penalties made severe, and then it should be enforced. No right-thinking man will evade its provisions, and all others should be compelled to observe them. The next Legislature should make an ample appropriation for the further investigation of the San José Scale, and for the enforcement
of any law pertaining to its suppression, as well as the prevention of any contagious or infectious diseases destructive of fruit trees, such as the peach yellows and peach rosette.

PENNSYLVANIA FRUIT AT ST. LOUIS.

One year ago your pomologist, in his annual report, called attention to the importance of making arrangements, in due time, for a proper representation of Pennsylvania fruit and flowers at the St. Louis Exposition. We are gratified to be able to report that the necessary steps have been taken, and that through the action of the committee on horticulture of the Pennsylvania Commission of the Louisiana Purchase Exposition your humble servant was appointed superintendent of horticulture, to take charge of the arrangements for a proper representation of the fruits, vegetables, plants, flowers and shrubbery that could be secured in Pennsylvania for exhibition at the great World's Fair this year. Fruit growers and horticulturists in every county in the State have been communicated with during the past month, and the replies received show that a very creditable display can be made. That it will be made depends largely upon the correspondents who so promptly responded to the letters of inquiry. Instructions will shortly be sent to all such correspondents as to what to do, how and when to send their exhibits, and what will be desired of them during the season of 1904, in order that there may be a continuous display of the products of the orchards, gardens and greenhouses of Pennsylvania. It is especially desired that there shall be a fair representation of the native fruits of Pennsylvania—such as had their origin within the borders of the State; for instance, the York Imperial, Smokehouse, Baer, Haas, Fallawater, Keim, Krauser, Ewalt, Dickinson, Jeffries, Lehigh Greening, Kocher, Rambo, Strode and other varieties of apples of peculiar value and excellence.

The CHAIRMAN: The next person on the program is Professor H. A. Surface, Economic Zoologist.

PROFESSOR SURFACE: Since there are several papers on this subject, and I speak extemporaneously, I should prefer to have the other papers read, if it is convenient, and I shall follow the others.

The CHAIRMAN: If there are no objections we will change the program to the extent that has been suggested.

The CHAIRMAN: Professor Geo. G. Atwood, of Albany, N. Y.

PROFESSOR ATWOOD. I esteem it a very high privilege to meet with you. That pleasure is enhanced by the further fact that I am the messenger of cordial greetings from the Agri-
cultural Department of New York to your Board. One other thing that is pleasant to mention is, that I have learned since coming here, that my superior Commissioner of Agriculture of the State, is a worthy nephew of your venerable chairman. I might say that everything I shall say, is what I have learned in regard to fruit inspection within the State of New York. The State of New York has a horticultural inspection law and is divided into ten divisions; each division is in charge of an inspector, whose duty it is to carry out the provisions of the law, acting as agent of the Commissioner of inspections, of the San José Scale and other insect pests is constantly at work. Primarily, the object of the law was to provide said provision for the Commissioner and the subjection of the San José Scale.

In 1898, the San José Scale first became known in the State and the people became alarmed, and the thought was that the only place for them was in Southern California. The first work was to inspect the nurseries because that was the medium through which they were being distributed, having originally come from California. From the nursery work the inspectors went to the orchards and they have given a great deal of attention to them. We have visited many hundreds of orchards throughout the State. An amendment was recently passed by which the agents of the law were compelled to examine shipments into the State; that has been productive of much good. A year ago an amendment was made in the law requiring all nursery stock that came into the State to be fumigated with hydrostatic acid gas. The constitutional power of the law I will not mention. Other states have the Scale. You need not be afraid to say you have it here in this State. It seems to be scattered all over the fruit growing sections of the United States and it is no wonder that we are alarmed. It is a very great pest and is destructive to the life of your apples, pears, plums, peaches, currants; it is absolutely destructive. That, you see, covers the entire list of fruits. I suppose there are a few quinces raised in this State. I have gathered here some notes in regard to the matter.

The following paper was then read by Prof. Atwood:
THE SAN JOSE SCALE AND METHODS FOR ITS DESTRUCTION.

Y PROF. GEO. G. ATWOOD. ALBANY, N. Y.

According to the United States Census of 1890 there were in the State of Pennsylvania 11,193,417 fruit trees, while in 1900 there were 17,844,269, an increase of 59.4 per cent. in the decade.

The number of plum and prune trees increased nearly fivefold, and the number of peach, pear and cherry trees about threefold. Apple trees increased in the ten years from 9,097,700 to 11,774,211. The increases mentioned were quite evenly distributed throughout the State.

Of the total number in 1900, 66 per cent. were apple trees; 19.7 per cent. peach trees; 5.4 per cent. cherry trees; 4.6 per cent. pear trees; 4.3 per cent. unclassified. The hinderances to the profitable and full development of orchard fruits are many. They consist of both insect and fungus pests. The annual loss to the agricultural crops of the country caused by insects is estimated at 10 per cent. of the product, and those who are best informed and who are capable of making an estimate of the losses caused by fungus parasites generally estimate the losses at even more than the losses caused by insects. Twenty per cent. at least of the fruit crop of this State is annually lost from causes that are to a large extent preventable.

The production of orchard fruits in Pennsylvania, according to the latest reliable reports, the United States Census of 1900, amounted to $7,976,464; small fruits, $1,268,827; nursery products, $541,032; plants and flowers, $2,246,075; total, $12,032,398.

Two and one-half to three millions annual loss is an amount well worth an attempt to save. The work of your State Board of Agriculture and of your Experiment Station demonstrates in a very clear manner how it may be done. It is now "up to" the practical fruit grower to apply the remedies and receive the rewards.

Insect enemies may be divided into two classes (1) those that destroy the foliage and fruit, and (2) those that are called dangerously injurious and involve the life of the trees and plants that they infest. The fungus diseases that are a menace to fruit growing are the parasitic vegetable growths that destroy the foliage, retard the full development of the fruit, deface its appearance and cause premature decay. Other losses are produced by causes yet quite obscure.

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If in the foregoing paragraph we have mentioned the principal pests of the orchard, we fortunately have at hand remedial measures for each that will reduce losses to a minimum and at the same time improve the quality, appearance and keeping properties of the fruit.

The essential tools of the orchardists of to-day are the cultivator and the spray pump. Both should be spelled with capital letters and the proper uses of each be fully understood.

If the orchard is unthrifty, the cause may be looked for at the foundation of the trees; it may need fertilizing and cultivation. If on the other hand single trees or a portion of the orchard are suddenly checked in growth, or give other evidences of injury, like withering leaves or dropping of fruit, the cause may prove to be an attack of fungus growth or an infestation of some insect. If the apples drop soon after forming, or if they are wormy, the codling moth is undoubtedly present. If the leaves are eaten bodily, some one of the many caterpillars or beetles may be blamed. If the plums drop before ripening, a little crescent mark on the surface proves the curculiosis injury. If the trees bloom but fail to set fruit, possibly the bud moth or case bearers are at work. If peaches ripen prematurely, or if they fail to grow the cause must be found.

If "honey dew" is abundant the aphides abound. If the leaves and fruit of pears are blackened and sticky look for psylla. Ascertain the cause of the trouble and apply the remedy. Every orchardist should acquire some information relative to the insects and fungous pests that surround him. A few leaves, twigs or fruits that are not in normal condition can be mailed to your Experiment Station with an explanatory letter. The various Stations have illustrated bulletins on the principal pests of the orchard. Study the life history of a certain insect from the egg state to the larva, the cocoon., the pupa and the adult.

Classify, or at least observe, the difference in the habits of insects, and you will soon learn where in the life of an insect a poison or other remedy will be most beneficial.

A small hand glass one magnifying from 12 to 20 diameters will be found useful. Fungal species are more difficult to classify, but afford to the trained mind an unbounded field of interest. Bacteria are known to be the cause of certain diseases of plant life and the causes of two important diseases of the peach still remain obscure.

It is along these lines that scientific students of entomology, mycology, chemistry and of horticulture have devoted their attention in the past few years. The results of their work may be summed up in the statement, "that there is a practicable remedy for the more important pests that the orchardists and fruit grower must combat to live by his business."
One of the most important features of the work that has been developed to an extent but of which much more undoubtedly can and will be discovered as time and experiment progress in the use of insecticides and fungicides, is in uniting the two; we refer to what may be called poisoned Bordeaux mixture. If Bordeaux mixture is required to prevent fungi, its application must be made at such favorable times as will insure the best results as a fungicide; fortunately it is known that arsenical poisons may be added to the Bordeaux mixture without deterioration either to the mixture or the poison. The right time to apply Bordeaux is the right time to apply the poison to reach many of the injurious insects of the apple, pear and quince.

The extensive use of the lime-sulphur-salt wash in 1903 as a remedy for San José Scale has developed the fact that this preparation is a most excellent preventive of the leaf curl of the peach, and one case is known where the lime-sulphur-salt was a perfect check to pear psylla.

Many formulas for the preparation and method of applying them have been recommended; but the following are such as have been most satisfactory in New York State. Success in the use of fungicides is dependent on their preventive effect. Rarely can any gain come from an application after the affected plants show injury, for by that time the fungus has penetrated beneath the surface and consequently beyond the reach of sprays. Such poisons as the arsenites remain upon the surface of the foliage or fruit and kill the insects after they eat them. Insects which do not chew the surface but pierce to the inner tissues from which they seek nourishment are not affected by such poisons.

For these sucking insects applications which kill by contact are adopted. Thorroughness in application is essential with contact insecticides since the insects must be touched by the spray. The time is also important as some insects are protected within rolled-up leaves or in other ways and are then harder to reach than at earlier periods.

Gases kill by inhalation and can prove effective only upon insects not in egg or pupal stages.

**INSECTICIDES: ARSENCAL COMPOUNDS.**

*Paris Green.*—One pound per 100 to 200 gallons of water to which four pounds of quick lime should be added for each pound of Paris green. Four to eight ounces of Paris green or other arsenical compounds may be added to each 50 gallons of Bordeaux mixture with perfect safety and without weakening the action of either. The excess of life will take up the caustic property of the Paris green.

*Arsenite of Lime,* is one of the cheapest and most effective of the arsenical poisons. It should more generally take the place of
Paris green. It is prepared by dissolving one pound of arsenic and four pounds of sal soda (carbonate of soda, washing soda) in one gallon of water and boiling in an iron vessel fifteen minutes or until the arsenic dissolves. Replace the water lost in boiling and use at the rate of one pint to each fifty gallons of water to which two pounds of freshly slacked lime have been added. With Bordeaux mixture use at the rate of one pint to fifty gallons.

Arsenate of Lead, operates more slowly than the preceding, but adheres better than any other of the arsenical compounds and can be used in large amounts without injury to the most delicate foliage. It may be purchased in a paste form ready for use or it may be prepared by dissolving five and one-half ounces of lead acetate (sugar of lead) in two quarts of warm water in a wooden pail, while two ounces of arsenate of soda (50 per cent. pure) are dissolved in one quart of water in another wooden pail. Pour these solutions into 50 to 75 gallons of water and the insecticide is ready for use.

Hellebore.—Fresh white hellebore at the rate of one ounce to three gallons of water is milder than the preceding and is useful when an application is needed upon fruits nearly mature, particularly currants and gooseberries.

CONTACT INSECTICIDES.

Whale Oil Soap Solution.—Whale oil soap containing 12 per cent. of potash when used at one and one-half to two pounds per gallon of hot water for late winter application, is one of the most convenient remedies for scale insects and is particularly suited to use upon peach trees, as these are more sensitive, as an over amount of kerosene or petroleum spray has worked injury, especially when applied early in the winter. Fall application of whale oil soap at the above strength will destroy fruit buds for summer use in the control of plant lice, pear psylla, etc.; the maximum strength is about one-fourth pound per gallon of water.

Mechanical Mixtures of Crude or Refined Petroleum, with water offer the most simple method of application of these oils, but only the special automatic mixing pumps can be employed for the purpose. Applications of crude petroleum testing about 43 degrees, Baume scale, or of kerosene, or a mixture of both, have been proved effective when applied just before the buds burst in the spring as a spray for scale insects. The crude petroleum remains longer upon the wood than does kerosene and has great insecticidal value. In summer use 15 to 25 per cent. sprayed very lightly so that trees are not completely drenched.

Kerosene Emulsion, or Petroleum Emulsion, is made of hard soap, one-half pound; boiling water, one gallon; kerosene, two gallons, and should be diluted four to fifteen times before applying. Use strong emulsion for dormant wood. For such insects as plant lice, mealy
bugs and red spider, weaker preparations will prove effective. Current worms and all insects which have soft bodies, can also be successfully treated. Use soft water in making soapy emulsions of oil. In limestone sections where hard water is the rule, better results will probably be obtained by using the sour milk solution, which is simply two gallons of kerosene and one gallon of milk, emulsified, by passing through a pump. Kerosene and water may be used in all cases where kerosene emulsion is mentioned. Dilute to the strength recommended for the emulsion in each case. It must be applied with a pump having a kerosene attachment.

**Tobacco Water, Tobacco Dust and Sulphur.**—Water in which tobacco stems have been steeped for a few hours is a standard remedy for plant lice and other soft-bodied insects. Dilution is made three to fivefold before application. Tobacco dust has been found effective against root aphids, when used freely in trenches around infested trees. Dry flowers of sulphur applied with a bellows while the leaves are moist proved effective against plant lice.

**Lime-Salt-Sulphur.**—This preparation stands in the front rank as a contact insecticide for application to dormant trees and has also a fungicidal effect particularly noticeable in its effect upon the fungus causing the leaf curl of peaches. The formula has been modified without marked variation in effectiveness and the salt is sometimes omitted. Apply any time when the trees are dormant, but not when the temperature is so low that the spray freezes as applied. A second application to cover places untouched is advised even when much care has been used at the first spraying. The preparation is made as follows:

Twenty pounds best unslaked lime; seventeen pounds sulphur (flowers); ten pounds of salt, for fifty gallons of water. Heat from five to seven gallons of water in an iron caldron and while this is heating sift the sulphur. Put the lime in the water which will cause a violent boiling, and add the sulphur, stirring continuously. If too much water is used, boiling over ensues, and if too little, the mass becomes dry and additional supply of hot water should be at hand from which to replenish as required. Continue boiling for an hour or until the lime and sulphur have united, when the color will be a deep amber. The salt is then added and the kettle filled with hot water; strain before use. Give pumps and nozzles an immediate cleaning when spraying ceases. Where live steam is available it may be used for cooking the mixture in place of the fire to great advantage.

**Caustic Soda Wash.**—This is a new remedy for scale insects thus far but little tested except on the Pacific Coast. It is recommended for experimental tests only. The formula is eight pounds of caustic soda (78 per cent, pure) to fifty gallons of water.
FUMIGATION.

Fumigation has proved absolutely effective in extended tests on stock infected with the San José Scale; but in other tests because of impure chemicals, leakages in the fumigating chamber, or the presence of a mud covering over the scale the live scales remained upon the stock.

The fact that it is easier to combat new insects by prevention than to exterminate them after their establishment, leads careful planters to set out only fumigated stock, for they have an additional safeguard by so doing.

For each 100 cubic feet of space use fused cyanide of potassium (98 per cent. pure). One ounce by weight.

Commercial sulphuric acid one and one-half ounces by measure. Water three ounces by measure. Expose three-fourths of an hour.

Good fumigation chambers are lathed and plastered with doors made refrigerator style to make the chambers as nearly air-tight as possible. A tight board construction, if doubled with paper between, answers well. The stock should rest on a grating or other support to permit free circulation of the gas, and means for ventilation after use should be provided. The stock should not be wet nor should mud or earth cover any part liable to infestation.

The gas should be generated as near the centre of the lot to be treated as practicable, and in case of large amounts, several generators should be used and so placed that rapid and uniform distribution of the gas will be insured. The cyanide must be kept in tight bottles in a safe place as it is a volatile, deadly poison. The cubical contents of the fumigating chamber should be estimated, the cyanide weighed out in amounts sufficient for a treatment and put in paper bags. Pour the acid slowly into the water, stirring the mixture constantly, otherwise drops may fly and burn those in the vicinity. After the stock is properly arranged, pour the necessary amount of diluted acid into a glazed earthen vessel, place the cyanide while still in the paper bag into the acid and water and close the fumigator. The advantage of putting the cyanide into the acid and water while still in the paper bag is that it prevents sputtering which is specially liable to occur when large amounts are used. Great care should be exercised in handling the cyanide, the acid, and in opening after fumigation. The substances used are deadly; even a slight burn from sulphuric acid is very painful.

*Bordeaux Mixture*—Copper sulphate (blue vitriol), 5 pounds; quick lime (best stone lime), 5 pounds; water, 50 gallons.

Dissolve the copper sulphate quickly by suspending it in a bag in and near the surface of about six gallons of water. Slack the lime using only the amount of water necessary to keep it covered and
before mixing the materials dilute each to twenty gallons, as a finer combination results than when lime and copper sulphate meet without dilution. If conveniences are not at hand for holding both the materials in dilution, the lime should be diluted to the full amount in the tank and the copper sulphate solution poured into this, as the resultant mixture remains in suspension better than if the operation is reversed.

**Ammoniacal Copper Carbonate.**—Copper carbonate, 5 ounces; ammonia (26 Baume) 3 pints; water, 45 gallons.

Make a paste of the copper carbonate with water. Dilute the ammonia with seven gallons of water, add the paste to the diluted ammonia and stir until dissolved. Allow it to settle and use only the clear blue liquid. This mixture loses strength on standing. Spray on grape vines when the fruit approaches maturity.

The introduction of San José Scale into the United States has been the primary cause for restrictive legislation in thirty-three states, scarcely any two states having laws exactly alike, but all of them tend to control nursery stock. Shipments of nursery stock have been the principal means by which scale has been so widely disseminated. It is too late now to eradicate San José Scale by restriction or even entire destruction of nursery stock. The scale is already established in many orchards, possibly in five per cent. of the orchards that have been planted within the last fifteen years.

The nurseries should have continued a thorough inspection and no infested stock should be shipped from them, and at the same time nurseries that are unfortunately located in a scale infested section should have all legal protection possible from surroundings.

**Horticultural Inspection** in the State of New York. The first laws on horticultural inspection enacted was known as the black-knot law, which for the reason that it provided for local inspectors became quite inoperative. The first discovery of San José Scale in the State was in 1898. In the spring of that year a law was passed amending the old black-knot law.

Chapter 519 of the laws of 1902, and chapter 20 of the laws of 1903 are part of the agricultural law of the State of New York. The provisions of these chapters cover all that the statutes of the State contain relative to horticultural interests. Since the first portion of this law went into effect in 1898, the work that has been done has assumed about the following shape: The first work was devoted almost wholly to the inspection of nurseries and granting certificates to the nurserymen, and this has continued to be the important feature carried on by the Department under these sections of the law.

Much has also been done in the orchards of the State to suppress the various diseases which infected them and the destruction of such
insects as infested the trees. The "dangerously injurious insects" referred to in the law is taken to mean those which are destructive to the life of the trees. Very little work has been done, excepting by way of suggestion, for the control of codling moth, which is a great enemy to the production of apples in this State. The bulletins of our experiment station have given much information relative to the control of all kinds of insects, including those that are merely injurious in a temporary way, while the special work of the inspectors of the Department has been to eradicate all insects and diseases that threaten the life of the orchard trees and plants. In the inspection of nurseries, it seems desirable to destroy all young trees that are infested to their injury, as in the case of San José Scale. A nursery tree, that is to be shipped for planting in an orchard, may carry with it a single scale which will spread to an unlimited extent. Nursery trees that are badly marked with this scale can not be called merchantable and are destroyed. Fumigation or other treatment may kill the scale, yet it seems desirable to prevent the shipping of all such trees in ordinary business transactions. Fumigation even if absolutely effective not being applicable to trees in the nursery row is an auxiliary to inspection, as a nursery infestation will certainly spread though the outgoing stock may be fumigated perfectly.

Instances have been noted where San José Scale has survived fumigation, the cause being non-circulation of the gas in the fumigator, leakage, impure chemicals, or that the scales were protected in some way. We have found that dormant nursery stock can be fumigated two or even four times with a strength of material at least twice the ordinary formula of one ounce of cyanide to each 100 feet of space.

We find that considerable stock is shipped into the State from other states which proves, on examination, to be infested with San José Scale and other pests. All shipments into the State from points without the State are required to be inspected by the agents of the Department and the statute requires that all such shipments shall be fumigated before dissemination or planting.

Treatment of orchard trees for San José Scale during the year was carried out in different portions of the State with various formulas and wherever done in a thorough and approved manner the results were satisfactory to the extent of saving the fruit and ridding the trees of the larger portions of the scale. A few scales remain in most cases, not because the insecticide used was ineffective, but because the last breeding female was not touched or covered by the remedy.

Three principal methods of treatment may be referred to (1) crude petroleum. This remedy when applied late in the spring before the
buds develop in, just as small quantity as will suffice to cover the tree without dripping or running down to the roots has been safely and successfully used, on apple, plum, pear and peach trees.

Some report injury on peach trees and some on the pear fruit buds, showing the necessity of great caution in the use of crude petroleum. Orchardists who have used petroleum for three successive years complain that while they have succeeded in keeping the scale in subjection, yet the bark of their trees has a thickened, corky and spongy appearance and the trees are off color.

The fumigation of orchard trees of large size proved entirely effective when properly done. A large orchard of peach trees fumigated in 1902 was free from scale in 1903, except in the portions of the orchard that were not fumigated. This suggests the importance of fumigating nearly everything adjoining that is a host plant of San José Scale. Fumigation of large trees is expensive, but it promises a satisfactory result if persisted in where surroundings are clean.

A large number of trees and orchards have been treated this year with different formulas of lime-sulphur-salt, to which have been added sometimes a quantity of copper sulphate. Very satisfactory results have been secured wherever thorough spraying has been done with the foregoing, especially, lime-sulphur-salt. Scales have been generally destroyed. No injury appeared in any varieties of trees, not even the peach. This mixture has the further merit of being a fungicide having reduced the apple scab and wholly checking leaf curl of the peach.

The lime-sulphur-salt solution has the merit of cheapness both in original cost, disposition to remain long on the trees, and further and more important is the fact that spraying may be begun early in the winter and continued on any suitable day until the buds begin to open in the spring.

The advantage is apparent to any orchardist who has sprayed in high winds, lost his work because of spring rains and dragged his teams and wagons through mud. With a mixture of such a nature as will serve its purpose, that can be applied when the trees are dry, on a still day at a season of the year when there is plenty of time to do all the spraying carefully and cheaply, we feel that a great advance has been made in the problem of control of San José Scale in the orchards.

The locations in the State that offer the greatest obstacles to the eradication of scale are in the suburbs of our cities, where a small section or area may be infested. This area is cut into small lots, the several owners are engaged in many different occupations and are difficult to find at their houses where an explanation can be made of the trouble; they are slow to adopt any method suggested for a remedy and persist in having nothing destroyed.
The San José Scale was said to be several years ago the most serious pest affecting the nursery and orchard interests of the country; it is so today notwithstanding all that has been done to check its spread.

If we have found applications that will save the orchard trees and their fruit, it must be borne in mind that those applications must be made use of at the right time and in the right manner. The process is somewhat expensive and is voluntarily used only by those who are progressive fruit growers, and those who have something to gain by their efforts. Others must be forced to care for their trees to abate the nuisance and prevent the spread of scale on premises adjoining.

San José Scale commence breeding in New York State about June 20; and from that time until freezing weather, the young larvae can be found upon the trees. It is known that a single female scale giving birth about June 20, to many young, the most of which commence breeding within a month and which are followed by other generations soon, so that within the breeding season, the progeny numbers millions. This condition suggests the desirability of an early inspection of the nurseries to discover and destroy the first females; it also emphasizes the importance of several inspections during the season. With many acres of trees covered with leaves no single inspection will suffice and no inspector can be sure that no scale is present. Nurseries suspected of infestation should have the attention of an inspector many times in a season. Every infested tree within the nursery and all infested trees in the vicinity should be destroyed.

The fact that thorough inspection seems the only way to prevent spread of scale within the nursery it is not certain that every scale will be seen and destroyed. Fumigation with hydrocyanic acid gas is the only method in use at the present time to set a seal of reasonable certainty that no live scales shall pass by shipment from the nursery to the orchard.

The major portion of the evidence in possession of the Department shows that when nursery stock is mature or well ripened, that it may be fumigated once or many times with hydrocyanic acid gas, using two or three times as much cyanide of potassium as is necessary to kill the scales, without injury to the trees. When fumigation is properly done with chemicals of known purity in a house suitably constructed, on trees that are ripe and dormant, dry and free from mud, there is no evidence to show that injury will result to the trees and no live scales will pass on the nursery stock. Emphasis must be laid on the point of proper fumigation in all its details, otherwise good results cannot be obtained, and disaster or loss may occur.
The disease known as peach yellows has been found in several orchards. The character of this disease is so well known by the progressive fruit growers that they root out and burn all trees in their orchards that show the first appearance of the disease; but in sections where the industry is new or neglected the services of the Department's agents are required. The disease "little peach" has been found in a few localities; the remedy is the same as for yellows. Peach growers throughout the State should watch carefully for this disease and apply the remedy promptly. It is possible for much loss to occur if it gets established in a peach growing section.

In the minds of many, the work of the Department is supposed to be the destruction of the San José Scale; but it will be seen that the law as it now stands is worded in such broad terms as to include all insect pests and fungous diseases that prove destructive to the life of trees and plants. Under this head have been included such as work this injury to orchard trees, plants and vines in the State.

In the near future it may be deemed desirable to extend the authority of the statute to the control of such pests as are detrimental to fruit production, such as are commonly called codling moth, canker worms, tent and forest caterpillars, pear psylla, etc. The time is coming when our State may be infested with the brown tailed moth and the gypsy moth. The latter has caused an expenditure by Massachusetts of nearly $2,000,000 in the past few years. These insects have not yet been discovered in New York State or Pennsylvania, but unquestionably will come in a few seasons and the early control should be provided for.

The CHAIRMAN: The Chairman of the Executive Committee is ready to report.

The report of the Executive Committee was then read by Mr. McGowan, which, on motion was accepted and filed (See list of officers and committees, pp. 503, 504).

Mr. HERR: I move that Mr. Hoover and Mr. McClellan be admitted.

The motion being seconded, it was agreed to.

The CHAIRMAN: The next address will be by Dr. J. H. Funk.

The address is as follows:
THE SAN JOSE SCALE.

BY DR. J. H. FUNK, Boyertown, Pa.

This pest, its origin, its migration to this country, the region of its first destruction, etc., has been described so often and so minutely, that a further description seems unnecessary. Yet, to treat intelligently any subject that is so much talked about, about which so much has been published during the past ten years, and of which so little is really known by the general public, it almost becomes imperative to give a short description. Our greatest danger always lies in being unfamiliar with the object of danger. In our fancied security, we fail to become cognizant of that danger until the work of destruction is complete. Of all the badly infested orchards, how many do we find of which the owner knew that he had the scale until his orchard is ruined almost beyond recovery. He then discovered it only by the lack of thrift, or the dying condition of his trees, or by the fruit being so completely scabbed as to render it unsalable.

I am satisfied that there are hundreds of orchards throughout the State, even in counties at present supposed to be free from this pest, that are so badly infested that unless they are treated and the scale destroyed, will be utterly ruined inside of two years. I was informed by high authority that Lackawanna, Susquehanna and Wayne counties were thus far free. The farmers and fruit growers are happy in the thought. Yet while they rejoice the foe is assiduously at work.

While attending the Farmers' Institutes in Lackawanna county, I had no opportunity to examine the orchards until I came to Toms River. Here I found a native plum tree completely encrusted with this scale louse. This tree stood just inside the fence along the public highway, beside the gate of the dooryard. It was passed and repassed dozens of times daily. It stood so close that in passing, the limbs brushed the clothing, yet the owner was surprised when I called his attention to the scale and showed him the pest under the magnifying glass.

If this insidious foe can work undiscovered beneath the very eyes of the average farmer, how important it is to educate every owner of a tree until he becomes as familiar with its appearance as the
child with its alphabet. Then and not until then can we hope to withstand successfully this terrible enemy. Our safety lies not so much in fighting the foe after it has full and complete possession, as it does in acting on the defensive and not letting it get a foothold.

HOW SHALL WE DO THIS?

First, expose the enemy by giving such a plain description of it that he who runs may read. No description equals an object lesson. You can only become familiar with an object by seeing and handling it. Go where it has become thoroughly acquainted. The general appearance of a badly infested limb can be compared to one sprinkled with ashes mixed with fine particles of sulphur and soot. Such is the appearance found during winter. The scale is circular, 1-32 to 1-16 of an inch in diameter. The body is dark gray convex rising in the form of a nipple with a slight indentation of a yellowish color in the center. This is the female. The male is a little more elongated with the nipple at one end. The scales are more easily seen upon the fruit of badly infested trees than upon the tree itself. The scale itself would not be more readily seen but around each one there is usually a bright red ring; and when full, covers nearly the fruit. Upon pears and apples, they cluster more thickly around the calyx. On plums and peaches the stem end suffers most. Fruit so badly infested fails to mature. It cracks and become worthless.

When examining a tree not badly infested, you find them around and beneath the buds. Where the twigs branch and offer sheltered positions, you find the adult female surrounded by smaller young scales of both sexes. In this condition the winter is passed by the insect beneath the scale. It can be readily seen, if a knife or other pointed instrument be inserted beneath the scale which on being raised will expose the true louse, a small jelly-like body, flattened and closely attached to the bark, minus legs or means of locomotion. From these scales, the male emerges about the beginning of May. About one month later the female matures. Instead of laying eggs as the majority of other insects do, she gives birth to living young about ten per day for a period of forty days. These young are very minute yellow oblong objects with six legs, two antennae and a strong beak. After birth they wander aimlessly about. I have watched them for hours during which time they did not travel more than an inch or two from the parent. After wandering thus, for from eighteen to forty-eight hours, they attach themselves with their beak to the limb and become a permanent fixture, never thereafter moving from the spot. If you mark this louse and examine it the following day, you will find that it no longer is as yellow but is gradually becoming covered with a white substance that is exuded from its body, like fine threads. In a couple of days, it is completely
covered with the waxy coat, concealing and protecting it from the elements, etc. In this condition it remains and develops to full maturity in about one month. It in turn performs the same functions of reproduction. Thus we have several broods, in this latitude, about four, sometimes five in favorable seasons. During the past season, 1903, they continued very late. I found living young uncovered as late as December 4. These late progeny does not seem to have much ambition and I doubt if any survive the winter north of latitude 40 degrees.

My first experience with this insect was in the winter of '98-'99 while attending the annual meeting of the Peninsula Horticultural Society held at Smyrna. I had the satisfaction of listening to Prof. Johnson, Cap. Emery and others who had several years experience with the scale in their own orchards. Upon examination I found three trees in my own orchard that were infested. These I treated with a twenty-five per cent. mixture of crude petroleum applied with a kero-water sprayer. I gave the trees a thorough spraying and effectually cleaned them of the scale. They are clean to this day. My next experience was in the summer of 1901. I found a Magnolia pear tree, pretty well covered, both limbs and fruit. As I was about to spray the tree, I saw a few black, twice stabbed lady bugs busy at work on the scale. I watched them and found they were turning over the scale and eating the lice. I delayed spraying and had the satisfaction of seeing that the lady bugs were making clean work as they went. By fall this tree was comparatively clean. I saw nothing further until the summer of 1902. Then I found several trees in different parts of the orchard which were infested. Some of these I marked for special treatment and decided to use the lime, sulphur and salt, using the California and Oregon formulae. Each of these seemed to me to be faulty. In the Oregon formula, 50 pounds of lime, 50 pounds sulphur, 50 pounds salt to 150 gallons of water, there being an unnecessary large quantity of salt; as the salt is considered a useless factor except to make the lime adhere. The salt can be greatly reduced without destroying the efficacy of the wash. The substitution of blue vitriol gave me very good satisfaction, but required more agitation to keep it from separating and floating on the surface. With this wash formula, 50 pounds fresh lime, 45 pounds sulphur, 4½ pounds blue vitriol prepared as lime, sulphur and salt wash by boiling one and one-half hours, I sprayed a block of fifty Elberta peach trees eight years old. When spraying it was very windy and I could spray one side only. I completed the other side a few days later, giving every tree a complete covering. Considering the large size of the trees, we did excellent work. These were sprayed about one week before the blossoms opened.

Results. No buds were injured. Blossoms opened very uniform
and set an immense crop of peaches. The foliage came out a rich luxuriant green, free from leaf curl or other fungi. There was no June drop on these trees, so we had to thin more than usual. They matured a large crop of choice peaches which sold for the highest prices. Upon examination in the fall, we found these trees comparatively clean, healthy and with a full set of large healthy buds.

Block No. 2, consisting of ten rows of large peach trees, was treated as follows: Formula, 50 pounds of lime, 45 pounds of sulphur, 22\(\frac{1}{2}\) pounds of salt, 150 gallons of water, prepared by boiling one hour and thirty minutes.

This block of peach trees had a ravine washed through the middle rendering is impossible to spray the full length. We sprayed back and forth at one end, completing six rows to the gutter on the first day. Bad weather then set in. Rain and high winds continued for one week. By that time the blossoms were opening. I was fearful of destroying the crop and as scale did not show up plentiful in this block, I decided not to spray further.

Results. Trees all set a full crop of fruit. June drop was considerably more on the unsprayed trees. Also more leaf curl and more fungus spots on the fruit. Foliage on sprayed trees was a richer green. Sprayed trees produced twice as many and finer fruit than unsprayed trees. The scale on sprayed trees were nearly all destroyed. Scarcely a live scale can be found. Unsprayed trees in the six rows and four remaining rows on side are one mass of scale with many limbs dying.

No. 3. Had one Mammoth Black twig apple tree very full of scale. This tree was sprayed very heavy and complete just before the buds opened.

Results. Leaf, also fruit buds opened with unusual vigor. Although this variety is subject to leaf fungi, which frequently attack the bloom and causes almost the entire crop to drop. Those remaining are badly affected with scab. Such is the case this year on unsprayed trees of this variety. Yet on the sprayed trees fruit set full, perfect in form and clean from scab. On close examination at the beginning of October we were unable to find one living scale and could find but two imperfect apples.

When to spray? Undoubtedly the best time is just before the buds open. But any one having a great number of trees will find it impossible to spray all at this time. Frequently bad weather holds sway at this very time. So we must take advantage of fine weather anytime through the winter; although I doubt if it is as efficacious as when applied just before buds expand. As to how late we can spray, the following will show: On going carefully over my orchard in May I found one peach tree very badly infested, so much so I knew it would be killed before the season was past, besides act-
ing as an incubator for the breeding and spread of the insect. I hesitated as to digging it out or experimenting. I decided on the latter. The tree was in leaf, and set full of peaches the size of peas. I filled my spraying tank with the lime, sulphur and salt, and went for that tree. By the time I was done there was not a spot on trunk, twig or leaf that was not white. When dry the leaves were so thickly covered that they broke on trying to bend them.

Results. The foliage was killed, but in a surprisingly short time new foliage came out. The tree grew with unusual vigor. The greatest surprise to me was that instead of dropping the fruit, it continued growing unchecked. Had no June drop. I had to remove three-fourths. It ripened a crop of peaches and all scale were destroyed.

Another experiment on a Missouri Pippin apple tree at the same time. This tree was in full foliage and set full of apples. This tree also lost its foliage but quickly came into leaf and the fruit continued growing. In the fall it had a heavy crop of the finest, cleanest, most perfect and highest colored apples of any one out of 200 trees of the same kind. Although I do not recommend waiting until this late nor do I claim it would be always safe, yet in emergencies I would not hesitate to use this preparation after buds have expanded. I believe that it is an excellent fungicide and one of the best applications for the trunk and heavy limbs any time in the summer as it invariably leaves the bark smooth, soft and clean and destroying totally all fungi.

Pure kerosene is one of the surest remedies if the environments are all right. A powerful pump, a very fine nozzle, an ideal day, bright and clear, and an ideal man holding the nozzle. With the average man it is not safe, as the remedy frequently kills more than the disease. Whale oil soap is safe but too expensive, two pounds to one gallon of water applied before buds open is all right.

SUMMER TREATMENT.

Frequently you find a tree or several that have not been treated in the spring, on which the scale is increasing so rapidly as to endanger the tree. A twenty per cent. kerosene emulsion thoroughly sprayed will not injure the foliage yet will destroy all scale with which it comes in contact; or one pound of whale oil soap to five gallons of water. But the ideal preparation is not yet discovered. What we want is, 1st, cheapness; 2nd, something quick and easily prepared remaining in solution so that it will always be of uniform strength and that it will flow and break into a fine mist; 3rd, to kill inside of one hour so work and material will not be lost in case of rain; 4th, to be both a fungicide and insecticide; 5th, when it has performed these two functions it will act as a fertilizer to the tree.
NECESSARY OUTFIT.

For the small orchard, any good force pump mounted on a barrel, the same placed on a sled or wagon, several feet of good hose, and one or more good nozzles on the end of the bamboo rod, together with a kettle, a couple of mixing tanks and the outfit is complete.

My outfit consists of a series of platforms built against the side of a hill. The lowest platform is high enough so that the material runs by gravity into the spraying tank which is mounted on a wagon. On the same plane with this I have a 75 gallon kettle with furnace, and on this platform two mixing tanks holding 160 gallons each, fitted with a gate valve (two inch) for rapid filling into the tank by gravity. This avoids all stop and loss, and it will fill a 100 gallon tank in a few minutes. Then above this is another platform with large tanks for holding water which can be conveyed to kettle. Mixing tanks or spraying tank through hose by gravity.

The portable part consists of a low down wagon, front wheels 24 inches, back wheels 30 inches, with 4 inch tread. Over this I have a platform 5 1/2 feet wide by 12 feet long. On the front end is a box seat for driver. In this box is a six-cell dry battery and room for necessary tools and fixtures. Back of this is a two-horse double cylinder gasoline engine and on the rear end is a 100 gallon tank with a good pump mounted thereon. The pump is run by being connected to a jumping-jack suspended overhead by means of an elevated platform supported by four well braced posts. This jack is connected to the engine by a three inch belt. The gasoline tank is also above, out of the way. Every part is under immediate control of the driver without moving from his seat. The valves controlling the engine are within easy reach. The switch board of battery is on back of the seat. The belt lever within easy reach above his head. The pump can be stopped instantly by turning to the loose pulley. The pressure is held uniform by an air chamber in which pressure is maintained at 80 pounds. This is controlled by a safety water relief valve which, when pressure reaches above 80 pounds, opens and leaves a portion flow back into the tank without in any way causing any variation in the flow of the spray. This pump runs 50 strokes per minute. With this I can with one hose and four nozzles put on 100 gallons in a perfect mist in a very few minutes. If I use two sets of hose and eight nozzles, in half the time.

To this pump we use a 40 or 50 foot hose. On the end of this is a bamboo pole with a brass pipe through the center, a stop valve at the bottom and four Vermorel nozzles at the terminal end. This completes the outfit, and a very satisfactory one it proves, doing away with half the terrors of spraying. The man holding the nozzles should have a pair of rubber gloves, a pair of goggles and a
mask to protect the face as all these preparations are very caustic. If a small particle gets in the eye it will cause intense pain. It will eat into the hands if they are too much exposed to its caustic action. If using power with 80 pounds pressure, be sure you have a strong hose. I use best seven-ply. Have the couplings securely fastened or they will blow out and you may get a dose in the face much to your discomfort.

How long will a tree badly infested survive? I have had both apple and peach trees 8 years old perfectly healthy, making new wood growth of over two feet the past season, killed by January 1st. I am satisfied two years will be about the limit for young trees, so it behooves us to act promptly. Spray with lime, sulphur and salt, if you have the scale. If you are not sure, spray anyway and you are safe. As to the remedy spoken of so highly in a late issue of a Philadelphia paper, I say, go slow. I have used the preparation of caustic potash and caustic soda for years with excellent effect on the trunks and larger limbs of my trees. It destroys all fungi and leaves the bark clean, soft and thrifty, but it will destroy buds. I have experimented with it for the scale, at a strength of one pound to six gallons of water but it will not destroy the louse under the scale, and if made strong enough to do so it will destroy buds.

I have also dissolved one pound sulphur in one pound caustic potash (90 per cent.) in two quarts of water. By boiling, this makes a beautiful amber colored liquid, throws no sediment and can be diluted to any strength. I have put this in seven gallons of water and sprayed the scale and, though doing better than the caustic soda alone, it is not satisfactory, and will likewise hurt buds. Although I will continue experimenting, yet I will rely principally upon the lime, sulphur and salt for peach and other trees not too thickly encrusted. If the scale are too thick I will spray with pure kerosene put on as a very fine mist with a kerosene nozzle having a hole the size of a fine cambric needle.*

Before closing, I desire to express an opinion as to the best method of awakening the fruit grower and the farmer and every one who owns a village lot to their danger; the best method of educating them to successfully fight this dread foe.

In my humble opinion this can be best accomplished through the aid of the Department of Agriculture and Horticulture. Make it one of the prominent features of the Farmers' Institute. Let the

*Note.—I have examined the trees sprayed during late November and I find the lime, sulphur and salt has not killed as many scale as was hoped, and I doubt if late fall or early winter spraying will destroy enough to pay for labor and material. If such is the fact, then the time for effectual spraying is very limited. Should the spring be late, with much rain, we may have but a few days of ideal spraying weather. We see the importance of having the material ready and the best machinery for thorough and rapid work.

I doubt if the lime, sulphur and salt wash really does kill as many lice while under the scale as is claimed for it. I believe it acts upon the louse during the first forty-eight hours of its life after birth, by preventing it from attaching itself to the tree, depriving it of nourishment or by the caustic action of the material upon the body of the insect causing its death. I believe that to more thoroughly subdue this pest we must use some one of the best summer remedies to follow the lime, sulphur and salt after it has lost its petency.
Department have at least one speaker wherever an institute is held that this scale may be so prominently brought before the people, so fully described and the methods of handling it so plainly given, all the formula be so accurately given that the average farmer will fully understand.

To fill this most important office, select such men as are thoroughly conversant with the subject; not theorists. We are facing too great a danger to depend upon theory and science alone. We must have the practical knowledge. Let these men be selected without fear or favor.

Put them under a rigid examination even to a field demonstration, the mixing and compounding the ingredients, to convince you that they are fully competent. Let it be such men as you know are successfully destroying this foe and capable of handling every department of horticulture.

As further aid, let the Department give field demonstrations in every county in the State, that the farmer can become acquainted with the practical side of the business.

At 3.30 P. M. the Governor of the Commonwealth was announced by Chairman Sexton.

The CHAIRMAN: It gives me pleasure to introduce to you Governor Pennypacker, and it gives me greater pleasure to say that he is a farmer of my own county. I will declare a recess of ten minutes in order to give you opportunity to shake hands with him.

After the recess, Governor Pennypacker presided.

The PRESIDENT: The next paper will be read by Mr. J. H. Ledy, of Marion, Pa.

MR. LEDY: I thought when Dr. Funk was speaking about protecting your eyes with a pair of goggles that you should also protect your head with some covering, especially if you have bald heads like some of the men in this audience. I scarcely know what to add to what has been said. These gentlemen have so thoroughly discussed this question that there seems to be very little left for me to say. I have prepared a paper and from the communication I had with our Secretary, I was informed that I was to say a few words about fruit culture and wind up with the Scale; but I think the scale business has been wound up. I want to say, before I start with this paper, a word about the spraying outfit. I use a little different engine than Dr. Funk. The one I use is run by natural gas. This is the kind I use (motioning up and down with the hand.)

Mr. Ledy then read his paper as follows:
FRUIT CULTURE IN PENNSYLVANIA.

BY J. H. Ledy, Marion, Pa.

I feel certain that this subject is of vastly more importance than very many of this audience will give credit to. And yet the fruit industry in Pennsylvania is practically undeveloped, and is yet really in its infancy. It has been demonstrated and I feel sure it will not be questioned here, that Pennsylvania has the best adapted soil for the growth of strawberries, raspberries, blackberries, currants and gooseberries, figuring along the line of small fruits, in the United States. Some one will say, perhaps, that I am selfish in thinking only of home; but I am certain that the soil of our own Pennsylvania will go side by side with that of any other state in our Union. And there are few localities within the boundaries of our great State in which these fruits cannot be properly produced.

The culture of small fruits has, in my opinion, been a sadly neglected industry by the farmers of Pennsylvania. And many thousands of dollars and untold pleasures might have been theirs with the credit side of the ledger telling quite a different story, and one much more pleasant to look upon had small fruit culture received its proper share of attention by the farmers of our State. However, small fruit being only secondary to that of the greater industry of tree fruit culture, and this being one in which I feel more particularly at home, I shall hasten on and discuss in my feeble way this still more neglected industry. It is my firm belief that Pennsylvania soil is capable of producing apples second to none other, while the quality of our pears, plums and peaches certainly cannot be questioned anywhere. Until ten or twelve years ago we could safely say to the farmers of the State, plant trees, prune and cultivate them carefully and success awaits you. The situation at this time seems to be, and indeed is different. In about the year 1890 the dreaded San José Scale was imported on nursery stock into the San José Valley, California, and not many years later made its appearance in the orchards of Pennsylvania, and is now spread broadcast throughout almost all of the entire State, becoming a serious menace to the culture of fruit trees everywhere within its borders. We can no longer say then to the average farmer, plant
trees. But it is only to those who thoroughly understand the situation and are fully convinced that success just as surely awaits them by persistent care and untiring energy in battling with this most dreaded of all insect pests that we can offer this same suggestion.

In tree fruit culture we are on the eve of a new era. If success is to be ours, or any of ours, we must have legislation which will compel not those of us who are anxious and who lie awake nights studying plans and formulae to eradicate, if such a thing be possible, or at least keep in check this dreaded pest, but those who having small orchards, or a few trees perhaps, are practically indifferent as to its results, to either treat their trees when infected according to the instructions of the Economic Zoologist of Pennsylvania, or have them destroyed. In the presence of the efficient and very satisfactory Surface, it is not my intention to suggest even a formula for the destruction of this pest. My experience, however, I believe, will be gratifying to him and may be of some interest to this audience. By actual experience I am fully convinced that either crude petroleum or the lime, sulphur and salt combination, if properly mixed, and properly applied, will satisfactorily serve to entirely destroy this worst of all insect pests. I have used the crude petroleum, twenty-five per cent, and seventy-five per cent. water, with complete results. And I have also applied the lime, sulphur and salt combination with equally good results.

The future of the fruit grower in Pennsylvania, who will take off his coat, roll up his sleeves and fight this pest, under the direction of the great chief of "Bugology," Prof. H. A. Surface, and having for his protection laws that will prevent utter carelessness on the part of the indifferent ones, a just and deserved success must be his to enjoy.

The PRESIDENT: What time in the year do you use it?

MR. LEDY: The Scale must be treated when the butts are dormant. It is almost impossible to reach it at any other time.

The PRESIDENT: That is, in the early spring?

MR. LEDY: Yes, sir.

The PRESIDENT: What do you find to be a good remedy?

MR. LEDY: Either lime, sulphur and salt, or crude oil, will kill the covering. If the tree is spread well the buds are entirely dormant. There is nothing as effective as oil and I have effectually killed the tree in the use of oil. My first experience was with eleven beautiful trees. I found out what it was when Professor McCartney came to Shippensburg to lecture on the Scale, and that I had it
and I dug those eleven apple trees out and I carried them out of the
orchard like eleven corpses and covered them with straw and
burned them and went to bed and slept well.

The PRESIDENT: We will now hear from Professor Surface.

THE SAN JOSE SCALE. LIFE HISTORY AND PRACTICAL
REMEDIES.

BY PROF. H. A. SURFACE. ECONOMIC ZOOLOGIST.

Mr. Chairman, Ladies and Gentlemen: In this State we are to-day
facing the most serious condition for the fruit interests that this
country has ever known and, perhaps, the worst that has ever
been known in the history of the earth. All kinds of fruit trees
are attacked by an insidious foe known as the San José Scale,
which was imported into this country about fifteen years ago on
nursery stock from California and brought into this State about
ten or twelve years ago from the New Jersey nurseries. It took
a strong foothold in the fruit growing sections of the State, par-
ticularly in the southern, southeastern and eastern portions of the
Commonwealth. It has been greatly disseminated over the State
until now it is found in more than three-fourths of the counties and
our more extended knowledge of it may show it more practically
in all the counties of this State. In 1897, it was known to be in
the following counties: Bucks, Montgomery, Chester, Lancaster,
Dauphin, Columbia, Lycoming, Union, Snyder, Juniata, Perry,
Adams, Franklin, Blair, Cameron, Beaver, Erie, Mouton and North-
umberland. In 1898, it was known to be in the following additional
counties: Northampton, Lehigh, Philadelphia, Delaware, Lebanon,
York, Mifflin, Westmoreland, Fayette, Allegheny and Armstrong.
In 1903, we ascertained its presence in the following additional
counties: Bradford, Susquehanna, Sullivan, Wyoming, Lackawanna,
Luzerne, Carbon, Monroe, Schuylkill, Berks, Clinton, Huntingdon,
Bedford, Cambria, Clearfield, Mercer and Butler. It is not known
how much earlier than these dates it first occurred in these coun-
ties. But the first appearance of it in the State was in 1892 or 1893.
There may be other infested counties at the present time and we
hope, by the co-operation of the members of this Board, to learn of
these at a date as early as possible.
The reasons this pest is so injurious are, first, that it attacks all kinds of fruit trees, many kinds of ornamental shrubbery and even some of our shade trees and forest trees. In saying that it attacks all kinds of fruit trees, however, we do not wish to be misleading and give the inference that it is equally injurious to all varieties. Some, such as the Kieffer pear and certain varieties of plums and cherries are not seriously injured by it. Others are more readily killed. It will destroy a tree in from one to five years. We have known of its existence upon currant bushes which bore fruit in June and were killed at the following September. A mere list of the plants which it attacks would not be of great usefulness because these attacks are in different degrees of severity upon different kinds of plants. For example, the Osage orange is decidedly injured and quickly killed by it, while the California privet is only slightly attacked. Thus to say in a mere list that it is found on both these plants would be misleading, and yet true. It attacks grape, but not to a very injurious extent, and may also be found to a slight degree upon soft maple, mulberry, elm and certain willows as well as other woody plants. It is particularly injurious to peach, apple, pear, quince, some varieties of plums and a few of cherries. We hope to publish a carefully prepared list giving the relative degrees of immunity of different plants attacked by it and this will be for free distribution as one of our monthly bulletins of the Division of Zoology of the Department of Agriculture. I would call the attention of the Board to the fact that these bulletins are published monthly from the office of the Zoologist and are free for all persons who desire them. They are making a special feature of the San José Scale and the practical remedies for it, and in the bulletin for November, 1903, may be found a discussion of its habits, means of distribution and remedies given in such detail that anyone can use this with success.

Second, another reason that this pest is so injurious is that it is so minute and inconspicuous; it is not as large as the head of a common dressing pin, and is not of a conspicuous coloration. It often exists upon trees until the latter are killed and even then the presence of the San José Scale is not suspected but it is thought that the tree has died of some fungous disease.

Third, another reason that it is so injurious is that it is very prolific. A single female becomes the ancestor of over three billion living young in one year's time. This figure is published by Professor Forbes, of Illinois, one of the greatest entomologists of the country.

Fourth, another reason that it is so injurious is that it is suctorial in its method of feeding and injects a poison into the inner bark of the tree, upon which it is found, similar to the manner in which
a mosquito injects its poisonous saliva into the system of its victim when feeding. This can readily be seen by scraping away the outer bark of an infested limb and observing the red effects and blotched appearance caused by the punctures of the beaks of the scale insects. The fact that it is suctorial also renders it impossible to kill it by the arsenical poisons, since these insecticides are effective only upon biting or chewing insects.

Fifth, another reason that it is so injurious is that it is hard to kill. Common insecticides are not effective against it. A paper, in the southeastern portion of this State, published that this pest was increasing, notwithstanding the fact that the citizens were using Bordeaux mixture and Paris green against it. This is not surprising. The Bordeaux mixture is not an insecticide but a fungicide. It is never recommended for the destruction of any kind of insects although it may repel a few such as the flea beetles. Paris green cannot kill a suctorial insect such as the scale because the poison must be eaten or taken internally as a stomach poison in order to effect the destruction of the pest. One might ask the question, what are the natural enemies of this pest and why has it not been destructive to the fruit interests of other countries before this time? It is here devoured by the American variety of lady bugs or lady beetles and, perhaps, a few others of the smaller species of parasites but is so small that the larger parasites of the larger scale insects do not work the destruction of this that they do of our native scales.

There is in this room, at the present time, Prof. C. L. Marlatt, Assistant Entomologist of the United States Department of Agriculture, who went to China and there found the native home of this insidious pest. He also found that it was there being held in check by a lady beetle, or lady bird, known as the Chinese lady beetle. He collected some specimens of this predaceous insect and brought them to Washington. There they thrive and they have been successfully introduced into the orchards of some portions of our country; but this work is yet in its experimental stage and entomologists do not advise orchardists to wait until the imported lady beetles can destroy the San José Scale. At present this delay is almost sure to end in the total destruction of the fruit trees. In the course of time the natural enemies may suppress the pest, but at the present the efforts of man are needed to control it. Fortunately, several effective remedies are known and those we shall mention later.

It is desirable to know how this pest is disseminated or carried from place to place. To a limited extent, as in orchards, it is carried in the following ways:

First, by larger insects upon which the little pests climb or fall and by which they are carried to greater or lesser distance, Sev-
eral insects, such as grasshoppers, beetles, etc., have been found carrying this Scale in its young and creeping stage.

Second, by birds that light upon trees that are infested with the Scale, the young pests crawling upon the feet of the birds are thus carried to various distances. This, however, means that the insect should be destroyed and not the birds.

Third, the wind may blow the young insects to other trees just as dust is carried, or it may blow leaves upon which they have crawled, in an active condition, and thus carry them along. They are not conveyed, however, by leaves to which they have fixed and commenced to feed for they cannot free themselves from leaves and attach again to another tree.

Fourth, they are carried by the larger animals, such as cats and squirrels that climb trees, as well as by live stock that may walk under the trees and upon which they fall.

Fifth, they are carried by the workmen themselves, upon whose clothing these young pests may fall, and then be carried from tree to tree. This has been known to be done.

Sixth, where the branches of trees touch one another it, of course, crawls from tree to tree. It must be remembered that all these means refer to the distribution of the insect in its young or active stage only.

I should here call attention to the fact that it is not conveyed upon ripe fruit of any kind in any of its stages, because upon ripe fruit it is in its fixed condition and cannot free itself, when in this stage, and become fixed at any other place. Thus the Germans and others, who prohibit the importation of American fruits to their countries, because our fruits may have this pest upon them, are acting in ignorance of a scientific and biological principle which recognizes the fact that the San José Scale never multiplies or lives after having fixed upon ripe fruits.

The chief way in which it is carried over great distances is upon the branches or trunks of young trees sent for propagation and by cuttings that are to be used as grafts, buds, or other means of propagation. On these it is nearly always in the fixed or older stage, and in this stage it is not carried in any other way than upon the woody plants that are to grow again. This means that for extensive distribution our nurseries are the source of great evil. For this reason our State is carefully inspecting the nurseries and compelling them to fumigate all trees found infested before they can be sold. Fumigation may be made effective; but it is not always so, and the purchaser is justified in refusing trees that have the San José Scale upon them whether they have been fumigated or not.

There are several remedies for this pest and most of them vary
in kind or strength, according to the plants to which they are to be applied or according to the season for application. Where the pest is abundant, summer remedies should be applied in order to check it so that it will not be able to injure the trees seriously before the dormant season. The summer remedies may be:

(1) Whale oil soap, one pound in six gallons of water, used as a spray.

(2) Kerosene emulsion.

(3) Kerosene mixture.

These should not be stronger than 20 per cent. kerosene for apple trees and not stronger than 12 per cent. kerosene for peach trees. They will not kill the adult or scale insect, but they will kill the young pest while it is crawling around and in its tender condition. They may be in this stage from one to two days, according to temperature, but not longer. Of course, during that time they are not covered by a waxy scale as is the adult, and they are killed by such simple contact applications as would be used in killing plant lice or aphids. There is considerable advantage in using the kerosene mixture if one has the apparatus for applying this. Such apparatus consists of a tank or vessel to hold the kerosene, which is to be placed in turn inside of the barrel which holds the water, and so arranged that these liquids are mixed in the definite and desired proportions at the time the spraying is made. One serious objection to the kerosene mixture is that the proportion of the kerosene is likely to vary, and at different times one may be giving an increased or decreased percentage of the oil. Another objection to it is that when the operator is spraying with a rod or long hose and stops for a long time, the oil will rise to the upper portion of the hose or spray pole and the water will sink to the lower portion of the tube. Then when he commences to spray again he will, for a few moments, apply pure oil and later pure water until the recently mixed substances appear. This means that during the time of application of pure oil the foliage will be burnt or injured, and during the moments of application of pure water the insects will not be killed. We wish to say now that it is much better to apply insecticides strong enough to slightly injure the foliage or the plants than to have them so diluted that insects are not destroyed. We should also call attention to the necessity of carefully following the printed formulas. If the substances are not applied in as strong proportions as we publish they may not be effective in suppressing the insects and as a consequence one loses his time, labor and material. If, however, they are much stronger than that for which the formulas call they may result in killing, not only the insects, but all the plants to which they are applied. We know of several trees that have been killed simply by the
operator thinking that if a little is good, more is better and consequently applying his insecticides so strong as to cause injury or even death to the plant.

The winter remedies for this pest are various and while oil is recommended by some persons, and I would use it upon my own trees, it is not to be recommended by me for you to use upon your trees. The reasons for this are that you are likely to put it on in a way that will kill the tree and this can be prevented only by extreme care and observation of various essential conditions. If I were to use oil I should choose either common refined kerosene or lamp oil or light crude petroleum. I should prefer the latter of the heavy grades with a specific gravity of 43 degrees Baume, or heavier. The reason for this is that the heavy oils contain the paraffine and other heavy substances that do not penetrate readily but stick to the bark and this makes it permanent and lasting, as do the latter oils. I should also choose a sunshiny and windy day in order to make the evaporation as rapid as possible. Then I should select the Vermorel nozzles, each with an orifice of not more than one-thirtieth of an inch and I would see that the pressure upon the liquid for the spray was as great as my apparatus could bear in order to make the finest possible spray. I would thus endeavor to secure a fine spray and rapid evaporation and by a single sweep up and down each side of each infested branch I would finish the operation, aiming to give only a mist of oil and not enough to make the branches even wet. By no manner of means should enough be applied to run together in drops upon the twigs or limbs. While I could do this and kill the pest, and save my trees. I fear that my hearers would not be sufficiently careful and consequently, in order to save your trees, I would recommend the lime-sulphur washes which have been used with complete success and satisfaction. Before mentioning this in detail, however, I wish to speak of whale oil soap, which is a first class insecticide. Two pounds in one gallon of warm water will kill insects but it is likely to prove injurious to the fruit buds if applied at any other time than very shortly before they open in the spring. For any trees and shrubs that are not going to produce fruits this is a desirable substance to use as a wash or spray for the San José Scale. I should also call attention to the fact that our trees vary in hardiness. The apple and pear are the most hardy; then, in order, come the plum, cherry, peach and finally the apricot. Most substances that can be used with safety upon the apple and pear will injure and may even kill the peach and sometimes the plum. However, it may be said in favor of the lime-sulphur washes that these can be applied in any amount upon any and all kinds of trees and shrubs with safety and one does not need the experience and precautions that are
necessary in applying oils. There are several methods of preparing the lime and sulphur washes. Salt is often added but it must be remembered that the salt does not have any insecticidal value and is used only to make the wash stick. One wash that can be used without boiling is known as the lime-sulphur-soda wash given to-day by Colonel Fox. This, however, is not yet generally accepted by careful experimenters even in the State of New York, where the wash originated, and in correspondence with dozens of our most careful economic entomologists in different states I have learned that the standard remedy which they are recommending, and which is being used with entire success and satisfaction, is the boiled lime and sulphur washes. This means they must be boiled by artificial heat which can be done either over a fire in an open iron kettle, stirring occasionally, or better, by live steam driven from engines or boilers through pipes and into barrels, tanks or vats prepared for this purpose. There are two formulae for the lime-sulphur washes; one is the Oregon wash, which calls for fifty pounds each of lime, sulphur and salt and six pounds copper sulphate in fifty gallons of water; the other is the California wash, as published in our November Bulletin, calling for thirty pounds of unslaked lime, twenty pounds of sulphur and fifteen pounds of salt for sixty gallons of water when completed. As is said the salt may be omitted and it is probably as well to reduce the lime to only thirty pounds. This should be boiled for two full hours, at which time the mixture will assume an amber or reddish color and the higher sulphur compounds, which are effective in killing the insects, will have been formed. It must be strained and applied while warm. The reason for applying it in this condition is, that it runs better through the spraying apparatus and nozzles and makes a better spray. Heat does not kill the insects; it is the substance. It is desirable to make two applications; the second may follow the first as soon as the latter is dried, but I consider it better to make the first in the fall as soon as the leaves are off and the second in the spring just before the buds burst. It will not retain its insecticidal virtue for a great period and consequently should be used while fresh. Calcothon, which is a substance now for sale by dealers, is practically this wash prepared and put into barrels. It will be observed that the fall application does not remain on the branches nearly as long as the spring applications. This is doubtless because the leaves, which appear soon after the latter is made, protect the branches and keep the rains from washing the lime and sulphur away. It is important that one should try and make these applications at a time when he will have a few days dry weather following the spraying. It is not wholly effective if rain should come before the lime is dry, which is, of course, within a few hours after having made the application. But it is
better if it can be done at such a time that a few days of dry weather follow. One great value of the spring application lies in the fact that the lime and sulphur remain on the branches and appear to have the effect of keeping the young insects from fixing to feed. Upon trees sprayed in March or April the young crawling insects may be found in June or July, and one may think that his work has not been successful; but these pests do not fix and feed, and upon examination during the fall one will find the trees practically clean. The great purpose of the second application is to be sure and cover all spots that were missed by the first. If a spot as large as the end of a man's finger should be missed it means that there are hundreds of scale insects left to commence the work of bringing forth young to re-infest the tree.

It is not claimed that this spraying kills all the San José Scale upon the tree, but it reduces them so in number that it will not have to be sprayed again for two or three years and possibly longer. However, this wash has such a decidedly fungicidal value that the best fruit growers are now using it every year to clean up the fungi that causes rusts, blights, mildews, leaf spots, leaf curl, etc. Sprayed even before the buds burst it will act as a very effective preventive of leaf curl. This can be applied by any kind of spraying apparatus; but it is important for the operator to cover his hand with rubber or oil skin gloves or rub them well with vaseline. It is said that leather gloves or mittens will not do as it will eat through the leather. Horses should be blanketed in order to keep spray from them. If one will keep to the windward side of the tree he need not be injured by the spray coming over him, but he should protect his eyes, and for this it is desirable to wear goggles during this operation.

In conclusion, I may say that while we really have a serious foe to fight in this pest we should not be discouraged in growing fruits in Pennsylvania. In fact I have, to-day, replied in the affirmative to the question: "Would you advise the planting of a young orchard under present conditions in the infested areas of this State?" This pest will prove a blessing in disguise. It will result in the destruction of worthless and unkept trees. It will make fruit culture a profession and better varieties and better culture will result in better fruits. This means also better prices and while we are at present under a cloud, it appears to be only that darkness which precedes dawn.

A Member: Do you believe our native beetle will be able to fight the San José Scale off?

PROFESSOR SURFACE: I have seen native lady beetles doing that in Berks county.
MR. SCHWARZ: I took it from Dr. Funk's paper that he has been successful in the use of kerosene.

PROFESSOR SURFACE: If I had an orchard I should spray it with pure kerosene, but I would not recommend my neighbor to do so. I would do it on a fine clear day and would put it on with the finest Vermorel nozzle with the finest spray. I would give it just a breath and that is all, and then it would evaporate, just enough to kill the insect and not kill the tree. But if I should wet it a quarter of a second too long I would kill the tree. There are so many things to be taken into consideration, in connection with this matter, that there is danger of doing injury.

MR. LEDY: What would be your excuse for using clear kerosene when you can use crude petroleum and eliminate the danger?

PROFESSOR SURFACE: I would prefer to use the crude petroleum because it sticks on better. I saw in Dr. Groff's orchard where he sprayed in April and it was there in October.

A Member: Would you use that spray on peach trees?

PROFESSOR SURFACE: I call on Professor Marlatt to come forward and help me out.

PROFESSOR MARLATT: You are doing very well and I don't think it is necessary.

The PRESIDENT: We will be glad to hear from you.

PROFESSOR MARLATT: This is taking advantage of me, but I suppose I cannot help it. Your Secretary promised me that I should not be asked to get on my feet except some one was in error, and I have heard no errors made.

The SECRETARY: And except some one should ask a question.

PROFESSOR MARLATT: I have been very much interested in what has been said and especially pleased at the sound advice that has been given you. I can subscribe to all that has been said by all the speakers with reference to the San José Scale and have been specially impressed by the practical work that has been done by Dr. Funk. Evidently he understands it. He has certainly shown himself to be very familiar with the scale and the remedies that should be applied. I was very much pleased to listen to his address and I felt when he was talking that he must have consulted me before he got on his feet because he expressed my own views. The same applies to Professor Atwood, of New York State. I have heard of him for a number of years but never had the pleasure of
hearing him. The same applies to Professor Surface and others. I was very much pleased to hear his talk on this subject and, evidently, he is the right man in the right place. After all that has been said I am afraid you have heard too much for one day on the subject of sulphur, lime and salt wash and San José Scale so that you must be getting tired, and I shall not take up much of your time in the discussion of this important question.

The SECRETARY: More questions will follow.

PROFESSOR MARLATT: I will regret it. I agree with all the speakers that oil, perhaps, has had its day; that the thing to use is lime, sulphur and salt wash because it is safe and there is no risk to run in the use of it upon your trees. Its effects are as good as oil and it has more lasting effects than oil. To answer this question about oil: We have sprayed peach trees with kerosene and crude petroleum for three or four years in succession without any injury. The same with apples and plum trees. After all it is the man at the end of the nozzle that does the work. Back in 1894, is the first I sprayed with oil and I killed those trees. I said to the sprayer, in order to be successful, that he should spray them until they are wet and those trees were killed. Afterwards we sprayed the trees, as Professor Surface has described, and I have never killed a tree with oil since. While I would spray my own orchards with oil I should not recommend any one else to spray with oil unless they have experimented with its use. Just now I would not spray them with oil but the lime, sulphur and salt because it is cheaper and the effects are better; that is, knowing what I do about its use I would not spray them with oil now because I would not entrust my man to do it. You have to employ men to do it and I do not believe you can get a man, whom you could entrust to put oil on trees.

I might say, with reference to this lime, sulphur and salt, that the first benefit seems to be due from its being an insecticide as to killing the scales, but as to its action through the summer, if you put on this wash and it is very strong and hot when put on you will kill most of the scale at once, but in a majority of the cases you will not kill all the scale but a larger per cent. of them. The balance of the scale will go through the winter and the females will hatch and produce millions of young and in the use of this wash you will find remnants of the lime, sulphur and salt for sometime after and here is where the benefits come in. There is enough lime and sulphur there to kill them, or at least enough remaining there until they die, which is probably due to the action of the sulphur and lime. The sulphur, as we know, has a very strong insecticide action, especially for very small insects, killing the young that have escaped the direct caustic effect of the wash.
I agree with most of the speakers in not advising short cuts. Lime, sulphur and salt is not a new thing; it has been used in California for some years and it is worth following. The long boiling makes a perfect combination of lime, sulphur, and salt makes it adhere. This caustic addition is on trial. It is recommended to avoid long boiling. It adds to the expense of the wash, but under no circumstances can you get lime and sulphur to have the same effect of chemical union that you will by long boiling. We know that the lime will cut the sulphur and get it in solution, but you don't get the caustic effect. The formula for lime, sulphur and salt you may vary as you like. My own belief is that an extraordinary amount of lime is unnecessary and makes it harder to spray. Thirty pounds of lime to twenty pounds of sulphur and fifteen pounds of salt in sixty gallons of water is about what it should be. I should recommend a greater amount of lime in the mixture because that is good for the tree and you can see what you have done. However, the more lime you have the more difficult it will be to get it through the nozzle and I should not use more than thirty pounds of lime to twenty pounds of sulphur.

DR. FUNK: Why should I have an increase of lime and use more lime than sulphur?

PROFESSOR MARLATT: By using more lime you have the tree more whitened and can see it.

DR. FUNK: You get that yellowish white on the trees after it is dried and is thoroughly effective.

PROFESSOR MARLATT: It don't make any difference what you use, you get perfect results. You can use equal parts of lime and sulphur and get practically the same results.

The PRESIDENT: You use sulphur and lime but advise using more lime than sulphur in the mixture because it gives it color.

PROFESSOR MARLATT: It gives color and is more adhesive.

The PRESIDENT: How much salt do you say you would use?

PROFESSOR MARLATT: Fifteen pounds.

The PRESIDENT: How much water?

PROFESSOR MARLATT: Sixty gallons of water.

PROFESSOR SURFACE: That is the same formula in our November Bulletin, except we put forty pounds of lime in.

The PRESIDENT: What do you mean by a long boiling?

PROF. MARLATT: If you should prepare fifty or sixty gallons,
at once, in big hogsheads or tanks you ought not to boil less than two hours, perhaps three, and it is advisable to have a steam plant. A man, who is doing as much work as Dr. Funk, needs a larger apparatus than where there is a small requirement. To boil a large quantity at one time you cannot get it properly made under two hours and in one boiling an hour or hour and a half is not sufficient.

The PRESIDENT: The proper time then is to boil the ingredients two hours?

PROF. MARLATT: It is. Of course if you have a small kettle, say, holding ten gallons and wish to spray only that quantity, if you have trees in your lot, you can get the combination in twenty minutes. The test of the boiling is the combination. If your sulphur has been all converted and thoroughly mixed with the other ingredients, when you dip it up your boiling is sufficient. You don't have to continue it until every bit of sulphur is gone.

The PRESIDENT: I think there are very few farmers who have a steam apparatus about their farms; most of them have not. If they have to depend on this remedy and the process of boiling which has been described they will have to boil in some other way. Can it be boiled in kettles?

MR. MARLATT: Yes, sir; it can be boiled in kettles.

MR. LEDY: How do you mix it?

PROF. MARLATT: It is advisable to mix the sulphur in the water first because it is fine powder and if you don't it will mix in lumps. Mix the sulphur in a paste and put the lime in a kettle and enough water to slake it, a fresh stone lime, and start the fire at once and you get the heat from the slaking lime and put the salt in at the same time, or, afterwards if you choose. Just as well put it in, all at the same time, and let it boil the time required. If you have a large tank it is well to have the whole amount of water at the start, but it is exceedingly more convenient to start with a third or half of the water and fill it out afterwards.

A Member: In applying strong solutions are not peach trees more likely to be killed than apple trees, quince trees or pear trees?

PROF. MARLATT: You are quite right.

A Member: It has been my experience.

PROF. MARLATT: In fact most any one can spray apple or plum trees but the peach tree is much more tender.

A Member: Should there not be a warning about mixtures on account of not stirring them properly? I had a friend who neg-
lected to stir the mixture and the substance became so compact and solid that he had to take the bottom out with a cold chisel.

PROF. MARLATT: It should be stirred until the lime is entirely slaked.

A Member: Would there be any danger in adding glue, on account of making it stick tighter to the tree?

PROF. MARLATT: I don't think there is any advantage in glue.

MR. RODGERS: Is the sulphur all pure?

PROF. MARLATT: We all know there are some adulterations in that article as well as there have been found to be in others.

PROF. SURFACE: We have all these formulae, in detail, in our monthly bulletins.

PROF. MARLATT: I wish to say, before I take my seat, that the San José Scale, while it is the most injurious pest that ever appeared in connection with our fruit trees, it is not a subject that we need feel very sad about. In other words, it has a bright side; this spraying is very beneficial to the trees; it prevents a lot of injury to the trees from fungi. One of our leading entomologists told me that he was inclined to spray with lime, sulphur and salt on his peach trees whether he had the San José Scale or not, for the reason that it cleaned up the trees and he had good fruit on those trees where he sprayed and none on the trees where they did not spray. In California they hold that the San José Scale has been a benefit, but they have constant spraying. The lime, sulphur and salt has produced better fruit trees, more fruit and better quality of fruit has been obtained and all that has resulted from the San José Scale, and taking it altogether, the benefits have been greater than the losses. On the trip that I made to Japan and China I discovered the beetle which was pursuing the San José Scale. The region where it has taken hold has been in Georgia, and in some very large orchards in Georgia it has taken hold and developed by the thousands, and the State Entomologist, Mr. Scott, was very much interested in it.

MR. MARTIN: Have you succeeded in having this beetle climatized?

PROF. MARLATT: It does not need to be climatized. It came from about the same climate we have here. The only trouble is to get fruit enough for it. If I was to give it to some one of you and you would put it in your orchard and spray with lime, sulphur and salt you would kill it. It would be best to use it in small gardens and lots where you can put it in and not spray. In com-
Agricultural orchards I would not recommend its introduction because you have to have the scale or kill the beetle. At present I recommend all men, who have orchards, to spray. In the meantime we will do what we can to spread this insect and, if possible, wipe out of existence this pest, but it will take three, four or five years to do that. Even if the beetle becomes very useful it will take some time to get a large supply and we should continue to spray in the meantime.

PROF. SURFACE: Tell us about caustic soda and water.

PROF. MARLATT: It is difficult to prepare. If you have means such as Dr. Funk has, the difficulty will be small; if you have a steam plant it will not be very inconvenient. It might be well for a number in a community to go together in order to have all the appliances necessary to do good work. The caustic soda has been recommended by the Farm Journal. We have had a report made on all these substances and years back one of our best experimenters, the late Mr. Hubbard, published all these formulas and the caustic soda was the worst on the tree and had the least effect on the San José Scale. Caustic potash was better than the caustic soda but that was bad on the trees and not efficient on the bug.

The consequence was that if you use it in sufficient quantity of strength to extinguish the bug you would kill the tree. I used also potash and I put it on, in strength, three pounds to the gallon of water, without killing all the scale insects but doing material damage to the tree and I used it down to half a pound to the gallon and it gave no effect. I do not believe caustic soda is going to be a remedy. You spray the tree with caustic soda and it cleans the bark and a man will think he has accomplished something, but he has not accomplished anything. If the caustic soda would do the work you would have a very easy remedy to dispose of the San José Scale, but it does not do the work.

MR. LEDY: Tell us about the summer treatment of the scale?

PROF. MARLATT: I think your advice covered that fully.

A Member: We have people who have used sublimate of lye.

PROF. MARLATT: We have used concentrated soda lye and concentrated potash lye. There are a great many brands of lye. If one placed reliance on all the statements we have seen we would be led astray.

A Member: I have tried it and have had pretty good results. It appeared to have good effect. Whether it would break it up or not I don't know.
PROF. MARLATT: My own experience has been that lye washes are not effective.

DR. FUNK: I think there is a great difference with reference to the length of time in boiling the ingredients. As I understand the Professor he shakes his lime first and then adds his sulphur and then builds his fire. I boil an hour and a half but I boil effectually all that time. I have a seventy-five gallon kettle and I have it on a natural boil all the time and I will put in fifty pounds of lime, the best fresh burnt lime that I can get, the Cedar Hollow line, and have a man stirring, and while I have the best heat I apply my sulphur and it never checks the boiling and I keep that boiling up from one hour to an hour and a quarter and apply my salt and keep it boiling for another half hour, so that there is not much difference because I have a solid boil all the time.

COL. DEMMING: I was about to ask the gentleman whether he had ever tried as a remedy diluted cadmium nitrate?

PROF. MARLATT: I have had no experience in that direction.

COL. DEMMING: When the San José Scale first appeared I tried that and found it was most destructive and also destructive to every specie of insect from the smallest specimen up. I also found, after experimenting several days with the San José Scale, I could feel them running over me and I wondered if there was any one here who has had that experience, because I believe they can be carried from one place to another very easily. I desire to say that I felt the sensation on my hand, and on examining it with a powerful lens I found some there.

PROF. SURFACE: I read from the November Bulletin, page 17, with reference to one way in which they are disseminated: "Workmen themselves are very likely to carry the young pests upon their clothing."

PROF. ATWOOD: I have had some experience with this lime, sulphur and salt wash and have burnt myself and done all kinds of injury, and one point that I wish to bring out is that, at the time the lime, sulphur and salt are boiling, they change color and when you procure the amber color you have accomplished the boiling you wish and sometimes you can secure that color in half an hour's boiling. Nearly everything depends on the character of the lime. I would use the finest sulphur I had opportunity to obtain, even if I had to pay an extra thirty per cent, more for it. Be sure that the lime is good; that is a very important consideration. I would like to speak of the way in which we prepare it in our State: We regard salt of not much importance, little bit perhaps, because it
helps to whiten it. The lime is put into the kettle and a sufficient amount of hot water added to it to slake it, just barely hot water in order to slake the lime and then this sulphur may be sifted in to accomplish the result. The point I wish to make was with reference to the color.

MR. HERR: I would like to know whether we can boil down a certain amount of the preparation made and hold it for any length of time until we want to use it?

PROF. MARLATT: I will say that the lime, sulphur and salt is not a concentrated mixture. It is something that you should mix and use soon after.

PROF. SURFACE: In other words, it will hold its efficiency just like Bordeaux mixture and in a few weeks it will lose its efficiency.

MR. HERR: The reason I asked was because very few persons have kettles large enough to boil a sufficient amount.

MR. HUTCHISON: We have a Committee on Legislation and if it would be proper we would like to make a report.

The PRESIDENT: We will hear from the chairman of the Committee on Legislation.

The report of the Committee on Legislation was read by Mr. Sexton, which is as follows:

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REPORT OF THE COMMITTEE ON LEGISLATION.

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BY HON. JASON SEXTON, CHAIRMAN.

Mr. President and Members of the State Board of Agriculture: Your Committee, as in the past, respectfully submit for your consideration their annual report, and as we do so, we feel sure that we can rejoice with you and congratulate you on the dawning of a brighter day for the spread of agricultural knowledge. As a Board you have labored long and hard, in season and out of season, to advance the interests of an occupation that stands at the head of the lists of all occupations. You have for years stood in the front rank of those who have battled for better and higher educational facilities for the boys and girls and young men and young women of the farm, that they might be as well equipped for their life's work as the
boys and girls who choose other occupations or callings. You have labored long and hard, and at times under great discouragements, to advance and protect the interests of the agricultural classes whom you represent.

We will not at this time attempt to give a detailed history of the work accomplished by your persistent and self-sacrificing efforts in and for the cause of agriculture since the organization of this Board over thirty years ago. Suffice it to say that through the medium of the Farmers' Institutes and many other channels which were children of your creation, there has through them been taught and disseminated a line of agricultural knowledge that has been and will be of untold benefit to the agricultural classes of the Commonwealth. The history of the success of years of effort are recorded in the annual reports of the State Board and Department of Agriculture from the date of your organization, so that he who runs may read and accord honor to whom honor is due and credit to whom credit is due. The interest you have taken in advanced agricultural education is familiar to all and the results achieved will ever redound to your credit.

But as much as we may have reason to be elated over the success attained, we must remember that the accomplishment of so great a work demands the united efforts of all our State agricultural organizations to bring about the desired end; hence, it was by the united and persistent efforts of the allied agricultural organizations of Pennsylvania, through their executive and legislative committees, backed by the progressive farmers of the State that secured the passage of a bill, which was promptly signed by our Honorable Executive himself—a farmer—appropriating a sum sufficient to build and equip an agricultural building at our State Agricultural College, so long needed, that will be an honor and credit to our great agricultural state, and which accord as a place among the Agricultural Colleges of our sister states which we should have held long ago. So as a Board, with the allied organizations, we may well feel elated and congratulate ourselves on the success achieved in this line of work.

But our efforts must not stop work so auspiciously begun in aid of agricultural education and investigation. The buildings are an assured fact and will soon be completed as the next Legislature is practically pledged to appropriate the remaining $150,000 for their completion. But we have learned that State institutions are not run without liberal appropriations, and the appropriation of $6,000 a year for maintenance of the Agricultural Department of the College is entirely inadequate to do the work which the farmers of the State will rightly demand, and we recommend that the sum first suggested by the allied organizations, namely $30,000, be asked for
the maintenance of the Department, or $15,000 per year. To get it we shall need the support of every progressive farmer of the State.

Next, comes the Experiment Station which is badly in need of funds to prosecute its work successfully, and we are assured by the Director that the work of the Station covers only a small part of the broad field of agriculture, and even that small part is not so thorough as it ought to be owing to inadequate funds. Of the 24 Stations reported by the United States Department of Agriculture, 12 receive larger incomes than our Station, and 20 receive larger or smaller appropriations from their respective states, ranging from $740 to $87,514, as is the case with New York, and the little State of New Jersey appropriates $20,000 annually to her Station. Therefore, we recommend that an appropriation of at least $20,000, annually, be asked for as a very modest sum when we consider the needs of our Station.

Then comes the proper enforcement of the pure food laws, for the enactment of which you spent years of thought and labor for the protection of the great dairy interest of the State, as well as furnishing pure food to those who buy products of the farm. These laws you understand will be a dead letter, unless they are enforced, and this enforcement backed by public sentiment and the power of the state administration. We may well at this time congratulate ourselves and the farmers of the State for the vigorous and fearless manner in which they are now being enforced by the Department of Agriculture through the present Dairy and Food Commissioner, and we pledge to them our earnest support as they discharge their various and unpleasant duties in the enforcement of law. But all must not be left for them, for under the sting which guilt brings to those who are violators of the law and who must suffer the penalty, there will arise a mighty opposition that will demand the repeal of such laws as are obnoxious to them and detrimental to their business. Already we are told that a strong effort will be made at the next session of the legislature to have some of these laws repealed, especially the oleomargarine law which has driven many dishonest dealers out of business. So we say, beware of the coming storm, for to be forewarned, is to be forearmed.

We also congratulate you and all the people who are interested on the results secured after years of earnest work in advocating and agitating the question of public road improvement, that at last, through our Legislative and Executive Departments we have been given a road law which we trust will be taken advantage of by every progressive township in the State, thus testing its practical workings. While the law as it now stands, may not seem to be all that is desired, it is a long stride in the right direction, and is worthy of our best efforts to give it a fair and practical trial, and when we have
learned by experience more of what is needed to improve upon it if we can.

We are also of the opinion, and recommend that the present fertilizer laws be so amended as to compel fertilizer manufacturers to print upon their sacks, in addition to the analysis, the sources from which the nitrogen, phosphoric acid and potash are derived.

We also continue our request that an appropriation of $3,000 be asked for, or so much thereof as may be required, to meet the actual and necessary expenses of the Board of Agriculture incurred in attending their annual meeting.

On account of the great destruction of the fruit trees of this State by the San José Scale, this Committee recommends an appropriation of twenty-five hundred dollars ($2,500), annually, to the Experiment Station for the use of experimenting with this pest, and ten thousand dollars ($10,000), annually, to the Division of Economic Zoology for use in the suppression of the scale and other injurious insects.

We heartily indorse the proposition made by Secretary Martin to establish a normal training school, as it were, for the further enlightenment of the instructors of the Farmers' Institutes of Pennsylvania; and as the benefits to be derived by this move are to revert directly to the agriculturists of the Commonwealth, that we recommend that the Legislature increase the appropriation already in effect for the support of the Farmers' Institutes sufficiently to cover the added expense of such teaching.

In conclusion, we most heartily endorse the work of the Department of Agriculture as performed by its separate Divisions, including the Dairy and Food Division, the Veterinary Division, the Division of Farmers' Institutes, and especially the important work being done by the Division of Economic Zoology.

All of which is most respectfully submitted.

The PRESIDENT: You have heard the report. What action shall be taken on it?

MR. SCHWARZ: I move that it be received and filed.

The motion being seconded, it was agreed to.

MR. CLARK: There has been a call issued for a meeting of the allied organizations at the close of this session and, as I understand, the member who represents this organization has not been re-elected or appointed since our last meeting. It seems to have been omitted and it is necessary to appoint or elect a member of this Board to represent us at that meeting.

MR. HUTCHISON: I move that we proceed to elect a representa-
The motion being seconded, it was agreed to.

The PRESIDENT: Nominations are in order.

A Member: I nominate M. N. Clark.

MR. CLARK: I represent the Grange on that committee and therefore decline. I move that this Board elect Jason Sexton.

The motion being seconded, it was agreed to.

DR. ARMSBY: The meeting of the Executive Committee of the allied organizations will be held in the ante-room, on the right as you go out, immediately on the adjournment of this session.

MR. HERR: I think it is customary to have three members of that committee elected and we have only elected one.

MR. HUTCHISON: It is only necessary to have one elected to represent this Board on the Executive Committee.

The PRESIDENT, (Governor Pennypacker) endeavored to state a motion to adjourn, and numerous calls being made for him to address the meeting, he responded as follows:

ADDRESS OF GOVERNOR PENNYPACKER.

Gentlemen: It is a very great pleasure to me to be here with you at your annual meeting, to see that you have so large an attendance and to learn of the very successful work which you are accomplishing. That work is of the utmost importance. One set of people, who belong to the same Aryan race from which we are descended, made it part of their religion and thought, and taught their people, that the only honorable avocation for mankind was the cultivation of the soil and the raising of cattle. Zoroaster said, "he who sows corn sows holiness." I don't go quite so far as those people, and yet, to a great extent, in my judgment, we ought to agree with that.

As we look around the world and see the great rewards which society, as it is constituted, gives to him who merely succeeds in accomplishing such results as heap up great fortunes, we sometimes stop, properly, to inquire after all what is the value of it, what benefit has he conferred upon humanity? The result of it is that no matter how complicated the process is, the results of the labors of the masses of men are accumulated in the possession of one or a few individuals and that is all there is in it. It is not the creation of benefit or wealth, it is the mere accumulation, and I think that the man who can look over his life and can say that he has made two blades of grass grow where one grew before, who can say that he
has made the brute to produce its kind, corn to be heaped up in the granaries of the world, has done the past a far greater and more beneficial result to humanity. (Applause).

To be more personal, it seems to me, if you gentlemen, who are connected with the agricultural interests of this State, will look at the way our work is now being done and the results which are now being accomplished, you will have reason for very great satisfaction. In the Message which I sent to the Legislature of Pennsylvania, upon coming here to assume the duties of Governor of the Commonwealth, I suggested going further than we had done in the State of Pennsylvania, where the greater part of our taxes are raised by imposing duties upon corporations, and to look at those tremendous natural deposits which we have, our coal, our oil, our iron, and to see the tremendous fortunes which have been accumulated out of those natural deposits, so that now the results of that accumulation are being scattered far and wide over the world, and for us to say that, in some way, the taxation should be imposed upon the output of those deposits to a still greater extent, while the ordinary property values in the counties which are made up of land values, should have the taxes now imposed removed. That suggestion bore no fruit, except in so far as it may have been lodged in the minds of men.

In the organization of the Department very much, it seems to me, has been done. I see from your report that you appreciate what has been done. As is properly said, no laws enforce themselves, and there is little benefit and little wisdom in the mere passage of laws. After all it comes down to the question of the enforcement of them, and I am led to believe, with respect to the pure food laws, there is no other Commonwealth in the United States where the same attention and the same energy is being given to it as in the State of Pennsylvania.

The Secretary of the Department of Agriculture is a plain farmer, one from among you. He is looking after the interests of his Department, and doing it well, and I am pleased to see from that same report that you appreciate the efforts he is making.

As to the Economic Zoologist—and how that strange term ever came about, for the life of me I cannot understand, he is really an Entomologist—he is giving his time and thought and care to the subject of the injurious insects that are destructive to the crops of the farmer and, especially, this San José Scale. You have him here among you and you see what he is doing. I may say, for myself, I never knew a man that was more earnest in the work he has undertaken than that same gentleman. You can find him there, if you will allow the expression, at night with the oil lamp or the gas burning, looking after the interests of you gentlemen in this direction.
and every month he puts out a bulletin of instruction. I say, therefore, it seems to me really, that you have very much upon which to congratulate yourselves and if there is anything further that can be done, if I can help you in any way, I want to know what that way is. (Applause).

On motion, adjourned at 5.15 P. M.

Wednesday Evening, January 27, 7.30.

The meeting was called to order at 7.30 P. M., with Mr. Jason Sexton in the Chair.

The CHAIRMAN: The first paper to take up this evening will be the report of the Botanist, Prof. Buckhout.

The SECRETARY: Prof. Buckhout sent his report to me to be read.

On motion, which was seconded, it was ordered that the paper of Prof. Buckhout be placed on file and printed for the benefit of the Board.

The report is as follows:

REPORT OF THE BOTANIST.

BY PROF. W. A. BUCKHOUT, Botanist.

But few and infrequent calls upon my services have been made during the past year. The inquiries have been chiefly regarding weeds and their eradication. The commonest weed received was Horse nettle (Solanum Carolinense). This came from several parts of the State, and attracts attention by its rank and persistent growth and spiny character. Hop clover (Trifolium agrarium), Field cress (Lepidium campestre), Sheep sorrel (Rumex acetosella) and Galinsoga parryi flora came in a few times. The wet season favored the unusual abundance and spread of some species which do not flourish sufficiently well to attract attention in ordinary seasons. The last mentioned, Galinsoga, seems to be slowly spreading all over the State in moist grounds. Only a few years ago it was practically confined to the extreme eastern part, where it was probably introduced from South America through shipping. The wet season also
brought out some inquiries regarding Chickweed, Speedwell and other delicate weeds which in wet and cool weather grow freely in lawns, crowding out the grass and producing unsightly patches of different color and texture from the main body.

The idea that there may be some quick and effective method of killing weeds and not injuring the useful plants with which they grow is still uppermost in many minds. There is little, if anything, to support this notion. Practically, we seem shut up to clean cultivation, when cultivated land is concerned, and to crowding out by vigorously growing grass and clover, when sod land is in question. True, this process requires time as well as labor and patience, but it does the work effectively and besides, leaves the ground in a fertile condition. Thorough and clean cultivation needs no commendation; it not only keeps down weeds, to some extent at least, but gives a larger crop of the plant under cultivation. Then, when seeding down, give the best preparation of the ground and as much fertilizer as possible, together with liberal seeding of seed known to be good. Grass and clover thus put in will grow rapidly and so rank that weeds get a poor chance and, generally, are choked out early in the race.

Farmers make a great mistake in letting such weeds as wild carrots overrun and take complete possession of a field, seeding freely and thus continuing the weediness indefinitely, year after year. If it it not possible to plow down wild carrot before it has run to seed it should be cut several times, so as to prevent any seeding. This followed by cultivation and periodical cleaning up of fence rows and out-of-the-way places will minimize the injury, if not entirely remove it.

Weeds in lawns present a much more difficult problem and one hardly possible to answer except for individual cases and where all the surrounding conditions are well known. Where lawns are shaded by buildings or trees it is scarcely possible to keep grass in good condition very long. Lawns which have been graded are often very unequal in soil quality, hollows which have been filled up to grade are generally in excellent condition for growing grass and holding fertility, while hillocks which have had the surface pared off to be brought down to grade are just the reverse, thin and poor, quickly drying out in hot weather, thus almost impossible of carrying good sod until they have been improved by liberal fertilizing and working. A careful study of the situation in each case is the first thing necessary. Palliative, if not full remedial treatment, will thereby be suggested. Few things about a home give more satisfaction than rich, green grass; hence preparation for the lawn deserves more careful consideration than is generally given it. It is the kind of work that pays in the long run.
Several letters were written in response to inquiries concerning improvement of forest land. This is a gratifying and hopeful sign. There is no good reason why a farmer's woodland should not be more productive. As a general rule such lands are left entirely to themselves and as a consequence, returns are haphazard and meagre. Several things should be done and done systematically. All old, misshapen or diseased trees should be cut out and utilized for firewood or other purposes. This will open the way to seeding and growth of new trees and of the more desirable kinds, such as white pine, white oak, etc. Similar trees which stand too close together, or the sprouts upon cut-over land, should be judiciously thinned out, affording a supply of fuel and providing for a stand of timber of better quality and size. The increasing scarcity of wood for various purposes and the higher price and the uncertainty of obtaining coal for fuel when it is desired should waken us up to the better conservation and utilization of our wood supplies. With our improved methods of producing power and of handling bulky materials it is feasible in many cases for the farmer to use wood fuel profitably. The proper care and handling of woodland has thus become a matter of renewed interest to all land owners.

Plant diseases naturally come in for some attention. Unfortunately, inquiries of this nature come with such meagre explanation and so late, commonly after the danger is done, that but little can be accomplished, except to diagnose the case, and thus put one on guard should there be a reappearance. Nowhere is the old proverb "a stitch in time saves nine," more appropriate than in the treatment of the diseases of plants due to insects or fungi. Their action is, in most cases, so rapid that their progress once established cannot be stayed; they must run their course. But their spread may be prevented or delayed, and something can be done, if taken in time, toward cultivating a resistant condition; for it is the weaklings which are first attacked and succumb the soonest. Intensive cultivation by gardeners and florists is having its difficulties, in that fungus diseases are often propagated and carried along year after year unless pains are taken to renew the soil or thoroughly sterilize it. Quite a number of cases of this sort have come to light.

Some fungi are spreading because they can grow on native plants, as, for instance, the hollyhock rust, a recent introduction into this country, was last year noticed for the first time upon the common round-leaved mallow; it is thus fully at home and even were it eradicated from the hollyhock, it will not continue upon the various plants of that family. It may probably get a foothold upon the cotton plant; in which case it could do immense damage. The asparagus rust is another case of a fungus which was unknown in this State until a few years ago. Although it is apparently now well
scattered over the State it has so slight a foothold that the effort to dispossess it is worth making. This can best be done by destroying all affected plants, or at least burning the "brush" or dead tops in the fall of the year.

Spraying for plant diseases, as well as to destroy predaceous insects, has been of great benefit in numerous cases, but it should not be forgotten that its greatest benefit comes when it is done so early as to anticipate the attack. Coincident with this should be an eye quick to observe what individuals or what kinds are weak-growing, and hence easy subjects for disease, and what are strong and resistant. Unfortunately the latter, desirable as they may be, because of their ability to resist disease or their immunity from insect attack, are sometimes not producers of the best quality or quantity of useful product, while the former may be particularly valuable for this reason. Such a contingency raises the most difficult question which the gardener and fruit grower have to meet, and must be decided according to the peculiar conditions appertaining to the case. The Kieffer pear is a vigorous growing, productive variety and but little subject to disease; the Bartlett less vigorous and productive, and more subject to disease. Under these circumstances whether to grow Kieffer pears or Bartletts is a puzzling question.

Other inquiries were of miscellaneous character and of less general interest. To all of them it is my purpose to reply so fully and definitely as I am able to do, and my services and the facilities of my department are always available to reasonable requests.

The CHAIRMAN: The report of Dr. Frear, Chemist of the Board.

The SECRETARY: There has been no report handed to me.

(The Secretary subsequently wrote Dr. Frear asking him to send his report to be printed with the proceedings of the meeting.)

The following is Dr. Frear’s report:

REPORT OF THE CHEMIST.

By Dr. William Frear, Chemist.

Among the cattle foods recently introduced in large volume upon the market have been dried brewers' and distillers' grains. Numerous inquiries have been received respecting the composition and feeding value of these preparations. During the past twelve years,
the Association of German Agricultural Experiment Stations has been making special studies of cattle foods and has assigned to various members the duty of preparing quite complete monographs, describing the composition, manufacture and feeding properties of the several important feeds. While these monographs are based chiefly upon the foods found in the European market, so that they do not precisely represent the corresponding American products, the general nature of the materials on both Continents is so similar that I have felt that it might be of interest to present an abstract of the monographs on the subject of brewers' and distillers' grains prepared by Professor Dietrich, of Marburg.

Brewers' grains are derived directly from malt and, more remotely, from barley, so that the latter grain may be regarded as the original raw material of brewers' grains.

Barley, as offered on the market, is composed essentially of three parts: (a) The hull, fruit and seed coats; (b) the embryo; and (c) the endosperm or starchy part. The hull of the barley, which is of especial importance because of its abundance in brewers' grains, is composed of a material like straw, very rich in silica. Omitting the author's description of the anatomy of the grain and the qualities it should possess for brewing purposes, we pass to its composition. Maercker found that in the European barleys the hulls amounted to five per cent. in the thin hull varieties; seven and one-half per cent. in those of middle thickness; and over ten per cent. in the thick hulled kinds. Richardson, examining thirteen American barleys, found the percentage of hull to range from 12.5 to 16.9 per cent.; average, 15.2 per cent. The average composition of barleys of different grades and of European origin is stated by Maercker as follows:

<table>
<thead>
<tr>
<th>Grade of Barley</th>
<th>Protein</th>
<th>Nitrogen-free extract</th>
<th>Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finest, well filled, mealy barley</td>
<td>8</td>
<td>63</td>
<td>3.5</td>
</tr>
<tr>
<td>Good, medium barley</td>
<td>9-10</td>
<td>60-61</td>
<td>4.5</td>
</tr>
<tr>
<td>Small-grained, poor barley</td>
<td>12-14</td>
<td>57</td>
<td>6.5</td>
</tr>
</tbody>
</table>

This statement does not include mention of the fat and ash which amount, on the average, to 2.3 and 2.7 per cent. respectively. The glassy barleys, which are of lower brewing value than the mealy varieties, contain somewhat more protein.

Respecting the nitrogenous substances of barley grains, 97.5 per
cent. of the total nitrogen is present in the form of albuminoids and 2.5 per cent. on the average, in the form of soluble crystallizable substances of lower feeding value, which are grouped under the name "amides." The proportion of amides sometimes attains 5 per cent.

 Osborne distinguished the following albuminoids in barley grain: (1) Leukosin, which is soluble in water and is identical with the albumin in rye and wheat; (2) proteose; (3) edestin, a globulin insoluble in water but readily soluble in solutions of common salt; (4) hordein, insoluble in water and salt solutions, but readily soluble in 75 per cent. alcohol; this material resembles the gliadin of wheat and rye, but has a different chemical composition; (5) a proteid, insoluble in any of the solvents above mentioned. Osborne estimates that the barley investigated contains 10.75 per cent. of albuminoids distributed as follows: Albumin (leukosin), 3 per cent.; hordein, 4 per cent.; edestin and proteose, 195 per cent.; insoluble proteid, 4.5 per cent.

The fat removed from barley by the solvent action of ether is a dark golden yellow oil having a specific gravity of .928 and a melting point of 13 degrees Centigrade. Various analyses show it to be composed of from 8.4 to 13.6 per cent. of free fatty acids; 77.8 to 83.8 per cent. of neutral fats; 3 to 4.25 per cent. of lecithin, a fatty body containing phosphorus and which occurs abundantly in the animal body associated with brain and nerve tissue; and finally from 4.7 to 6.1 per cent. of cholesterol, a vegetable compound, very similar to the cholesterol found abundantly in animal bile. Not all of the lecithin of the barley is dissolved with the fat by the action of ether. Schulze has found that the quantity removed by ether corresponds to about 0.07 per cent. of the dry weight of the barley, while by the further action of alcohol from .2 to .4 per cent. more can be removed.

The nitrogen-free extract amounts to about 67 per cent. of the barley. Of this extract, 95 per cent. is starch, 1 to 3 per cent. sugars of various sorts (cane sugar, dextrose, levulose, maltose), and about as much gum and dextrin. Lintner has named the water-soluble barley gum galactoxygen; when inverted by the action of acids or ferments, it is changed into galactose and xylose. The so-called pentosans, xylan and araban are also included in the nitrogen-free extract, and arabinose, derivative of araban, has been obtained by Tollens from barley and brewers' grains.

---

*Wallenstein obtained for barley fat the following data:

- Acid number: 16.52
- Saponification number: 132.1
- Ether number: 105.83
- Reichert-Meissel number: 401
- Glycerine: 9.58

*Stellwag obtained: Saponification number: 181.7; total fatty acids: 86.68 per cent.; molecular weight of the fatty acid: 2.46.

*Dietrich obtained: Specific gravity, temperature not stated, c.345: refractive index at 40° C., 65°; iodin number, 106 to 107; free fatty acids, 9.92.
The principal constituents of barley ash are: Potash, 20.92 per cent.; phosphoric acid, 35.10 per cent.; and silica, 25.91 per cent.

[American barleys are, on the average, richer in protein than the European varieties and contain somewhat less fat and fiber. E.]

Malt is prepared from barley by the processes of softening, germinating and kiln-drying. In softening, the grain is stirred in contact with water until it takes up, of this liquid, about 48 per cent. of its weight; the water in turn dissolves from it about 1 to \( \frac{1}{3} \) per cent. of the original substance, the dissolved matter consisting chiefly of phosphoric acid, potash and certain organic materials. According to Heinzelmann, one-fifth of the phosphoric acid of the grain is thus lost.

The softened and swollen grain is then removed to a room well- aired and kept at a temperature of 59 to 63.5 degrees Fahrenheit, and is frequently stirred. The germination is sufficiently advanced when the plumule or grass blade is nearly as long as the grain, the radicle being about one-half longer. Very marked chemical changes occur during the germination, which affect practically every group of constituents. The protein and nitrogen-free extract are especially changed. Behrend and Sturcke found that a barley which, in its original condition, had 13.1 per cent. of its nitrogen in a water-soluble condition, including 5 per cent. of non-albuminoids or amides, had, when it was malted or fully germinated, 35.2 per cent. of its nitrogen present in water-soluble state including 2.07 per cent. of non-albuminoids or amides. Osborne and Campbell have found that, in the malting process, the hordein is replaced by an alcohol-soluble proteid of entirely different composition. The barley globulin edestin is replaced by a new globulin to which the name bynedestin has been assigned. The albumin is changed only by an increase in its quantity, and a new proteid, bynin, insoluble in water and salt solutions but soluble in dilute alcohol, appears. Osborne calculates that the malt contains about 7.84 per cent. of true proteids distributed as follows: Leukosin, bynedestin and proteoses, both those in coagulable and incoagulable forms, 2.79 per cent.; bynin, 1.25 per cent.; insoluble proteid, 3.80 per cent.

Among the nitrogenous substances are several ferments: According to Liitner, barley grain contains diastatic ferment possessing a larger power of converting starch into sugar; it is, however, unable by itself to attack the starch in the endosperm. The more diastase by whose agency the starch is chiefly dissolved in the mashing process, appears first when the grain is germinated. There is also present a ferment which attacks the cellulose of the endosperm cells.

The nitrogen-free extract is changed during fermentation chiefly as the result of the conversion of starch into various sugars by
the diastase. The respiration of germinated seed is very active. According to Schutt, during nine days of germination, one hundred pounds of dry substance loses 6.7 pounds of starch by respiration and gives off 10.9 pounds of carbolic acid. Brown and Morris show that, as a result of germination, a large amount of cane sugar forms in the embryo and that the softened endosperm, while it exhibits an increased quantity of this sugar, is characterized by the presence of considerable maltose, a closely related sugar which does not occur in the embryo. It appears, therefore, that the maltose is confined to the place in which it was formed and is not transported as such into the young plant. The crude fiber is increased in quantity.

A number of plant acids, formed, some by direct oxidation processes, such as succinic, oxalic, malic and citric acids, and others as the result of bacteriological action, which unavoidably accompanies the malting process; the latter products include acetic, propionic and lactic acids.

The fat contained is reduced to 20-30 per cent. of the original amount.

Kiln-drying is conducted at different temperatures according to the kind of malt which it is desired shall be produced, whether the lighter malts used for pale beers or the roasted malt used for dark beers. The temperature of the malt in the former case goes no higher than 90 degrees (192 degrees F.) in the latter case, it may reach 120 degrees (248 degrees F.). The malt is stirred during drying for the purpose of removing the malt sprout. The heat causes changes in the soluble carbohydrates, sugars, etc., by which the peculiar malt aroma is developed and the quantity of invert sugar increased. The investigations of Shulte im Hoffe show that, as a result of the kiln-drying at low temperatures, the amount of extract (water-soluble material) is not changed; at higher temperatures it is reduced in considerable degree, the amount of soluble albuminoids decreases, and that of amides is diminished at the higher temperatures. Peptone, the typical product resulting from the action of the gastric or stomach juice upon protein, is also a constituent of finished malt and even occurs in very small quantity in the raw barley. Hilger and Van der Beeke found that in kiln-dried malt, nitrogen was present in water-soluble compounds as follows: Albumin, .1194; peptone, .0233; ammonium salts, .0057; amido acids, .2257; amides, .0029 per cent. According to Thansing, 100 lbs. of air dried barley will yield, on the average, 78 lbs. of kiln-dried, germ-free malt. Maercker gives the following average composition for the raw barley and the finished malt, together with a statement of the amount of the original constituents which appear in the final product:
Brewing. In brewing, a "wort" or water solution of the malt is prepared. For this purpose the malt is "mashed" or mixed with a certain quantity of water and kept at 167 degrees F. for five or six hours. By this process not only are the water-soluble materials present in the malt, taken into solution, but the diastatic ferment acts further upon the starch, converting it into sugars and dextrin. The wort is then separated from the undissolved materials, which remain as the spent malt or brewers' grains. Before the removal of the wort, the grains are allowed to settle out; the albumin that is coagulated in the mashing separates in part with the grains and in part with the remaining starch as a smearable mass overlying the grains. One-third of the kiln-dried malt remains in the grains, so that 100 parts of barley yield 26 parts of dried, or 110 parts of wet brewers' grains.

Wheat is sometimes malted and used for making "weiss beer." Since it has no hull, the residual grains are more valuable than those of barley.

Corn and rice, in a ground condition and freed from their embryos, are used in American breweries, and the latter in those of North Germany and Norway for the preparation of an export beer low in albuminoids. The starches of these grains are less vigorously attacked by diastase than barley malt starch; hence the grains from these mixtures with raw cereals, are richer in starch.

The "grains" contain of the malt constituents, all the hulls, the undissolved starch and other bodies of slight solubility, nearly all the fat and of the proteids, both the insoluble portion and that fraction of the soluble proteids that is coagulated in the mashing process and separates with the grains.

According to E. Pott the grains contain 65 per cent. of the nitrogenous materials of the malt and 20 per cent. of the nitrogenous free extract; Behrend states that there remain in the grains, of the original materials of the malt:
Dry matter, about one-third.
Crude protein, about three-fourths.
Crude fat, about four-fifths.
Nitrogen-free extract, about one-fifth.
Total ash, about two-thirds.
Phosphoric acid, about three-fifths.
Potash, about one-eleventh—one-twelfth.

Lintner gives slightly different proportions for the ash constituents retained, viz: Phosphoric acid, two-thirds; potash, one-sixth; all the lime and most of the magnesia.

The average composition of the fresh grains as given by Dietrich and König and the coefficients of digestibility determined for oxen by G. Kuhn, are:

<table>
<thead>
<tr>
<th>Composition, per cent</th>
<th>Coefficients of digestibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>76.2</td>
</tr>
<tr>
<td>Dry matter</td>
<td>23.8</td>
</tr>
<tr>
<td>Ash</td>
<td>1.3</td>
</tr>
<tr>
<td>Organic matter</td>
<td>22.6</td>
</tr>
<tr>
<td>Crude protein</td>
<td>5.1</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>5.2</td>
</tr>
<tr>
<td>Nitrogen-free extract</td>
<td>10.6</td>
</tr>
<tr>
<td>Crude fat</td>
<td>1.7</td>
</tr>
</tbody>
</table>

**Drying the Grains:** The moist grains sour quickly and become undesirable for feeding purposes. They may be packed in silos, but the product obtained is not satisfactory and the process of ensilage is accompanied by a large loss of valuable material. Attention was early turned to the preservation of the grains, without loss of nutrients, by drying. At first, the plan of drying partially, mixing with a dry feed such as bran and then baking or drying the mixture was tried. The result was only partially satisfactory. Sometimes the wet grains were mixed with kiln-dried malt.

The present methods were first employed early in the eighties. In the methods used the aim is to dry the grains without loss of nutrients, without affecting their digestibility and at the least cost.

At first the grains were submitted to a preliminary pressing, and this procedure is still practiced by some. This pressing removes, however, not only the water and the substances dissolved in it, but also some of the most valuable nutrients that are present in suspension, the greater loss being in this suspended matter. In
general, the pressing removes about 30 per cent. of the weight of the moist grains; the loss by the use of a new press amounts to about 6 per cent. of the dry substance, and, as the press becomes worn by use, the loss rises to about 10 per cent.

The detailed description of the various forms of apparatus used for drying will be omitted. At first, the drying was effected by direct contact with furnace gases followed by indirect exposure to high pressure steam. At present, escape steam or low pressure steam is used, producing a drying temperature not higher than about 130 degrees F., mechanical stirrers being employed to assist in the drying.

By this process, about one part of dried grains is produced for three parts of malt; if a similar productive value be assumed for malt substitutes (raw cereals), the breweries of Germany could produce, with proper drying apparatus, about 400,000 long tons of dried grains. The production is confined, however, in many localities to the summer months when pasturage and soiling crops are abundant, the moist grains being consumed as fast as they are produced in other seasons. The present production is, therefore, only about 50,000 to 75,000 long tons annually; besides which, 25,000 tons are imported, chiefly from the United States.

The American grains are not pure malt grains, because of the general use of corn grits in preparing the wort. English and Scotch grains are of darker color, owing to the direct use of flue gases in the drying. In general, the sum of protein and fat in the grains of different origin are: Germany and Holland, 27-29 per cent.; Scotland, 25-27 per cent.; American, 28-32 per cent.

The Quality and Composition of the Grains: Since different malts and malt-substitutes are employed for making different beers, there are corresponding differences in the yield and quality of the dried grains. Thus Behrend found that 100 parts of malt used in making pale (Pilsener) beer, produced 29.9 parts of dried grains, while that for the dark (Bavarian) beer left 32 parts of grains. Schulte im Hoffe observes that as a consequence of a thorough extraction in preparing the wort, the residual dried grains may contain 6.5 per cent. less nitrogen-free extract and 2.6 per cent. more protein, than where the extraction is imperfect.

Analyses by the German Experiment Stations show the following averages for grains of different kinds:
ANNUAL REPORT OF THE

<table>
<thead>
<tr>
<th>Number of samples.</th>
<th>Protein.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water</td>
<td>Ash</td>
</tr>
<tr>
<td>Barley malt:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) With preliminary pressing,</td>
<td>3</td>
<td>4.9</td>
</tr>
<tr>
<td>(b) Without preliminary pressing,</td>
<td>13</td>
<td>6.7</td>
</tr>
<tr>
<td>(c) Laid by ill-gases,</td>
<td>1</td>
<td>8.9</td>
</tr>
<tr>
<td>Wheat malt,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley malt, 20 parts,</td>
<td>1</td>
<td>5.0</td>
</tr>
<tr>
<td>Barley malt, 2 parts,</td>
<td>1</td>
<td>5.0</td>
</tr>
<tr>
<td>Barley malt, in quantity,</td>
<td>7</td>
<td>9.2</td>
</tr>
</tbody>
</table>

These analyses indicate the superiority of grains derived in part from cereals devoid of hull.

As the result of analysis of nearly 1,000 samples, the average composition of the dried brewers' grains on the German market is:

<table>
<thead>
<tr>
<th></th>
<th>Per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>10</td>
</tr>
<tr>
<td>Ash</td>
<td>4</td>
</tr>
<tr>
<td>Protein</td>
<td>22</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>15</td>
</tr>
<tr>
<td>Nitrogen-free extract</td>
<td>42</td>
</tr>
<tr>
<td>Fat</td>
<td>7</td>
</tr>
</tbody>
</table>

Respecting the condition of the protein in the various grains, the results of 23 detailed analyses are summarized as follows, in terms of total nitrogen (100 per cent.):

<table>
<thead>
<tr>
<th></th>
<th>Range per cent.</th>
<th>Average per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuminoid nitrogen,</td>
<td>80-96.6</td>
<td>95.7</td>
</tr>
<tr>
<td>Non-albinoid or amid nitrogen,</td>
<td>9.8-11.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Digestible nitrogen,</td>
<td>63.7-81.3</td>
<td>74.3</td>
</tr>
<tr>
<td>Indigestible nitrogen,</td>
<td>15.8-21.4</td>
<td>21.4</td>
</tr>
</tbody>
</table>

The digestibility of the protein is greatly affected by the temperature at which the drying is conducted, as the following results obtained by B. Schulze show:
Grains dried at a low temperature in vacuum, 79.6—84.1
Grains dried in ordinary kilns, ....................... 67.8—73.6
Grains dried by flue gases, .......................... 58.3—59.0

The fat of dried brewers' grains has been little studied. Dietrich found in mixed grains from various sources a brown fat,* showing the following characters:

<table>
<thead>
<tr>
<th>Character</th>
<th>Per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free fatty acids reckoned as oleic acid</td>
<td>32.7</td>
</tr>
<tr>
<td>Neutral fat</td>
<td>56.2</td>
</tr>
<tr>
<td>Lecithin</td>
<td>6.3</td>
</tr>
<tr>
<td>Unsaponifiable matter (cholesterin)</td>
<td>4.8</td>
</tr>
</tbody>
</table>

The total lecithin content of the grains was 1.48 per cent. of the dry matter. The free fatty acids, calculated as oleic acid, on the basis of 72 analyses, range from 12.7 to 57.4 per cent. of the total fat, and average 33.1 per cent. That is, as a comparison with the composition of the fat of the original barley quickly shows, the proportion of neutral fats is greatly reduced and that of free fatty acids correspondingly increased, in the course of the malting, mashing and drying of the grains.

The *nitrogen free extract* comprises nearly one-half of the dried grains. It is made up chiefly of more or less modified starch that has failed of complete inversion, gums and dextrins. There is very little unmodified starch remaining.

The grains contain, partly in the nitrogen-free extract, partly in the crude fiber, from 22 to 30 per cent. of pentosans. Tollens and Glaubitz found that of the constituents in the malt, three-fourths reappear in the dried brewers' grains; they further found that, in a sample yielding 26.48 per cent., 22.76 per cent. was readily attacked by dilute acid and 1.20 per cent. by dilute alkali, leaving only 2.52 per cent. in the crude fiber; so that over 90 per cent. of the entire amount appears in the nitrogen-free extract. When acted upon by acid, the chief product is xylose—the characteristic pentose sugar yielded by bran, corn cobs, etc.—though some arabinose is also obtained.

The *ash* of the brewers' grains usually contains from 0.5 to 0.75 per cent., rarely 1.0 per cent. of sand or other foreign mineral matter. On the average, one ton of the grains contains of the more important mineral matters:

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Pounds.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potash</td>
<td>2.6</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>29.6</td>
</tr>
<tr>
<td>Lime</td>
<td>96</td>
</tr>
</tbody>
</table>

*The fat had an iodin number of 93.6; saponification number, 195; refractive degree at 40 degrees C. 65.
[Since a ton contains also 70.4 pounds of nitrogen, the fertilizer value of this quantity of the grains, at the prices now ruling, would be $13.43. F.]

Feeding qualities: The grains should be free from scorched or burned particles, possess a strawy odor and, when stirred with luke-warm water, emit no sour or mouldy smell. When moistened with recently boiled and cooled water, they should show no tendency to the development of molds or bacteria and should not change in odor.

The digestibility of the constituents of the grains, as determined in (a) five experiments with sheep and (b) one experiment with steers, expressed in percentages digested of the total amounts of the respective constituents, is:

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Sheep</th>
<th>Steers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total organic matter</td>
<td>65.7</td>
<td>69.1</td>
</tr>
<tr>
<td>Protein</td>
<td>72.7</td>
<td>73.5</td>
</tr>
<tr>
<td>Fat</td>
<td>57.3</td>
<td>59.7</td>
</tr>
<tr>
<td>Nitrogen-free extract</td>
<td>61.6</td>
<td>56.0</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>56.1</td>
<td>38.3</td>
</tr>
</tbody>
</table>

Dried brewers' grains are extensively used for all feeding purposes and form, when properly prepared, a healthful and nutritional food, which keeps well under all conditions.

DRIED DISTILLERS' GRAIN.

Distillers' grains are very similar in their appearance and methods of production to brewers' grains. The distillers' grains are obtained in the manufacture of yeast by the aeration process and today the yeast is often applied to the wort instead of being put in the mash, as formerly.

The principal raw materials are green malt (less frequently, kilndried malt), rye, or maize, more rarely wheat and buckwheat and occasionally malt sprouts.

In the mashing, the shredded grain mixture is macerated for a shorter (23 hours) or a longer time (12-14 hours), with slightly acid water. The temperature is then raised to the usual degree by the addition of hot water. Any maize used is previously cooked. After the starch is converted to sugars, the wort is either run off from the grains or separated therefrom by means of filter-presses. The grains, after repeated extraction with pure water, are then dried in the same manner as the brewers' grains.

Owing to their similarity to brewers' grains, distillers' grains have only recently been sold under a distinctive name,
The new process of yeast manufacture has been generally adopted throughout Germany and Austria and is also used in England and America.

The only analysis heretofore published of distillers' grains was by E. Wolff in 1900. A number of samples have since been examined at Marburg.

It should be remembered that malt sprouts are always present, whether introduced separately or not, since they are part of the green malt used in the mash.

The results of the examinations at Marburg are as follows:

<table>
<thead>
<tr>
<th>Sample number</th>
<th>Grain (Crude Malt)</th>
<th>Composition (Per Cent.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Water</td>
</tr>
<tr>
<td>1</td>
<td>Maize</td>
<td>35</td>
</tr>
<tr>
<td>2</td>
<td>Few grains</td>
<td>21-26</td>
</tr>
<tr>
<td>3</td>
<td>Maize, little wheat</td>
<td>40-45</td>
</tr>
<tr>
<td>4</td>
<td>Maize</td>
<td>26-30</td>
</tr>
<tr>
<td>5</td>
<td>(2)</td>
<td>22-26</td>
</tr>
<tr>
<td>6</td>
<td>Rye, sprouts</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>Rye, sprouts</td>
<td>24</td>
</tr>
<tr>
<td>8</td>
<td>Rye, sprouts</td>
<td>21-25</td>
</tr>
<tr>
<td>9</td>
<td>Maize, sprouts</td>
<td>28-32</td>
</tr>
<tr>
<td>10</td>
<td>Rye, sprouts</td>
<td>25-30</td>
</tr>
<tr>
<td>11</td>
<td>Malt 5, rye 20, sprouts 2</td>
<td>28</td>
</tr>
<tr>
<td>12</td>
<td>Malt 50, maize 25, rye 18, sprouts 6</td>
<td>48</td>
</tr>
<tr>
<td>13</td>
<td>A little rye</td>
<td>63</td>
</tr>
<tr>
<td>14</td>
<td>Maize, rye</td>
<td>59</td>
</tr>
<tr>
<td>15</td>
<td>Maize, sprouts</td>
<td>23</td>
</tr>
<tr>
<td>16</td>
<td>Rye, maize</td>
<td>47</td>
</tr>
<tr>
<td>17</td>
<td>Rye, maize, sprouts</td>
<td>48</td>
</tr>
<tr>
<td>18</td>
<td>Malt 50, maize 20, rye 20</td>
<td>51</td>
</tr>
</tbody>
</table>

Owing to the differences and kind of raw materials used, it is impracticable to state an average composition for these products.

The proteins are, on the average, 95 per cent. true albuminoids. In nature, these albuminoids doubtless closely resemble those of the raw materials, though no especial study has been made of them. Their digestibility varies, as in brewers' grains, with the degree of heat used in drying them. The percentage of protein digestible varies from 75 to 84, average 80.

There is a wider variation in the fat, owing to the raw materials used. In general, the amount is greater, the more maize there is used.

The proportion of free fatty acids ranges from 24.5 to 52.1 per cent. of the total fat. When malt is the principal raw material, the fat resembles that of brewers' grains, but when maize is used in considerable quantity, the maize fat materially alters the character of the fat of the distillers' grains.
Respecting the nitrogen-free extract and crude fiber, little can be said. Sample No. 11 contained 21.8 per cent. of pentosans.

Dried distillers' grains are used for the same purposes as the brewers' grains, but are usually of higher value.

Very little searching chemical investigation has been given to these materials as they appear on the American market.

In 1901 was published an analysis made by Dr. C. A. Browne and Mr. C. P. Beistle in the Experiment Station laboratory of dried distillers' grains. I present a brief recalculation of their results. The material was received in a moist, very slightly fermented state from the H. J. Heinz Pickle Co., Pittsburg, and was quickly dried at a temperature of 160 degrees to 180 degrees F.

<table>
<thead>
<tr>
<th>Per cent.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture,</td>
<td>3.83</td>
</tr>
<tr>
<td>Ash,</td>
<td>1.84</td>
</tr>
<tr>
<td>Protein,</td>
<td>23.44</td>
</tr>
</tbody>
</table>

**Nitrogen-free extract:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar,</td>
<td>0.00</td>
</tr>
<tr>
<td>Dextrin,</td>
<td>2.13</td>
</tr>
<tr>
<td>Starch,</td>
<td>2.66</td>
</tr>
<tr>
<td>Lignic acids,</td>
<td>10.81</td>
</tr>
<tr>
<td>Pentosans dissolved by acid,</td>
<td>17.66</td>
</tr>
<tr>
<td>Undetermined (resins, pentosans, etc.),</td>
<td>11.12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>44.38</th>
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</thead>
<tbody>
<tr>
<td><strong>Crude fiber:</strong></td>
<td></td>
</tr>
<tr>
<td>Lignin,</td>
<td>1.14</td>
</tr>
<tr>
<td>Cellulose,</td>
<td>15.05</td>
</tr>
<tr>
<td>Pentosans,</td>
<td>0.87</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>17.06</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crude fat,</strong></td>
<td>10.25</td>
</tr>
</tbody>
</table>

|                        | 100.00 |

This statement shows a large proportion of undetermined substance, part of which is resin, etc., dissolved by alcohol, and part is pentosans. For an independent series of pentosan determinations show that 24.86 per cent. of these substances were present; of this amount, however, 3.88 per cent. disappeared in the treatments for the determination of dextrin and starch and are, in part, represented by the percentages given for these two constituents; 2.45 per cent. also are represented in the lignic acids.

Note.—The term "distillers' grains" is applied, in America, to other products besides that obtained in the manufacture of pressed yeast, and includes the dried grains from alcohol and whiskey distilleries and vinegar factories. Large quantities of these distillers' grains are now being sold in this country.
In general, this analysis corresponds closely to the German analyses earlier given. The conversion of the starches to sugars and the extraction of the latter appear to have been quite completely effected.

Here, as in the brewers' grains, most of the nitrogen-free extract is composed of materials of distinctly inferior nutritive value as compared with sugar and starch.

Recently, analyses have been made in the Station laboratory of various samples of dried distillers' grains, the results of which are here presented.

<table>
<thead>
<tr>
<th></th>
<th>Blues XXXX grains</th>
<th>Other, Partial Analyses (4)</th>
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<tbody>
<tr>
<td></td>
<td>Range, per cent.</td>
<td>Average, per cent.</td>
</tr>
<tr>
<td>Moisture</td>
<td>6.86</td>
<td>7.06-10.82</td>
</tr>
<tr>
<td>Ash</td>
<td>1.85</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>33.00</td>
<td>31.12-34.81</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>19.97</td>
<td></td>
</tr>
<tr>
<td>Nitrogen-free extract</td>
<td>22.67</td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td>14.65</td>
<td>7.94-13.62</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td></td>
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These figures differ distinctly from those of European analyses. The Marburg samples showed from 14.4 to 27.7 per cent. of protein, from 10.8 to 18.0 per cent. of fiber, from 34.5 to 53.9 per cent. of nitrogen-free extract, from 5.1 to 16.1 per cent. of fat, and from 1.6 to 4.5 per cent. of ash, the moisture being the same as in the Pennsylvania samples. High protein, high fat, and low fiber and nitrogen-free extract characterize the American distillers' grains now offered upon the market. The digestibility of the several groups of constituents is probably not very different from that observed with respect to those of European grains.

These analyses show the materials to be especially rich in protein and fat. In these particulars they compare closely with the oilcakes, but are of less value as to the nitrogen-free extract.

These grains have given excellent results as food for dairy cows. It is sometimes complained that the peculiar odor is imparted to the milk; but the best evidence I have found upon that point, indicates that the odor passed directly from the grains to the milk rather than through the cow. Their composition also suggests that they may make an excellent food for both road and draught horses.
The CHAIRMAN: The report of Dr. Pearson, Veterinary Surgeon of the Board.

The SECRETARY: There has been no report handed to me.

The CHAIRMAN: The report of Dr. Lee, Sanitarian of the Board.

The SECRETARY: I have the report.

On motion, which was seconded, it was ordered that it be placed on file and be printed for the use of the Board.

The report is as follows:

REPORT OF THE SANITARIAN.

BY BENJAMIN LEE M. D. Secretary State Board of Health, Sanitarian.

Mr. President, Ladies and Gentlemen:

Allow me during the few moments allotted to call your attention to the sanitary history of our State during the period which has elapsed since the establishment of the State Board of Health, eighteen years ago, and to a comparison of the conditions then existing with those which now obtain. We shall find in it, I think, subject for mutual congratulation, and for serious reflection as well.

A careful student of the legislation of Pennsylvania comes upon the curious fact that many laws have been enacted, often of an extremely valuable character, which have remained a dead letter for the reason that no machinery existed or was created for carrying out their provisions and no penalty was prescribed for their violation. It would seem as though they had been passed tentatively in order to test their acceptability in the eyes of the people, with a view to their enforcement later on if the public should demand it, or their abrogation if they failed to meet general approval. This is especially true of most enactments for the protection of the public health.

The principal object in the creation of a central sanitary authority in the State was evidently to infuse life into certain of these dormant laws, and to establish an authority having both the duty and the right to enforce them. But even this power was converted in a half-hearted, hesitating way, and the Board was crippled from the outset by an utterly inadequate and insignificant appropriation. War was to be waged against the grand army of disease germs, strongly supported by ignorance, prejudice and negligence, and amply supplied with the sinews of war by avarice and greed; and
to prosecute this contest there was put in the field a general staff, without troops and with a most beggarly treasury.

In an area of 45,000 square miles, with a population of more than five millions, and containing 374 incorporated cities and boroughs, there were but eleven boards of health. More than 70 per cent. of the population, and 90 per cent. of the area of the State had no health statistics, no registration of deaths, no notification of infectious diseases, no contagious disease hospitals, no inspection of foods, no legal health authorities. "The sanitary condition of portions of the State outside of the larger cities was indeed shocking."
The city councils of Philadelphia, long before compelled by the Legislature to maintain a board of health themselves, took the alarm and memorialized that body that the State was quite unprepared to check the spread of transmissible diseases, which it claimed caused one out of every five deaths occurring in the Commonwealth.

The State Board of Health, created in response to this and similar appeals, therefore announced in an "Address to the People of Pennsylvania," adopted at its first meeting, that it would deem it its first and most important duty to encourage and urge the establishment of sanitary authorities, not only in all cities and boroughs, but also in townships, so that there might be a complete system of sanitary administration throughout the State, and that there might not remain a single nook or cranny, however secluded or remote, with which the Board might not be in regular communication in order both to receive information and to extend aid. All boroughs had the power to establish boards of health, but it was slow and discouraging work to induce them to exercise this power, and it was not until 1893, eight years after the establishment of the State Board, that sanitarians succeeded in having the law so amended as to make it mandatory instead of merely permissory. This of course at once greatly increased the number of boroughs having boards, but left the townships still unprotected; and yet the farmer values the lives of his wife and children as dearly as does the citizen. Disease germs are no respecters either of persons or of localities. The empty place at the dinner table and the vacant desk at school are mute but terrible witnesses to the frequency with which these subtle foes select their victims in the farm house. Not until 1899, fourteen years after the creation of the Board, did the Legislature accept this fundamental statement and pass a law authorizing school boards in townships to assume the functions of health boards, in so far as the restriction of communicable diseases was concerned. This was a most unsatisfactory solution of the problem. The school boards hesitate to incur expenses not provided for by law as part of the educational system of the State. The poor directors claim that inasmuch as the law has authorized school
directors to enforce quarantine, it has also authorized them to devote funds raised by means of the school tax to the support of persons in quarantine, thus relieving themselves, i.e., the poor directors, from a burden which they have always heretofore assumed; while both bodies unite in demanding that in every instance in which the State Board of Health establishes a quarantine, that body shall become responsible for all expenses incurred in maintaining the same.

“Everything,” therefore, in reference to this troublesome problem, is, as the perplexed hero of the comic opera observed, “is either at sixes or at sevens.” It is earnestly to be hoped that the next Legislature will bring order out of chaos by establishing a symmetrical and consistent system of health administration for the entire State, making it incumbent upon all counties, cities, boroughs and townships, to appoint and maintain appropriate health authorities, having for their sole duty, the protection of the public health and the careful and systematic registration of vital statistics, including notification of cases of communicable disease.

By vital statistics or the movement of population is understood the systematic reporting and recording or registration of every marriage, every birth and every death, occurring in a community. This is the foundation stone of sanitary administration, the very A. B. C. of sanitary science. By this alone can the sanitary executive officer measure the effect of his labors or determine in what particular locality they are most needed. It has been well said that “Wherever statistics are wanting, sanitary administration is defective. Wherever they are complete, sanitary administration is efficient. Defective vital statistics and low ideals of cleanliness and health go hand in hand.”

More than fifty years ago, a law for procuring such registration was placed upon our statute books, in the preamble to which it was stated that the law was demanded because from such statistics could be “drawn important truths deeply affecting the physical welfare of mankind.” Unfortunately this was a conspicuous instance of the class of laws referred to at the beginning of this paper, admirable, intelligent and humane in its conception, but unsupported by provisions for its enforcement. Notification of cases of contagious disease goes one step farther, and that a step of the utmost importance, in that it places in the hands of the executive health officer information which will enable him to extinguish with little effort and at small cost, a spark which, undiscovered, may be the starting point of a terrible conflagration. More than a hundred years ago, Matthew Carey, one of the most brilliant thinkers that Pennsylvania ever produced, urged the prime importance of this matter in a paper before the American Philosophical
Society, entitled "An Account of the Malignant Fever lately prevalent in Philadelphia, etc."

Only certain cities, however, were, half a century later, required to insist on such notification. Among these may be noted, Philadelphia, Pittsburg, Allegheny and Williamsport. All city boards were required to establish registration of births, marriages and deaths; but it was left optional with boroughs whether they should do so or not, and very few of them were willing to incur the necessary expense.

In the townships, the statistics of births and deaths were collected, annually, by the assessors. It is easy to understand how imperfect and incorrect they are likely to be. The data thus obtained were returned to the clerks of the Orphans' Courts of each county. Marriages could not be contracted without a license and were registered in the office of the clerks of the Orphans' Courts; but outside of cities and boroughs no medical certificate of death or burial permit was required, so that a human being might die and be put under the ground with no more legal formality than if he were a dog, and no official record of the fact for nearly a year. The demise of a blooded horse or an Alderney cow would be at once recorded in a stock book or herd book with the due history of the pedigree of the decedent, but the man would disappear from the surface of the earth without official note of record. Is it any wonder that graveyard and infant insurance flourished in Pennsylvania?

As compared with the conditions already described, let us now consider those at present existing as indicated by the operations of the State Board of Health, and the action of the Legislature during the past year.

**BOARDS OF HEALTH.**

Contrasted with the eleven local boards existing in 1885, we have now upon our books 768 legally organized health authorities. Of these 132 are found in townships.

**REGISTRATION.**

The number of borough boards which are establishing a system of registration is slowly increasing. Apart from this fact the only distinct advance has been that the assessors, in accordance with the law of June 6, 1893, collect statistics in the rural districts twice a year instead of once a year. This is a slight improvement, but falls far short of the system of prompt and complete reporting which we should have.
ABATEMENT OF NUISANCES.

During the year the Board has, either directly through its inspectors, or by means of correspondence, abated seventy-six nuisances complained of, principally by residents of the rural districts.

SUPPRESSION OF EPIDEMICS.

The outbreaks of contagious diseases reported to the Board have been 101, classified as follows: Diphtheria, 8; scarlet fever, 16; smallpox, 58; typhoid fever, 19.

In nearly all of these cases the Board has rendered assistance either by advice or pecuniarily. It has furnished free vaccination to many thousands, and has aided many townships in meeting the wages of guards performing disinfection and paying for bedding and clothing destroyed. The number of cases of smallpox has been 6,976, with 628 deaths.

The Butler epidemic of typhoid, with its 1,339 cases and 101 deaths, is still fresh in your minds. Never have I seen a community thrown into more dire confusion and perplexity, except in the awful calamity of Johnstown. It will always be a matter of gratitude to me that our Board was able to take the burden of controlling the epidemic off the shoulders of their authorities, thus leaving them and the charitable organizations which came to their aid a free hand for the treatment of the fever-stricken and the relief of suffering.

PROTECTION OF FOOD SUPPLIES.

In this important province an entirely new department, that of the Live Stock Sanitary Commission, including the State Veterinarian and the Dairy and Food Commissioner, has been created, and is doing admirable work, especially in the matter of checking the spread of bovine tuberculosis.

PROTECTION OF WATER SUPPLIES.

The only direct legislation for the protection of public water supplies from such pollution as would be injurious or fatal to human beings, which has been effected since the establishment of the State Board, was the law of May 2, 1899, which forbade the pollution of streams furnishing water for cities of the first class (Philadelphia) by the introduction into them of the excreta of human beings, and which authorized the State Board of Health to investigate complaints of such pollution, and to prosecute the offenders.

The necessity of an abundant supply of pure water to the preservation of the health, whether of the individual or the community, cannot be overestimated. But the rarity with which pure water
can be obtained is inconceivable to any who have not investigated the subject. *Hudor men ariston.* “Water is the best” of all God’s gifts said the old Greek father of medicine. But he lived in a day when every source of water supply had its tutelary divinity and to pollute it was sacrilege. He could not have conceived of a race of men so degraded that they would purposely pollute streams and heedlessly drink the waste of their own or their neighbor’s bodies. Nothing is more difficult than to convince the farmer that his own well may possibly be polluted. Let me give you a leaf out of my own experience, showing how pollution may exist where least expected. A friend living in the country had often boasted to me of the excellence of his well and called attention to the clearness and sparkle of the water and the absolute impossibility of pollution of any kind entering it. The last time I met him, however, he had a different tale to tell. It seems that the pump which forced the water to the top of his house had become choked. Knowing that there could be no obstacle in the well, he went to work to repair the valves of the pump, and soon got it into working order. That day he had friends to dine with him and as usual boasted about his water; but while at the table it was reported that the pump was again out of order, so he and his friends went down after dinner to fix it. While he attended to the valves, one of his friends asked to be permitted to look into the well. “Oh! certainly; I’ll lift the cover for you, but you won’t find anything there.” So the cover was lifted and the inquiring friend threw himself on his face and peered down into the depths. Presently, as his eyes became accustomed to the gloom he called out, “Why, Jack, there’s a scum all over the top of the water.” “Oh! that’s nothing but a little dust blown under the edge of the cover by the high winds.” Then came another and more vigorous exclamation. “Hang me, if I don’t see a dead rabbit in the well.” “Quite impossible,” was the rejoinder, “there’s no place where a rabbit could get in.” “Well, look for yourself, you can see his nose sticking out of the water.” So my friend looked, was convinced and with the aid of a rope was let down to remove the intruder. He passed up the dripping carcass and his friends were about to haul him up, when he shouted, “Hold on, I believe there’s another.” Sure enough up came another, and again, as they were about to pull on the rope, “Don’t be in such a blamed hurry! I’ve got another.” When his friends bade him goodbye they thanked him kindly and said they “wouldn’t take any water in theirs, please.” Think of it! Bragging of the purity of a well, while at that moment there were three dead rabbits in it. And yet if you’ll examine your own wells when you go home, I venture to prophesy that many of you will find worse things than rabbits in

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them. Of course, what we most dread is not dead bodies of rabbits, rats, snakes or frogs, which can be seen by the naked eye, but those invisible destroyers, the disease germs; but if the rabbit can get in, much more easily the germ.

LEGISLATION.

But probably the most encouraging indication with regard to sanitary advancement during the year has been the greatly increased interest shown in the subject by the State Legislature.

No less than fifteen laws having a direct bearing on the protection of health were passed by that body.

Two separate acts were passed each appropriating the sum of $50,000 for the use of the State Board in meeting emergencies, one of them entirely for aiding the local authorities in the suppression of smallpox, while at the same time a small addition was made to the regular appropriation to the Board. Among those of most interest to rural communities, are Act No. 60, "To encourage the repression of tuberculosis of cattle;" Act No. 100, allowing school directors and constables to be members of a board of health; and Act No. 254, prohibiting adulteration of food.

Even more satisfactory than the large increase of appropriations was the passage of the law "extending the powers of the Board;" as it evinced a degree of confidence in the sound judgment and discretion of its members, which was most gratifying.

It will be seen then that the Legislature and the various agencies which it has created for the protection of the lives and health of the people of the Commonwealth, are more and more appreciating the full measure of their responsibilities; and it now becomes your duty, representatives of the great agricultural class and leaders of thought and opinion in your own districts, to do all in your power to disseminate knowledge on these subjects and to create a public opinion favorable to utilizing all the opportunities thus offered by the State government.

The CHAIRMAN: The report of Dr. Leffmau, Microscopist and Hygienist of the Board.

The SECRETARY: I have no report.

The CHAIRMAN: The report of Prof. Cochran.

The SECRETARY: I have no report.

The CHAIRMAN: The report of Prof. Surface, Ornithologist of the Board.

PROF. SURFACE: Mr. Chairman and Members of the Board and Visitors: I place on the desk some publications of the American Ornithologist Union. Some of them are colored plates of our own
birds, designed to instruct people with reference to the common birds around them. Others are leaflets and pamphlets describing flickers, woodpeckers and orioles. They are sent to me for distribution here and I wish to call attention to this excellent distribution so that those who are interested may obtain them. I shall mention my own publication and will proceed with my report. I am accustomed to speaking from notes or extemporaneously and beg pardon for filtering my report through a written paper.

The following report was then read by Prof. Surface:

REPORT OF THE ORNITHOLOGIST.

BY PROF. H. A. SURFACE, Economic Zoologist of Va., and Ornithologist of State Board of Agr.

During the year of 1903, all over the earth there has been considerably increased activity along ornithological lines. The standard publications as "The Auk," "The Condor," "Bird Lore," "American Ornithology," "Birds and All Nature," and others have not only continued to exist, but to thrive; yet the "Osprey" is temporarily suspended while an effort is making to find a competent editor and manager. There have been several new books on the subject of birds during the year. Among which are the following:


"Birds," by Prof. Evans, of Cambridge.

"Bird Studies with a Camera," by Frank M. Champman.

"The Home of Wild Birds," Prof. F. H. Herrick.


And several others.

Several states have published Bulletins on the subject, including Maryland, Louisiana, Alabama, Mississippi, Michigan, Georgia, New York, Ohio, Pennsylvania and others. The United States has pursued investigations along this line, and has brought out important results in publications of the Biological Survey of the United States Department of Agriculture. The United States Department of Agriculture has republished its Farmer's Bulletin, entitled, "Common Birds Around the Farm." The New York Fish, Game and Forestry Commission has published an attractive report on "Economic Ornithology," by Prof. Frank M. Champman.
The work of societies and lecturers is worthy of our attention. The American Ornithologists' Union has been progressive, and has been successful in having a mutual bird law of the Union established as a law in almost every state east of the Mississippi, except Pennsylvania and Virginia. The Audubon Society has also maintained its activity, and has published many tracts upon the aesthetic features and economic value of our birds and the necessity of preserving them. Individual organizations have been active, and birds are receiving greater thought now than ever before. For example, "Bird Preservation" has been made one of the necessary and fundamental features of growers, as the Ceylon Tea Association in India has found it necessary to make a special feature of "bird protection" to rid plantations of the pests of the tea. At the antipodal point of the earth, from India, farmers of Chester county, Pa., have organized themselves into clubs in order to reduce the losses from the attacks of insects by the protection of birds. The work of the Pennsylvania State officers has been worthy of attention. Dr. Kalbfus, Secretary of the Game Commission, has been making vigorous enforcement of the laws against the destruction of song and insectivorous birds, and is making foreigners and careless gunners understand that these birds must be preserved. He has, also, written several articles bearing upon this important subject, one of which was published, at our request, in the January issue of the monthly bulletin of the Division of Zoology. As Economic Zoologist of the State Department of Agriculture, your Ornithologist has found opportunity to investigate problems concerning bird life, and to publish the results of these investigations in bulletins, which will be sent free to yourselves and your friends upon receipt of names and addresses. Several such bulletins have been issued, and the original illustrations by Mrs. H. A. Surface have been highly commended.

The individual work of the Ornithologist has been along the following lines:

First. Specimens have been sent by persons in the various parts of the State, as well as in other states, with the request that he name them, and give other information. This has been done, and apparent satisfaction has been given.

Second. Questions, oral and written. A great many questions have been received by your Ornithologist, and these always have been given careful attention, and the replies have been sent in such detail that the desired information was doubtless conveyed.

Third. Making investigations. Many investigations must be made, and new facts must be obtained before making due mention of any statement in a publication for the benefit or aid of readers. We have had an opportunity to examine original material, such as stomach contents of birds, and also to learn what other investi-
gators are doing along this line before putting statements into the bulletins. This is very necessary, and while we are working along this line, we shall publish statements on all families and all species of birds, known in this State before the series of bulletins is completed. We do not, of course, have it complete in every detail, and shall publish other parts in our quarterly bulletins of the Division of Zoology of the Department of Agriculture.

Fourth. Making experiments. We have experimented with boxes for birds' nests, and have found that the blue birds and house wrens have brought forth two broods each year in the same boxes at our own residence. I shall now refer to the boxes erected for their nesting. The hole in the box for the wrens may be one and one-eighth (1\textfrac{1}{8}) inches in diameter, and the English sparrow will not enter therein; but the hole for the blue bird must be at least two and one-half (2\textfrac{1}{2}) inches, and then the English sparrow will enter unless it be kept out by man. There are several species of birds that can be induced to nest in boxes thus provided for them, and the results of our experiments may be had in our bulletin for May, which is to be obtained by applying to the office of the Economic Zoologist.

Fifth. Collecting information and other means. I am firm in the belief that the only way to obtain proper scientific knowledge is for the naturalist or scientist to make investigations for himself, and to interpret by his trained mind the facts, which he may see in the various fields, orchards and woods. It also becomes necessary for the scientist to call upon the experiences of others at times, and to try to learn from them such facts as may be useful. For this reason a few circulars containing questions have been issued, and returned to us by the citizens of this State. These are filed, and their facts will be considered in the future publications of the Ornithologist. However, there has been issued, from a source not connected with our office, a circular calling for information of our Pennsylvania birds, which through the very nature of the statement of the questions may be misleading, and since several members of the Board have asked us how to answer these questions, we shall take pleasure in showing them the printed answers in publications from Washington, D. C., and elsewhere.

Six. Speaking or lecturing. The Ornithologist has been called many times to speak or lecture on the subject of "Bird Protection," and as a consequence, we can say that our citizens are becoming more thoughtful along this line, and there is evidence that our labors have not been in vain, and that they have done good for the Commonwealth. Among the places where we have spoken upon such subjects are several Teachers' Institutes, Clubs, Grange meetings, Farmers' Institutes, the annual meeting of the American Ornithologists Union in Philadelphia last fall, Natural History Society, etc.
Seventh. Collecting and preserving material. It is very desirable to have at a central point and readily accessible in this State, as for example at Harrisburg, a complete collection of beneficial and injurious insects, birds, mammals and other animals. We have lost no time or effort in trying to form such a collection during the short time at our command, when primary duties were not more urgent. We have now in preparation a collection, showing several types of our more common birds with their food, habits and enemies as indicated. This is prepared for the St. Louis Exhibition, and our May quarterly bulletin will be devoted to the discussion of this subject. The collection will be returned to a museum room in the Capitol at Harrisburg, and will remain there as nucleus for a complete collection, showing the natural history resources of Pennsylvania. It will, of course, be open at all times to our citizens, and members of this Board are invited to co-operate with us in making this, as it should be, a creditable and interesting feature of natural history in this State.

Eight. Writing articles upon "birds." Your Ornithologist has written several articles for the press, which have been published more or less widely, and has, also, prepared four quarterly bulletins upon this subject, and has devoted portions of ten monthly bulletins to the discussion of ornithological topics. It has been our aim (1) to make these accurate and reliable, based upon our personal scientific researches rather than upon the casual observation of untrained persons. (2) We have tried to make them clear and practical, so that any person could read and understand their contents. (3) We have tried to make them systematic discussions of the orders, family and species of American birds in definite series and scientific plan of treating. In this we hope and believe that we have succeeded, but the acceptability and practicability of such publications is left to the intelligent persons whom we have endeavored to serve. If this has not been done, we regret it very much; but if it has not been in vain, we have no regret whatever for it has been our effort to serve our citizens in this State from whom we hope to hear more abundantly in the future than in the past.

MR. FENSTEMAKER: We have thirteen schools in our township and I would put one set of these bulletins in every schoolhouse and I believe it would do a great good.

DR. CONARD: A few years ago I sent for a bulletin on the "Economic Status Value of the Crow," and the information I received from it was an eye-opener to me. Until I got that bulletin I always regarded the crow as a very questionable institution, but since that I have had a great deal more respect for that bird. It shows what he eats and they were able to do this by opening up his
stomach and showing what he fed upon in comparing him with other birds with reference to his habits until they brought him out quite a useful bird. It was exceedingly interesting in that it showed that the crow is rather a genius and witty fellow and excites a large amount of interest. I gave that bulletin to several boys around me and it had a very good effect. I did not follow it by putting it in the schools, but I think it would be a good thing to place such bulletins there.

MR. HERR: While we are on this crow question I want to make one remark. The Professor stated that by planting corn extra deep a crow would not disturb it. I have been immuned from their attacks if I feed them. If I sow a peck or so of corn over the field a few days after I plant it I have not been bothered. I think that is the best thing for the crow. If you just feed him he will not bother you.

DR. CONARD: What is the economic value of the robin?

PROF. SURFACE: Some persons in the State of New Jersey are looking towards the passage of a law for the extermination of the robin. I would call to the attention of the members of this Board that the law allows anyone to kill a bird that is in the act of destroying his crop. That is the law of the State of Pennsylvania. The fruit grower who has had a scarcity of fruit on account of deprivations made upon his orchard by birds as they come to his orchards, and he knows that they are destroying his fruit, has the privilege of killing those birds and is not transgressing the law. But the robin and catbird are known to be the most valuable birds that are found in our State. It is a fact that the robin sticks his bill into a strawberry or cherry, as an individual told me the other day, that the main fault with the robin is that he sticks his bill into the strawberry and does not eat it; the reason is that the robin is starving for fruit. It eats both insects and fruits, and when it does not eat ripe fruit it may stick its bill into the red where it expects to get sweets and for that reason it sticks its bill into the strawberry. It has been very injurious to fruit and so has the catbird. I can stand on the State College campus and count two hundred robins in sight and I did not lose a strawberry last year, but it was because right across the road from that strawberry patch there was a mulberry tree constantly bearing. It commenced early to bear and bears until late. It is the longest bearing tree there is, and by means of that tree the robins were supplied with fruit. Mr. George T. Powell, of Ghent, New York, has said that he had trouble with the robins eating his cherries and he left his Gov. Wood cherries to get ripe and sweet and did not pick them and in that way he got rid of damage by the robins. Another man told me that he got
rid of the robins eating his choice strawberries by letting his early strawberries get ripe and they eat those and let the others alone. The economic status of the robin is like the economic value of the crow, and I don't think we are justified in killing it because it comes to us and gets something to eat. I believe instead of exterminating them we should use some method by which they can be attracted to some other fruit which is not so valuable. One method is to plant fruit trees along the roadside for which the owner will be allowed some rebate of taxes and at the same time the robin will feed upon those fruits.

DR. CONARD: I noticed on three different occasions when the seventeen year locusts were plenty the robins did not disturb the cherries. Last summer we had quite a good crop of sweet cherries and they hung there and dried up, those that we did not use, and the birds did not use them, showing that if they have insects to feed upon they prefer insects. That was one year ago last summer.


The report read by Col. Demming is as follows:

REPORT OF THE MINERALOGIST.

BY COL. HENRY C. DEMMING, MINERALOGIST.

The best silicates of this Commonwealth are becoming more and more important, commercially. A few years ago any kind of sand would do for mortar or plastering, and the use of best sand for purifying water was not taken into account. Science has made such advances that all this is changed, and attention is called to the importance of the purest silica sand, not only for filtering purposes, but numerous other ways. Many of our streams have become so polluted by sewerage and other foul sources, that to use gravel or sand from their beds is positively dangerous to health and a menace to human life. The main rivers of the Commonwealth are reeking in places with decomposed vegetation and putrid animal matter, and when the two come together under the sun's hot rays, disease-breeding germs are a sure result. In proof of this, some time ago a quantity of sand was taken from one of our best known river beds. An analysis yielded nearly 20 per cent. of organic matter; some of it coal, but a large proportion decayed or partly decayed vegetable and animal matter. It was a very easy task to have cultures from
the combining of the two latter of typhoid fever, diphtheria and scarlet fever bacteria, and in one instance anthrax from deposits from below a railroad bridge. Some of this sand was taken and worked into mortar and plastering; the first used between bricks, and the latter in the regular way on lathing. It was found that the heat of a chimney soon made the mortar porous, and then noncohesive; a common cause of defective flues and the destruction by fire of happy homes. With the plastering, to prevent cracking on the wall, it was necessary to mix horse or bullock hair. Experimentation proved that the water and lime used did not destroy the disease breeding bacteria, though in most instances the microbes remained inert until the plastering had been thoroughly warmed. This may explain why, in some homes, contagious diseases have appeared—the first in the neighborhood, or even in a county—to bring sorrow and woe to an otherwise happy household.

**SAND FOR FILTRATION.**

What has been stated applies with equal force to such material being used for filtering water. Several large cities have used river bottom sands for filtration, and though the sands were washed, using 300 parts of water to one of sand, it was shown conclusively that disease breeding bacteria still remained. Nearly two years ago I was employed to visit and examine, and report upon, every municipal sand filtration plant in North America. The most alarming feature connected with the whole work was the poor quality of sand used in nearly every instance. Notwithstanding, there was an invariable improvement in the water supply, though the mortality list would have been still smaller everywhere with a first quality silica sand. Washington, D. C., will soon have the model sand filtration plant, wherein all the defects of foreign and American filtration will be happily remedied.

For all the evils mentioned the best sands of Pennsylvania can effect a sure cure. Samples have been taken from the crests and sides of hills or mountains in more than a dozen counties, with results as follows: Crests of Cove Mountain in both Fulton and Franklin counties 99.53 per cent. silica; Chestnut Hill, two miles north of Columbia, Lancaster county, 99.51 per cent. silica; one-half mile north of Mountville, Lancaster county, 99.00 per cent. silica; Welsh Mountain, one and one-half miles northwest of Honeybrook, Chester county, 98.27 per cent. silica; three and one-half miles northwest of Wrightsville, York county, 99.04 per cent. silica; three and one-half miles northwest of Lewistown, Mifflin county, 98.84 per cent. silica; Sinking Valley, Blair county, 94.89 per cent. silica; near Greenville, Mercer county, 95.16 per cent. silica, and 3.22 per cent. alumina; near Duncannon, Perry county, 98.65 per cent. silica; Tus-
carora Mountain, one mile south of Van Dyke, Juniata county, 99 per cent. silica; South Mountain, two miles south of Boiling Springs, Cumberland county, 99.03 per cent. silica, and same range of mountains two miles northwest of Mont Alto, 98.82 per cent. silica. In every instance the sand or sand rock is in very large body, and all the constituents other than silica contain a minimum of deleterious substances. It is doubtful if another state in the Union has so many large deposits of first grade silicates.

Practical examination has shown that any of these sands will, in sufficient body, thoroughly purify any water, no matter how completely impregnated with disease-breeding germs. Why any other method of filtration should be thought of, much less adopted, in Pennsylvania is beyond my ability to state.

BEST SAND FOR MORTAR AND PLASTERING.

It has also been demonstrated that plastering made of these silica sands, and with a good quality of Pennsylvania-made lime, does not require hair of any kind in the mixture. With first grade silica sand from any of the localities mentioned, and our best lime, there is no cracking of the plastering, there is an extraordinary adherence to the lath, and there are no disease-breeding germs in the mass; Then the plastering is so nearly a snow white that whitewashing is unnecessary. Furthermore, mortar made of the materials mentioned make a brick wall almost as solid and enduring as if the whole wall were of one brick. The samples exhibited herewith are manifestly ample proof of what has here been stated.

LIME AND LIMESTONE.

While the limestones of the Commonwealth have received more than usual attention during the past five years, the subject of their varieties and properties is not exhausted. It was my intention to complete, during the year just closed, a collection of average samples from every known deposit within our borders, but an unusual number of calls to other states and territories prevented. The work has been carried sufficiently far, however, to enable me to report that we have at least 28 varieties, from the almost pure carbonate of lime to the magnesite. When every variety has been ascertained, and a complete analysis of each made, we will then understand more clearly why some burned limestone helps some soils in so extraordinary a way, and other lime accomplishes so little. Tests have proved that some limes, having marked percentages of magnesia, if allowed to thoroughly air-slake before using, will be beneficial to soils where otherwise they will not.
SALT AND BROMINE.

Many years ago—between 50 and 100—Pennsylvania prepared salt was a very important commodity, and there was a great demand for it beyond our borders. There was a ready market as far away as New Orleans. For some reason, not fully explained, the industry has been allowed to gradually die away. True, the official reports show that during 1902 the States of Ohio, West Virginia and Pennsylvania produced 2,318,579 barrels of 280 pounds each; but careful inquiry will show that most of this came from our two sister states. Three hundred thousand barrels, or say 1,000 barrels each working day, would be a very liberal estimate for Pennsylvania, while New York produces more than 8,000,000 barrels, annually. Is the very small output in our State due to small deposits, or to the high standard weight of 83 pounds per bushel, when no other state has fixed higher than 70 pounds (Vermont), and most of the states 50 pounds? Or is it due to lack of encouragement or otherwise in the manufacture? One thing, however, is sure. Pennsylvania prepared salt is as attractive in its pure white color as any in the world, and it surpasses in bromine nearly every species of halite (common salt) found elsewhere. Careful geological and mineralogical examination of the rock formations of the Commonwealth convince me that salt, of the very best quality, can be profitably produced in the following counties: Bedford, Blair, Bradford, Cambria, Cameron, Carbon, Centre, Clarion, Clinton, Clearfield, Columbia, Crawford, Dauphin, Elk, Erie, Fayette, Forest, Fulton, Huntingdon, Indiana, Jefferson, Lackawanna, Luzerne, Lycoming, McKean, Monroe, Northumberland, Perry, Pike, Potter, Schuylkill, Somerset, Sullivan, Susquehanna, Tioga, Wayne, Westmoreland and Wyoming. In Pike and Wayne counties it may be necessary to bore 2,000 to 2,200 feet, but the superior quality of the brine will more than compensate for the extra expense. In Fayette, Indiana and Westmoreland counties some of the best salt wells of the past were less than 800 feet deep.

I have called attention to the bromine in our salt because of the increased demand for it as a constituent in bromide of potassium, while the American product seems to be gradually decreasing. Pennsylvania is credited with the production of bromide as follows: In 1898, 119,998 pounds; in 1899, 111,150 pounds; in 1900, 105,592 pounds; in 1901, 101,595 pounds, and in 1902, 93,593 pounds. The exact figures for 1903 are not yet available. The market price for bromide is now about 28 cents a pound. Michigan is the chief producer. Most of the product of Pennsylvania is prepared for market by manufacturing firms in Allegheny, Natrona and Pittsburg. That there is much inducement to revive the salt industry of Pennsylvania for bromide alone is apparent, when it is officially stated that the
magnesium-bromine (MgBr) of Ohio brine—the largest producer next to Michigan—averages 0.097 per cent., and the Western Pennsylvania 0.14 per cent. By the use of the electrical current the extraction of bromine is much less expensive than formerly, and by the Dow process bromide containing less than 0.3 per cent. of chlorine is made without difficulty.

This special attention has been called to salt and bromine because both are to be had in so many counties of the State, and the former is so essential on every farm. With comparatively little outlay many farmers could produce their own salt, could sell their overproduct to their immediate neighbors, and have an additional revenue from the sale of the bromine. Of course care would have to be exercised in bromine manufacture and subsequent handling, as it is very poisonous. From it are made, in addition to bromide of potassium, hydrobromic acid, oxygen bromic acid, bromo-acetic acid, bromo-succinic acid and hypobromous acid; also bromoform and bromo-caffeine, the latter preparation quoted at $5 an ounce. Wholesale. Then bromine is used for bleaching and disinfecting purposes, and extensively in the manufacture of aniline dyes. The bromide of potassium is most importantly applied in medicine and photography. Bromide of ammonium and bromide of cadmium are also used for the latter purpose. A few years ago potassium bromide was frequently used in the separation of some of the precious metals, but with such indifferent results that it is little sought for now for that purpose.

PEAT FOR FUEL.

Coal is becoming so high in price that farmers and others are beginning to seek other kinds of fuel. In other states, notably Massachusetts, Michigan and Wisconsin, peat is gradually finding favor. In Pennsylvania we have a number of peat beds. The most extensive and valuable thus far found are those of Dauphin, Lackawanna and Lawrence counties. Machinery has recently been introduced whereby peat can be mined, dried and manufactured into briquettes ready for use at about $1.30 per ton of the manufactured product. This is now done every day in the three states mentioned; also in Canada. In some respects the peat thus prepared is superior to coal, as it is nearly smokeless; and, whatever smoke or odor, there is no injury to the lungs. Then a well-lighted peat fire throws out more heat than a similar amount of coal, weight for weight, and will not go out until every atom of fuel has been consumed.

Now, having touched upon four very important items connected with the welfare of our great Commonwealth—silica sand in the construction of our homes and the purification of our water; lime for building, and the increased fertilization of our fields; salt for
the cattle, and bromine for the manufactories; with peat as one of
the coming articles of fuel for the farmer—this report is closed to
prevent undue encroachment upon the very valuable time of the
Board.

A Member: You spoke of the sand being a good thing for filtra-
tion. Will it take sulphur out of water?

COL. DEMMIN: Yes, sir.

A Member: Can you tell us how to distinguish salt-rock from
other rock, and can you tell in what way to bore for it?

COL. DEMMIN: In the counties I have named, Pocono sand is
c ons picuous, and that is the producing salt-rock for Pennsylvania.
In Michigan it is the Marshall sandstone. I find by very carefully
boring for the Marshall sandstone and Pocono sandstone, until
you reach the crevices, you are likely to find the brine you are seek-
ing and find it in very large quantities.

The CHAIRMAN: "Economy in Feeding the Farmer's Family," by
Mr. Miller, of Friedens, Pa.

The paper read by Mr. Miller is as follows:

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**ECONOMY IN FEEDING THE FARMER'S FAMILY.**

*By Jacob S. Miller, Friedens, Pa.*

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The Man of Nazareth taxed the very powers of heaven to provide a
single meal for a few thousand very ordinary people. They might
have gone in search of food, and at the worst, they would only have
been weary for a short time, a loss of perhaps a few hours, a single
nights rest would have set all right, but Jesus met their present
needs and sent them back to their homes or their toil with every
faculty at its best. Then He said, "Gather up the fragments that
remain that nothing be lost."

Economy is the Divine idea or life; it is also the Divine practice.
Waste, if not a human idea, is certainly the human practice, and it is
so much the worse, so much the more hopeless because we don't
know it. It is economy to know what to feed, how much, and when;
these three adjuncts are very important ones. The farmer must
study in order to know what to feed for the health of his family;
it is not the products of the farm that have been harvested for a
long time, but fresh from the garden, orchard or field. He may be
able to buy vegetables from the grocers that may look all right, but it may be like the colored waiter’s Christmas turkey he served to his guest who said: “I want the same kind of turkey I had last Christmas.” The waiter said, it was the same as they kept it in cold storage; you don’t know what you buy, but you do know when you take it out of your own garden. Then there is this difference, when you know your food is pure and clean, you eat it with a relish. This rule will hold good in all things raised on the farm, hence it is important to know what to raise for the table that we may preserve the health of the family, as well as save money and give general satisfaction and enjoyment. To do this we must learn to produce in that garden all the vegetables that are possible to raise from early spring to late fall, so there will be something from the garden the whole year. You can have your onions, celery, beans, cabbage, tomatoes, and many other things the whole year; your lettuce and the like for two-thirds of the year. In addition to the products of the garden, we have the fruit of the orchard; the apple, the pear, the peach and the plum. How the family enjoys to get in the orchard to pluck the fruit which is the best medicine that can be taken. As for meat, the farmer has at hand the very best; the fowl, mutton and beef. With this variety of food the good wife or mother will prepare an innumerable amount of dishes that will give general satisfaction. You will not tire like you do when there is the same every meal.

Now as to how much to feed. There are many families fed so much that they really become gluttons. Do not let the little child eat until it can eat no more. I have seen families that would eat twice as much as another family of the same number and were not near as healthy. There are families that eat themselves poor. The parents should have the right to say when the boys and girls have enough, as eating too much becomes a habit. Let different families dine together and you will observe that one boy will eat just twice as much as the other boy.

Now as to the time of feeding the family. There should be three meals at regular hours, morning, noon and evening, and the last meal not too late in the evening, so there will be time enough to exercise before going to bed; not like Bonasteel said they do in Philadelphia. He said, “They eat breakfast at nine, dinner at three and supper the next day.” If meals are served at regular hours, it becomes “second nature” as the saying is. Those of you who are used to your meals at regular hours, can you not tell almost to the minute when they ought to be ready? Doesn’t nature tell you? As soon as that hour is past, you are not hungry whether you eat or not. It is economy to obey Nature’s call in eating.

It is economy to raise as much as possible on the farm and buy
as little as possible. I am acquainted with a family of fourteen that were raised on fifteen acres, all hale and hearty. They were financially poor, but strong in body and mind. Why? Because they were fed the proper food, the right amount, and at regular hours. No rich cakes and pies, but plenty of vegetables and fruit; no tea or coffee, but pure spring water to drink. The mother knew just how much to cook and place before them and it was just enough and nothing wasted. When you feed your horse or cow, you don't feed them all they can eat, but just enough. That is economy. The same rule will hold good in feeding the family.

In conclusion, if you are the head of the family, claim the authority to say what to eat, how much to eat, and when to eat. Let there be no waste, but just enough.

The CHAIRMAN: "The Relation of Electric Railroads, Telephone Companies, etc., to the Agricultural Interests of the State," by Mr. Rodgers, of Mexico, Pa.

Mr. Rodgers then read the following paper:

THE RELATION OF ELECTRIC RAILROADS, TELEGRAPH COMPANIES, ETC., TO THE AGRICULTURAL INTERESTS OF THE STATE.

BY MATTHEW RODGERS, MEXICO, PA.

Power by electricity has become so general, and is being used for so many different purposes of late years, that it is useless to describe it in this paper. None of the greater nations of the earth are so controlled by transportation as the United States.

Transportation of passengers on electric railroads is one of the great conveniences, and is also becoming a recognized factor in the transportation of freight for short distances. In fact, in most of the states of the Union electric railroads are allowed to carry freight. Pennsylvania and possibly a few others are behind in this, and why is it? During the last few years this industry has increased very rapidly, and many rural communities throughout the Union, depend almost entirely for the transportation of their products by electricity, to the nearby markets. In the Middle and Western states, the development of this branch of electric transportation, has assumed apparently greater proportions than in other parts of the United States.
Electric railroads, or what is termed now in traction circles, interurban transportation, could be made very useful to the agricultural and dairy interests of our State, if, in their charter, they would grant the right to carry freight and dairy products. But to ask for this in the charter, and the right of eminent domain for electric railroads, might look to some like socialism; yet these people do not stop to think that the postoffice conducted by the National Government, the school system and even our road system, are socialistic—used by all—or are open to the use of all, and are operated by the laws of the State and Nation. But when the people ask for something akin to the instrumentalities just mentioned, the cry of socialism and paternalism is raised, and by the very people who enjoy special privileges, and thereby thrive and wax fat at the expense of the general public. So if you agitate the question of permitting or compelling the electric railway companies to carry parcels and light freight, you run square up against the steam railroads and express companies, and encounter special privileges which the possessors hold most sacred. I hold that no invention, which conduces to the happiness and comfort of the people should be withheld from them. And further, I hold that the relation of electric railroads does conserve, and will add far more to the happiness, comfort, convenience and financial condition of the farmers, dairymen and fruit growers of our State, as the people are educated to what great use, these roads can be to them.

The time has gone by when the steam roads and express companies should have a monopoly in carrying freight, etc., from place to place. The electric railroad is a marvelous convenience for carrying passengers, and this could be augmented by carrying freight as well. It seems to me unreasonable, that these roads should be limited to passenger traffic only, when they could be utilized to the advantage of the agricultural interests of our Commonwealth in carrying produce and merchandise. No class of people deserve higher consideration as a result of inventions and conveniences than the producers. They are fairly entitled to the best facilities in the matter of exchanging commodities and convenience in travel. True, we have some places in the State where the electric railroads do carry milk, and other goods, and it greatly reduces the cost of transportation. For instance, an electric road from West Chester carries milk, etc., to the Delaware wharfs, for about two-fifths of what the steam roads charge to Broad street, 14 squares less distance, at a loss of but 30 minutes. And this only illustrates what could be done all over the State if the right of way could be had, without a fight which is so often the case. This can only be remedied by an act of the Legislature, allowing electric railroads the right to transfer mail, freight and packages as well as
passengers, and require them to pay a yearly rental for the use of the public highways, where they run over them. This would help to keep up the roads, and ease the farmer, greatly assisting in solving the road problem. But it is doubtful whether the Pennsylvania Legislature, nominated as is by corporate influence, will ever change the present law.

Now from what I have said, do not for a moment think that I am opposed to the steam roads. Oh, no; far from it. They have helped to make this great State what it is, and to do without them would be like going out into the unknown world; but with a net-work of electric railroads extending across our State, the time, labor and expense of transporting farm and dairy products would be greatly lessened.

After carefully considering the different ways in which the agricultural interests of our State could be benefited by electric railroads, etc., I would give the following reasons:

First. That which will come home to the heart of every true patriotic citizen, is the education of our sons and daughters. The centralization of high schools would be made possible, and this problem being solved, schools could be established at central points, regardless of township lines.

Second. By the rapidity with which produce could be taken to markets, especially perishable products, such as vegetables, berries, etc.

Third. Because routes would go directly through communities producing market products.

Fourth. Dairy products could doubtless reach the consumer in better condition, from the fact that they could then be taken direct from producer to the consumer.

Fifth. Rates of transportation would be less than the present railroad charges, and a division of this difference between buyer and seller would add to the profit of both.

Sixth. Transportation by electricity in these days of congested "freight traffic," would be a relief, as well as a benefit to trade.

Seventh. Transmission by electricity, now when there is so much demand for fresh dairy and poultry products in the large hotels of towns and cities, by transporting lines through good farming communities, would supply a want not filled by railroad transportation.

Eighth. It would enable dairymen, farmers and poultrymen to compete with commission men, who, under the present plan, have things in their own hands.

Ninth. Every new method of transportation and transmission, of necessity, will add to the progressive spirit of the age.

Tenth. New methods begets new energy; convenient and quick transportation creates a necessity for more and better products.
Eleventh. By the quick distribution of dairy and farm products from grower to consumer, the health of the consumer would doubtless be improved by having fresh products.

Twelfth. American progress demands rapid facilities in business methods; American energy demands modern facilities. In fact, Americans demand the best of everything, and will have the best.

The CHAIRMAN: These papers are now open for discussion by the members.

MR. HUTCHISON: I would like to have the first subject taken up, on the water supply of this country. I think it is something that should be given attention. They speak of the filtration plants and I see it discussed in all the papers and large sums of money are expended for the filtration of water. In Harrisburg they are drinking a great deal of coal dust and filth that comes down the river. Did it ever occur to your mind, that the Lord put a supply of water in the earth and that you can get it out by boring down into the earth and supplying ourselves with it for domestic purposes? Did it ever occur to you that these streams are for the purpose of having drained into them and carrying out the filth of the country? To-day I read an editorial cautioning the people to boil their water because this freshet would bring down germ diseases from up the country on account of the filth and dirt being washed into the river from various places. If you drill for the water that is in the earth there is no doubt a sufficient supply can be obtained to supply the demands of the people. At the Commonwealth Hotel, in this city, every bit of water is taken out of a drilled well, known as an artesian well. This is a serious question to think about and the time has arrived when we should give it our attention. Up in our country, beyond where I live, is what is called Dry Hollow Valley. There was only one spring there. A few years ago they drilled 240 feet and there are two eight-inch pumps in operation. In Centre County there are eight wells down in the earth and they are getting pure water. Doubtless this condition of water supply exists all over this State and if the supply is procured in that way it will do away with the filtration plant as well as do away with the diseased germs. We come to the Legislature every winter and try to legislate against tanneries and factories that are located on most of these streams; but I think the Lord placed the water in the earth for man to obtain and use. Why wouldn't it be as easy for this city to drill wells for the purpose of supplying water to its citizens instead of forcing it out of this dirty river? I throw out these suggestions in order to bring it before this Board.

MR. NORTHUP: I was forcibly impressed with the paper on the
"Economy in Feeding the Farmer's Family." I don't believe there is any class in the world that enjoys eating and sleeping better than the farmer's family, and I don't believe there are any boys that like to sleep better than the farmer's boys. I thought this evening that it would have been a good thing if my father had choked me off and I would not now have to carry about so much flesh; but the farmer don't like to check a person when he is eating and usually lets him stop when he gets ready. I was thinking of the boy who came up one evening where the ladies of the church had a free supper and this boy never had much to eat and he worked hard. Up in our country they furnish a whole meal at these places for ten cents and it is cheaper than they can get it at home and they go there for supper and get filled up, and on one occasion one of these boys came out; you know what large hearts these ladies have, and one of them said to this boy: "Have some more, have some more," and they kept saying to this hungry boy, "have some more," and he was trying to talk and finally said: "I can chaw but I can't swallow." I know if our farmers' boys could be choked off it would be cheaper for father; but it is the best place on the earth to make boys and girls and send them out into the world. We all know that four-fifths of our business men in the cities come from the farms and that is the reason they have these broad shoulders. The fellow, reared in the city, dies off and he never gets there. If the farm is the best place to raise boys and girls and feed them, we should let this feeding go on and continue to live in this happy family.

There is a magazine published in Chicago, entitled, "What to Eat," and I wish that was placed in the hands of each member of this Board. We get in the habit of feeding our families, and it is just as important for the housewife to give us something that is palatable and nutritious as it is to give us good water. I worked eight years selling farming implements, and you know how it is in threshing through the country, and traveling around among the farmers, I found that they lived a great deal different than they do today. They have been educated on this subject, but they put too much on their tables; it is impossible to eat it and be healthy. We don't want to say to the boy or to the girl, you must quit eating, you have had enough; but to my mind we should place literature into their hands that will teach them about what to eat, and how much to eat, and making it clear that to eat too much is injurious. We tell them not to drink liquors, and it seems strange to me that there is no literature on the subject of eating distributed throughout the country. This magazine
is edited by a gentleman from Chicago, and if that was placed in the library of each one of the farmers of this State it would be a valuable thing to educate our people along this line. I am glad this subject has been brought before us; but I don't like the idea of saying to the boy or girl, "Don't eat any more;" we must educate them to it through literature. I believe that more of the subjects on practical life should be taught in our public schools. I think it would be of great advantage to educate the people along this line and I would be glad if our Secretary would get out a bulletin on the nutrition and value of foods in connection with the human system, and circulate it throughout the State. By so doing I have no doubt but that it would result in great benefit to the people.

MR. HERR: This is an important question, if you view it from a serious standpoint. It is not so much how much we eat, as to what we eat. We spend a great deal of time in our meetings upon the discussion of the character of food we feed our domestic animals and talk about protein and all that in building up the system for the purposes for which we want them. Now if the same care was taken to provide a digestible food and have it properly prepared in order to make it digestible, so that it would be palatable, I think it would be a very important matter to take up and have discussed. There are bulletins published as to the composition of different foods with a view to eating the proper proportion of protein and hydrates, and if we had that kind of literature I think it would be of great value to the people because it would show them the character of food that is best for them to eat. If the directors of institutes could find the right kind of people to send them to the institutes, an expert on cookery for instance, and how to prepare a good meal of the material we have on hand, it would be a very valuable help to the women of the farm as well as to the men. There are a few persons who can do that, but very few. I remember when Dr. Frear came to our institute he gave us the theory of cooking meat and explained how to cook it to make it, not only digestible, but palatable and tender. I think it is a very important item in connection with our work and I believe that could be added to our information in very many directions. I think it would be a good thing if we could add an instructor of that character to our institute force, one who is thoroughly acquainted with the subjects of foods and their preparations. We ought to pay more attention to our cooking than we do.

MR. MILLER: I agree with Brother Herr in every respect; but I don't agree with the other gentlemen who say that we should not tell the boy or girl they have enough. Those gentlemen know
that the cooking is good and they eat too much themselves for their own good, like the boy who said he had the stomach-ache. I say you ought to have the authority to say when they have enough. Of course when boys and girls come to the proper age that they know right from wrong, it is all right, but the little ones don't know when they have enough. How often have you seen mothers feed babes until they could not take anymore. I hold that to be wrong.

MR. HUTCHISON: I was raised in a large family and I am the runt. That is my idea. After we are grown up, it seems to me it is hard to do that with a child and I don't feel that I can do it because it is not in our make-up.

The SECRETARY: It has been my privilege to stretch my legs under the table of Brother Miller and, while he has ventured to say it is the right thing for the father to say to the child when he has enough, I want to tell you there is not any restraint placed on his family. I have happened there just about meal time. It is not because of any special restraint in Mr. Miller's family that he has given this paper. I want to say further, that I was in a large town of our Commonwealth sometime ago, spending the evening with one of the principal physicians of the place. He had a professional call but did not want to go. I was there and he was expecting another and he had a friend whom he called on the 'phone and asked whether he would make that professional visit for him. Afterwards he came and reported to the doctor and the doctor asked what he found to be the matter; he replied, "A child was sick." "What was the trouble?" "Well," he says, "the patient is a child about six months old. The trouble is indigestion; there is a very vigorous, healthy mother and the child is being nursed and I learned that she allowed the child to nurse whenever and as much as it desired; there is some inflammation of the stomach and bowels attending this indigestion, which was brought about by the overfeeding of this child." That led to a discussion between the physicians, and the doctor whom I was visiting said, he had had a number of children afflicted in the same way. I remember that many a time when I was a boy and would come to the sugar-kettle my mother would say to me, after I had eaten about as much as a boy could eat: "Now, it is time to quit, you have had enough." I am very thankful that that restraint was put on me and I am glad to say that I have never been troubled with dyspepsia. I have no knowledge of being in bed a day sick since I was a babe, which is doubtless owing to being careful in my eating.

MR. RODGERS: It seems strange to me that these men who get up to talk about how much to eat and what to eat are all big fat men. Now if it was Clark and such men of that size they might
tell us; but my friend Hutchison, Northup and Father Herr have all talked about it. I think our inward feelings will show us when we have enough and we can generally stop. I want to say if you send out bulletins to the people of Pennsylvania, instructing them how to cook, my wife and the wife of the Deputy Secretary of Agriculture would say: "We know what to cook and how to cook it." I have traveled through the State and I want to say that they cook things well all over the country, and that farmers' wives are good cooks, as a general thing. All over the Western states, and everyplace you go, you will hear the expression where you happen to be at mealtime: "I hardly know what to cook for that man, he is from the State of Pennsylvania and the women of Pennsylvania, they say, are the best cooks in the world." I think the cooking of Pennsylvania women is all right and if Mr. Hutchison don't know when he has enough some one sitting at the table next to him can tramp on his toes.

MR. WOODWARD: The subject is of most intense interest to me. I spent some time on last Sunday reading an article, in the February number of The Century, written by Dr. Tracy, of New York, under the title, "How to Live Long," and no matter how well our wives cook, and the Secretary will bear me out that I have a wife who knows how to cook, yet this article appeals to every man and woman how to eat and what to eat. I think if you would expend thirty-five cents in the purchase of that magazine in order to read that article, it would be money well spent.

MR. CLARK: I don't want to talk on the food question, but I would like to speak on the paper read by Mr. Rodgers, on electric railroads and telephone companies. I was very much pleased with the ideas he suggested of the trolley line and its use to the agricultural interests of the State. While his talk was almost entirely confined to the trolley line, we find the question reaches out to the telephone line also. I don't believe there is any one thing that will be as much benefit to the farmers in general as good telephone lines throughout the country. My attention was called, particularly, to this in the West, especially in Iowa, where the telephone lines reach almost every farm home. I have a friend engaged in buying hogs for a Des Moines packing company and he had taken some hogs to market and I said: "How many hogs did you take to the market?" He replied, "I took in five car loads." I added, "When did you buy them?" And he said, "I bought them last evening." I asked, "You did not ride over the country and hunt them up?" And he replied, "No, what one farmer knows they all know. I called upon the 'phone John Smith and asked him how many hogs have you for the market in morning, and he called to a neighbor and he asked him
how many hogs he had, and he says, 'a car load in the morning?" I asked, "Don't you say anything about the price?" He said: "They know the price of hogs, there is no use to speak of that. The man at the end of the line keeps posted and what one knows they all know."

This seems to be a great advantage that we do not have in this State. I know in our county we have quite a number of telephone lines but they are not within reach of the farmer. We must go into the towns and cities in order to use them. To illustrate: About four of us, a year ago, had a car load of wheat and we were watching the prices and one of the parties happened at the telephone in the morning and was talking to the party that bought it and he telephoned to him that the wheat was shrinking, and he had better sell it. He says: "The wheat is on the siding and if you are willing I will let it go." He remarked: "I can pay you so much to-morrow morning and after that I can't pay within ten cents as much." That would have been ninety dollars less, and that man had he not been at the 'phone, there would have been a loss of ninety dollars and a local 'phone would not have cost more than that.

I don't know anything to-day that would be of greater advantage to the farmer. I don't know of any other means that would unite the farmers so well in a business way, and otherwise, than to have a net-work of telephone lines throughout the farming community. The farmers themselves could erect their own lines and I think there would be no trouble to exchange communication with the general telephone lines throughout the State. It seems to me that it is a matter in which there should be much needed legislation with reference to the setting of poles by these telephone companies. Of course farmers could set the poles on their own lands without any trouble; but we are annoyed with the companies who have charters and set their poles on our lands at places where we do not want them set. We have a decision handed down by Judge Beaver, of the Superior Court, concerning them, and this we don't like, therefore, it seems to me if we could use our own lines at a small outlay it would be a great benefit to us. We have two lines at my own home, the one within about one minute's walk to get to it and the other about two minutes walk and when they come to set my pole there, my farm runs about two hundred feet in the locality where they wanted to set them, and I said if you will not injure me and not tramp down my crops I won't object to your setting the poles, because it will be an advantage to our community; and I don't regret that I gave them the privilege without cost, because I believe it has been a benefit to the farm. My farm has been damaged to no extent at all.

That is all I have to say about that and I commend very highly
all that has been said along the line of the trolley railroad and
like every suggestion that has been made and hope that every-
thing can be carried out in our Legislature that will be proposed
in the interest of better conditions in that direction. I hope we can
go to the Legislature with one mind. I am certain that the farmers
are not all of one mind with reference to giving the trolley lines the
right of eminent domain and I am sure we will never get it until
we are united on some solid ground.

A Member: I have been very much interested and pleased with
the talk of the gentlemen with reference to the telephone. I live
in the extreme end of Bradford county. We have in our township
a private telephone line; on this line there are something over one
hundred 'phones. This line is put up by private individuals, headed
by Mr. North, and he rents the 'phones on the Bell telephone line and
we are connected with them. We are connected with Wysox and
with a place in New York State and we have a very fine thing of it.
One of the gentlemen spoke about the buying and selling of hogs
by the use of the telephone; of course we don't raise them by the
car-load but we all raise them to sell and we are connected with
half a dozen different buyers and shippers on this telephone line
and it is not anything uncommon for these buyers to buy a car load
of hogs over the line, and only two weeks ago there was a man, who
lives a little above me and handles stock and ships it to Orange coun-
ty, New York, and he called up a few of us and wanted to know
whether we wanted to buy corn, and some of us manifesting a desire
to do so, in a few days he had a car-load of corn on the siding ready
for distribution to those who had ordered it. By taking a little pains
you will be surprised to find out how cheaply you can put up a tele-
phone line.

MR. McHENRY: I heartily concur with the paper that was
read. It is this telephone line that interests me. I would like
to ask the farmers here, why will you make such an effort to have
your farms interlaced all over with telephone lines that you have
to pay to different companies for talking over, sufficient to make for-
tunes for companies, when you can do it yourselves. In our county
we have about one-half of the county covered with the farmer's
telephone. They put it up themselves and they are managed by
our own people. We have a switch-board in the county seat by
which we ran our own line that extends into the two adjoining coun-
ties. We expect to connect with the adjoining counties in the
near future. We have about four hundred 'phones.

There is one thing I am proud to say to-night. I am living to see,
what some of the grangers predicted twenty-five years ago, that
they have something now throughout the farming districts that the
farmer need not go out of doors to speak to his neighbor on any subject—they can do so by ‘phone. We formed a company in sections of about five miles and we united all those sections and chartered a company and made shares of stock about what we expected it would take to wire the lines that are running along the line. Then each man living near the line is simply at the expense of putting in his own ‘phone, in addition to what it would cost for a share. It was nothing more than for his ‘phone and what wire it took to wire to the main line. If he lived a mile off it was that much more to pay for. I think it is one of the grandest things we have in connection with our farming operations. In connection with the trolley line system the farmer wants the telephone line. Those are the two things that we should work for and get and make use of to-day. We want the trolley line to have the authority to carry freight, and all those things we want as well as the telephone system.

While I have the floor I would like to ask Brother Hutchison something about the water supply question, which he spoke about. Are you certain that drilled wells would supply the city of Harrisburg?

MR. HUTCHISON: There should be a number of drilled wells, not just one, and I think a sufficient supply could be obtained.

MR. McHENRY: I want to give you our experience in Indiana county. We had originally drilled a well for oil or gas near the town and did not get that but got some of the finest water that existed anywhere, which was almost equal to Centre county water and, with a view of supplying water in large quantities, a water company went to work and drilled two more wells and they kept on drilling wells until they had nine to eleven wells, and with all these they found they could not keep up the supply that was desired. They found that the increased number of wells did not increase the amount of water proportionately. How soon do you strike the salt?

MR. HUTCHISON: I am not in the salt business and, therefore, cannot give you the particulars, but I feel a great interest in this question and hope it will be agitated in order that pure water may be secured.

MR. McHENRY: In places in Indiana county, I think it would be about 1,300 feet to get water; I would not be positive that that is correct but I merely mentioned this as being our experience.

The food question has also greatly interested me and a good illustration is afforded in the raising of cattle, because when we start to raise a calf, a hog, or anything of that kind, we don’t shut
it off but let it have all it wants. Another thought came to my mind, when that good paper suggested that the head of the family tell each child when it had enough; I just thought what a time I would have doing that.

MR. KAHLER: I raised a pretty large family and I was always more interested in what I had to feed my family than in anything else. I wish to state a little incident: A number of years ago I sent my boy over to see his uncle, and he was a kind old fellow, and after he sat down to eat at one of their meals, every once in a while he would reach over and put something on the boy's plate, and after while the boy began to cry. The uncle asked: "Benny, what's the matter?" He said: "I can't eat all this stuff." I think, as a rule, it is well to educate them what is best for them; but my heart is too weak to tell them not to eat any more. I think they will know themselves, if they are kindly spoken to, with reference to what is not good for them. Brother Herr spoke about sending out word to tell our wives what to cook and how to cook it. I don't know what his wife would say, but I know what my wife would say if anybody was to tell her how to cook.

MR. MILLER: In Somerset county we have about five hundred farmers who control their own 'phones. Our company has about 175 'phones alone and they talk about connecting with the rest. One of the great benefits derived from the line is the information we get from the weather bureau; every day we get reports about noon for the next day and you would be surprised how that helps us out. Even this cold winter it tells us about the condition of the weather and gives us notice about storms and bad weather and we are in the house and ready for it.

MR. MARTIN (Deputy Secretary): I have been especially interested in the discussion of the food question. I want to say that I suppose I have traveled up and down this State as frequently as anyone in the house, and I want to bear testimony to one thing, and that is, the wives and those who do the cooking in Pennsylvania need no apology for the quality of the food cooked; but if there should be any exception taken to it, it is this: Of the one million farmers in Pennsylvania, there is food enough cooked to supply another million. That is my conviction and, so far as the farmers' institutes are concerned relative to this question of domestic economy and the science of cooking, and all that, it is a little this way: We find that the difficulty of procuring persons versed in the chemistry of foods, is a very serious problem. In many places in which institutes were held, especially in one county, there was a school of domestic science and the teacher took her entire class to our
institute and there prepared foods and gave object lessons before
the institute in the preparation of them, and in almost all the
counties we have lessons in domestic science and economy along
this line; but the only exception we can possibly take in regard
to the cooking, that I know of, there is too much of it in variety
and quantity. This is no reflection upon anybody, but in many
places, if one-half were not cooked it would possibly be better for
the people.

MR. HERR: I would like to say one word, in answer to the words
spoken reflecting on my remarks with reference to eating. I never
knew before that a man had to be married to a woman to know
whether she was a good cook or not. I suppose his appetite would
not be changed; that he would have the same judgment on cook-
ing whether he was a married or a single man. I am willing to
testify from my knowledge, that Pennsylvania cooks are the best
cooks in the world and I am here to testify also that they are not
as good as they might be. I believe half of the things cooked are
wasted and I believe it is very important to give instructions in
our institutes along that line. The idea of children knowing when
they have eaten enough I think is unlikely in most cases. Chil-
dren ought to be instructed by their parents because I know
some who are older than children who don’t know how to eat and
that is the reason they look so lean and long drawn out. Such
men as the railroad men and others are the dyspeptics of the
country, not because they eat too much but because they eat too
fast. I do say it is a very important matter. I know this much,
that a good cook can command almost any salary at our restaurants
or hotels, and I don’t think there is any science that we are trying
to learn that is of more importance and requires more knowledge
than cookery.

DR. CONARD: I am afraid if the head of the family is to
decide the amount of food a growing boy is to eat, it would not be
very satisfactory and might create a great deal of trouble, and
I think that boy would be glad when the old man was away from
home. I remember myself of an experience I shall never forget:
I sat along side of a boy, in my young days, and I think if I would
have told him when he had enough he would have eaten just
about half what he did. But I think if we would give them some-
thing to eat oftener, in the middle of the forenoon or afternoon,
I believe it would be an improvement. We cannot measure his
demands by our own appetites. I think it is very opportune to
discuss this matter before the institute workers because I don’t
believe there is anything that will create more discussion than to
go around to institutes and eat rather than starve to death by
eating too little. I spent a week in Brother McGowan's county about a year ago and I never had such a time in my life eating. There is where they have pound cake, sponge cake, layer cake and buckwheat cakes for breakfast and I never had such a time eating cake in all my experience. I will have to tell you a story about a little boy eating at the table: They had cherry pudding and this little fellow could eat and eat and went on and eat and one day he had as much cherry pudding as he could get away with and he went out and straightened himself up and said: "My! I wish I was all belly."

MR. STOUT: I had not intended to get up but I thought it was about time to rise in self-defense. I happened to come from a very impoverished section of our State. Schuylkill county is not known as a very thriving agricultural county and that is why I am so lank and lean; but in traveling around among farmers I think I can always pick out the farmer, the actual farmer, from his appearance. Whenever I see one of those corpulent, fat men, I come to the conclusion that he does his farming by proxy, or is one of those farmers that farms other farmers.

MR. FENSTEMAKER: I remember when Dr. Barnes was a member of this Board he employed Mrs. Rohrer, the famous cook, to speak at Cooperstown institute, and our wives were very anxious to hear her, and when Dr. Barnes introduced her he said he took great pride in the fact on account of her reputation and ability as a cook. She did not say a word about cooking or baking but spoke about the well-fed man and also spoke about the bulls and bears of Wall Street and how well they ate.

MR. PERHAM: I wish to say a word about the telephone. If three or four got together to build a telephone they will be surprised to see how fast it grows. We have now six hundred and the only difficulty is to keep the farmers off of it because it gets so heavy we can't use it. The revenues received from it pay to keep it up; we are assessed two dollars a year, which pays for keeping up the line. They own their own stock. We started out with selling stock at ten dollars a share and now it is worth thirty dollars.

A Member: What is the cost for the service?

MR. PERHAM: Two dollars a year. We have six or seven centrals and it is growing very rapidly.

A Member: Do I understand the gentleman that the two dollars covers the expense of 'phoning, or the expense of keeping it in repair. I would like to know what it really costs these people?

MR. MILLER: I had that 'phone four years and it did not cost me five cents.
MR. HUTCHISON: Who kept up the expenses?

MR. MILLER: I am manager of the line. We charge outside people for talking over the line five cents on one section, ten cents on two sections and fifteen cents on three sections. Then we charge two cents switch fees for the members of the company coming through the switch. If you talk through the switch you have a right to pay for talking through it and that keeps up our switch expenses. If you have built your line properly and secured it with lightning arresters you will have no trouble from lightning. There has not been one 'phone knocked out on our line; the lightning runs down to the ground by having the lightning arresters. Our telephone is a mutual farmers' line and we have thirty farmers on one line.

MR. HUTCHISON: Do you talk to Altoona?

MR. MILLER: No, sir; only through the county, but we can talk any distance we wish. We have the long distance 'phone.

MR. McGOWAN: How many 'phones are you able to carry on one line?

MR. MILLER: Forty parties and it gives satisfaction. You can ring up anybody.

MR. McGOWAN: Just a question, that might be a little out of the family: How many are listening?

MR. MILLER: Everybody. That is where you get your news.

MR. McHENRY: We have decided just lately on our line that we will not try to carry over fifteen 'phones on one wire.

MR. MILLER: We have the metallic system—two wires.

MR. McHENRY: We don't propose to carry over fifteen 'phones on any one wire but we will add more wires on our poles. The way we get rid of the trouble is, we put up an extra line, that is, a public line and that is our pay-line, which is not connected.

MR. MILLER: It is called a trunk line?

MR. McHENRY: Yes, sir; it is not connected with the local line.

MR. MILLER: We do that.

MR. McHENRY: If I have any business that I don't want my neighbors to know I call him up on the local 'phone and have him come to the nearest point on the other line and we can talk there.
MR. RODGERS: I want to make an apology. I was on the program to write on the telephone, but at the executive committee meeting it was suggested that we were to be short and I did not mention it and at the hotel, in the presence of Brother Holman, I destroyed it.

The following resolution, relative to the employment of a stenographer and typewriter in the office of the Economic Zoologist, was offered by Mr. McGowan:

"Whereas, We have learned that the office of the Economic Zoologist is not regularly equipped with a stenographer, and as it is very important that we as practical producers be supplied with full and complete information from this important office, both by personal correspondence and its publications; therefore, be it

"Resolved, That we, the members of the State Board of Agriculture of Pennsylvania, do hereby respectfully request the Governor of this Commonwealth, and the Secretary of Agriculture to aid us by providing at once means for the employment of a stenographer and a scientific assistant for the office of the Economic Zoologist, until the next session of the Legislature, when proper appropriation for the same should be made. We ask this for the sake of receiving the full benefit of the efficient work of this important office."

MR. McGOWAN: I fully endorse this resolution and am heartily in favor of it. I am of the conviction that it is very deserving. The Governor stated this afternoon that the Economic Zoologist is burning the midnight oil for our interests. I, therefore, move its adoption.

MR. WOODWARD: I second this motion. I know the man is being thoroughly overworked in his desire to do his full duty to the people throughout the State. The time has never been in the State of Pennsylvania in which the matters of which his Department treats have been of such vital interest as they are to-day. In the last three months I have had my attention brought to the fact that unless something was done the farmers could not furnish their own fruit but that it must be raised by specialists and the farmers must buy their fruit from these commercial men who make a specialty of it. I know the Divisions of the Department are doing their very best in every direction. I know the head of the Department is doing his best to sustain those Divisions; but it seems to me that this is of vital importance to us to-day. The development of fruit growing is going to make such a demand for the destruction of those pestiferous pests and I know Prof. Surface is overworked. I know of it of my own knowledge and I stand here to-day to testify that I never heard the Governor of Pennsylvania make a speech that the farmers should appreciate more than that made by him to-day. The whole State is getting this information and they are writing hundreds and hundreds of letters and it is impossible,
with his own hands, to do that work without the assistance of competent assistants. I could not be here to-day if it was not for the assistants I have in the work I have to do. Let us give a unanimous vote for this resolution in order that we may have more thorough and a more complete knowledge of this subject, unless we are going to yield to the insects and be eaten up by them.

The SECRETARY: Before this vote is taken I desire to say a word, and that is, there is no one who is better acquainted with the situation than myself. I know Prof. Surface is a very hard worked man and I know he ought to have more help than he has. I don't know what the Governor will be able to do. You know what a difficult thing it is for a public officer to take funds, appropriated for some specific purpose and use them in some other direction. I am ready to do anything in my power, and Prof. Surface will bear me out, that I have done everything that I could do. It is an exceedingly difficult matter for a public officer, who has charge of public funds, to pervert the funds appropriated to one use to another object.

MR. WOODWARD: It was because I knew that the Secretary was trying to do his work, and doing it well, that I seconded the resolution in order to give him backing. The Governor said to-day: "If you feel you need help in any way I want you to let me know." It seems to me that the Secretary and Governor can give us support in this direction. It was because I knew the Secretary's willingness to carry this out that I made the strong plea I did, which I am sure he will appreciate. He has a difficult task to perform, I know that, and every public official recognizes that fact.

COL. DEMMING: I think I have heard every important address made by the Governor before the State Board of Agriculture since its establishment, but I never heard an address to this organization that had more meat in it than that given to us just before adjournment. The Governor referred to the very efficient work of Prof. Surface. I believe he is the right man in the right place and he ought to be supported by every possible means, and I believe the Governor can provide some way by which this employment can be provided for out of some contingent fund. Here is a question we must meet, the San José Scale, and it will do more injury than typhoid fever in one or two months and I think the Governor will be able to provide some means to meet this very urgent question.

The motion being put, it was agreed to.

MR. HERR: Since we last met, Mr. Murray has died. I don't know of any others. I move that a memorial committee be appointed to draft resolutions with respect to the members who died last year.
MR. RODGERS: I second the motion.

The motion being put, it was agreed to.

The CHAIRMAN: I appoint Messrs. Herr, Stout and Clark as such committee.

On motion, adjourned at 10.10 P. M.

MORNING SESSION.

Thursday Morning, January 28, 1904.

The Board met at 9 o'clock A. M., with Hon. Jason Sexton in the chair.

MR. HUTCHISON: I desire to offer a resolution before proceeding with the regular order of business.

The resolution read by Mr. Hutchison was relative to Col. Thomas J. Edge, and is as follows:

"Whereas, We have heard with sincere regret of the accident that has recently befallen the former Secretary of this Board, and Secretary of the Department, Col. Thomas J. Edge, of this city; therefore, be it

"Resolved, That we, the members of the State Board of Agriculture, in annual session assembled, do hereby extend our sympathy in his misfortune and express our hope for his early recovery.

"Resolved, That the Secretary of this Board be requested to transmit to Col. Edge a copy of said resolution."

MR. HUTCHISON: I move the adoption of the resolution.

The motion being seconded, it was agreed to.

The CHAIRMAN: There was a paper left over from yesterday, that of Mr. Temple, on the subject of poultry. We will now hear the paper read.

The following paper was then read by Mr. Temple:

REPORT OF THE COMMITTEE ON POULTRY.

By Norris G. Temple. Chairman.

As the years roll by the breeder of poultry finds demands increasing, prices advancing, and all markets short on high grade stock. In years gone by many a time have we heard these remarks: "Your poultry business will soon be overdone and our markets glutted,
incubators will hatch them by the thousands and you will have more than can be sold." It would seem that facts are stubborn things and our demands are greater to-day than ever and none need fear to exert their best efforts to the production of more and better poultry. The true fancier is a market poultryman and many a market poultryman makes a great mistake by not breeding fine-bred poultry, carefully and scientifically mating for best results, selecting only his best for breeding purposes, and advertising and selling for breeding only such birds as he himself would yard. The condition of the poultry industry in the State of Pennsylvania and throughout a greater part of the Middle and Eastern states the past year has been favorable. Owing to the great quantity of rain in the hatching season much of the young stock was hurt, yet with it all that which was successfully reared when placed on the market has brought, owing to the prevailing high prices, profitable returns to those engaged in growing poultry, either for market or breeding purposes. Eggs at from forty to sixty cents a dozen demonstrates clearly that the hen is not too plentiful.

We do not care to go into statistics farther than to say that if all fowls and eggs produced in every way were listed it would show a value of over five hundred million dollars to the credit of the poultry interest, annually. Even with this vast product the markets are seldom, if ever, overcrowded and there is always a strong demand for the better grades of all kinds of poultry. In fact, at no time in the history of poultry would high-class exhibition fowls sell so well as now, and never before was there such a demand for the better grades of dressed poultry and freshly laid eggs at prices far above former values.

The scarcity of turkeys the past season has led me to offer a few suggestions along the line of profitable turkey raising. The turkey is, without question, the most favored or sought after as a table delicacy during the winter months. All over the world it has the place of honor at special-day feasts; no other kind of poultry has or will demand the prices paid for the best turkeys. Game birds may sell at higher prices, but no domestic fowls can out-class them, and since the broiled poult has become a favored dish in our larger hotels and restaurants the constant use of turkeys the whole year around has increased the demand so much as to make it necessary for an increased product to supply the demand.

We have been surprised many times to see breeders sell off their largest and best birds on the market, and a very large per cent. of those who attempt to raise turkeys are doing this year after year, and keeping the small birds for breeding, thus they are killing the goose that lays the golden egg. In buying a gobbler or hens, to change the blood, they choose late-hatched, immature birds be-
cause they cost less. They sometimes reason that young hens commence laying sooner and do not steal their nests out as bad as old hens, not once thinking that two-year old hens or older give stronger poults and are much easier raised, and will, therefore, raise much larger per cent. than those hatched from poor and immature stock, not saying anything of the excess of weight you would get. This practice is not confined to the poor and least intelligent people, as would be expected, but on the other hand is followed by those well informed and who appreciate and pay long prices for horses, cattle and sheep that are bred in the blue. If such a course was pursued in this stock and followed up very long the best stock in existence would be ruined in a few generations.

To breed from poor or immature specimens is a violation of one of the first laws of breeding. Selection of the best for generations has given us the improved and most profitable breeds of stock. The hereditary influence of such selections is of great value. The most inferior bird out of such a flock of blood-lines may "throw back" and breed very fine stock and do better than a much finer bird from a haphazard breed strain. But the repeated selection of inferior birds for a number of generations makes this inferiority hereditary. The future of the flock depends almost entirely on the parent stock or its ancestry. If valuable birds are used in the breeding, their off-spring will be like them and will amply repay for all your expense and trouble. The best are the cheapest and are none too good.

**BREEDING STOCK, ETC.**

In the selection of breeding stock one should aim to use those birds that are fully matured, as from such the young stock will be of large size and greater vigor than from young and immature birds. A cock of from two to four years of age, with hens of from one to three years of age will give excellent results, much better, as a general thing, than from younger stock. Turkeys will often breed well up to five and six years of age. One should not look for excessive weight in breeding stock, but rather for good-sized frame and vigorous constitution. An over-fat bird is seldom a good breeder. One male bird is sufficient for 4 to 6 females, the number varying somewhat according to the vigor of the male bird. Turkeys do not bear confinement well and require plenty of range and are, therefore, more easily raised on farms than when the range is limited to small enclosures. On a farm they will range at will and pick up much of their living and utilize much that would otherwise go to waste.

Turkey chicks are very delicate and tender for the first six weeks or two months of their existence up until the time they begin
to “shoot the red” as it is termed, which is the development of the red protuberances upon the neck and throat. After this time they become hardy and vigorous and will stand almost any condition of climate, but up until that time care must be exercised to keep them from setting damp or chilled; they will not stand the effects of a heavy rain-storm, and damp quarters are almost certain to prove fatal to them. If their quarters are dry and comfortable and they are not allowed to remain out in rain-storms, they will get along very well. Their first feed should be hard boiled eggs, at least for the first day or two, and then mix in some green food, of which dandelion leaves are the best that can be given them. Also milk curd, squeezed dry, and after two or three days barley meal or bread crumbs may be added to the boiled egg feed, little at a time, but feed often.

Where chicks run at large they will select their own green food, but when confined, chopped onions or dandelion leaves will be good for them. (They must be kept dry, as dampness is fatal to them until they have passed the tender age, after which time they are the most hardy of chicks and will stand any kind of weather without apparent harm.) The most critical time is the first two months of their lives and during that time they must have the care and attention necessary to pull them through, after which they will be able to look after themselves so far as the weather is concerned.

We have found a pen 16 feet square made of boards one foot wide very desirable to put the coop in containing the young turkeys. This, if moved twice each week, gives to your flock fresh ground without too much traveling for your young stock, which at the start is a very important feature toward success.

Taking all in all, the past year has been by far the greatest and most important one in the history of the poultry business. But while this is an opportune time for reviewing the work of the past year, it is more fitting, and more pleasant, to look to the new year. What will the new year bring? Can we not say it truthfully and honestly, and seriously, that whatever the new year brings to us it will be largely the result of our own efforts. We should then resolve to make our new year a profitable as well as a pleasant one, and include in the resolution the provisions that if the year in advance of us does not meet all our anticipations it will not be our fault or for lack of effort on our part. Our lives are largely what we make them, and while circumstances and environment each have their part to play, our own individual efforts for the most part direct our fortunes.

Providence has been very kind to us during the past year, and every indication points to a rich and fruitful year ahead of us.
Let us look favorably upon the new year, and make it one of great achievement and progress in our own individual lives, in our own work, in our own poultry yards, and in whatever will uplift and make brighter and more useful those things which are given to our care.

COL. DEMMING: Is there no report from the Geologist of the Board?

The SECRETARY: There has been none handed in.

The CHAIRMAN: We will now take up the first paper on the program, entitled, "A Broader View," by Mr. H. V. White, of Bloomsburg, Pa.

MR. WHITE: When asked to furnish a paper for this meeting I replied to the Secretary that I had little time for the preparation of a paper that would interest men actively engaged in the pursuit of agriculture and had opportunities for securing information along the lines that they were working, but at his request, I agreed to make some suggestions for a "Broader View" and will offer them now, in the hope that what I may say will bring from each of you an opinion that may be beneficial in the future.

Mr. White then read the following paper:

A BROADER VIEW.

BY H. V. WHITE, Bloomsburg, Pa

There certainly has been no period in the history of nations when a people could point with such commendable pride to results achieved in all lines of progress as can the American people in reviewing the year just passed. All through the year the eyes of the world have been turned toward us, keenly observing our treatment of other nations in matters commercial and political, and scanning the methods employed in the governing of our family at home. The public has hissed and applauded, the press has passed judgment on men and methods, and the country has maintained a steady growth and improvement most encouraging and gratifying.

Not one, but many and diversified have been the interests demanding the attention of our people. The steel trust, the Panama question, cotton and grain prices, the boll weevil, and the San José Scale; yet the equilibrium of the public mind has been well preserved and the real condition has been one of satisfaction and prosperity.
Some one has well said: "Anxiety in the Wall Street center of gambling has not been too seriously received by the world at large. We have ceased to frighten the industrial world abroad as much as we did a year ago, but we are still high on the top of the tidal wave of prosperity and good luck, and there are no signs of darker fortune." With these facts patent to-day the blood warms and a genial feeling prevails everywhere making life brighter and better, physically and morally, as well as commercially.

It is true we have had a bitter clash between capital and labor and many, if not all of us, have felt the results of the anthracite coal strike in our own Commonwealth; yet we are inclined to the opinion that there has been reached an understanding between the employer and the employed that will result in vastly improved conditions in the future. Labor received vastly more money in the last half of 1903 than the most sanguine worker had ever dreamed of, and it had a decidedly beneficial and cheering effect. It brought comfort and plenty to homes that never knew the meaning of these terms and with these conditions came information and knowledge. Labor is prepared to deal more intelligently and fairly, and the chances for strikes and misunderstandings have been reduced to a minimum.

Perhaps no branch of industry has felt the pulsation of prosperity more than agriculture. Crops have been good, prices have been well maintained, mortgages have been lifted, and the farmer stands to-day independent and justly proud of his position. He is beginning to see the world in a new and a brighter light. He has come to have greater confidence in his fellow-man and has decided that his children shall be given an opportunity to know and enjoy more than he. That old saw, "What is good enough for father is good enough for son" has been buried down deep. The light of progress has dawned upon the country home as never before and verified the oft-repeated prophecy that in the rural home is nurtured the brain and brawn that is capable of directing the affairs of commerce and of State, and the fathers have seen the handwriting. They are giving more attention to the education of the sons and daughters. They are studying economics and planning their work as never before.

They are investigating and making research along lines largely or totally neglected in the past. They are claiming their rights with an assurance bred of knowledge, and their demands are being recognized as well-founded. They are joining hands and putting up a united front that commands attention. They are looking into the future and planning as farmers never planned in the past. Nor are they arrogant or boastful in all this. On the contrary, their demands are made with the feeling that they are asking for only a
portion of their inheritance and the humble assurance that it will be granted without question. This was demonstrated most admirably in the passing of the bill by our last Legislature granting the appropriation for the agricultural building at our State College. When the Allied Agricultural Associations put their shoulder to the wheel the van moved, and it will move again whenever the farmers of the State find necessity for it. This is not the time nor place to halt. With each point gained there is an obligation attached—a debt incurred. Everytime we reach out we gather up a load. This being true, it is intensely important that we make no mistake in our movements. We must have an advance guard—a pilot. Just as our financiers look to Wall Street to list the "digested" and "undigested" securities and pay well for services, so can and should our farmers look to our State College and Experiment Station for aid and counsel and give them their undivided support in return.

Perhaps nothing has been more gratifying to those of us who have been attending the meetings of the State Board for years past than the steady development of sentiment on the part of its members in favor of a closer relation to our State College. That such a condition would prove mutually profitable has been apparent to many and that every test has proven a success must certainly be an inspiration to those undecided. The action taken on the several subjects in this relation at this meeting, inspires the belief that we have all been giving thought to the methods to be employed to secure the most good for the future and have unanimously decided that by making "a long pull and a strong pull, and a pull all together" much good will surely accrue to the cause of agriculture in our State.

When we listened to our old leader, Prof. John Hamilton, the Institute Specialist of the United States, and heard his report of the work done in agricultural education in Canada and the West and the great good that was being accomplished by the up-to-date methods they employed, we all experienced a feeling of glad satisfaction that we had received instruction and training from one so able and willing and interested, and that he was still one of us, just as interested and willing and much more able to help than while his efforts and talents were limited to the confines of our Commonwealth. His reports should stimulate and inspire us to emulate our neighbors and fill us with a determination to place our work on an equality, at least, with that of any state in the Union. It can be done. Will we do it? I believe we will if we have the proper support.

Our Farmers' Institute work has permeated the length and breadth of our Commonwealth and carried untold blessings to thousands of homes. The methods adopted, originally, have served their
purpose and served it well, but, through the information thus disseminated, the people have, of necessity, made advances along all lines and they now demand more and better instruction. It will no longer do to take the progressive farmer over from one district or country into adjoining territory to instruct his brother farmer. Both have been studying from the same sources and what the one wants to know the other has failed to learn. The demand is not for more but better instruction. The call is for scientific instruction. (Just what was repudiated five years ago.) Farmers have reached the position where they can make the application if they have the approved method. That we have most able and excellent instructors on the institute force goes without question. That we need more of this class is equally patent. That the farmer is ready to use his influence to aid in securing this is just as true. The suggestion made yesterday by our most worthy Deputy Secretary, Mr. Martin, that a week of normal instruction be given the instructors preparatory for next winter's work was most excellent and timely and much good is certain to accrue. This summer or fall meeting, if carried forward on the plans outlined by Mr. Martin, will certainly prove a long stride in the right direction and we all hail its announcement with unmingled pleasure.

There is one class intimately connected with this work that has been obliged to see the bright side by climbing up and peeping over and doing it at their own risk and expense. They may not be scientists. They need not be classical men. They must be workers and managers. I refer to the local county chairmen, generally members of the State Board of Agriculture. About the only function of this Board to-day is to attend the annual meeting at their own expense to receive instruction to take home to our respective counties and disseminate without compensation. The chairman who will make his institutes a success must begin his work in June and keep it up in a quiet but persistent way for the next six months, and then give a solid week at the meeting, driving, possibly, a hundred miles over all sorts of roads and in uncertain weather. For the next six months he is plied with questions by telephone and by mail, each demanding an intelligent answer, and all for love of the cause with thirteen millions of dollars in the State Treasury. There may have been a time when such sacrifice on the part of the members of this Board was necessary and commendable, but to continue this practice under existing circumstances is questionable policy. The State is sending out men to assure the farmer that he cannot expect his boy to do good work and be loyal if he does not grant him remuneration, and at the same time it is asking the members of this Board to be loyal, faithful and industrious, but refuses them compensation or recognition. The hobo is paid to
break stones on the roads. The school teacher gets $35.00 per month by law. "The laborer is worthy of his hire." We are all taking "A Broader View." What view will the Department take?

PROF. SURFACE: As a rule I stay within my own field, that of pathology, but when we hear a paper of this kind read I desire to say a few words. I wish to state that the value of the farmer is recognized today as it has never been before. I want a few words to prove that. Last summer when Wall Street circles were agitated and finances were weakened they sent out a committee to investigate the crops of the farmer, they did not go to the copper mines and the coal mines to investigate the conditions there, but they went among the farmers in order to ascertain the condition of the crops, and it was on that report that the finances of Wall Street were strengthened, because that committee reported that the farmers had prospects of a good farm crop and a good fruit crop and stocks went up five and ten per cent. As was said in the National Stockman, three or four weeks ago, the farmers' institute of ten years ago, that had been successful would not be a successful institute today because the farmer has become educated above that of ten years ago; the man who was a teacher at the institute then would not be tolerated today. Just as was said by the Governor yesterday, it is the man who can make two stalks grow where one used to grow that is the successful farmer of today. It means that the farmers are the great source of products on which we are depending. I believe that the toil of the farmer and the brain forces that are exercised in conducting his work are the greatest resources we have. If we had a balance cast up between England and America, America would owe England eighteen hundred and some million dollars, if it was based outside of agricultural productions; but when agriculture is left in, it makes England owe America fourteen thousand and some million dollars. I am in hearty sympathy with the suggestions as to appropriations that should be asked for, as indicated in this paper. I believe the prospects of the country lie, not in the man that owns stocks and bonds and stocks in the copper mines and coal mines, but it lies in the man that tills the soil.

MR. HERR: A thought occurred to me during the reading of the paper by my friend White concerning the work we did yesterday. I am convinced that it would be wise to leave the time of fixing that institute with the Deputy Secretary. We fixed it for the month of October and sort of limited it to that month and with a view of leaving to him. I would like to reconsider that action of yesterday, therefore, I move to reconsider in order to fix the time for the meeting.
MR. HUTCHISON: I second the motion.

The motion being put, it was carried.

MR. HERR: I move to strike out the word "October" and leave that to the discretion of the Deputy Secretary.

MR. HUTCHISON: I second the motion.

MR. TEMPLE: At the meeting of the Allied Organizations didn't we name the time as October?

The CHAIRMAN: I am not certain as to that.

MR. TEMPLE: I think that is the time the building is to be dedicated, according to a statement of Dr. Armsby, after communicating with Dr. Atherton.

MR. WOODWARD: The time for the dedication of that building can be arranged at a time that will suit this Board. The building will be ready for dedication on the 1st of May and any time after that, for its dedication, will be convenient to the Board of Trustees.

The motion being put, it was carried.

The CHAIRMAN: The next subject on the program is, "Specialties in Farming," by Mr. Henry W. Northup.

(Not present).

MR. HERR: I have a report to make as chairman of the Committee on Memorials.

The report was read by Mr. Herr and is as follows:

"Whereas, Death has removed from us, Joseph K. Murray, member of the Board from Montour county, therefore be it

"Resolved, That in his death this Board has lost an interested, earnest and valued member, whose active work and wise counsels in our body will be greatly missed, and one whose high Christian character was a worthy example to all of us.

"Resolved, That a copy of these resolutions be sent to the family of the deceased, and be also spread upon the minutes of the Board.

"J. A. HERR,
"W. H. STOUT,
"M. H. CLARK,
"Committee."

MR. HERR: I move the adoption of this report.

The motion being seconded, it was agreed to by a rising vote.

MR. Mcgowan: I beg leave to make an additional report as
chairman of the Committee on Credentials and report the name of Jacob S. Miller, of Somerset county. The credentials are regular and correct. I also ask the Secretary to make a little change in the Apiary Committee, in the report that was handed in yesterday. By agreement of the Committee we have handed in the name of J. W. Nelson in place of George C. Butz.

On motion, the report was accepted and placed on file.

MR. NELSON: I desire to offer the following resolution:

"In view of the fact that the interests of the bee-keepers of the State have not been considered by the Committee on Legislation, while other branches of agriculture have been protected by recommendations, and justly so, and while the apiary is threatened with destruction by contagious diseases from which most of our neighboring states are protected, therefore, be it

"Resolved, That we recommend that the Committee on Legislation be instructed to ask the passage of such laws that will give the bee-keepers the same protection as accorded to other branches of agriculture."

MR. HERR: I move that it be referred to the Committee on Legislation.

The motion being seconded, it was agreed to.

The CHAIRMAN: I see that Mr. Northup is now in and we call upon him to read his paper on "Specialties in Farming."

MR. NORTHUP: I thought I had better lay down this paper and speak extemporaneously, but I want to get home and was afraid I might talk too long. Therefore, I think I had better read it and not stroll away from the subject.

The paper read by Mr. Northup is as follows:

SPECIALTIES IN FARMING.

BY HENRY W. NORTHUP, GLENBURN, PA.

A man who is a genuine farmer is expected to produce the products that are grown on the farm, either in a special, or else, in a general way. The object in discussing this topic, is to know whether it is more desirable and profitable to grow a limited number of farm products, and to thoroughly qualify ourselves to do so, rather than to have a general understanding of our business, and try to grow
most everything. We will observe in the first place, that men who are specialists in all the professions of life, are usually the ones we consider masters of the situation. In the medical profession, there is an expert for the eye and the ear; another for the throat and the lungs; another who gives special attention to surgery; and then we have a fellow in the country districts we call doctor. He carries with him a little leather box over our country roads. He used to ride a horse, carry two saddle-bags, and have a little apothecary shop right along with him. He cures everything. He can administer chloroform. He can extract teeth. He can perform surgery. He can formulate a prescription, and fill it at once, for he has the material right at hand. He is the fellow that does a general business. But he does not get very rich at it, and his life is attended with many hardships.

In the law profession we have the judge of the court. We have the corporation lawyer. We have the real estate lawyer. We have the criminal lawyer. We have the special pleader at the bar, and the office lawyer and counselor. We have the district attorney. Then we have another fellow, we call him "petafogger." He does a general business. He looks after everyone's affairs. He is at hand in the justice of the peace's office when the first prosecutions take place; and then he goes into open court, where he can do a general business and spar with all the antagonists he can encounter. But he never gets very high on the roll of fame. He commences as petafogger, and he usually ends his life as one. We have another prominent profession. It is the Gospel ministry. We have specialists to do that sacred work. We have Doctors of Divinity. We have Ph. Ds. We have bishops. Then we have another fellow, they call a local preacher. He does a general business. He preaches a little; perhaps he farms a little; he may trade horses a little. But he has a hard lot of it. He works hard and lives poorly, while on the other hand the D. Ds. the Ph. Ds. and the bishops, are specialists. They have large salaries. They serve popular churches, and immense conferences. They dress in fine apparel and live on the good things in this world, and expect to, in the world which is to come. The profession of teacher runs abent in the same sphere. We have the president of the university of learning. We have the president of the college. We have the superintendent of public schools. We have the principal in our academies and high schools. We have the professors of languages, higher mathematics, music and the arts. These too are specialists, and their business pays. But there is another fellow, partially educated, who does a general business. He is the fellow who has a provisional certificate. He tries to teach a little while in the autumn and winter, and then in the summer he is a book agent, fertilizer agent or something of the
kind, and unless he can get out of that kind of a life, he will eventually die in the poorhouse.

Thus we see that men who prepare themselves to do special work, are the men who succeed in their business. Nearly every farmer is so located, or circumstances are such that he can do some things vastly better than he can do others. If growing grain and grass is the chief business, and a good market is found to consume them, then let the farmer bestow all of his energies in that direction, and make a success of furnishing those productions. He must look well to the fertility of his fields. He must be in readiness to top-dress his meadows. He must have the right kind of fertilizer for his grain fields. He must maintain the fertility of his soil, or that business will eventually prove a failure. If a farmer can haul a fine load of hay to the market, receive full value for the production, and then return a valuable load of manure to replace the fertility lost, he is certainly making a success of the business. His success also will be far greater by making the business a specialty. He can secure a better class of customers to purchase his hay. He can find a more ready sale for this article than his neighbor, who is mixed up with everything. His reputation for furnishing a good quality of hay is already established. His goods are already advertised, and it is one straight road to success, if he maintains his integrity. The dairymen who is a specialist, will get where his mixed-up neighbor can never reach him. He will have a better dairy farm. He will have a more convenient stock-barn, it will be better arranged. The water supply on his premises will be complete. He will be a man in the community that everybody knows. He will have a better class of farm help to assist him with his work, for he can afford to pay better wages, and he will have the means at hand to do so. He will be a far better judge of dairy cows, and he will get better prices and a more ready sale for his milk and butter. He devotes more time to the study of the business, as he is continually consulting scientific investigation. He can feed his animals with more intelligence. He can give them scientific rations, and there will be less loss in his business, than otherwise, where he is doing a little of most everything. The market gardener who devotes his entire time to the growing of truck, can do so far better than the man who is only dabbling in the business. He knows just what to plant, and then just how to care for it. He is familiar with all the diseases and drawbacks in the business. He knows full well that neglect will result in failure in the growth of his plants, and he is careful to give them timely attention. He understands the advantage of getting his products into the market early, before his neighbors get there. It means better prices and more ready sales. He knows very well that his large supply will take him
regularly to the market, and that means to a large extent, that he will almost, at the time, monopolize the business. He can furnish seeds and plants for his neighbor, for he grows them on a large scale, and has them in fine condition. Its a continual income for him, but an outgo for his neighbor; which is a decisive difference in the profits and always gratifying as he sees his dollars continually coming in.

He also has a large variety of products, and can furnish what his neighbor is utterly unable to do, so he has the preference with customers every time. The poultryman who makes a specialty of the business, can succeed vastly better than the farmer who conducts the affair with other branches of his business, in a slipshod way. The farmer with a multitude of cares, usually lets his poultry take care of themselves. They roost in the fruit trees, straggle over his gardens and scratch out the tiny plants in search of the earth-worms and insectiverous food. They live largely on grass, and the tender leaves of garden plants. They take care of the crop of garden peas as fast as they develop into palatable food. They are fond of stripping the leaves from beets and celery, and they take peculiar delight in appropriating the delicious strawberry to their own use. In fact, they destroy, on the premises of such a man, doing that kind of business, vastly more than they will ever be worth; and are kept at an actual loss. To the specialist they are an exceedingly profitable investment. They are given comfortable quarters. They are well-fed and cared for. They have separate apartments. They represent a family of choice birds, and they are an ornament to the farm. Their egg and meat production, aggregate an income to the farm larger in proportion to the investment, than anything else on the premises.

The same is true with the fruit grower who makes a specialty of his business. The general farmer puts out a few fruit trees, as he realizes that he will surely need an orchard, but he largely leaves them to take care of themselves. He is easily capitivated, as I perceive, with the string-fellow method of setting them, because that does not require so much work. He can clip off all the roots of young trees, make a hole in the ground with a bar, crowd them in and stamp down the earth around them, easier and much faster than could be done by digging out the earth, making a suitable hole, and then carefully placing the tree to live and grow for years to come. But this farmer is doing a general business, and he is crowded to get through with his vast amount of work. He usually lets the borer destroy about half of his young trees before he realizes what is taking place, and then he is quite apt to think that the soil is not adapted to fruit growing. What is the appearance of our orchards in Pennsylvania as we pass along our roads and see them on farms, where our farmers are doing a general business? The answer
is. They are very much neglected. The pruning and the spraying has not been done. The fruit cannot possibly be what it would have been if a specialist had been in possession of the orchard. There are fine orchards in Pennsylvania, but they are owned by men who are specialists, and take more than ordinary care of them.

The potato grower succeeds best as a specialist. If the general farmer is only growing them to fill up the measure of his time, have a home supply, and a few to sell, he will not be watchful enough to overcome the difficulties that encounter the business. The blight will not be promptly met by previous spraying. The growth of the tubers will be suddenly stopped, and decay and disaster will be the result, and consequently the crop, comparatively, will be a failure. Scab, another serious defect, will not be prevented; for time was too precious when they were planted, to stop to treat them with any solution. The variety may be very defective; for anything will do to plant with the farmer who has not given the business of potato growing special attention. Not so with the expert. He plants only the productive and best eating varieties. Its a smooth, white potato with him that is good enough to fill the requirement, and he will have it. Soil conditions with him must be made right, when the crop is planted. The fertility of the soil must be up to the standard. The cultivation must be constant, all weeds must be destroyed, and the soil moisture must be retained under all circumstances. Blight and the potato beetle are promptly met with sprayings, and the whole process is up-to-date, and a crop follows that is satisfactory and paying.

Thus we can see that successful farming is a special business. It requires special preparation, and is only thoroughly successful in the hands of the specialist. A man in his make-up is not calculated to do everything, and do it well. There is a possibility of trying to do too much. While it is not necessary to be a man of one idea, it is necessary that he understands what he is doing. If it is done with intelligence and forethought, it will in all probability be a complete success. A farmer can have two or three specialties in his business, and attend to them; but when he comes to spread everything over his premises, he will unnecessarily burden himself, and his profits will be comparatively small. George Washington, the Father of his Country, said: "Agriculture is the most healthful, most useful, most noble employment of man." He might have added with equal propriety, if he had said that the farmer is a specialist, and understands his business. The age in which we are living to-day is the most progressive period the world has ever known. It is equally true with agriculture. The time of plowing with a straight stick has past. The time of reaping with the sickle has gone by. The time of treading out the grain on the open threshing-floor
with the slow ox is tolerated no more. Our prairies are turned over by means of the steam plow. The sowing is accomplished by means of the drill. The harvester is called the great header; and the grain is harvested, cleaned and bagged by the same power, and garnered without any gleanings. We are a mighty people, but we are only here as the consequence of the brain power of the specialist. He planned the whole business, and carried it into successful operation. Manual power could never accomplish the mighty work, so necessity is indeed the mother of inventions. It will be a sad day in the history of our people, if the specialist ever steps aside, and the world tries to go on without him. But that will never happen, for he can not be dispensed with. He is needed not only in agriculture, but everywhere; in the household, on the farm, in all the business relations of life, and as a master leader at the head of the nation. Specialties stand forth like gems in a royal crown; they adorn and beautify nature, accomplish their work in general, and will continue to do so till time shall be no more.

MR. HERR: I would like to call attention simply to one thing with regard to specialties. It is pretty hard to confine institute work on specialties, yet we need them. These specialties ought to be presented more particularly to young people. It takes time to plant fruit trees and have them grow and live long enough to have a successful orchard. It is a matter that we ought to begin while we are young and grow up with them. It is hard to train an old mind. It is hard to get out these conceits that are deeply imbedded. You have to take a young person, who can be convinced of these matters, in order to be most successful. I am very heartily in favor of having a good deal more said as to these specialties and I highly recommend the paper of Brother Northup as an institute paper.

MR. NORTHUP: I will use that paper when I come over to your institute.

MR. HERR: All right, bring it along.

MR. SCHWARZ: The gentleman realizes that the only hope for the future of Pennsylvania are the young men, therefore, Mr. Herr's remarks are all right. The man who would address those remarks specially to the old men would make a mistake because the hope of the country is in the young men. It is hard for the young men to realize that there are good business prospects on the farm and just as good chances for making a fortune on the farm as through any other avenues of life, and, therefore, I heartily endorse the paper of Mr. Northup.

COL. DEMMING: The address of the distinguished gentlemen
was so original, so remarkable, so unique, so complete, that it is like attempting to paint the lily to discuss it.

The CHAIRMAN: I was very much interested in this paper and with the talk of Brother Northup; but there is certainly, after all, two sides to this question, and it depends largely on our locality and on our surroundings as to the character of work we should follow and make a specialty of it. There are localities, where to make a specialty would be decidedly to the advantage of the dairy farmer. There are other localities where it would not do to make an entire specialty of the dairy, that is, in order to make a success of it. For instance, go down to the farm near the cities, where the dairy farmer has forty or fifty acres of land and has, probably, fifteen or twenty cows and makes butter and has a city trade and delivers it to his customers, and has been successful. In addition to that he has dozens of other crops that he delivers directly to his customers in addition to that butter. His customers make inquiries for fruit and vegetables from the vegetable garden and they say, bring it along when you bring the butter. Those men have been largely successful. So it depends on the man who is behind the plow or the hoe. It does not do, in a general way, to put all our eggs in one basket. I have learned that it does not do to depend on one or two crops, but we must have something else besides, and if one thing fails we will have something else to meet our bills. We know it does not do to depend on the grain; we know it does not do to depend on the fruits; for I heard our brother say this morning that is was an entire failure last year, and everything was frozen this year. Now, must he depend largely on that? No, that won't do. Always have something ready for market, is my motto. A few years ago there was a tremendous crop of potatoes. We hauled to the city of Philadelphia at twenty-four and twenty-five cents a bushel, on a farm that I had charge of, and we had a large flock of sheep, and we had raised turnips for them and we had to get away the potatoes, but the turnips brought three times the price of potatoes and we fed the potatoes to the sheep and sold the turnips.

The CHAIRMAN: The next subject on the program is "Our New Road Law," by Mr. Hunter.

The paper read by Mr. Hunter is as follows:
Mr. President and Gentlemen of the Pennsylvania Board of Agriculture:

I have attended with much pleasure and profit some of the sessions of your meeting. I have listened to the instructive addresses with a great deal of interest. I am a much better listener than talker. I lay no claim to being a public speaker, but I am deeply interested in good roads, and I appreciate the honor that you have conferred upon me by asking me to address this meeting of representative farmers of Pennsylvania. Some say agriculturists, but I prefer the word farmer; it is shorter; and an agriculturist may be a mere theorist, but a practical farmer is not a mere theorist. He gets down to hard pan every time. He wants to know what benefit is to be derived by a change from an old to a new method. He may be slow at times in making up his mind to accept proposed changes or innovations in his usual course of life, or in his way of doing things, but once his mind is made up to accept a proposition or change, such a cause has no stronger or more earnest supporter.

The farmers are the mainstay of the nation. They support and maintain us, and in no state or nation are they more progressive than in this great Commonwealth. We excel all other nations, except in the matter of good roads and easy methods of transportation, and in this particular I believe that in a few years we will be abreast of the foremost state, if we do not lead the procession, in the onward march of progress. Ninety-five per cent. of every load by railroad, steamship or express must be carted in a wagon or truck over a highway. It costs the farmers of the United States 75 per cent. more than those of Europe to market an equal tonnage of farm products over primary roads.

The question of Good Roads has been before the people of this Commonwealth for upwards of a quarter of a century, various attempts having been made to secure legislation in the direction of road improvement; and while we have been discussing the question pro and con, neighboring commonwealths have had the courage of their convictions and for ten years past have been constructing
good roads and to day are enjoying the benefits derived therefrom. Notably is this true in the State of New Jersey, with upwards of 1,000 miles of improved roads; Connecticut, Massachusetts and New York with about 500 miles each.

It was not until the last session of the Legislature that an act, known as the Sprout Road Law, was introduced and passed that any substantial progress was made in this Commonwealth towards the construction of good roads. It is true that the Flinn Road Law, in which the various counties are authorized to take charge of, reconstruct and maintain township roads in townships that are too poor and upon the taxpayers of which the cost of constructing good roads would be an excessive burden, has been in operation since 1895, and in Allegheny, Northampton and Luzerne counties roads have been reconstructed under said act, but the total mileage of such roads is small. In traveling over the State I have heard considerable about poor counties and poor townships, poor townships in particular, and that it would be a long time before they could do anything towards helping construct good roads within their limits.

When I have asked the reason for this, the reply invariably has been: "The assessments are so low and the people so poor that we cannot get enough money to keep our roads in repair now, let alone raising additional funds to build stone roads." When I have asked about the tax rate in these townships I have been told that it was ten mills, or one per cent., for road taxes, and in several instances the county rate was the same, on the assessed valuation. Now, this is all wrong. The method is wrong. Exceedingly low assessments work an injury to the property owner, the township and the county. Prospective purchasers of farm properties will not go into a township that has been advertised as being a poor township and brought into disrepute thereby. What is the difference to a taxpayer if he pays one per cent, on an assessed valuation of twenty dollars per acre, or one-half per cent., on a valuation of forty dollars per acre. I take it that the owner, the township and the county are all benefited by the higher valuation. You know the old saying: "Give a dog a bad name and it will kill him." If you allow your township to get a bad name, it is virtually killed so far as progress and improvement are concerned.

Another wrong that helps make a poor township is the working out of road taxes by the tenants or owners of the real estate against which the tax is assessed. Fifty per cent, of the tax levied for road purposes is wasted, or paid as a premium for idleness, and for which no value is given. All over the State the same plain is heard: "We do not get value for our money expended on road repairs." Macaulay, in describing the almost incredibly bad state of the roads in England in 1785, says: "It was by the highways that
both travelers and goods generally passed from place to place; and those highways appear to have been far worse than might have been expected from the degree of wealth and civilization to which the nation had even then attained. On the best lines of communication the ruts were deep, the descents precipitous, and the way often such that it was hardly possible to distinguish in the dark the line of travel from the heath and fen which lay on both sides.” I have no doubt but each of you can readily call to mind such a road in this State, that fits exactly this description.

Macaulay further says: “One chief cause of the badness of the roads seems to have been the defective state of the law. Every parish was bound to repair the highways which passed through it. The peasantry were forced to give their gratuitous labor six days in the year. If this was not sufficient, hired labor was employed and the expense was met by a parochial rate.” “A change from this law was at length effected,” says Macaulay, “but not without much difficulty, for unjust and absurd taxation to which men are accustomed, is often borne far more willingly than the most reasonable impost which is new.”

Gentlemen, do you not agree with me, that we should set aside our old road system which is practically the same as the old English system that was condemned over a hundred years ago, when the present system of road improvements in that country was inaugurated, and establish a system that will enable the farmer and taxpayer to enjoy to the utmost the benefits derived from having good roads, besides giving value and having something tangible to show for the money expended? Not since the passage of our public school law has there been placed upon our statute books an act that so vitally affects all the people of this Commonwealth as does the act of 13th of April, 1903, and which is known as the “Good Roads Law.” It is of especial interest to the farmers. Many of you are undoubtedly familiar with its provisions, but a hasty review of it may, nevertheless, be of interest to you.

The act may be divided into two parts, the first of which provides for the reconstruction of township roads, and the second, for maintaining them after reconstruction, and also the maintaining of other roads that have been already built in accordance with the best standards.

The primary move in obtaining State aid in the reconstruction of township roads should be made by the supervisors or township commissioners, who may petition the county commissioners to make application to the State Highway Department for the co-operation of the State in the reconstruction or permanent improvement of any principal highway within the township, or any section thereof.
which is used as a thoroughfare by the people of said township, and the neighboring township, cities and boroughs, agreeing by resolution to assume, for said township, the proportionate share of the expense of said improvement. Should the supervisors or township commissioners of their own volition fail to take the necessary steps to secure State aid, as aforesaid, then the owners of a majority of the assessed valuation of real estate in the township, may present a petition to the supervisors or township commissioners requesting them to make the necessary application to the county commissioners. Upon receipt from a township of the proper application, it is the duty of the county commissioners to petition the State Highway Department to undertake the improvement of the highway or section thereof specified in the petition from the township, and authorizing the assumption by the county of its share of the expense of said improvement. Accompanying the petition of the county commissioners should be the petition of the supervisors or township commissioners, and an accurate map or plan showing the layout lines, profile and grade of such highway, and giving such other information as may be necessary to the proper planning of said road improvement. The county commissioners are to state the kind of material to be used or available for the construction of such road.

If the county commissioners neglect or refuse to act after the proper applications have been filed with them, the law provides for the appointment of a jury of view by the court of quarter sessions upon petition from the township authorities, and upon a favorable report from said jury, and with the approval of the court, it shall be the duty of, and the court may by order require, the said county commissioners to petition the State Highway Department for the aid asked for by the township.

Upon receipt of the application and plan from the county commissioners, it is the duty of the State Highway Commissioner or his assistant, to make an inspection of the road for the reconstruction of which State aid is asked, in order to obtain data which can only be obtained by such personal inspection. A plan is then carefully marked out and estimates are made of the amount of excavation, macadam, etc., required. Copies of this plan, with the specifications, are sent to the county commissioners, who are required to advertise in two newspapers for thirty days prior to the time fixed for the opening of bids. The bids are received by the State Highway Commissioner, who opens them and afterwards submits them to the county commissioners and township supervisors or commissioners. If all the parties agree upon the acceptance of one of the bids, an agreement is then entered into with the county and township for the payment of their respective
shares of the cost of said work. After this has been done a contract is then made between the Commonwealth and the successful bidder, such bidder giving bond as required by law. Of any such contract the State pays two-thirds of the amount and the county and township one-sixth each.

During the progress of the work, it is carefully inspected and the final inspection is made by the State Highway Commissioner or his assistant upon completion of the work and before it is accepted by the Department.

The construction fund as provided by the act is apportioned among the counties in proportion to the number of miles of township roads in each county. This apportionment per mile to each county is a fraction over $4.58. No part of this fund passes through the hands of any person connected with the Department. It remains in the hands of the State Treasurer and is paid out by him upon warrant properly drawn by the Highway Department. Westmoreland county has the greatest number of miles of township roads, 3,644; York county next, with 3,598 miles, and Lancaster county third with 3,143 miles. Cameron county has the least mileage, 167. The total mileage of the State is 98,123 miles of township roads. There are 1,101 miles of turnpike roads in the State.

According to the square miles of area, York county has 4.1 miles of public roads; Lehigh county, 4.07 miles and Montgomery county 4.01 miles. The distribution of the fund apportioned to a county will be determined by the county commissioners. Just how they will do this I cannot say, but in some cases I have suggested that the distribution be chronologically; that is, the applications to be taken up in the order in which they were filed with the commissioners and pushed to completion in that order. Possibly in some instances, the commissioners may decide that a particular application, owing to circumstances, may have a priority over preceding ones. This will be a matter wholly for them to decide. There is no direct apportionment by the State to a township, of any part of the construction fund. The money apportioned to a county remains at the disposal of that county for a period of two years, and if not called for or used in the reconstruction of township roads within that time it is returned to the State Treasury, and added to the appropriation for the current year, and distributed anew among all the counties.

The maintenance fund available each year is ten per cent of the amount appropriated and also remains in the hands of the State Treasurer until paid out upon warrant of the Highway Department. This fund is apportioned by the State Highway Department among the townships and counties applying for the same, in proportion to the mileage of improved highways made under the
provisions of this act, or which have already been made or may hereafter be made, at the expense of such townships or counties, and which are of the standard prescribed by the State Highway Department for improved roads.

Section 16 of said act, which I will read, gives the method to be observed in making application for a share of the maintenance fund:

"Section 16. Whenever the supervisors or commissioners of any township or county shall desire State aid for the purpose of maintenance of improved highways, whether State highways improved under the provisions of this act or otherwise, it shall be the duty of said supervisors or commissioners to file with the State Highway Department, on or before the first day of April in each year, a sworn petition requesting such State aid, and setting forth the number of miles of highways improved according to the standards of the State Highway Department in said township, and the cost of the same to said township, together with the condition of said improved highways and the average annual cost of maintaining the same. The State Commissioner of Highways, if in his judgment the conditions warrant the co-operation of the State in maintaining said highways, shall apportion to said township its proportion of the total amount available for the maintenance of improved highways, as hereinbefore provided, and the said amount shall be paid to the supervisors or commissioners of said township by warrant of the State Highway Department; but in no case shall the amount thus given by the State for maintenance, be more than one-half the amount which, in the judgment and experience of the State Highway Commissioner, the annual cost of maintaining improved highways of the standard of construction prevailing in such township should be, nor more than one-half the sworn, average annual cost of maintenance, as set forth in the petition of the supervisors or commissioners of the said townships."

Section 22 provides that "County commissioners or county engineers of the several counties of this State, and the officers of all cities, boroughs and townships in the State, who now have, or may hereafter have by law, authority over the public highways and bridges, shall, upon the written request of the State Highway Department, furnish said Department with any information relative to the mileage, cost of building, and maintenance, condition and character of the highways under their jurisdiction, and with any other needful information relating to the said highways."

Some of the township and county authorities have been very dilatory and indifferent about furnishing information asked for; while others have been commendably zealous in obtaining and furnishing to the Department needed information.
The basing of the apportionment upon the number of miles of
township roads in each county is eminently just and fair, but it has
been a herculean task to obtain the reports of the mileage. In near-
ly all of the counties there was absolutely no record showing
whether there were five or five hundred miles of roads in a township.
The county with but five townships and the smallest number of miles
of township roads is the only county that has failed to make a proper
return of mileage as required by the law.

Section 23 of the road law provides as follows:

“All highways improved under the provisions of this act shall re-
quire the construction of a macadamized road, or a telford or other
stone road, or a road constructed of gravel, cinder, oyster shells, or
other good materials, in such manner that the same, of whatever ma-
terial constructed, will, with reasonable repairs thereto, at all
seasons of the year be firm, smooth and convenient for travel. The
county commissioners shall have the authority to select the kind
of materials to be used in improving any road under the provisions
of this act. Any difference of opinion that may arise between the
county commissioners and the township road authorities, as to the
kind of a road to be built, shall be decided by the State Highway
Commissioner. The State Highway Commissioner shall furnish to
the county commissioners and township road authorities informa-
tion as to the probable cost of improved highways, as defined in this
section.”

The cost of constructing macadamized roads as above provided
for will vary according to localities and the proximity of good ma-
terial out of which to construct them. In some sections of the
State good material for road construction is exceedingly scarce. The
qualities required in a good road stone are hardness, toughness and
ability to resist the action of the weather, and these are not always
found together in the same stone.

Limestone possesses another quality; that of furnishing a mortar
or cement-like détritus which binds the stone together and enables
it to wear better than a harder material that does not bind. For
moderate traffic the harder limestones are sufficiently durable and
make the smoothest and pleasantest roads. For heavy traffic the
best materials are trap, basalts, greenstones and cyanite. Roads
constructed of these materials will cost from one to two dollars per
running foot, according to the width of road bed, amount of grading
and the convenience with which material can be obtained. The cost
per lineal foot of one of the roads for which a contract is ready to
be signed is one dollar and fifty cents ($1.50) and for another one
dollar ($1.00).

Within a short time the present road law has been designated as
a “gold brick,” and a “snare” to the farmer. This sort of an as-
sortion is erroneous and very misleading and should not be tolerated. A law that provides for the payment of two-thirds of the cost of a substantial and permanent improvement that will greatly benefit the farmer and further provides 50 per cent. of the cost of keeping said improvement in repair, is no gold brick nor snare. No taxpayer is asked to contribute to such improvement against his will except in the very small percentage of possible increase in his county tax, and probably the amount that most counties would have to pay for the reconstruction of a mile or two miles of a township road would not increase the county tax rate at all. Even should he have to pay a trifle more in taxes for having a good, permanent road over which to travel, he has something tangible to show for the expenditure. The farmers of this State furnish a capital of about $5,000,000 a year for the supervisors to go into business in the way of making so-called road repairs, and this sum is actually thrown away, and again subscribed for the following year.

Again, it is asserted that the act casts a grave reflection on the township and greatly disparages the abilities of its citizens to manage its own internal affairs, when it centralizes the expenditures of the money appropriated and puts the construction of good roads in the hands of an individual or under a department. This assertion is also wrong. There would be no general system of road improvement. There would be as many systems, standards and methods as we have supervisors in the State and the same would be liable to change each year. Just imagine turning the public school system over to the various township school boards. It would soon be “confusion worse confounded.”

It is true, to a certain extent, that the farmers have been at the expense of keeping the township roads in repair for the benefit of travel that pays no part of the expense. But who uses these roads the most? The farmer; and unless he keeps them in repair, how is he to get to market to dispose of his produce? How is the merchant who sells him goods going to deliver them unless he has a means of access to the farmer’s house? Why should the citizen or purchaser of the farmer’s products be asked to or be required to pay for maintaining the roads that enable the farmer to get his goods to market and dispose of them at market price, any more than the farmer should be asked or compelled to help pay for the improved streets or roads in the city or borough in which he markets his wares, which he can do more quickly and to better advantage than if he had mud roads or streets to haul through. The taxpayers of a city or borough can with as much propriety say: “We will not improve our streets because the farmers with their teams use them so much on market days and cut them up, keeping them in bad condition,” as the
farmer can say: "We will not help build good roads because the citizens drive over them and wear them out."

The present law gives the farmer the advantage of the county tax levied in cities and boroughs insomuch that no part of the county tax is used in the improvement of the roads in cities or boroughs except where a portion of a through or main road is in a borough and the reconstruction of which will be the connecting link between roads already reconstructed or improved. There is reciprocity in the fullest and best sense of the word, in good roads. No farmer, citizen, taxpayer, State, county or township can afford to be without them. I believe with DeWitt Clinton: "That every judicious improvement in the establishment of Good Roads and Bridges in creases the value of land, enhances the price of commodities and augments the public wealth."

I have heard it said that the road law is a failure; it cannot be made a success; the farmers will have nothing to do with it. There is no question as to the fact that the farmers can make the law a failure or a success. A failure of the law is not and will not be, because the farmers appreciate the fact that it will be a great benefit to them and have decided to give it a fair trial and hearty support. The Department has had many difficulties to contend with and overcome and expects to meet and overcome others as we progress. It is no small task to establish such a movement, to build up the system from nothing. It was with a full sense of all that was involved that I entered upon the duties of the office. Since the organization of the Department, September 1, 1903, I have been in many parts of the State, attended meetings as called upon, and have found a very deep and earnest desire on the part of the farmers and other citizens to become posted as to the workings of the law. The Department has to this date received forty-six applications for State aid in the reconstruction of township roads, and one application from a county asking for aid in the reconstruction of a road that the county had originally taken under the act of 1895, and which had been destroyed by the severe rain storm of last October, making in all 47 applications. These applications aggregate 98.37 miles; the longest road applied for being six miles and the shortest 1,400 feet. These applications have come from all parts of the State: Snyder, Mercer, Crawford, Beaver, Lackawanna, Lehigh, Cumberland, Huntingdon, Delaware, Warren, Lycoming, Chester, Montgomery, Montour, Susquehanna, Clinton, Northampton, Northumberland, Berks, Greene, Bucks, Erie and Lawrence counties being represented, a total of 23 counties, or one-third of the whole number in the State, and I know of several more that are getting ready with their applications. Contracts are ready to be signed for the work in two counties, Crawford and Snyder. Bids are being received for the work.
in Lackawanna, Huntingdon, Clinton, and Northampton counties, while plans are prepared and specifications being drawn for work in several other counties. Our office work is being retarded by the very crude plans and surveys that have, in many instances, been sent to the Department. With this showing, I am sure that you will agree with me, that it is very unjust to condemn our road law as a failure. With a little patience on the part of our citizens and the hearty co-operation of those interested in good roads, the Department will show that the law is not a failure, but an assured success.

I believe in the law. I believe what has been done once can be done again. I believe that if our sister states, New Jersey, Connecticut, Massachusetts and New York, have made a success of similar laws, that with your hearty and earnest support, Pennsylvania not only will make a success of our road law, but that in a few years she will be in the first rank of road-making states, if she is not the leader of them all.

There has been criticism, and some of it justly. It is an easy matter to criticise, to find fault; but those who criticise and find fault very seldom have anything better to offer. We have the road law; it may not be ideal, but it is the very best that we have had and it will stand until a better one is passed. The sum appropriated under the law for road construction is said by some critics to be insignificant—a mere drop in the bucket. This may be true when compared with the whole amount of work to be done. It is a beginning. We cannot do all at once. No city was built in a day, no great work or undertaking completed without a beginning. The work of building, of reconstructing the roads in this Commonwealth is the greatest, the most stupendous undertaken by any Commonwealth.

The success or failure of this great undertaking depends on you. If you give it your hearty support and co-operate with the State Highway Department, you can demonstrate to the next Legislature the success of the law, and show by your action that you desire good roads and that you appreciate what has been done. I believe that beyond a question of doubt a larger appropriation will be made, the State pay a larger percentage of the cost of reconstructing the township roads and that real estate will be relieved of a portion of the burden of taxation that it is now bearing. If, however, on the other hand, you show by antagonisms that you do not propose to accept the benefits to be obtained under the provisions of this law, then there will be no incentive for the Legislature to make increased appropriations for your further benefit, but a possibility of a repeal of the present law. The burden rests with you.

Gentlemen, I depend on your aid in carrying out the provisions of our present road law. I consider you as my assistants, and I feel
sure that you will not fail me and that I shall not be disappointed in you.

Will you do it?

The CHAIRMAN: What is the width of the road in Snyder county?

MR. HUNTER: Eighteen feet wide and costs one dollar a running foot; but that portion is to be re-constructed over a road on which a considerable amount of stone has been placed, but which has become rutted. We will use native stone in the bottom and place a course of limestone on top; that is, Crawford native stone, four inches in depth with a course of limestone on top. When I say, that I doubt very much if the county tax rate will be raised and the township can build one or two miles of road, without materially increasing their taxes, I speak with my knowledge of the roads constructed in Abington and Cheltenham townships, in Montgomery county, under the previous law. In Abington township they voted an indebtedness of eighty thousand dollars; that was used up in 1893, and the following spring they voted an additional loan of fifty thousand dollars. I had charge of the construction of those roads and the bonds were sold at a considerable premium. I think the premium was something like thirty-two hundred dollars. In 1893, the mill tax was four mills on the assessed valuation; that gave the township between ten and eleven thousand dollars to expend on their roads. The following year, 1894, they raised the mill tax to five mills. Out of that they have paid the interest on their bonds and eight per cent. of the principal, as required by law, and have kept their township roads in repair and have built from one to two miles of road each year and that five mill rate has been continued ever since, for over ten years. With the development of the properties in that township the amount raised for road purposes this year was nearly twenty-five thousand dollars. It is true, there has been some slight increase in the assessed valuation, but most of the money has come from the putting up of the value of farms. In 1893, farms that were assessed at $150 to $200 an acre have been cut up into four and five-acre lots, and these been cut up again and houses placed on them at a cost of from $10,000 to $15,000. However, there are many properties assessed now just the same as they were ten years ago. This same condition applies to Cheltenham township. The latter township was bonded and have been carrying on their tax rate under the same principle for the last five years. Even after the township became first class the tax rate was five mills for township purposes. Nineteen hundred and two was the first year the rate was increased; it was increased to seven mills; but, in addition to what they did formerly, they now police the township from one
end to the other with mounted policemen and lighted with electric light. So I can say that a township or county can build a mile or two of road each year without increasing the tax rate. Great interest is being taken with reference to the improvement of the roads in the lower counties of the State. I would say that in Bensalem township, Bucks county, notably, they voted at the fall election for a bond issue of $75,000 and it carried at the rate of seven to one in favor of the loan.

COL. DEMMING: During the past nine years that I have been acting as State Geologist, since the death of J. P. Leslie, I would state to the gentleman that I have gathered a lot of information that I think would be of benefit to the proposed new roads. He refers to the material for roads and he places basalt first. I would say first in quality is basalt, then trap and cyanite third, and limestone about the last for this reason: That in localities where limestone is used on roads you will notice that people are afflicted with eye troubles. In this State, where there are limestone roads, you will note that more eye-glasses and spectacles are used, which is on account of there being more poisonous matters in the limestone than any other stone used in connection with road improvements, which is on account of the dust of the limestone flying around. In every part of the State there is good material to select from. I think that the material to be used should be left to the Highway Commissioner instead of to the county commissioners. I am glad to know that in Pennsylvania we are going to have good roads. Sometime ago I had occasion to do some geological work in New Jersey and it was a pleasure to travel over the roads of that State.

MR. SCHWARZ: I can say that I am one of the original good roads-men in the State. I would like to know whether the Commissioner would allow me to ask a number of questions.

The CHAIRMAN: Commissioner Hunter will be ready to answer any questions that may be asked.

MR. SCHWARZ: My only reason is, that I am anxious to have good roads in Pennsylvania; but there are some things in this bill that don't exactly touch the spot. I want to ask whether you are going to recommend to the next legislature any changes in the law, or whether you consider the law perfect as it is now?

MR. HUNTER: In reply to the gentleman I would say, that in this little address I said that the law might not be ideal. There are some changes that should and I believe will be made.

MR. SCHWARZ: I saw Senator Roberts and had a talk with him about this bill and he said he was going to agitate some changes.
Have all the counties made their returns of by-roads, and what is required of them under the law?

MR. HUNTER: All the counties have made a return. The county having but five townships and but 167 miles of roads has not made a return. We furnished them blanks but they thought it was not necessary to send in those blanks and we have been trying for three weeks to get them to send them in and have them sworn to under the law. All the counties have made a return.

MR. SCHWARZ: There was a belief, at the time the law was under discussion and after its passage, that there were a number of counties that would fight this bill by refusing to make a return.

MR. HUNTER: The act requires that county commissioners and township officers shall furnish information on request of the Highway Commissioner. Some of the counties sent the blanks back and said they had no time to get this information and said they did not know who was going to compensate them for it. I consulted the Attorney General, and he instructed me to write them that they should make returns or he would mandamus them. There is an old law that he could take action under in mandamus proceedings.

MR. SCHWARZ: Who determines a width of a road in a certain locality, the Highway Department?

MR. HUNTER: No, sir; that is more of an agreement with the petitioners, or the townships in which the improvement is to be made. I would like to see the road-bed eighteen feet wide, but if I cannot get that I am willing to go ahead with sixteen or twelve feet. Twelve feet is better than nothing.

MR. SCHWARZ: Do you think the law, as it stands, is more favorable to largely populated counties than thinly populated counties?

MR. HUNTER: I think that it is, and that is one of the improvements that will be needed in this bill. I like the provision in the Connecticut law very much. In the Connecticut law the contracts for the building of the roads are made between townships, or towns as they are termed, and the Highway Department. The counties are left out the contract entirely and in the towns that have the assessed valuation of a million or upwards the State pays two-thirds of the cost. In the townships where the valuation does not amount to so much, the State pays seventy-five per cent.

MR. SCHWARZ: We have a road in my own county—Monroe—and it passes through a good township first and then it passes through a township which is not able to make the repairs. There are only thirty voters in that township. Now I want to know what is going to become of that township. If a road is finished through that township, where will they get the money from?
MR. HUNTER: In reply to that, I would say, why don’t that township make application to the county of Monroe to take that road under the Flinn act and let the county apply to the State for the construction of the road. That would relieve the township of the expense of that road.

MR. SCHWARZ: I am thoroughly in favor of good roads, but if the county commissioners would do that they would never be re-elected. Of course the small townships would vote for them but the larger townships would vote against them. We all know that it is human nature.

MR. HUNTER: That is purely selfishness, undefiled.

MR. SCHWARZ: Certainly, but we have to face it.

MR. MILLER: Can I ask the Commissioner a few questions? In our county the people are wondering how this law would affect the tax-payers and we have been urging the supervisors to go ahead and get this two-thirds, and others who were in the Legislature advised them not to do it because there was too much red tape about it. Will you furnish blank petitions for the citizens of the township and must we survey the road?

MR. HUNTER: The law requires that a plan must accompany the petition. That plan should give the necessary information that will enable the Highway Commissioner to make such a plan as will enable him to make an estimate showing the amount of excavation necessary to be made and the amount of material to be used on the road. The expense does not, necessarily, fall on the county. The county should primarily pay the bill, although in some cases they have not; the township authorities paid it. The cost of that survey goes in and two-thirds of that is paid by the State and the survey is part of the cost of doing the work. If you don’t make a survey you cannot get started. I have a few blank forms here for distribution. Here is a resolution and petition of the supervisors; here is a petition of the citizens to the supervisors and here is a copy of the letter of instruction sent to every set of county commissioners in the State (exhibiting) and sent to every supervisor in the State as far as I have been able to get their addresses.

MR. NELSON: Just a few words on the question, in regard to the county not reporting. I had some experience in my county some years ago and I paid six mills tax. There is very little travel on the roads because most is on the railroad. The roads are very narrow and you often have to wait for a team to come a mile on the narrows before you can pass. There is a little settlement up the stream, along the road, and a little bunch on the plateau, on
this one and that one, and they have to keep up miles of roads to get to the schools. In my own county of Clearfield, we had an institute last week in a very intelligent section, where we have very good roads, and they attached to the resolutions that were offered in the institute, a resolution making a wholesale attack on the road law. For lack of time and a chance to get all the points in regard to it I succeeded in having that resolution tabled until they would have time to make a better showing.

MR. FENSTEMAKER: It just happens that I have been placed on the Committee of Road and Road Laws through my friend, Mr. Mcgowan. I wish to ask Mr. Hunter if he intends to make any recommendation to add an amendment to the bill compelling people to use wagons with broad tires that haul heavy loads. We have an experience right at my home, on the turnpike that passes by and is driven over by Berks county farmers, going to market with hogs and other products, and there is one continuous rut from Coopers-town and Allentown and they use narrow tread wagons. I would like to have another amendment made to the present law and that is, that the trolley roads do not gobble up our macadamized roads. We are afraid to send out our best horses on those roads on account of the trolley roads; and on account of them it is a great inconvenience that we are unable to send our wives and children out with horses that we are afraid to use.

MR. HERR: I would like to suggest to the Secretary of the Department of Agriculture that this valuable address be published in bulletin form and sent out to educate us more fully on this valuable topic.

MR. SCHWARZ: I am asked as to material to be used on the roads. In Montgomery county, from Bridgeport to King of Prussia they had limestone finish and they determined to use trap rock. I heard the argument of Col. Demming, but I don't think the people took that into consideration. The limestone was there.

MR. HUNTER: There has been no action whatever taken on the application in Upper Merion township, on the road running from Bridgeport towards King of Prussia. While I believe that in the construction of roads, as well as in other things, that anything that is worth doing at all is worth being done well; but I am not going to be a stickler for trap rock. I know that trap rock is a very scarce article. I do know we can get limestone all through the carboniferous regions. All through the State you will find very good stuff to finish on top. You will have to have a stone that will bind and stand the weather. Sandstones are thoroughly good for
foundation because they help to carry the weight. In Montgomery county, on that road you speak of, I know they have no limestone convenient and the limestone right along the line of that road is not good enough and all we have to do is to go to Howellville and we will get a very good material.

MR. SCHWARZ: Here is a question right now: We have in our county roads that are close to a borough but in the township and the people of the township say we would build this road but the moment we build it the borough will take it. Why should we be asked to build this road and the borough take it afterwards? Is there no provision by which the borough should be made to pay the township, or if that is not so should there not be an amendment made to the law covering that point?

MR. HUNTER: I suppose there could be an amendment made, but I don't see why a borough cannot take the adjoining ground because they take it with the consent of the township.

MR. SCHWARZ: They have done it in the township in which I live.

MR. HOLMAN: Who is to maintain those roads that have not been constructed by the township?

MR. HUNTER: They are under the supervision of the township authorities.

MR. HOLMAN: We have a road in our county, north of Newport, which runs through Howe township. It is constructed along the river bank and is a great convenience to surrounding counties in passing through the county, but of very little advantage to Howe township. This road was constructed by the county commissioners, but the township would never take it off their hands and consequently the road there is not in very good condition. It has been traveled for years. Everybody travels it at their own risk. They travel it in preference to going around over the hills, which made it two miles further. We would like to have that road kept up and it could be made a very fine road instead of having it in the worst kind of condition. Now if we, by private subscription, would make up one-sixth of the cost of maintenance could we force the township to maintain it?

MR. HUNTER: Undoubtedly, unless that road has become a county road. Under the Flinn law, if that road was taken and improved by the county under the act of 1895, it becomes a county road and the county is bound to keep it in repair.

MR. HOLMAN: It was constructed in the 70's and has been traveled ever since.
MR. HUNTER: If that is still a township road and the township authorities do not keep it in order they are indictable.

MR. HOLMAN: It is a road that was newly opened by the commissioners. Do you know anything about that, Mr. Stephens?

MR. STEPHENS: The road was built by a contractor with an appropriation made by the State. In the first place they got an appropriation from the State. There were three commissioners appointed and it was built on a cut-and-cover style. They only cut through the rock half way and filled up and when the floods came they washed it away. After the road was constructed these commissioners or trustees took the contract off the hands of the contractors and they threw it onto the township. The township did keep it up for awhile but they still kept fighting and fighting about it, and eventually there was one man, a little smarter than the rest, and he went to Bloomfield and employed the whole bar of lawyers. He got up a petition to have it taken off the township and the other party had no attorney and it went through.

MR. HOLMAN: What would be a proper way to have this road built by State aid?

MR. HUNTER: It is immaterial to the State Department where the money comes from to build the township's share.

MR. HOLMAN: There would be no law to compel Howe township to make an effort to secure State aid?

MR. HUNTER: No, sir. The law compels them to keep it in repair.

MR. SCHWARZ: Where I contribute money to repair a road, in a township, do you mean to say that they can bind the township?

MR. HUNTER: The application must come from the supervisors. The arrangement is made between the man who contributes the money and the supervisors and the supervisors must make the application. The citizens can petition the supervisors and if the supervisors fail to act on that petition then they can go into court and ask the court to make them act.

MR. SCHWARZ: I would like to second the motion made by Mr. Herr, that the address of Mr. Hunter be published in pamphlet form and be distributed as largely as possible, for the purpose of giving this valuable instruction to the people of Pennsylvania.

MR. HUNTER: In answer to the gentleman who spoke with reference to offering an amendment compelling the use of the broad tire, I would say, there is a broad tire law and I don't know why 43—6—1903
more farmers do not use them because they are allowed a rebate on their taxes in the use of the broad tire.

MR. SCHWARZ: Mr. Martin knows that we advocated the passage of that law, for the broad tires, and we claim that would help keep the roads in repair.

The motion of Mr. Herr, as to the publication in bulletin form was seconded by Mr. Schwarz, and being put, it was agreed to.

COL. DEMMING: Would it be of much advantage to the State Commissioner of Highways if, through the instrumentality of the Board, a table was prepared showing the best material for road building, as to hardness, toughness, durability and compactness, and the localities where this stone is found?

MR. HUNTER: In reply I would say that would be a very great benefit and assistance to me and I should like to meet the gentleman and go over the subject with him in order to get the information where the material is to be found. We have no conveniences in the State for testing materials in any way. They have at Washington a testing department and I am going to attend a meeting there soon and propose to take with me some samples of the rock that I obtained in various sections of the State and have them tested.

COL. DEMMING: They have a first class testing machine at State College.

MR. HUNTER: We have a State College and if this road law is to be carried out we will have to have a lot of young men trained in the art of road building. We have very few road builders in this State. We have a lot of theorists, lots of men who can sit down and tell you how to do it, but none who can go out and build them. One of the things our State College should do is to prepare young men for this work. I am willing to help them and instruct them in the art of road building so that the State will furnish a crop of efficient road builders all over this State. It is impossible with the force in my Department, myself and one assistant, to keep control and examine all the roads to be built. This summer we have a road in Lackawanna, one in Chester, one in Snyder, one in Warren, one or two in Bucks and how are we going to do that work, and do it right, unless we have more experts in the work? We should also have inspectors because it is not fair to do this work without having them inspected.

A Member: One of the gentlemen referred to the trolleys being a menace to the farmers. After having constructed a number of miles of this road, are you going to allow the trolleys to tear up our roads which have been made by State aid?
The CHAIRMAN: That question was before the Board last night but it did not get as thoroughly discussed as it ought to have been.

MR. HUNTER: I don't know just how that question is going to be settled in that case. I think pretty nearly every question will have to be settled on its own basis. When I was called on to examine a piece of road, which was proposed to be built, I was informed that in the course of time a trolley line would be extended over that road. I practically became balky. I said, gentlemen, if that is a fact I don't like to give a recommendation to get State aid to build this road and have it torn up unless we have it arranged that the trolley company will put this road in as good condition as it was before they touched it and give a bond for its faithful compliance before they put a spade in it. That matter was taken up and to-day the people interested have secured one of the best sorts of agreements with those people and I have a copy of it with regard to the building of that road. It was the same way in another county. The question of grading a hill came up in the building of a road, where it had about ten per cent. grade, that would be about 3½ to 4 per cent. at the outside, and they said, you can't do that, the trolley people will not agree to that. The trolley road was there and I took the trouble to go and meet the superintendent of that road and after talking it over an agreement was made by which they agreed to put down their tracks at the same time the road was built. I think pretty near every case can be worked out in that way. It is a hard rule to fix and you have to carry it out to suit every case as you find it.

MR. HERR: In our township we imagine that limestone is the very best material to use on our roads.

MR. HUNTER: There is a gentleman here who said that he knew about the county that had such a small amount of roads and that they were too poor to do anything. If that county will take the total amount of money set aside they can build one mile of road at a time.

The SECRETARY: In the preparation of the program it was thought best not to make it too heavy, and there was no place mentioned for queries. We have got along so nicely that we have concluded the exercises for the forenoon. Mr. Schwarz has presented a question here, and I think we will have a little time at the opening of the afternoon session, and if you will take a slip of paper and write out any question you may wish to ask, I have no doubt it will be answered. I ask the Board to appoint some one to act as chairman to take in charge those questions. You will observe that no arrangement has been made for an evening session and that is owing to the fact that we were unable to get the room for an evening session, and, in fact, had some difficulty in getting it for the afternoon.
The CHAIRMAN: I will appoint Mr. Stout to take charge of the questions.

Mr. SCHWARZ: Will the Commissioner be here this afternoon? I have one more question to ask him that I would like to have cleared up.

MR. HUNTER: If it is the pleasure of the Board, I will be here.

MR. SCHWARZ: I want to know this: After a county fails to take advantage of this appropriation for two years where is that money put?

MR. HUNTER: It is put into the fund and re-divided to other counties.

MR. SCHWARZ: It does not go back to the State Treasury?

MR. HUNTER: No, sir; it is divided among the other counties proportionately.

On motion, adjourned at 12:10 P. M.

AFTERNOON SESSION.

Thursday, January 28, 1:30.

The Board was called to order at 1:30 P. M., with Hon. A. J. Kahler in the chair.

The CHAIRMAN: There are a couple of questions to be answered. The Secretary will please read them.

"Aside from the plant food, introduced with the application of fertilizer to soils, what chemical effect does it have to promote plant growth?"

The CHAIRMAN: This is referred to no one and I do not see anybody in the audience better qualified to answer that question than Mr. Stout.

MR. STOUT: It is my question and I refer it to some of these gentlemen here who, I think, are better qualified to answer it than I am.

The SECRETARY: We would be glad to hear your voice on the subject and have no doubt that you are fully competent to answer.

MR. STOUT: I have no views to give. I ask this question for information because I imagine there is something going on in
the soil besides the application we make in the way of plant food. It seems to me there must be something going on besides the chemicals that produce the changes in the soil. I would like to have some scientific answer to it. I don't see how the application of two or three hundred pounds of plant food, to an acre, would have much plant food in itself, but at the same time the results are often very remarkable for a small application.

The SECRETARY: It is very likely that Dr. Funk is able to answer the question and we would be glad to hear from him.

DR. FUNK: All commercial fertilizers contain, in addition to the actual plant food, large proportions of other ingredients, such as lime, magnesia and other mineral elements which, although not actual fertilizers in themselves, yet they indirectly act as such by going through chemical changes in the soil, forming new chemical compounds and liberating other elements which, in turn, act upon the soil, disintegrating and breaking it up, setting free, nitrogen, phosphoric acid and potash, which exists in large quantities in all moderately fertile soils, of which analyses shows that the first eight inches contains 17,500 pounds of potash, 9,000 pounds of phosphoric acid and from 4,000 to 8,000 pounds of nitrogen. Now by adding even a comparatively small portion of immediately available fertilizer which feeds the plant in its early and feeble stage until it has established sufficient root system to reach out and gather in the essential elements for its growth, that is being constantly set free by the chemical action of such ingredients contained in the fertilizer and, by other elements working in the great laboratory of nature, such as air, moisture, heat and cold. The acids and gases—even by the roots of the plants themselves, which form an acid at their terminal end, acts upon the small particles in the soil, corroding, breaking up and liberating such food as it needs. If a crop of two hundred bushels of potatoes take from the soil about 110 pounds of nitrogen, 55 pounds of phosphoric acid and 192 pounds of potash, and when we apply 500 pounds of fertilizer analyzing 5, 6, 12, we have 25 pounds of nitrogen, 30 pounds of phosphoric acid and 60 pounds of potash; the balance required must be taken from the soil. If the season is very favorable, with sufficient rainfall, and it is given plenty of cultivation this may be accomplished, but at a fearful loss of soil fertility and, ordinarily, nature rebels, and because she does so the farmer who has applied this $8 worth of fertility in comparison with $25 worth of stable manure, if he does not get as good results, condemns the commercial fertilizer, whereas, had he applied equal money value, the commercial fertilizer would have outyielded the stable manure.
The SECRETARY: I see that Dr. Pearson is in the audience and I would ask him whether he has a report to submit to the Board?

DR. PEARSON: I have no prepared report to make.

The SECRETARY: You might tell us something about your line of work on the farm.

DR. PEARSON: Mr Chairman and Gentlemen: Since our last annual meeting the Legislature has done something in the way of legislation for the State Live Stock Sanitary Board and the two pieces of legislation that are regarded of the most importance are first, a law with reference to rabies and the quarantine of dogs; and second, an appropriation for the suppression of tuberculosis in cattle. The law with reference to dogs was one which was badly needed. The State Live Stock Sanitary Board was combating with this ques-
tion without sufficient laws but, under the new law, it is now possible to quarantine dogs, where the rabies exist, and enforcing it. Under the old law the quarantine could be raised and the only thing that could be done was to take the dog and put him in jail and he could not be destroyed, even if found strayed or without an owner, because the owner might turn up afterwards and claim damages for his dog.

Under the present law the quarantine is proclaimed in a given district and the quarantine is advertised in a regular manner so that all dogs running at large, being affected with rabies, may be shot without any damage being incurred by the man who destroys them. The quarantine is not proclaimed unless it is necessary. Now and then a dog runs through a district and bites other dogs and thus it has been transmitted to horses and cattle. Secretary Critchfield has a very sad case in his county, where a young boy was bitten in his neighborhood by a stray dog.

The SECRETARY: The dog was killed on my own farm.

DR. PEARSON: It is very interesting to know that this particular piece of legislation is acting well and serving a very useful purpose. Where the quarantine is proclaimed and dogs are kept in the district for a time, and they go mad, they have no chance to go away and spread the disease further, and, therefore, at the out-
break it is nipped in the bud and its propagation ceases. Just now, or to-day, a quarantine has been proclaimed in part of Somer-
sset county, where the mad dog was at large and there, unquestionably, a number of dogs that have not been located and cannot be located, have been bitten.

The SECRETARY: There is a petition, signed very numerously by the people residing in that neighborhood, perhaps you have not seen it, and it states that there are a number of dogs known to have been bitten.
DR. PEARSON: Where it is known that a dog has been bitten, it may be destroyed under the act of 1832. Where an affidavit has been made before a magistrate, making it known that a dog has been bitten, the magistrate is required to kill the dog.

MR. CREASY: How about counties that have special dog laws?

DR. PEARSON: It is the same in all counties, except where special dog laws have been passed since the act of 1832, but almost all the dog laws were enacted after that law. So that it applies to most of the counties.

The other subject of legislation to which I desire to call to your attention is one that provides for the investigation of the diseases of animals as well as for the investigation of tuberculosis. I made a report some years ago with reference to the vaccination of cattle against tuberculosis. The State of Pennsylvania has the reputation of having made the first experiments in this direction, and, as far as I know, the first experiments made on cattle anywhere in the world. This has recently been going on, to some extent, in Germany and in Washington it is being investigated. The vaccination of cattle for tuberculosis depends on the principle that after an animal is affected in a mild form, and is inoculated, it has increased resistance to that disease and so it is put through that principle in order to counteract the disease. The test of the method has consisted in vaccinating cattle, and exposing them, by direct inoculation, by injecting germs of tuberculosis into the windpipe or causing them to inhale them or eat them and sometimes the experiment has been to expose the unvaccinated animals in the same way and the result has been that the animals not inoculated have contracted the disease, where vaccinated animals were protected against the disease. In many instances they have been protected wholly from the disease. In other cases they have not been protected wholly; there was some effect, showing that the vaccination was not sufficient in those cases to wholly protect them. That brings us to the point, that the degree of protection depends on the number of vaccinations. It is not a single vaccination, unfortunately. If the animal was proof against it with one vaccination it would be very easy of solution. The more often the vaccination is repeated the higher degree of resistance is afforded. The experiments that are now being made are with cattle kept on a farm for the purpose of making these tests. There are about eighty cattle on the farm in Delaware county.

A Member: With vaccination would it continue to be proof against taking tuberculosis throughout the life of the animal?

DR. PEARSON: We have animals now vaccinated two years ago.
Those are the oldest cases and they seem to be protected against it. One of the objects of this experiment is to determine the length of time the animal is protected. The work that we are doing is along several lines. We have a number of tubercular cows and the calves are being vaccinated and grow up with the cow; the calf cats from the same place and drinks from the same watering place and the purpose is to determine whether, under these very strong exposures to the surrounding conditions, the calves can be cured. These calves are perfect specimens of animal life and are in good shape and smooth and slick.

A Member: What age were they vaccinated?

DR. PEARSON: They were vaccinated at two or three weeks of age. One calf was vaccinated a day after it was born. Other experiments consist in vaccinating cattle that are yearlings and some that are two years old. We have a herd of thirty and twenty of those are vaccinated and ten not vaccinated and they are placed alternately in the stalls and thus the healthy animals are exposed to those which are affected in the worst form. After a period of thirty months the entire lot of thirty will be killed. From the results, so far as they have been attained, there appears to be good reasons to expect that the disease will be prevented in these vaccinated animals.

MR. STOUT: Have you any knowledge of the experiments made by Dr. Ravenel in transmitting tuberculosis from the animal to the human system. I read in a paper not long ago about an experiment made by Dr. Koch.

DR. PEARSON: I do not know all about his work, because it is done in connection with my own. The Koch theory you mention was announced in London in 1902. At that time Koch stated he believed there was very little danger in the transmission of tuberculosis from cattle to man and he based his conclusion upon this fact, that he had tried to transmit the tuberculosis of man to cattle. He had inoculated it on cattle and found that cattle resisted it and he concluded that if cattle resisted it from human beings that human beings could resist taking it from cattle. Therefore, the conclusion was that human beings could resist bovine tuberculosis. In Germany the Board of Health appointed a commission to sustain Koch’s position. Koch was an officer of that department and that commission has recently reported and, among other things, it reports this, which is extremely interesting, that under the auspices of this commission the tubercular bacilli were taken from sixteen children and their virus was inoculated on cattle and four of those cases the germs of the tubercular of children produced
tuberculosis in cattle. Koch's statement, at London, was that if one is in doubt, in a given case, whether the disease comes from cattle or from man the doubt can be removed by inoculating a cow or calf with the material from the man. If the calf contracts the tuberculosis it shows that the man can't get it from the bovine, but if the calf does not take it then it shows that the man caught it from another man. If we accept that it would seem from this report of the German commission that one-fourth came from cattle. Whether that is a safe means of determining remains to be ascertained by further investigation. He found in five cases that two, with the germs having the characteristics of the bacilli taken from cattle, which was determined by being inoculated in cattle, and died.

MR. RODGERS: Can the doctor say that there is any cure for tuberculosis? I see that some experiments are being made, way up in the mountains, by having patients in the open air as much as possible and they expect to bring about an entire cure by having tents located on top of mountains.

DR. PEARSON: There is at this time a great interest taken in the establishment of camps or open-air hospitals to accommodate people suffering with consumption and the idea is to have people who are afflicted in this way spend as much time as possible in out-door life. They do improve and sometimes recover most astonishingly. It is impossible to say how permanently they do improve; that they improve is beyond doubt. Perhaps some of them remain well throughout life and others may suffer and decline later on, through a lapse of the disease. The question of tuberculosis is rather an interesting one. When tuberculosis afflicts a person a considerable amount of tissue, oftentimes in the lung, is lost and a cavity is formed and a portion of the lung sloughs away. When a person recovers, that lung does not grow again, but the part of the lung that is lost is permanently lost and what is meant by recovery is that it ceases to progress, but the scar always remains and sometimes the germ of the disease remains but is enclosed in a rather thick fibrous wall, fenced in and, for the time being, does no harm. When the system is debilitated from some cause or other they are there just as smoldering hay is covered up and when the air gets to it it blazes forth.

A Member: I think I heard the doctor say something to this effect, where young animals have been born in the midst of tubercular surroundings they have grown up without being affected. Isn't it true that those animals offer greater resistance than those that have never been subjected to the disease?

DR. PEARSON: I think that is true, and the same thing is ob-
served in tubercular families. Dr. Flick, who is at the head of the Phipps Institution for the study and prevention of tuberculosis, has stated that children who have been born of parents affected with tuberculosis resist it better than others, until later in life, if they get through without contracting the disease that shows a resistance; but the fact is that so many of them get the disease as a result of this exposure.

MR. SCHWARZ: Dr. Pearson is an authority on tuberculosis. I am glad to hear him talk about mad dogs. He has had quite a controversy with other physicians as to whether dogs are mad or not and I would like him to tell how he knows they are mad.

DR. PEARSON: One very good way to find out is to let a mad dog bite another dog and see whether the dog goes mad. It is astonishing to see and hear how conflicting the views are as to this disease. The rabies has as much individuality, as a disease, as any other disease. It is a disease that produces a nervous effect on those bitten, causing them to have a maniacal desire to bite others, and the injury is imparted by the saliva, it being dropped into the wound when the bite occurs. It never arises from starvation, from thirst or from heat, or from any cause whatever, excepting exposure from animals afflicted with it. Strange to say there are some men who deny the existence of it. Especially does this occur where they never have seen it and they think a thing they have never seen cannot exist but, fortunately, this class of thinkers is becoming less and less and you do not hear so much of this sort of foolish talk as we did a few years ago. The whole head and front of this unbelief is concentrated in a certain physician in Philadelphia, who has made a report from year to year and has denied the existence of this disease. It happened last August that a man working in a machine shop was bitten by a mad dog as he run through the machine shop. One of his fellow-workmen picked up a crow-bar and killed the dog and threw it into the furnace where it was burned. Nothing more was thought of it and this wound was not dressed. In about three weeks the man felt a tingling sensation in his left hand and in his arm and had a depression in feelings and became irritable. One morning when he was going to work his wife induced him to stay at home and she sent for the doctor. He said he thought it was rabies, but in order not to excite anyone he was told he had inflammatory rheumatism. He began to get worse and they decided this man had rabies. He was unable to swallow and would get nervous and was thrown into convulsions and the duration of them became longer at each successive occurrence. So this physician, who holds the remarkable view on rabies, was called in and he says, no, he has no
rabies, he is suffering with delirium. He says, just go out of the room and I can cure him, and the patient died the next day. A post-mortem examination was held and in his brain was found the worst type of rabies. Rabbits were inoculated from the virus taken from the brain and they died of rabies and it was discussed by a hundred physicians and the gentleman who contested the diagnosis, and who contests all diagnoses on the subject, had nothing to say.

MR. MILLER: You said it can only be transmitted by a bite?

DR. PEARSON: Yes, sir.

MR. MILLER: Couldn’t it be headed off by killing all the other dogs and keeping the human patients away from those that were afflicted?

DR. PEARSON: Yes, I have no doubt it could.

The SECRETARY: Can it be transmitted by throwing off the saliva and it getting into the skin?

DR. PEARSON: Persons have been known, where there was a wound on the hand and the dog licked the hand, and it was transmitted.

MR. HERR: The disease is not carried in the blood?

DR. PEARSON: The blood is almost free from the virus. It is concentrated in the nervous system. It extends up the nerve duct and the closer the bite is to the brain the shorter of incubation. As an experiment, I inoculated two cows, one on the face and it took her about two weeks, and I inoculated the other on the tail and it took her about two months later.

MR. M. N. CLARK in the chair.

MR. McGWAN: The Executive Committee desire to make a report and asks permission to add to the Committee on Specialists the name of Col. H. C. Demming as additional Geologist, and we claim that Doctor Wadsworth will receive the assistance of an able assistant.

MR. RODGERS: I move that Col. H. C. Demming be elected by this Board as Assistant Geologist.

The motion being seconded, it was agreed to.

MR. HOLMAN: I desire to offer the following resolution:

"Whereas, At the Spring Meeting of the State Board of Agriculture held at Huntingdon, June 4 and 5, 1903, the committee on resolutions offered the following, which was unanimously adopted:
Resolved, That the Secretary of Agriculture endeavor to secure the appointment of one member from each of the Allied Organizations to present the views of this body (views relating to the Agricultural Exhibit from Pennsylvania to St. Louis Exposition Society) to the State Commission and to urge equitable recognition of the interests of agriculture.

And whereas, The Hon. N. B. Critchfield, Secretary of Agriculture, on June 30th appointed Norris G. Temple to represent the Pennsylvania State Poultry Association on that committee; therefore, be it

Resolved, By the Pennsylvania State Board of Agriculture at its annual meeting held at Harrisburg, January 28, 1904, that we heartily endorse the appointment.

Resolved, That we believe the magnitude of the poultry interests of the State of Pennsylvania warrant us in demanding a just and equitable distribution of the appropriation made by the last Legislature to the Louisiana Exposition Commission.

Resolved, That we endorse the application of Norris G. Temple as one well qualified to have charge of all the Pennsylvania exhibits in the poultry and pet stock department of the universal exposition at St. Louis, October 24th to November 5, 1904.

MR. HOLMAN: I move that this be adopted and the Secretary be requested to endorse it as having been passed by this Board and a copy be sent to Col. James H. Lambert, Philadelphia.

The motion being seconded, it was agreed to.

MR. NELSON: I offer the following resolution:

Whereas, We are informed that the Grange Organization purposes to systematically question legislative candidates with a view to securing legislation granting to trolley companies the right to carry freight in this State; therefore,

Resolved, That this State Board of Agriculture reiterates its position favoring such legislation and that we instruct our legislative committee to further such legislation by all honorable methods.

MR. STOUT: Wasn't that embodied in the proceedings entered on the minutes?

MR. SCHWARZ: It does not seem to be necessary to make any remarks with reference to this. I think it is only by persistent endeavors that we can ever gain our point. My opinion is that until the trolley interests are equivalent to the steam railroad that we cannot get it to carry freight and, therefore, I second that motion with all my heart.
MR. RODGERS: It follows so well, after the reading of my paper, that I heartily second the resolution.

MR. CREEASY: I have made some study of this matter and I find that in all states of the Union, except Pennsylvania and New Jersey, trolley roads carry freight and it seems to me it would be a great help to the farmers in the East if they could send their products to the markets by means of the trolley road and thus compete with the products of the farmers of the Southern states.

The motion being put, it was agreed to.

The CHAIRMAN: The next subject on the program is "The Man Behind the Plow," by Mr. McGowan. The paper read is as follows:

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THE MAN BEHIND THE PLOW.

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BY H. G. MCGOWAN. GEIGER'S MILLS, PA.

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Nothing can be more correct than—

"He who through the plow would thrive,
Must either hold himself, or drive."

By this is meant that the farmer must be at the helm of his business, personally directing the affairs of the farm, not only directing the affairs of the farm, but an actual performer of the work that is required to be done on the farm.

There has been a mighty lot said about "the man behind the gun," so much so that people have praised him greatly, for the faithful work he has done.

We are glad that we can speak of one who is more than equal, and who, for convenience, we will say now, is "the man behind the plow."

The man who won a lot of honor for the land where men are free, was the man behind the gun, who sent the Spaniards pretty lively across the deep blue sea. But the man who feeds the world and did it from the very beginning of all creation until now, is "the man behind the plow."

We take off our hats and bow to the warriors and heroes of our land; and when the shouting is over and all the fighting done, we somehow find that we are still dependent on "the man behind the
plow.” We have even sang about the glories of the “man behind the gun” and people are prone to praise him for the noble work that he has done. Many a battle has been fought and many a victory won and in this all praise is due to the man behind the gun. In this busy, bustling age people seem to be going it on the run, and somehow have not time for thinking about the “man behind the plow,” but after all we must acknowledge that we are all dependent upon him notwithstanding.

When we write or think about the man behind the plow we must remember we are discussing the first man whom God created. In His infinite wisdom, God created Adam who was the first man and who also was a farmer. God said to Adam, “Till the ground and keep the garden beautiful.” So from that time down along uncounted ages, the earth has been tilled and the whole world has been kept in life and vigor by “the man behind the plow.” When we speak of this man we do not simply mean the one who turns over the soil behind a pair of sturdy horses, but we mean the man behind his business, the man who is thoroughly in sympathy and love with every feature of his work in, on and around the farm. Love your farm as you should love it and your sons and daughters will learn to love it also.

Speak unkindly and half-heartedly about your farm and the boys will soon lay plans to leave the parental roof for an abode in the city. Herein lies one of the secrets of why boys want to leave the good old farm.

Praise the bridge that carries you safely over the stream and thus praise the business that controls the prosperity of our Nation.

The man behind the plow should be an active man, full of energy, full of push, full of minding his own affairs and not that of his neighbors.

The right man behind the plow will set his work in order and make his plans for attending all the Farmers’ Institutes within his district; who will take down notes of the good and valuable points thrown out by thoroughly practical men; who will put the same into practice during the following season and thus raise higher the standard of agriculture, which is the most honorable, most healthful, most noble and most useful pursuit of man.

The successful man behind the plow is the man who personally oversees his business in all its details. The writer knows what that means. A paper or essay has been commenced to be read at some farmers’ meeting (perhaps at the State Board of Agriculture meeting), when he is frequently interrupted by calls from the telephone, or is wanted at the stock barn or other places to direct affairs there, that needs his personal attention. After dropping pen or
pencil and setting matters in order, he again resumes his task—probably to complete "the man behind the plow."

While this man is an active, busy man, he at the same time must be a gentleman, one who has time to stop for a short time to converse with his neighbors and entertain all visitors at his home with politeness and gentility. Again, the successful "man behind the plow" (for we are not discussing the other fellow) is not a loafer in the corner grocery or blacksmith shop, spends little time discussing politics, phases of the moon, etc., but should be alert to his business, spending no more time away from his home and farm than is absolutely necessary. For instance, how would the merchant or manufacturer succeed if they would not be extremely attentive to their work, looking closely into every detail of their trade.

"The man behind the plow" should be a man of fair education, public spirited and of good mechanical judgment. One who can plow a straight furrow instead of one that may be so crooked that water could not follow it down hill. The furrow should be even in depth and the work when done look like a garden. All the ground should be well plowed and no misses. If the plow is thrown out of its course suddenly, back your team and see that there is no work done like that; that is called "cutting and covering." Some critic may here say, Why speak of this plowing? Anybody can plow. No, anybody cannot. A poor plowman means a poor farmer and a poor farmer means what? A poor farm.

If there was more time spent today in plowing the fields of our farms properly, there would be a surprising increased yield per acre. "Good plowing is one of the chief essentials to successful crop production." Boys many times can be directed to more profitable work on the farm, instead of trying to plow before they are able to do it practically.

Rev. J. B. Detrich, who operates that remarkable 15-acre farm at Flourtown, Pa., does every inch of the plowing himself; has done it all for 16 years and would not think of directing anyone else to do this important work, although he is supplied with help far superior perhaps to many farmers.

Cato asked the question: "What is the best culture of land?" His answer was: "First, good plowing; second, plowing in the ordinary way." It would, therefore, be wise to give more thought concerning the plowing of our farms, for the labor of the plowman produces the wealth of the world.

Very much is said about thorough cultivation, which is all right, but spend more time in thorough plowing. This will lessen the work of cultivation and very materially increase crop production. The
farmer must not think he is a slave to hard work, for men work hard in all trades and professions. James A. Garfield, Abraham Lincoln, and nearly all our great men were hard workers and be it understood that it is only the hard workers, men of toil and sacrifice of the present and past generations who succeed in their callings and rise to the pinnacles of fame. Talk with doctors, school teachers, institute workers, lawyers, contractors and all successful business men, and they will tell you how hard they have worked and how they have burned the midnight oil in order to make life a success.

Work is honorable, noble and right. Don’t ever think of apologizing that you are a farmer. Honor your calling as farmer, although it may call for the free exercise of all the muscles, yet it will honor you, for the farmer is the “Bone and sinew of our country.”

Elihu Burritt was the greatest scholar of his age, and yet he wanted to be called just what he was and that was a blacksmith.

“How pure is the air we breathe, my friends
What beauties open to our sight
Although tired we may be from toil, my friends,
But how sweet is our rest at night.”

“The man behind the plow” must be a sociable man, for sociability has a brightening effect upon the farmer’s life. Brood not over the ills of life. Every profession, trade and business of all pursuits has its discouraging features, and while the farmer is not exempt from discouragement, yet, the health that generally comes to the tiller of the soil, can be taken as so much wealth, remembering that with “Godliness and contentment there is great gain and that there never was a cloud so dark, but what had its silver lining, tinted with some glittering rays of good cheer.” To the honor of the sturdy men behind the plow, let it be said, with all reverence, that from their ranks, among the hills and valleys of our country, came most of our great men, who became leaders among the civilized nations of the world. Statistics tell us that nine-tenths of our men of high position in life came from the farm.

The farmer is one of the greatest of miners, although upon the surface of the earth, for it is said that between the months of April and November, the corn crop raised in one year was valued at $952,000,000. The digging of gold is a slow business compared with the work and achievements of the “man behind the plow.”

The man we are discussing must be a thinking man, rather giving more time to thinking out and planning his business and less to working. All successful undertakings have been, in their beginning, carefully thought over and well-planned. So it is with the farmer, who must plan his work and then work out his plans. “The ideal man behind the plow,” is a lover of Nature and feasts upon that which has been created by the Father of Light.
He enters into close communion with Nature and natures God. He breathes the pure air, sweetened by the gentle dews from Heaven, uncontaminated by the sulphur, smoke and dirt of city and town.

He believes in making the home attractive, the surroundings of his home beautified with evergreens and flowers, which at this age must be done to keep apace with the numerous attractions and allurements of the city.

In short, make the home the dearest, the loveliest, the sweetest and the most attractive spot on earth. He beholds the wholesome effort of the dew, the rain and sunshine upon his labors with Mother Earth and is in partnership, so to speak, and reigns over earth, sea and sky. Man can cultivate and fondle the earth, but is brought to a point of dependence and is led to willingly believe and acknowledge that, “Paul may plant and Apollos may water,” but God and God alone can give the increase. The man behind the plow feeds the world.

The farmer’s trade is one of worth, for he is partner with the sky and earth. He is partner with the sun and rain and he feeds, yes, he feeds them all.”

“The writer thinks, the poet sings, the craftsman fashions wondrous things. The doctor heals, the lawyer pleads, but the farmer feeds them all. The merchant, he may buy and sell, the teacher do his duty well. And men may toil through busy days, but the farmer feeds them all.”

For protection and advancement, “the man behind the plow” needs organization, for organization is the motive power that rules and guides the world. Organize for individual benefit through combined effort. The world is prone to selfishness, and organization breaks down designed influences and will bring prosperity and good cheer to many farmer’s homes. Organize that legislation may be secured in favor of the tillers of the soil.

And now, in conclusion, permit me to add that:

“In all the pomp and splendor of an army on parade, And all through the awful darkness that the smoke of battle made, In the halls where jewels glitter and where shouting men debate, In the palaces where rulers deal out honors to the great. There is not a single person who would be doing business now, Or have any medals if it was not for ‘the man behind the plow.’

“We are building mighty cities and we are gaining lofty heights, We are winning lots of glory and we are setting things to right; Why, we are showing all creation how the world’s affairs should run. Future men will gaze in wonder at the things that we have done, But they will likely overlook the fellow, just the same as some do now, Who, let me say, is the whole concern’s foundation, and that is, The man behind the plow.”

COL. DEMMING: I thought the list of Consulting Specialists had been filled, but I think there is room for another and that is the Poet-Laureate of this Board.

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MR. SCHWARZ: I have listened very attentively to the address, entitled, "The man behind the plow," and I have been very much pleased with it; but nothing is said about the partner of the man behind the plow, the wife of the farmer. I, therefore, offer the following resolution:

"Resolved, That this Board expresses its appreciation in the presence of Mrs. A. L. Martin, of Harrisburg, and Mrs. Fritz, of Duncan- non, for their attendance at this meeting."

MR. McHENRY: I would like to offer a resolution, if this would be the proper time. Before reading it I desire to say that when I look around here and see a majority of those present now, and those who have been present here, have grown gray and some of us have grown gray in the work we have engaged in. I think my resolution will pretty nearly come in place. What I mean to say is this: It comes from my end of the State, and I wish to say that the decision of the court, in Mercer county, is striking at the most vital interests of the farmers of this State and we think that this State Board ought, at least, to express its views on that question. I will read my resolution and that will explain what I mean.

The resolution is as follows:

"Whereas, We the members of the State Board of Agriculture believe that an honest, fearless and impartial enforcement of the pure food laws is a matter of paramount importance to all classes of our citizens, and

"Whereas, We have recently learned, through the public press, and otherwise, that Judge Miller, of Mercer county, has arbitrarily refused to impose sentence on defendants who have been convicted in his court for the illegal sale of imitation butter products; therefore, be it

"Resolved, By the State Board of Agriculture, assembled in annual session at Harrisburg, this 23d day of January, 1904, that the Secretary of Agriculture and the Dairy and Food Commissioner are respectfully urged to carefully investigate the matter, and if it is found that Judge Miller has taken a position which is contrary to law as well as to the dairy interest, and the protection of public health, that they shall, without delay, appeal to the proper legal tribunal to secure such aid which will prevent the Mercer county judge or other members of the judiciary of the State from taking an attitude concerning the acts of Assembly, which not only are revolutionary in character, but a menace to public health,"

MR. McHENRY: I move the adoption of the resolution.

A Member: I second the motion.

MR. FENSTEMAKER: Wouldn't it be better to strike out those words "being against public health" and insert "being contrary to the law."

MR. McHENRY: I have no objection to that, except the striking out. I have no objection to adding it. I think I have covered that by referring to the act of assembly.
MR. CREASY: It seems to me it would have been a wise plan to add, according to the law. Of course the latter part of the resolution refers to that. I think this Board should take a decided stand on this question because you, who took any interest in getting this law passed, know what we had to combat and it is a question whether we have not the same interest to combat now, and I think it is right that these resolutions should be passed.

MR. FENSTEMAKER: A judge cannot be censured for deciding something contrary to the public health but he can, if he decides contrary to the law.

MR. CREASY: I ask to have it read again.

Resolution read second time by Mr. McHenry.

MR. RODGERS: I move that the words “contrary to the law” be added.

MR. NELSON: I think we can’t be too careful in the passage of this resolution. There is a good bit of difference of opinion as to the deteriorating effects on public health. I am opposed to it personally but I thought we would get up a discussion with reference to this subject.

MR. McHENRY: It is a very delicate question to take into consideration right here. We are only going on public report and newspaper report as to the action of this judge in Mercer county. Before we can accuse him of ruling “contrary to law” we should have his decision as it is recorded on the books of Mercer county. I know that some of the best minds are making a very careful study of this question just now. It may be a very intricate question as to the right of a judge to withhold sentence after one has been convicted of breaking the law. If he has only withheld sentence, or suspended sentence, it is a very grave question as to what we shall do here. If he has deliberately thrown it out of court, as has been given in public print, it makes it very plain and I say you cannot make it too strong if that is so. If he has thrown it out and says he would not sentence the party simply because the party had not been notified, with reference to the law, prior to his breaking the law, then I don’t care what you put in there. If he has taken the ground that because I am going to break your safe tomorrow night or steal your chickens, that you must come and notify me not to do it, then I am satisfied to put that in; but we have nothing to show exactly how this matter is except from newspaper accounts and the general public reports.

MR. SCHWARZ; It seems to me you are on awful dangerous grounds. I know the man who stands up here and speaks against
this resolution is subjecting himself to attack. We have, Mr. Chairman, many judges who suspend sentences. Very often it is done in the case of one who has violated the law for the first time in order to give him a chance, and as a warning to other offenders to keep them from breaking the law. You do more than this in this resolution; you place the Secretary in a false position. You put him in the place of attacking the lower court, and if the opinion of the judge of the lower court is wrong there is a higher court to determine that.

MR. CREASY: I received a report a week or so ago from the Dairy and Food Commissioner of this State showing a statement where he received the sum of $38,000 for violations of the law, which was placed in the State Treasury and which was to be used for the suppression of violations of the oleomargarine law. Who is to enforce that law? Is it you, or myself up in Columbia county? No, I can't do it because I haven't the money. It is the State Department of Agriculture that should enforce that law and here are $38,000 with which to do it. I am thoroughly in favor of that resolution stating, that it is contrary to law and the dairy interests.

MR. McHENRY: We have added a certain thing, and with your permission I will read it: "And if found that Judge Miller has taken a position which is contrary to law as well as to the dairy interests and the protection of public health."

MR. CREASY: That is all right.

MR. McSPARRAN: I don't know whether I have a right to speak before this body. I am not a member of it. I came here representing the cattle club of my own county. As I am in a section where the dairy interests are the most important interests of the farmer I am sure we would appreciate, to the fullest extent, the passage of this resolution by this Board practically as it has been presented to us. The matter of pure dairy products is one of great importance to us for the reason that we are manufacturing pure butter and putting it into the market, and we made the strongest fight against the manipulations and endeavors of people who wanted to substitute a spurious article to the endangerment of our business, and, while I should not advise the State Board to go into a criticism in the exercise of the powers of the judiciary, yet it does not appear to me that we can state our case any too strongly, and if in that statement there is warranted a condemnation of the action of the judge he must take the consequences.

COL. DEMMING: In my long experience with the courts of Pennsylvania I believe the Judiciary are above reproach. But sometimes it does occur that a person is elevated to that responsible position
and assumes the position of autocrat and I think, in a case like this, the Board should take action.

MR. SCHWARZ: It seems to me that one word there is wrong. It says there, that the State Board should take action in case the decision of the court is found to be contrary to law. A judge could not suspend sentence unless the law gave him the right to do so. That is all he has done. If they have a right to do so, how has he gone contrary to the law? He has acted in the right of his discretion.

MR. BLYHOLDER: I hope this will pass. It does seem to me that the action, according to the information given, of taking the law into his own hands, is going too far. He gives as his reason for not sentencing them that they should be notified beforehand and then if they violate the law they should be punished. If that precedent is permitted to be established, what can't I commit in the State of Pennsylvania, and then claim ignorance of the law? It seems to me wonderful that we should set up such a precedent as that, and I think the State Board of Agriculture ought to set itself on the side of right.

The question being called and a vote taken, it was agreed to with one negative vote.

The CHAIRMAN: The next subject on the program is the paper on the "Relation of the State Board of Agriculture to Farmers' Organizations and the Farmer," by Mr. Blyholder.

The SECRETARY: At the time arrangements were being made to make up the program I wrote Mr. Blyholder and asked him if he would take a place on the program and he very kindly said he would, and subsequently I learned that serious affliction in his family influenced him to turn his thought in another direction; but he has come here and stated that he would be willing to give us his thoughts on the subject of his paper. I move that he be given opportunity to prepare his paper and send it to the Secretary for publication.

The motion being seconded, it was agreed to.

MR. SCHWARZ: I thought he was to give his thoughts on the subject now.

MR. BLYHOLDER: I might say that the position I hold, or the thoughts I would express, or rather in the form that I would write a paper on the subject, that I would endeavor to show the object of the organization of the Department of Agriculture and show in various ways that these Departments and Boards have been formed for the advancement of the best interests of the agricultural class. Then I should go on and take up the subject of the Board and De-
partment of Agriculture as to their association with the various societies, as they are formed throughout the different counties in our State; and in that connection I should certainly point out what I believe are some of the bad or evil practices in existence with some of those societies, and, if possible, find a remedy for that in this, that some of the agricultural societies who send representatives to this body, their actions, or their affairs, or their meetings, are not any credit to this Board and therefore it seems to me and my endeavor shall be in that paper to point out some of these evil practices, and if possible, suggest a remedy and show the necessity of the most intimate connection between this body and the various bodies in the State; and go on and show that the most harmonious action should exist between these bodies and the other various societies organized under other names, such names as grange or farmers' alliance and other organizations that we have reasons to believe are organized for the bettering of the condition of the farmer and his family. That is an outline of my thoughts on this question. It seems to me we ought to have papers or discussions on this line so that an influence might be thrown out from the State Board over the organizations in the different counties, throughout the State, so they would feel the influence of the higher organization, and if that can be done it would be a great benefit to this organization. We have too many farmers in the State of Pennsylvania who seem to know nothing at all about the work of the State Board of Agriculture, therefore, we ought to reach out and educate the farmers so they would act in unison. Those are about the details I would present in a paper of that kind.

The CHAIRMAN: The next paper is entitled, "How to Grow and Utilize the Indian Corn Plant to the Best Advantage," by Mr. Holman.

The paper read by Mr. Holman is as follows:

HOW TO GROW AND UTILIZE THE INDIAN CORN PLANT TO THE BEST ADVANTAGE.

BY A. T. HOLMAN, NEWARK, PA.

It is not necessary to enter into the details of the origin of the corn plant in this paper, as we all well know where it originated. The subject to be considered is how to grow the most profitable
plant or stalk, and how to utilize it to the best possible advantage. When one starts to grow the plant, the fertility of the soil and rotation should be considered at least two or more years before. We must accept the nature of the soil as we have it and not as we would like to have it. My soil is limestone clay and will, therefore, consider it from this point of view.

The soil should be of a clover sod, being mowed but one year, the aftermath or second crop, unless it is very full of seed, should be left on the field to supply humus to the soil. Some prefer to manure ground just before plowing. Our practice is to manure the tiny plants immediately after the grain crop is harvested. This method in connection with clipping the young plants and keeping all stock off the land, enables the grass to make a vigorous growth of the clover plant, and will encourage it to the extent of never failing to have a good catch of clover. We sometimes have it burnt out by excessive drought and hot sun in the latter part of the summer. But as yet I have found no remedy to avoid this, and try to accept the situation as good naturedly as possible.

To get the best possible stand of corn, it seems necessary to plow our tough tenacious clay in the fall, allowing the action of the frost to pulverize the soil. I very much prefer the spring plowing if it was not for having the action of the frost upon the soil; and on very rolling land I prefer to take the chances on the spring plowing, as it is not as likely to wash the field into gutters which is very discouraging to those who have any pride in the looks and condition of his fields.

The next to be considered is the preparation of the soil by harrowing and rolling until it is fine and firm. Our method is not how often, but how thorough. There are too many of our farmers who measure their success and failures by the number of times harrowed and cultivated. One of my neighbors was complaining of his poor corn crop and unable to feed any cattle this winter when, in the same breath, said, he could beat Perry county for corn for only having one cultivation. This man should be classed with the man out west who mowed the weeds along the roadside without being compelled to do so by the road supervisor. The neighbors are arranging to exhibit him at the World's Fair at St. Louis.

Before leaving this point, I want to say, to do this thorough work at a profit, one must have good implements. My favorite harrow is the spring tooth in connection with smoothing, and Acme harrows, our soil being too tenacious to use either disk or spade, requiring too much power for amount of work accomplished. When speaking of harrows, some people think a harrow is a harrow, which is not the case. There are many harrows on the market and among the farmers that I would not take as a gift, being simply made to
sell and not to till the soil, and farmers would make lots of money by simply giving them away and buying those that would be of some value to loosen the soil and not hop over it like a toad.

Having said nothing about the depth of plowing, I would advise against plowing a deep soil shallow, or a shallow soil deep. While having great faith in deep soil, it should be deepened by plowing a little deeper each time and not getting too much inert soil to the surface at one time as this is detrimental to plant growth, especially to the smaller plants as grass, wheat, etc. Corn can stand more, but I do not prefer it.

The next point to be considered is the seed; remembering that there is just as much profit in good plants as there is in animal life. While the prize winner at the International Live Stock Show this year was a grade of three different and distinct breeds, does not make it a good criterion to go by; it is the exception and not the rule. One should experiment every year to find something better, of course. But I have done so for a long time, and at present am planting the same corn my father grew thirty years ago. Having tried crossing by mixing and planting alternate rows, etc., I find the best and most profitable way, is to select your ideal seed and plant this in the best part of your field and select your seed from these plants, year after year, and plant all of the butts of the ear and not the point, and you will find your seed improving. One should avoid barren stocks, etc. But I will wager if this method is followed, the barren stocks will be few, in an average year. While there is much being done by our Western brethren along the line of breeding by crossing, pelenizing and making an effort to grow a corn with a larger percentage of protein and a small per cent. of carbohydrates. I will leave this experiment for some one whose time is less valuable than mine; but will try and profit by his experience, as life is too short to try all the experiments that benefit the farmer.

This is what our Experiment Stations are for. In securing a corn plant we should consider not only latitude, length of season, etc., but our height above sea level. My ideal plant is the one I can grow the largest amount of grain to the smallest amount of fodder. Some of our Experiment Stations claim that there is 55 per cent. of the feeding value in the stalk. I do not hesitate to believe this when passing some corn fields with gigantic stalks and dwarf ears; in fact I sometimes think the fodder is underestimated. The grain being the easiest to handle, I prefer a variety that gives the largest return of shelled corn per acre. While this has been an off-year for corn, by following the above methods we succeeded in raising 148 1/2 bushels ear corn per acre, which I am satisfied would have made 80 bushels shelled corn.

Cultivation should be early and late. Last, but not least, often,
While we have very good machines for cultivating from two to six rows to the round they are not sufficient to lay by a crop. Some people think as soon as corn gets too tall that the machine brakes or bends the stalks, work should cease and the machine laid by.

While this is the time it pays to cultivate, I think a man, a mule or small horse and an up-to-date-one-horse cultivator can earn more dollars in a single day than any other work on the farm. You may say it takes too long or do not have the time. I will say it will pay you great to neglect your harvest for a day or two to give your corn a cultivation; also after harvest as long as you can get through, which is only impossible when we have a storm that blows the corn down and over the row. It pays to watch the corn after a storm for a few days as it very often becomes erect again, when cultivation can go on. You may say a farmer does not have time to do all this. I say a man following a diversified system of farming has the time if he gets up and hustles. A horse and man who cannot cultivate 8 or 10 acres a day I do not consider very valuable, as I have cultivated 10 acres in 10 or 11 hours many times with fair length of rounds and reasonably clean soil.

One man should be able to attend 50 acres of corn in a moderate season; I mean if we do not have too much rain, necessitating the work to be done between showers. This would give him six acres per day, and the corn a cultivation about every eight days which is sufficient on the average soil; and my word for it, "It will pay."

After having given an outline of the kind of corn and how to grow it, I will try and give you an idea of how to make the most of it, partly by experience of my own and partly by the experience of others. The highest feeding value of the plant and ear is just when it is in the glazing stage. This is the time to secure it, same as you would sell stocks and bonds if we know when they are at their highest point. It has been thoroughly demonstrated that the glazing stage is the zenith of the corn plant.

Then why not use it. We cannot of course feed it all in this stage. The next best thing is to silo as much as one can use to advantage. Next cut and shock the remainder, husk and secure both fodder and corn with as little bleaching and leaching as possible. The corn and cob can be fed whole to a profit up to about February or March when the cob becomes too hard and should be reduced by crushing or grinding by some system, as it has been thoroughly demonstrated that the corn and cob meal will make as many pounds of beef as corn meal alone, and if hogs follow the cattle more dollars can be made out of the crushed corn and cob than by corn meal. The fodder or stover should be reduced by a shredding or cutting and crushing process to make every bit of it available for feed. I prefer the cutting to one-fourth in lengths and crushing it. I think this puts it in the best possible feeding condition either
to feed dry or as mixed feed. By this you double your feed and feeding stover whole. You may think this a pretty broad statement and is stronger than I have ever heard anybody claim, but I have demonstrated it to my own satisfaction. Say it doubles the feeding value if properly handled. It has long been termed a shame to feed whole corn stocks, but of late it is considered a gross if not an unpardonable sin by our friend Bob Seeds, and thinks it cannot be done in safety only before a protracted meeting. I heartily coincide with him in the assertion.

In conclusion, in making the most of the corn plant, I will say let every one consider their location and environment and decide for himself. Dairying and being able to get 5 or 6 cents per quart for milk is the most remunerative, selling butter at a contract price the year around. Second. Dairying and selling milk to the creameries for less than $1.00 per hundred pounds is a slow but sure way to the poorhouse, as they are slowly but surely selling their farms for less than their real value, not including their labor.

Last, but not least, is the man who follows mixed farming, keeping 6 or 8 cows, raises his calves, takes 3 years to grow them before they are ready or large enough to get a buyer to look at them, and finally sell all at once in the fall for beef, glut the market and get a low price per pound, and then claim feeding cattle does not pay; but start in the following spring and graze from 16 to 32 head all summer and have every spear of grass and as well as weeds pastured off, and then complain that their soil is lacking in humous, and nine out of ten will say, "I guess I must apply lime as I cannot get clover to catch."

To this class of people I would say, the Lord is certainly good and kind to you; he is giving you a living on the farm, and in my judgment they are not entitled to it for the amount of energy and labor applied. They have more than they are entitled to, and truly hope the time is not far distant when the average farmer will make better application of his time than he does at present or go out of business. Our Western brothers, who farm corn as a business, do not hesitate to say, good corn land is worth $100.00 per acre. I am willing to make the assertion that we have as good corn land in Pennsylvania as they have anywhere if we will put it in proper condition to produce it and give it thorough cultivation. Do not understand that we can raise the bumper crops they can in a year that is favorable to their environment. But in a series of ten years, we can beat them. Much of our best corn land can be bought for little more than the half of $100.00 per acre. You may say our taxes and expenses are more than theirs. Well, yes they are, but we are responsible for the existing circumstances and should not complain.
In speaking of the corn plant I want to say it is the general opinion that it is a one-sided ration and sometimes must be raised to balance up the rations for farm animals. An acre of good corn siloed contains 555 pounds of protein or as much as is found in three and one-third tons of clover hay or about the product of two acres upon an average, or as much protein as in five and five ninth tons of timothy hay or the average product of two seven-ninth acres. Thus it will be seen that in one acre of corn silage we have as much protein as in one and two third acres of clover hay and two and seven-ninth acres of timothy hay.

It has been quite generally conceded for years that clover hay is the most desirable roughage that the feeder can produce; but experience has demonstrated that corn silage will furnish cheaper protein, besides the advantages of the succulent nature of the feed, thus giving our stock a ration closely resembling that of summer feed.

In summing up the advantages of the corn plant when the most has been made of it, is as follows:

1. More and cheaper protein.
2. Having June conditions the year around.
3. Storing feed in less space.
4. Can do with less purchased feed.
5. The producing capacity of farm increase.
6. Cheapest and best feed than can be produced on the farm.

Therefore, as corn has been termed “king,” why do we farm wheat at a loss? Let us make the corn crop our specialty in our diversified system, as it is necessary to diversify in order to fit our soil for specializing. We are not all situated to follow market gardening, raising tobacco, potatoes or many other specialties, but let us follow a good system of rotation, “short if you please.” Specialize some crop, giving our care to careful study and pencil work, in connection with plenty of mule and elbow-grease, as Massey terms it, applied to our tillage, and I feel sure there will be less to complain about and farming will be more remunerative in the future than the past or present.

In conclusion, I beg to say that the enclosed points are my methods with a few facts culled from our bulletins.

MR. CHUBBUCK (Bradford County): If we get a dollar a hundred out of our milk and creamery we are doing well, and I want to say that I believe the only thing that saves us in our county is our corn crop. I want to give a little experience of my own. I took one-eighth of an acre, planting it in corn with a seed called Mortgage Lifter, intending to thin it to three stalks in the hill, believing that the reason we did not get more to the acre was because
the corn was planted too thick. I don't know whether you gentlemen have raised this particular variety of corn or not, but it is the yellow kind. I planted it the second day of June which, in my latitude, was late, but I was told that it would grow. It came up very nicely, but when I went through to see it I saw some hills had only two stalks in it and I left as high as four stalks in some hills, just about enough to overbalance the number that had only two in. I cultivated that and it made a splendid growth. In the first place, it was a clay sub-soil and I did not put any manure on it. It was a pasture field with quite heavy clover sod and in ninety days' time that was just in the position the gentleman speaks of. I cut that and cured it and husked it and I had one hundred bushels shelled corn to the acre and I sold that corn for seed corn. It was at the side of the road and I had letters about it. It is the same year I raised four hundred bushels, besides filling the silo, and I want to say if you don't raise corn you should do it. I don't believe there is any place in Pennsylvania but what you can raise corn. It is a cheap way to feed cattle. You can keep cows on about two cents a day on corn and silage. We make a business of doing it. It will cost you eight cents a day to keep them on timothy hay. If we have buckwheat straw we feed that and we feed oats straw and I keep my cows in all winter and they are gaining all the time. In my section cows are dry from six to eight weeks.

The SECRETARY: May I ask whether you mean they are gaining in their milk production or in flesh?

MR. CHUBBUCK: In flesh.

The SECRETARY: And giving milk all the time?

MR. CHUBBUCK: There is not very much time lost, from six to eight weeks.

The SECRETARY: As a rule there is not very much corn raised in your county?

MR. CHUBBUCK: As a rule they raise corn. It is a crop we lay ourselves out to raise. We must have it.

The SECRETARY: There is a great deal of river bottom land there but all that land is corn land.

MR. FENSTEMAKER: I think it is a pity that they don't pay more attention to the naming of corn. I think the gentleman called it the Mortgage Lifter. I had some of the same corn with the same name and it did not mature.

MR. CLARK: What is the average yield?
MR. CHUBBUCK: In a good corn year we get fifty bushels of shelled corn to the acre. There was a question handed in that Prof. Surface was requested to answer.

The SECRETARY: The question is: "Will Prof. Surface tell us something about spraying potatoes for blight? Also the cause of blight?" Professor Surface is not here. Perhaps some other gentleman will tell us.

MR. FENSTEMAKER: I think Mr. Schwarz can satisfactorily answer that question.

MR. SCHWARZ: I spray all my potatoes and never have any blight, but I have been traveling with a doctor of the University of Pennsylvania, as a lecturer on potato culture, and I am convinced that by spraying with Bordeaux mixture it will be prevented except it is in a very wet season. It is claimed that it starts from the leaf and the spores are washed from the leaf into the ground and there produces the rot of the potato. I am entirely clear from it and I always spray my potatoes with Bordeaux mixture.

The CHAIRMAN: We are now up to the closing remarks. Is there any one present who has anything to say before we adjourn?

The SECRETARY: I feel that I am under an obligation of gratitude to those who have responded so promptly, when asked, to take part in the program. I am gratified with the fact that we have gone through with the entire program. There is nothing left unfinished. I shall go away from this meeting much refreshed and with the thought that it was good for me to be here.

MR. HERR: I have been watching the work of the State Board of Agriculture for a good many years and when the Department of Agriculture was created, the supposition seemed to be conveyed that the Board was at the end of its work and its services would not be of much value. But the longer we are in it the more interested we seem to become and I am very much gratified with even the little recognition the Board receives from the administration and from the Legislature, as well as gratified that there are so many members who stick to it, pay their own expenses, attend its meetings and take an active interest. There is no other institution, no other body in the State, to my mind, that makes the sacrifice, gratuitously, to do the work that is done by the State Board of Agriculture, and they are doing a great work, especially in institute work and in co-operation with the Department of Agriculture and, it seems to me, they do not get proper credit for the work they do. I think they ought to be credited with more than
they are credited with doing, because they do the work that is essential to the successful work of the Department of Agriculture in many ways. As a member of the State Board of Agriculture I don't want it understood that we are doing anything more than we ought to do, but you know we are the agricultural centers, each one in his own county, and that he has not only to attend to the meetings in his own county, but he is considered the center of agriculture there and he is plied with letters and questions from all over the county. I say we have done a gratuitous work and it is very pleasant to know that so many have come out to this annual meeting, and the hope is that we will stick to the work and that we may receive proper recognition, that we deserve.

MR. HERR: I move that we now adjourn.

The motion being seconded, it was agreed to, whereupon, the meeting adjourned at 3.50 P. M.

N. B. CRITCHFIELD,
Secretary.
PROCEEDINGS OF THE ANNUAL MEETINGS

OF THE

STATE HORTICULTURAL ASSOCIATION

OF PENNSYLVANIA,

HELD AT

HARRISBURG, PA., JANUARY 21, AND 22, 1903, AND AT LANCASTER,
JANUARY 19 AND 20, 1904.
STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA.

OFFICERS FOR 1904.

PRESIDENT.

Howard A. Chase, .............................................. Philadelphia.

VICE PRESIDENTS.

Gabriel Hiester, ................................................ Harrisburg.
Hon. W. T. Creasy, ............................................. Catawissa.
D. C. Rupp, ........................................................ Shiremanstown.

RECORDING SECRETARY.

Enos B. Engle, .................................................... Waynesboro.

CORRESPONDING SECRETARY.

Wm. P. Brinton, ................................................... Christiana.

TREASURER.

Edwin W. Thomas, .............................................. King of Prussia.

MEMBERSHIP.

LIFE MEMBERS.

Bartram, J. Hibberd, Milltown, Chester Co.
Boyer, John F., Mt. Pleasant Mills, Snyder Co.
Brinton, Wm. P., Christiana, Lancaster Co.
Chase, Howard A., 1430 S. Penn Square, Philadelphia.
Chase, Charles T., 1430 S. Penn Square, Philadelphia.
Calder, Dr. James, Harrisburg, Dauphin Co. (deceased).
Cornelius, Robert, Philadelphia.
Creasy, Hon. W. T., Catawissa, Columbia Co.
Engle, Henry M., Marietta, Lancaster Co. (deceased).
Engle, John G., Marietta, Lancaster Co.
Engle, Enos B., Waynesboro, Franklin Co.
Ermentrout, Hon. Jas. N., Reading, Berks Co.
Fox, Cyrus T., Reading, Berks Co.

45—6—1903
Garrettson, Joel V., Floradale, Adams Co.
Good, C. W., Waynesboro, Franklin Co.
Hacker, William, Philadelphia.
Hayes, Charles P., Philadelphia.
Heyser, Jacob, Chambersburg, Franklin Co. (deceased).
Hildrup, W. T., Raleigh, N. C.
Hiller, Casper, Conestoga, Lancaster Co. (deceased).
Hiller, Peter C., Conestoga, Lancaster Co. (deceased).
Hoopes, Josiah, West Chester, Chester Co. (deceased).
Landis, Israel, Lancaster, Lancaster Co.
McCormick, Harry, Harrisburg, Dauphin Co. (deceased).
McCormick, James, Harrisburg, Dauphin Co.
Martin, J. O., Mercersburg, Franklin Co.
Meehan, S. Mendelson, Germantown, Philadelphia Co.
Reist, Peter S., Lititz, Lancaster Co. (deceased).
Scribner, Prof. F. Lamson, Knoxville, Tenn.
Shaffner, Jacob, Harrisburg, Dauphin Co.
Swift, Rev. E. P., Mt. Oliver, Allegheny Co. (deceased).
Thomas, George B., West Chester, Chester Co.
Thomas, Edwin W., King-of-Prussia, Montgomery Co.
Van Deman, H. E., 3630 13th St., N. W., Washington, D. C.
Wertz, D. Maurice, Quincy, Franklin Co.

HONORARY MEMBERS.

Barry, P., Rochester, N. Y. (deceased).
Downing, Charles, Newburgh, N. Y. (deceased).
Ellwanger, George, Rochester, N. Y.
Edge, Thomas J., Harrisburg, Pa.
Garber, J. B., Columbia, Pa. (deceased).
Heiges, Prof. S. B., Saxe, Va.
Meehan, Thomas, Germantown, Pa. (deceased).
Michener, Dr. E., Toughkenamon, Pa. (deceased).
Parsons, Prof. S. B., Flushing, N. Y.
Parry, William, Parry, N. J. (deceased).
Rathvon, Prof. S. S., Lancaster, Pa. (deceased).
Rowe, Hon. D. Watson, Chambersburg, Pa.
Rutter, John, West Chester, Pa. (deceased).
Stitzel, George D., Reading, Pa.
Thomas, John J., Union Springs, N. Y. (deceased).
Warder, Dr. John A., North Bend, O. (deceased).
Wickersham, Dr. J. P., Lancaster, Pa. (deceased).
Willetts, Rev. Dr., Philadelphia, Pa.

ANNUAL MEMBERS.

Achellis, George, West Chester.
Adams, Wm., Enslow.
Allison, J. W., Mercer.
Ammarell, Charles, Reading.

Armsby, Dr. H. P., State College.
Baker, Dr. A. C., West Chester.
Balderston, John L., Kennett Square.
Barnhart, Hon. W. R., Greensburg.
No. 6.

DEPARTMENT OF AGRICULTURE.

Barnard, C. P., Northbrook.
Bartram, Frank, Stephen Girard Building, Philadelphia.
Bickel, Isaac, Reading.
Bittenbender, C. F., Bloomsburg.
Boekestone, Wm., Castle Shannon.
Bolton, W. P., Liberty Square.
Bone, George, Thorndale.
Border, Wm., Reading.
Boyd, M. H., Atglen.
Boyd, E. L., Connellsville.
Bracken, J. W., Hollidaysburg.
Breisch, D. D., Ringtown.
Breisch, Robert A., Ringtown.
Breneiser, Sr., Charles, Reading.
Brenneman, J. D., Harrisburg.
Briggs, W. H., Carrick.
Brinser, C. E., Middletown.
Bromell, J. Horace, Cheyney.
Brumbaugh, A. J., Reading.
Bryfogle, S. G., Bloomsburg.
Bucher, Dr. J. Riley, Lebanon.
Butz, Prof. Geo. C., State College.
Burkey, Joshua R., Reading.
Burns, J. S., Clinton.
Campbell, J. J., Cuddy.
Carrahan, M., Carnegie.
Carter & Son, J. I., Chatham.
Clark, M. N., Claridge.
Clemson, J. W., Halifax.
Collins, R. A., Rodl.
Comfort, H. W., Fallsington.
Cooper, Calvin, Bird-in-Hand.
Cooper, D. W., Sunbury.
Critchfield, Hon. N. B., Harrisburg.
Darlington, Frank P., West Chester.
Davis, W. H. H., West Chester.
Day, Theodore, Derry.
Denlinger, Amos B., Iva.
Demming, H. C., Harrisburg.
Derr, Cyrus G., Reading.
Dickson, John, Mt. Lebanon.
Dunn, Henry J., Reading.
Dunlevy, M. C., Carnegie.
Ely, Amos F., Mt. Joy.
Engle, Ezra B., Marietta.
Erb, Amos H., Littlestown.
Eslinger, Samuel L., Good Hope.
Fergus, W. P., Mustard.
Fink, Fredk., Green Tree.
Foster, C. A., Carnegie.
Foster, T. C., Harrisburg.
Fryer, W. J., Woodside.
Funk, Dr. J. H., Boyertown.
Garrahan, M., Kingston.
George, J. M., Shermansville.
Grant, Jeremiah K., Reading.
Graybill, Hon. D. W., East Petersburg.
Haines, Mary M., Cheltenham.
Hall, E. H., West Chester.
Hamilton, Prof. John, State College.
Harnish, H. H., Hubers.
Harper, Wm. Warner, Chestnut Hill.
Harris, L. C., Perryopolis.
Harris, Philip, Cabin Run.
Harrison, Orlando, Berlin, Md.
Hartman, D. L., New Cumberland.
Haundenshield, J. E., Carnegie.
Hawley, Jesse G., Reading.
Herr, Joel A., Cedar Springs.
Herr, Daniel D., Lancaster.
Herr, Aldus J., Lampeter.
Herr, David S., Mountville.
Hess, Enos H., Lancaster.
Hester, Gabriel, Harrisburg.
Hirschinger, John, Enslow.
Hochberg, Wm., Whiteoak.
Hochberg, Jacob, Job.
Hoke, David, Hanover.
Horn, P. T., Oakdale.
Ingram, E. T., West Chester.
Jamison, J. E., Swales.
Johnson, W. B. K., Allentown.
Johnson, R. F., Carnegie.
Jones, S. Morris, Westgrove.
Keller, Col. D. C., Reading.
Keppel, Samuel B., Sinking Spring.
Koons, Dr. P. R., Mechanicsburg.
Kready, John, Mt. Joy.
Kraybill, S. S., Mt. Joy.
Krewson & Sons, James, Cheltenham.
Lee, Samuel W., Woodville.
Leinbach, Joseph A., Reading.
Leinbach, Geo. A., Reading.
Lesher, C. M., Northumberland.
Longsdorf, C. L., Floradale.
Longsdorf, D. E., Mechanicsburg.
Long, H. R., Mt. Lebanon.
Loop, A. L., North East.
Lutz, Frank, Gayly.
McFarland, J. Horace, Harrisburg.
McHenry, G. S., Benton.
McKenna, John, Green Tree.
McLanahan, J. King, Hollidaysburg.
McSparran, W. S., Furniss.
Mackall, R. C., Beaver.
Marshall, Mrs. J. L., 239 Fourth Avenue, Pittsburg.
Mashey, Mrs. Geo., 6736 Penn Ave., Pittsburg.
Mayer, H. M., Rohrerstown.
Mayer, Dr. J. M., Willow Street.
Meehan, Thomas B., Germantown.
Miller, J. W., Tippecanoe.
Moon, Wm. H., Morrisville.
Moon, Samuel C., Morrisville.
Morrow, Thos. J. E., Hickman.
Murray, J. K., Pottsgrove.
Myers, William, Bendersville.
Neiley, John R., Bloomsburg.
Neyhard, John R., Bloomsburg.
Nissley, P. R., Mt. Joy.
Ort, Henry, Lewistown.
Obold, John H., Reading.
Patterson, J. A., Stewartstown.
Peters, Earl, Uriah.
Persing, E. E., Sunbury.
Philip, George, Mt. Lebanon.
Pierce, Geo E., North East.
Pyle, J. W., Willowdale.
Rakestraw, Thomas, Willowdale.
Richards, A. C., New Paris.
Rife, Jacob L., West Fairview.
Roesler, F., Carnegie.
Root, A. W., East Petersburgh.
Root, J. W., Manheim.
Rumbel, W. H., Ringtown.
Rupp, D. C., Shiremanstown.
Rupp, Jno. F., Shiremanstown.
Rush, J. G., West Willow.
Schaeffer, Dr. N. C., Lancaster.
Schaefer, Dr. N. C., Lancaster.
Scheidy, Daniel, Pinegrove.
Schick, Jacob, Carlick.
Schock, O. D., Harrisburg.
Scholl, Calvin P., Fisherville.
Scott, J. W., 3 Union Street, Pittsburg.
Scott, John, Cliftonville.
Sellers, H. W., Bailey Ave., Pittsburg.
Seyler, D. M., Basket.
Shaffer, Dr. J. A., Carnot.
Shearer, Joseph, Reading.
Sheiner, A. S., Redington.
Smith, Paul, Beadling.
Smith, P. P., Sunbury.
Snavely, H. C., Lebanon.
Snavely, H. H., Lancaster.
Sohn, Henry, Woodlawn.
Stalze, John R., Library.
Stein, Geo. E., East Prospect.
Stone, B. M., Stull.
Stout, Wm. H., Pinegrove.
Stover, F. S., Bowmansville.
Strachan, Wm., Banksville.
Surface, Prof. H. A., Harrisburg.
Thomas, Joseph W., King-of-Prussia.
Traver, F. E., Wyebrook.
Troutman, Gilbert, Millersburg.
Tucker, O. M., 114 Franklin Avenue, Pittsburg.
Wagner, Geo. A., Alinda.
Wakefield, S. M., Redstone.
Wallize, H. C., Sunbury.
Watts, Prof. R. L., Scalp Level.
Wentzel, Aug. L., Reading.
Westrick, Frank A., Carrolltown.
Williamson, E. C., Morrisville.
Williams, Dr. C. C., 24 Washington Ave., Pittsburg.
Wild, Wm., Carrick.
Woods, T. A., Harrisburg.
Yeager, A. H., Lancaster.
Young, A. P., Millville.
Youngs, L. G., North East.
Zigler, Amos, Rowenna.
PROGRAM OF THE FORTY-FOURTH ANNUAL MEETING OF THE STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA, WITH SYNOPSIS OF PAPERS READ.

HELD AT HARRISBURG, PA., JANUARY 21 AND 22, 1903.

Wednesday, January 21, 2.00 P. M.

1. Opening announcement.
2. Reading minutes of previous meeting.
4. Election of officers.
5. Reports of officers.
6. Reports of special committees.
7. Reports of standing committees.
8. Appointment of committees.

Evening Session—7.30.

10. President's Address.
11. "Pennsylvania's Duty to its Horticultural Interests."
   Prof. S. B. Helges, Ex-Pomologist United States Department of Agriculture, Saxe, Va.
   To be followed by addresses by:

Morning Session, Thursday, January 22, 9.00.

15. Unfinished Business.
   Gabriel Hiester, Harrisburg, Pa.
18. "Apple Culture in Pennsylvania."
   Prof. R. L. Watts, Scaip Level, Pa.
   Wm. H. Stout, Pinegrove, Pa.
20. "The Evolution of the Peach."
   Wm. M. Dickson, Woodside, Del.
22. Question Box.

Afternoon Session—2.00.

23. "Should We Plant Trees that are Visibly Affected with Crown Gall?"
24. "Is the Custom of Many Nurserymen in Cutting Buds and Scions Continually from Nursery Rows to be Commended?"
   Calvin Cooper, Bird-in-Hand, Pa.
25. "Shall we Fertilize the Land or the Crop?"
   Prof. Wells W. Cooke, Washington, D. C.
26. "Garden Slips."
   C. W. Good, Waynesboro, Pa.
27. "Beautifying Waste Places."
   S. Mendelson Meehan, Germantown, Pa.
28. Final Resolutions.
29. Adjournment.

MINUTES OF THE ANNUAL MEETING OF THE STATE HORTICULTURAL ASSOCIATION.

Wednesday, January 21, 1903, 2.00 P. M.

The forty-fourth annual meeting was held in the Board of Trade Rooms, Harrisburg, Pa., on Wednesday and Thursday, January 21 and 22, 1903, and was called to order Wednesday, January 21, at 2 o'clock P. M., by President Howard A. Chase.

Minutes of last annual meeting having been read and approved, the usual recess was taken to give members, and others desiring to do so, an opportunity to pay their dues.

Wm. H. Moon, H. C. Suavely and H. C. Wallize, were appointed a committee to nominate officers for the ensuing year.

Mr. Hiester, who was appointed at the last annual meeting to prepare a list of fruits adapted to the different localities in the State,
was called upon for a brief report. He stated, that at the request of Secretary Hamilton, he undertook the work of preparing a bulletin, giving varieties and conditions suited to different localities in the State. He further stated:

"About 3,000 letters of inquiry were mailed to fruit growers in different sections of the State, and about 2,000 replies were received. In the compilation of the bulletin I tried to use the best judgment of these 2,000 correspondents as to soils, elevation and climatic conditions in every section of the State as affecting varieties, and to deduce therefrom some general facts and conclusions of permanent value. Of course the information thus gained is not so valuable as would have been possible by personal visits and observation. It is not such as I hoped it would be, not such as I want, but it is a beginning, and I hope it will result in some good.

"I feel sure that if planters will study the information at hand they will be able to select lists that will be profitable. They may not always be able to select the best but it will be a help in that direction.

"While we have found out that we can grow fruit in every county in the State, not one per cent. of the 2,000 correspondents has made any pretense toward giving special care to fruit culture. Spraying is not generally practiced, farmers believing it not worth while, or too much trouble to operate, and too expensive to buy apparatus. I think a good beginning has been made, and an effort should be made to have the work continued."

The PRESIDENT: This is a most important subject and deserves attention. There is scarcely a fruit grower in the United States but has found that about 50 per cent. of varieties planted are not suited to his location.

MR. MOON: I am glad to see Mr. Hiester's work so ably conducted and I hope it will be continued.

PROF. WATTS: To best accomplish this work it could be done more effectually by personal visits. I would like to see it continued, so as to properly locate the best varieties of fruit.

MR. BRINTON: I am inclined to doubt whether this plan can be made practical, whether we can grow Pippins in one locality, and Ben Davis, York Imperial and Baldwin in other respective localities. While to me it looks like nonsense, I don't want to condemn it. While certain trees and plants are adapted and at home in certain situations and localities, I do not believe we will be able to cipher out where certain kinds of apples or peaches will grow. I think I am safe in saying that we can grow all the Rosacea in
every county in the State. In natural conditions, "the survival of the fittest" is the rule.

MR. MOON: While reluctant to take exception to the remarks of the last speaker, I can not endorse his views. He considers it entirely reasonable that certain varieties of fruits were partial to certain soils and locations.

After further remarks by Messrs. Lesher, Youngs and Hiester, the following statement was submitted by the treasurer:

Edwin W. Thomas, Treas.,

To the State Horticultural Association of Pennsylvania:

Dr.

Receipts:
Cash balance 1st mo., 15th, 1902, ................ $17 65
Annual dues 1902, collected at Bloomsburg, ... 38 00
Life membership fee, John G. Reist, .......... 10 00
Life membership fee, W. T. Creasy, .......... 10 00
Dues for 1902, received since Bloomsburg meeting, ................. 8 00
Dues for 1903, in advance, ..................... 3 00

Total receipts, ......................... $86 65

Cr.

By amounts paid to:
H. C. Snively, salary, printing and postage, ... $32 25
E. B. Engle, salary, printing and postage, ... 30 90
T. C. Foster, badges and postage, ............. 3 50
D. R. Coffman, services as janitor, .......... 4 00
J. K. Miller, rent of piano, .................. 4 00
Balance cash on hand, ........................ 12 00

$86 65

On motion the statement was received and submitted to an auditing committee consisting of John G. Engle, A. W. Root and F. A. Westrick, who subsequently reported same correct.

The following report of Executive Committee of Allied Agricultural Organizations was read by the Secretary:
REPORT OF EXECUTIVE COMMITTEE.

The Executive Committee has approved the following resolutions and recommends them to the conference for adoption:

Number one, offered by Mr. E. S. Bayard, of the State Live Stock Breeders' Association:

1. “Resolved, That we favor, and hereby instruct our Legislative Committee to secure, if possible, an increase of $5,000 in the contingent fund of the Secretary of Agriculture, the same, or as much thereof as is needed, to be applied to the publication and distribution of the proceedings of the annual meetings of the State Dairy Union, the Pennsylvania Live Stock Breeders' Association, the State Horticultural Association and the State Poultry Association.”

Number two, offered by Hon. John Hamilton, representing the State Department of Agriculture:

2. “Resolved, That the Allied Agricultural Organizations of Pennsylvania hereby pledge their several organizations to join in the effort to secure an appropriation by the next Legislature of at least one million dollars for the permanent improvement of our public roads.”

Number three, offered by Mr. H. V. White, representing the Pennsylvania State College:

3. “Resolved, That this conference request from the next Legislature an appropriation of $10,000 per year for two years for the Pennsylvania State College to defray the expenses of continuing the preparation and distribution to the teachers of the public schools of the State, of bulletins and leaflets on Nature Study, with special reference to agriculture.”

Number four, offered by Mr. H. V. White, representing the Pennsylvania State College:

4. “Resolved, That we request the State Legislature to make sufficient appropriation for the erection and maintenance at The Pennsylvania State College of a suitable building for the teaching of the different branches of agriculture, including Dairying and Forestry.”

Number five, offered by Dr. J. T. Rothrock, representing the State Department of Forestry:

5. “Resolved, That the Legislature of the State of Pennsylvania be requested to appropriate $25,000.00 to provide instruction in Forestry, and furnish equipment for this purpose at the State College of Pennsylvania.”
Number six, offered by Dr. J. T. Rothrock, representing the State Department of Forestry:

6. "Resolved, That the Legislature of Pennsylvania be requested to furnish funds requisite for the establishment of a training school of Elementary Forestry, at Graeffensburg, Adams county, where, on the State Reservation, the pupils may, by work done on State forests, earn what it costs the Commonwealth to board, clothe and educate them, provided, said pupils furnish bond to repay the State what it cost to educate them if they fail on examination, or are discharged for misconduct."

Number seven, offered by Mr. W. C. Norton, representing the Pennsylvania Breeders' Association:

7. "Resolved, That the report of the Legislative Committee be accepted and the committee discharged, and that the President of the Conference be authorized to appoint a Legislative Committee of five members."

Number eight, offered by Mr. W. C. Norton, representing the Pennsylvania Breeders' Association:

8. "Resolved, That each delegation of this Conference be charged with the duty of presenting the work of this Conference to its organization and of securing for it the active support of that organization."

Number nine, offered by Dr. Nathan C. Schaeffer, representing the Department of Public Instruction:

9. "Resolved, That it is the sense of this Conference that the appropriation in aid of township high schools be continued, and increased if necessary."

Number ten, offered by Dr. Nathan C. Schaeffer, representing the Department of Public Instruction:

10. "Resolved, That we recommend the action of the State Normal Schools in lengthening the Course of Study to three years so as to include in said course the Sciences which are needed to fit teachers for giving instruction along the line of Nature Study."

Number eleven, offered by Dr. Nathan C. Schaeffer, representing the Department of Public Instruction:

11. "Resolved, That we favor one or more Summer Schools for the benefit of teachers who can not attend our State Normal Schools or the State College, and yet desire opportunities for Nature Study and other forms of self-improvement."

On motion of Mr. Hiester, the report was submitted to a committee of five, with instructions to report at a subsequent session.

The following Committees were appointed by the chair:
DEPARTMENT OF AGRICULTURE.

NOtNENCLATURE AND EXHIBITS.

J. Hibberd Bartram, J. L. Rife, T. C. Foster.

TO ATTEND ANNUAL MEETING OF STATE BOARD OF AGRICULTURE.


NOMINATIONS.

Wm. H. Moon, H. C. Snavely, H. C. Wallize.

LEGISLATION AND ALLIED ORGANIZATIONS.


FINAL RESOLUTIONS.

Calvin Cooper, Thos. Rakestraw, L. G. Youngs.

Report of General Fruit Committee not being ready for submittal, the President referred to the presence of L. G. Youngs and I. A. Loup, of Erie county, who were here in the interest of the fruit and grape growers of that section of the State.

Mr. Youngs spoke of the magnitude of the fruit industry in Erie county, and submitted the following paper, giving statistics in reference thereto. He also read the subjoined act, which it is proposed to ask the Legislature to pass:

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FRUIT GROWING STATISTICS OF ERIE COUNTY.

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BY L. G. YOUNGS, North East, Pa.

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Area of Erie county, 700 square miles.
Farming land, 625 square miles.
Land along the lake suitable for grapes, 50,000 acres.
Land already planted to grapes, 6,000 acres.
Present normal production, 1,800 car-loads.
Value at loading stations, $600,000.
Annual value of berries and other small fruits, $300,000.
Annual production of apples, 95 per cent. of which are only fit for cider, 400,000 bushels.
Annual value of fruit and produce used by canning factories, $150,000.

The grape and fruit section comprises about 50,000 acres adjacent to Lake Erie. The climate of this strip is so equalized by lake influence, that, to a certain extent, a Northern summer and Southern winter is produced. The temperature is seldom at or below zero in winter or above 90 in summer. No other section of the known world produces Concord grapes of equal quality or quantity. Grape rot has appeared to such an extent, that a serious inroad has been made in the output. Mr. J. B. Martin, of East Springfield, reports a total loss of crop on 65 acres, and an actual damage of more than $5,000.00 for the season of 1902. Most other growers report small loss of 1 to 15 per cent.; a few from 30 to 60 per cent. loss.

The history of other grape sections has been, that sooner or later, grape rot has ruined the industry. Experiments lately carried on in Ohio by the Ohio Experiment Station show, that proper treatment under expert directions will prevent the rot and save the crop, and that the work can be done at a moderate cost per acre. Our growers do not understand these processes; very few of them can follow intelligently the necessarily complicated directions of a printed bulletin. They need and must have practical illustration of the work.

The business of grape growing gives employment to thousands of people in Erie and adjoining counties in Northwestern Pennsylvania. It is a business that can and will be increased, if a little aid is given. It is equally true that the industry will be practically ruined if this is withheld.

There are in this section other lines of fruit growing, in which a little expert knowledge would work wonders. Years ago it was a famous apple country; trees bore regular crops of fine fruit. Today, their old orchards are going to decay, production is irregular and fruit almost worthless.

To illustrate: The past season was not a prolific one for apples, not nearly enough good apples being raised for home consumption, hence a good many car-loads were shipped in; while on the other hand a single cider mill in Erie county ground up over sixty thousand bushels for cider. This condition of apple growing is due to ignorance of the improved methods of culture and of combating injurious insects and diseases. Many an orchard will prove a veritable gold mine to its owner, if he is shown how to handle it.

Another thing that will receive attention if experts are sent to the grape country, and that is, the adaptability of this strip to the beet sugar industry. It has soil and climate to produce the beets to perfection; abundant pure water, cheap fuel. Geographical location and transportation facilities are unequaled.
AN ACT.

Making an appropriation to the Pennsylvania State College for the investigation of diseases and insects injurious to the grape and other fruits and arresting the spread of, and finding remedies for the same.

Section 1. Be it enacted, etc. That the sum of $6,000.00, or so much thereof as may be necessary, be and the same is hereby specifically appropriated to the trustees of the Pennsylvania State College for the two fiscal years beginning on the first day of June, one thousand nine hundred and three, the same to be expended by the Agricultural Experiment Station of said College for investigating, arresting the spread of, and finding remedies for diseases and insects injurious to fruits, particularly the grape.

Section 2. That an amount not exceeding five per centum of the sum appropriated by this act, may be used by the said Experiment Station for publishing and printing the results of the experiments herein provided for in the shape of bulletins, one copy of each of which shall be sent to every newspaper published in the State, and to such individuals as may request the same, so far as the means of the Station may permit, and that the results of the said experiments, together with an itemized financial statement, shall be published in the annual report of the said Station to the Governor of the Commonwealth.

Section 3. That said appropriation be paid in accordance with the provisions of an act of Assembly, approved March fifteen, one thousand eight hundred and ninety-nine.

After some discussion the matter was referred to the Committee on Legislation and Allied Organizations. Mr. Hiester, chairman of committee, subsequently offered the following resolutions which were adopted:

"Resolved, That the Pennsylvania State Horticultural Association does heartily endorse and approve the action taken by the Allied Agricultural Organizations at the meeting held January 21, 1902, and hereby pledges the support of its members to the carrying out of the same, and instructs its legislative committee to co-operate with the corresponding committee of the Allied Organizations to that end.

"Resolved, That we approve Senate bill, entitled, An act making an appropriation to the State College for the investigation of diseases and insects injurious to the grape and other fruits and arresting the spread of and finding remedies for the same.

"Resolved, That the Pennsylvania State Horticultural Association fully appreciates the efforts made by Secretary of Agriculture, John Hamilton, for the advancement of the fruit industry in this State, and earnestly urges a continuance of the good work by him or his successor in office, and especially recommends a still more thorough and systematic fruit investigation and report, to the end that the many thousand acres of excellent fruit land now uncultivated and unproductive may be speedily utilized, thus adding to the material wealth of the State and the prosperity and happiness of its citizens.

"Resolved, That the Pennsylvania Horticultural Association favors the es-
tablishment of a Division of Horticulture in the Department of Agriculture of this State for the encouragement and fostering of the fruit and horticultural interests to such an extent as the importance of the industry deserves."

In a general discussion which followed on the question of spraying for leaf curl and other diseases, Mr. Youngs urged the importance of early spraying in order to be most effectual. In this work “an ounce of prevention is worth a pound of cure.” Since he had followed this method he has had six successive crops of peaches. Prof. Watts thought that but little good could be done after trees were in leaf, as an application strong enough to do any good would destroy or at least injure the foliage. Mr. Youngs also strongly advocated spraying apple trees for destruction of codling moth, urging the importance of making the application before the fruit turns down. Tests between rows sprayed and unsprayed showed the former were practically immune, while on the latter much of the fruit was worthless or of inferior grade.

PROF. WATTS: I believe Mr. Youngs' method is correct. All diseases of fruits are carried by spores or germs. They live over winter in twigs and buds, and any application before foliage appears is preventive. The finest specimens of apples on our tables here are from the orchard of Mr. Simons and they are perfect and free from scab and disease, because he has sprayed for years.

PROF. HEIGES: Some of our fruit growers make the error of spraying with the wrong mixture or at the wrong time. Bordeaux mixture, while an excellent preventive of fungous diseases, scab, blight, etc., is of no special value as an insecticide, and Paris green, London purple and similar poisons have but little effect as fungicides, but are excellent remedies for codling moth, tent caterpillar and other injurious insects. Spraying for insects should be successive, as they pass from the egg to the larva state. All forms of fungous diseases propagate more rapidly in damp weather. It is a principle of nature that the smaller and lower forms of life are most tenacious of life, and may survive several years without losing the power of development.

MR. LESHER: What is the best time to spray for codling moth, when in bloom or after the bloom has passed?

PROF. HEIGES: Not until at least three-fourths of the bloom has passed. Pear and apple blossoms do not all open at the same time, but during a period of 6 or 8 days in fine weather. It is a safe rule to spray when the petals have fallen.

Adjourned.
President Chase called the meeting to order and stated that he had no formal address to make. He referred to the present as the forty-fourth annual meeting of the Association, and while its meetings have been productive of good to the horticultural interests of the State, it is a matter of regret that its work has been handicapped on account of its limited list of regular members. Another reason why interest in its work has declined is owing to the delay in the publication of its annual reports which are usually issued about two years after adjournment. While we as members have a duty to perform in this matter we believe our great Commonwealth also has an interest in the great question of horticulture.

The PRESIDENT: We have with us this evening one of our former presidents who will tell us what, in his opinion, is "Pennsylvania's Duty to its Horticultural Interests." I have, therefore, the pleasure of introducing Prof. Heiges, formerly of Pennsylvania, now of Virginia.

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PENNSYLVANIA'S DUTY TO ITS HORTICULTURAL INTERESTS.

By Prof. S. B. Heiges, Saxe, Va.

I would do violence to my feelings, if not grateful for this cordial reception. I have come at the kind request of your President and Secretary, and am glad for the opportunity to meet with you on this occasion.

I think I can say, truthfully, that I have been all over this State. There is not a county in which I have not spoken once or twice, and in some, many times, and I have discussed before your Farmers' Institutes almost every practical side of agriculture, horticulture and pomology. I have observed and studied the unlimited resources of Pennsylvania with great pleasure. There is no state so highly blessed in natural resources, with such diversity of soil and advantages, and railroad facilities for bringing to market its bountiful crops from all sections. And yet with all these advantages at command, I regret to see so little progress made in the direction of horticulture. An empire in herself, Pennsylvania has done less for this industry than some of the smaller states. Although the question
has been agitated for years, our Legislature has never recognized the importance of creating and supporting a Department of Horticulture and Pomology, and not until this has been accomplished will this State stand where she should in this important work. We have the altitudes and climatic conditions for growing an endless variety of fruit, and instead of being importers, we should be exporters of the leading varieties grown in the State. I do not say we can grow fruit superior to that grown in any other state, but that our fruit cannot be surpassed. Other states may produce handsomer, but in quality ours is equal to any.

In an address at Pittsburg a few years ago, I stated as my positive conviction that the day of wheat growing at a profit in Pennsylvania was past, and that the most promising occupation for the tiller of the soil was in the direction of fruit culture and market gardening.

In comparing my own State with others I realize how little support is given to horticulture, and often hang my head in shame when I see what is being done elsewhere. I have asked the Assistant Pomologist at Washington to give me some statistics showing what other states are doing for horticulture and pomology, and he has sent me the following memorandum in reference to the matter:

**HORTICULTURAL APPROPRIATIONS BY VARIOUS STATES.**

**ILLINOIS.**

This State in 1901, the last information available here, appears to have appropriated $4,500 to the State Horticultural Society, the society publishing its own report.

**MARYLAND.**

This State appropriates $1,000, annually, out of which the Society publishes its own report.

The Peninsula Horticultural Society receives $300 from Delaware and $300 from Maryland, annually, out of which the Society publishes its report.

**INDIANA.**

This State appropriates amounts that vary from about $500 to $1,000, annually; usually the latter sum.

**MICHIGAN.**

The State publishes the annual report and appropriates, in addition to this, an amount varying from $1,000 to $1,500, the latter amount being the present appropriation.
The State appropriates $500, out of which the Society publishes its report.

OHIO.

The State publishes the report and appropriates $1,000, annually, to the Society, according to our latest information.

IOWA.

The State publishes the report and appropriates $2,500 to the Society, out of which the Society maintains experimental testing stations in different parts of the State.

MISSOURI.

This State makes an appropriation which, as nearly as we can ascertain here, is about $2,500, annually, in addition to printing the report of the Society.

OREGON, CALIFORNIA, WASHINGTON AND COLORADO.

These States maintain State Boards of Horticulture which consist of several Commissioners; but we have no data here on the amounts expended. They are sufficient to enable the State Boards to maintain central offices, and in California, Oregon and Washington, at least, the Commissioners have certain authority to inspect shipments of nursery stock, fruits, etc., and to quarantine or destroy them, if necessary. The Secretaries of these Boards are salaried officers, and are usually active workers in the Horticultural Societies of their States. The societies of these States do not receive appropriations direct, so far as I can learn.

NEW YORK.

Under her constitution, this State cannot appropriate State money for State Societies, but the same end is accomplished indirectly by offering a premium of $500 at the State Fair, annually, for the best collection of fruit exhibited by any Society in the State. The premium has been secured the last two years by the newly organized New York State Fruit Grower's Association through the instrumentality of large and comprehensive fruit exhibits contributed by its members.

KANSAS.

This State publishes the annual volume of proceedings, and I think makes an annual appropriation to the Society besides, but we have no data as to the amount.

46—6—1903
This State appropriates $1,000, annually, out of which the Society publishes its proceedings.

From the foregoing you will see that, although this is one of the original colonies, the Keystone of the arch, yet in respect to its horticultural interests it is far behind some of the younger states. I sincerely hope your President will appoint a committee to draft a bill creating a Division of Horticulture, and that the Legislature will pass the same. I thank you for the careful attention you have given me, and regret that other engagements prevent my being with you during the balance of the sessions.

Prof. Hamilton, Secretary of Agriculture, being unavoidably absent, the President called upon Hon. A. L. Martin, Deputy Secretary of Agriculture.

ADDRESS.

BY HON. A. L. MARTIN, DEPUTY SECRETARY.

In taking the floor the Deputy Secretary expressed the pleasure he felt in being able to attend the meeting and coming in touch with its members. He expressed the hope that not only this Society, but other organizations such as the Dairymen's, the Stock Breeders' and others should be liberally encouraged by the State, not only by words, but by appropriations to aid in defraying expenses of meetings of this kind. The discussions and proceedings of such meetings should be recorded and promptly printed and distributed for general information, and not delayed until several years old. He further stated: People who live hundreds of miles away and who are interested in your work should have prompt access to your report, and when the demand for their early and prompt publication is properly and earnestly pressed, the man who has an orchard in Western Pennsylvania will be able in a week or two, to read the result of your deliberations. I fully agree with Prof. Heiges, that there should be in this State, a Division of Horticulture, and believe that if you stand up and combine your efforts, you will have it. That will be the avenue through which your work will be put on an established basis.

We have just entered the threshold of horticultural work in this State, and the time will come when we will give object lessons in
spraying, pruning, fertilizing, tilling, etc., and in view of the continued warfare that must now be waged against diseases and insects, those only who are intelligent, persevering and prepared to use the latest practical methods of extermination will succeed. If we have learned anything, it is that there is a vast area of land in this State that has the proper altitude for growing the finest varieties of apples. There are acres and acres actually lying in waste today, while the great cities and centres of trade are holding out their hands for choice fruit. Every farmer in Pennsylvania ought to be, in a certain measure, a grower of fruit. If apples are extensively grown in Berks, Lebanon, Lancaster, York, Columbia, Franklin and other counties, the result is that they will entice buyers from all directions, and command the best markets everywhere.

New York, Pennsylvania and Ohio occupy a place on the map of the United States unequaled by any state in the Union. New York with 52 million, Pennsylvania with 37 million and Ohio with 36 million bushels of apples, easily lead in this important branch of horticulture. And when we adopt the latest and most improved methods, and avail ourselves of the great natural advantages and resources at our command, we will easily stand first on the list in the whole line of agricultural pursuits.

The PRESIDENT: We heard at our afternoon session some reference to the Allied Agricultural Organizations and the committee representing them. We have with us this evening the chairman of that committee, the Superintendent of Public Instruction, Dr. Schaeffer, and will be glad to hear from him.

ADDRESS.

BY DR. N. C. SCHAEFFER, Superintendent of Public Instruction.

The interest I feel in horticulture has brought me here, and inasmuch as the opportunity has been offered, I will try to point out the close connection between my work and that of this organization. As a member of the Capitol Commission, I have succeeded in having incorporated into the plan of that building an auditorium, and when completed, this and similar organizations will be invited to meet there for deliberation. I would say also as chairman of the Allied Organizations Committee, that we had a very satisfactory
meeting and the result should be of interest to you. One of the things needed at State College is a new agricultural building. The present building is no credit to this State, and it seems to me we ought to be able to place on the College grounds one that will be a credit to this great Commonwealth. We also ask that the appropriations for correspondence course in "Nature Studies," which was cut off on account of insufficient revenue, be again restored, and that a liberal appropriation be made for the public roads of the State. If country boys and girls are as good as city boys and girls, they should have equal advantages in the way of township high schools. Ohio has about 900, Pennsylvania 80 to 100 high schools. Surely a state with an annual revenue of 17 million dollars can do something for the sons and daughters of our farmers. We need only see the class of illiterates that come to this country from Southern Europe to realize the great advantages of our common schools.

In conclusion, I would say, that if you can reach the ear of any legislator, plead with him for a liberal appropriation for the various items recommended by your committee.

Mr. Hiester urged the importance of a liberal appropriation for the agricultural building at State College. He stated that boys who went there, intending to take a course in agriculture, were discouraged by the inferior buildings erected there for the agricultural course, when compared to those devoted to the scientific and engineering courses; and although they go there with best intentions, they are "switched off" into other branches because of the superior facilities offered. He hoped the resolution, when offered, would receive the hearty support of this organization.

The following paper was then read:

APPLE CULTURE IN PENNSYLVANIA.

BY PROF. R. L. WATTS, SCALP LEVEL, PA.

More than a year has elapsed since the writer addressed the Horticultural Association on the subject of "Apple Culture in Pennsylvania." The address was entirely extemporaneous and we have very little recollection of what was said on this topic. At the request of the Secretary of the Association, a brief article has been prepared, discussing only a few phases of the subject, without attempting to treat cultural methods.
AS A BUSINESS VENTURE.

As a business venture apple culture in Pennsylvania is especially promising. Thousands of acres in the State are admirably adapted to the cultivation of this fruit. It is grown to the highest standard of perfection in many counties, and by the proper selection of varieties splendid apples may be grown in every county. Certainly there is little room for complaint regarding the natural conditions most favorable for the development of both tree and fruit.

It is surprising how tenaciously the great majority of farmers cling to the raising of grain, particularly wheat, when no profit can be derived from this line of farming. It works well into a system of rotation, and the writer, along with a host of other farmers, is guilty of devoting a small acreage, annually, to rye and wheat. But there is absolutely no profit in wheat farming in this part of the country, and profitable substitutes must be chosen to make the greatest advancement along all lines in rural districts. It is a most common occurrence for one or two apple trees to give larger returns than an entire acre of wheat on land of the same degree of fertility. Numerous instances of this kind show the great folly of giving so much attention to the production of cereals. The properly cared for commercial orchards of the State are yielding the owners handsome profits. There is no danger of ever over-stocking our markets with first-class fruits, and the most extensive apple growers claim that there need be no fear in this direction.

Again, there is a very large acreage of hilly and mountainous lands in the State which are poorly adapted to general farming and have the very qualifications essential to the production of first-class apples. If the owners of such farms could be induced to plant large areas of well-chosen winter apples, and then give them the proper attention, it would bring the cultivators an era of prosperity vastly superior to that occasioned by the selling of coal fields and timber lands.

THE APPLE VERSUS OTHER TREE FRUITS FOR PROFIT.

It is not our purpose to say anything which would tend to discourage the cultivation of the other tree fruits. It is a fact, however, that comparatively few in the State have derived satisfactory profits in the production of peaches and plums, when a series of years is taken into account. Pears and possibly cherries have made a better showing on the right side of the ledger; but none of these fruits are to be compared with the apple as a money maker. Every farmer has his family orchard which usually affords a surplus of fruit for the market and our commercial apple growers are much better satisfied with their results, as a rule, than the growers of other
fruits named above. The apple has well been called "the king of all the fruits." It is the most popular fruit with both the rich and the poor. It may be prepared for the table in a greater variety of ways than any other fruit. It is used the year round. It is not so particular about soil or climatic conditions as other tree fruits. It may be placed in cold storage after harvesting and held for months, if necessary, until the market price is favorable.

**PROCURING THE TREES.**

In starting a young orchard the greatest care should be exercised in procuring the trees. An orchard is expected to live and produce fruit for fifty or more years and too much thought and attention cannot be given to this initiative step. The following methods may be employed:

1. **Buying from unreliable nurseries.** This is a most common practice. The statement may be disputed by some, but it would be an easy matter to find hundreds of witnesses who would testify to the truthfulness of the assertion. First grade trees are ordered and second and third grade trees are shipped. Varieties highly valued for one reason and another are ordered and the nurseryman substitutes to suit himself or pays very little attention to the varieties wanted. This kind of treatment has brought bitter disappointment to hundreds of farmers in our own State. It is a very poor and unsafe policy to order trees from any nursery unless you are positive that the firm is absolutely reliable and trustworthy.

2. **Buying from reliable nurseries.** There are many in the country. Their names and addresses may be easily obtained by writing to the State Experiment Station, Department of Agriculture, or inquiring of experienced orchardists.

3. **Propagating from trees of known value.** There is a marked individuality among fruit trees. Every observing fruit grower has noticed this. Trees growing under like conditions and receiving like treatment vary in vigor, habit of growth and fruiting characteristics. Some bear more regularly and uniformly than others, and there are decided differences in the color, form, size and quality of the fruits produced. In brief, some trees are much more valuable than others of the same variety. These are the trees from which the young trees should be propagated. It will take longer to get the trees by this method than to order directly from the nursery, but the results will more than pay for the additional time required. The trees may be root-grafted at home, and grown on the home farm. Root-grafting is a very simple art and may be learned from literature which is profuse on the subject. If this plan is too much trouble send the scions from chosen trees to your nurserymen and let him do the grafting and return the grafts to you from which the
young trees may be grown. The nurserymen will charge you only a small sum for the grafting and there is nothing difficult about growing the trees. This plan will bring certain results without any anxiety of getting trees not true to name. Another plan is to plant vigorous growers where the trees are to stand permanently, and when well-established, top-graft with scions from the most desirable and profitable trees. Northern Spy is a vigorous grower admirably adapted to form the stock.

VARIETIES FOR THE COMMERCIAL ORCHARD.

It is generally conceded that winter apples are more profitable than summer or fall varieties. There is frequently an overproduction of early ripening sorts, rendering it difficult to sell the fruit at remunerative prices. Winter apples may be placed in storage and held until prices are more satisfactory.

It is not our purpose to furnish a list of apples which should be planted in the commercial orchard. Each individual grower must decide this matter for himself. Local conditions and markets have much to do with the selection of varieties. The following points, however, should be considered: The ideal winter apple should be bright in color, at least medium in size, smooth, regular in form, good in quality, texture fine, white flesh usually preferred, tender and juicy. The fruit should hang well to the tree so that the percentage of windfalls will be small, and should keep well in storage. The tree should be hardy, vigorous in growth, upright or spreading in habit of growth, and bear large annual crops with a low percentage of small fruit. The ideal winter apple has not been found. York Imperial and Baldwin are the most extensively grown in Pennsylvania. Other winter apples, which at the present time are receiving considerable attention by commercial growers are, Rome Beauty, Winesap, Stayman, Paragon, Oliver Red, Sutton, Stark, York Stripe and a few older varieties as Northern Spy and Smith’s Cider.

THE FAMILY ORCHARD.

It is to be regretted that the family orchards of our State do not receive the attention that they deserve. Many are disappearing very rapidly because of old age and neglect and on many farms no effort is made to start young trees. The number of trees on our farms should be, at least, maintained for the pleasure and benefit of whoever is to occupy the farms. It would be a splendid practice for at least a few trees to be planted annually on every farm, particularly in nooks and corners and along the roadsides.
Thursday, January 22, 1903, 9:00 A. M.

The business of the session was prefaced by reports of committees. The Committee on Nominations submitted the following list of officers:

PRESIDENT.

Howard A. Chase, ........................................ Philadelphia.

VICE PRESIDENTS.

Gabriel Hiester, ........................................ Harrisburg.
Hon. W. T. Creasy, .................................. Catawissa.
D. C. Rupp, ........................................... Shiremanstown.

RECORDING SECRETARY.

Enos B. Engle, ........................................ Waynesboro.

CORRESPONDING SECRETARY.

Wm. P. Brinton, ......................................... Christiana.

TREASURER.

Edwin W. Thomas, ..................................... King-of-Prussia.

On motion, Mr. Stout was authorized to cast the ballot of the Association, and the aforesaid were declared elected.

On motion, Lancaster was selected as the place for next annual meeting.

On motion of Mr. Engle, the treasurer was authorized to purchase a book in which to keep a record of the receipts and expenses of the Association.

The following resolution by Mr. Stout was read and adopted by the Association:

"Resolved, That the State Horticultural Association of Pennsylvania now in session, favors the enactment of a law permitting trolley railroads to carry merchandise, freight and express matter upon all lines and branches of said roads; and further, that a State tax be levied upon lines accepting the provisions of said act, and that all monies so collected by the proper authorities be set aside for the improvement of the highways in the State."

H. C. Snively, chairman of the General Fruit Committee, submitted his report, which is as follows:
REPORT OF THE GENERAL FRUIT COMMITTEE TO THE
STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA.

BY H. C. SNAVELY, Chairman.

Again it has been allotted to me to prepare and present a report upon the horticultural conditions and progress during the past year. Nineteen hundred and two, like former years, had its successes and failures. In some sections of the State the yields of fruits were large and fine, while in others the results were somewhat discouraging. While during the last quarter of a century, we have made great advances in the increase and in the varieties of fruits grown upon our soil; while the dwellers on the farms and in the towns are supplied almost the year round with an abundance of fruit; yet too much of this supply is brought from the orchards and fields of other States. It can not be gainsaid that our State has the soil, the climate, and her people the intelligence to produce all the apples, pears, peaches, plums and small fruits required by our population, and yet it is a fact that we frequently go to others to supply us with much that is consumed here. While our people are as intelligent as those of other States, there seems to be a lack of intelligent direction along the line of fruit production. Of course, there are many exceptions, for our State can justly lay claim to as successful fruit growing as can be found anywhere.

Too often land is selected without regard to its adaptability. Varieties are planted without any regard to their value for home use or for the market. Neglect in feeding, cultivating and combating insects and fungi are the causes of failure.

In fruit growing as in any other sphere of activity one must know what to do and do it; one must also know what to do next.

Workers in other parts of the country are beset with the same foes as we are here in Pennsylvania, and if they handicap us it is because they are more diligent in the care of their fruit trees.

Andrew Carnegie said a short time ago in Washington, that he is engaged in any one thing; producing libraries. He succeeds. To succeed in the horticultural field one must concentrate mind and muscle upon the work.

One of the main causes of failure, is the lack of sympathy with nature. Our boys and girls are instructed in about everything except their environment. The three R's are supplemented by a long list of studies. They must know all about the rivers of Africa,
the mountains of Asia, and the islands and sub-divisions of the Philippine Archipelago, when they don't know the names of the trees in the dooryard or the woodland; much less do they know about the value of them for the ordinary uses or the influence they exert upon climatic conditions. Modern education educates the boy away from the soil. He is stuffed and stuffed, but little is attempted to put him in sympathy with his environments. No earnest attempt is made to put the young in communion with Nature. The various languages she speaks is deeply veiled. The boy of 1903 will not travel in the old rut; you must show him the new and the better way or he will join the mad rush to the city.

During the last two years I endeavored to ascertain to what extent (1) feeding or fertilizing, (2) tillage or cultivation, and (3) spraying or insuring the crop against insect pests and fungous diseases are practiced in the State. I am forced to the conclusion from reports received that these essentials are sadly neglected. For fuller information, members are invited to examine reports from the various localities.

A summary of the answers to the inquiries follow:

**APPLES.**

While on the whole, there was a fair crop of this fruit, the results were very variable. Some of the correspondents, notably, from the northern and northeastern portions of the State, report the yield "very good, the largest for years, the largest ever known." With some exceptions the yield in the southern section was below the average. Some counties report an almost total failure; others from one-eighth to one-half a crop. The central counties, on the average, report a fair crop.

In some instances, the failure is attributed to adverse climatic conditions, cold and wet weather during the blossoming period, the off-year, etc. Unavoidable climatic conditions it is believed contribute far less to fruit crop failures than neglect of the orchard. The orchard is often the most thoroughly neglected spot on the farm. It is expected to serve every purpose, pasture lot, potato patch and so on, except the one for which it was intended, or for which should be set apart; the production of apples. Neglect is written all over it; it is starved, given over to the ravages of insects and fungi, and then the unhappy owner wonders why his family crop fails.

The varieties reported as doing best over the State are herein noted. Ben Davis and York Imperial are planted more largely than any other varieties. The wisdom of this is questionable. The State will hardly go to the front as an apple producing state with these two varieties in the lead. You may catch the crops, but catching the markets is something else.
Notwithstanding the kicks and cuffs aimed at the Ben Davis, it is probably to day planted as largely as any variety, and this, perhaps, upon the principle that it will stand more neglect in the orchard and produce a red apple than for any merit as to quality.

It is to be feared that York Imperial planting like Kieffer pear planting will be overdone. This is not said to discourage the planting of this variety; but let it be emphasized that there are other varieties as good, and in better demand, if the care is bestowed on the tree that orchard trees deserve. To the inquiry, What varieties do best? The following are named: Ben Davis, York Imperial, Smith's Cider, Baldwin, Winesap, R. I. Greening, Northern Spy, Fallawater, Red Astrachan, Maiden's Blush, Grime's Golden, Summer Rambo, Stark, Delaware Winter, Gano, Duchess of Oldenburg, Hawley, Smokehouse, Rome Beauty, Early Harvest, Rambo, Paradise, Ladies' Sweeting, Hubbardston, Jeffries, Wealthy, Primate, Ewalt, Belleflower, Major Nottingham, Newtown, York Stripe. No doubt many varieties known only locally are omitted here, and if disseminated would be very valuable.

PEARS.

There was a surplus of Kieffer pears. Of other varieties the yield over the State was an average one. A few report a total failure.

This fruit is mostly grown in a limited way, and for home use or nearby markets. The varieties mentioned as doing best are Bartlett, Clapp's Favorite, B. d'Anjou, Sheldon, Seckel, Lawrence, Duchess, Howell and Kieffer. The last named should be at the top on the score of doing best, producing the largest quantity of fruit. The Clairgeau is hardly mentioned. This is a large showy pear, about as good or better than Duchess, a thrifty grower and an early and abundant bearer.

PEACHES

Taking the State over there was probably a half crop of this fruit. In a number of localities the late ripening fruit was a failure, due to a continued spell of wet weather which caused the fruit to rot on the trees. The "yellows" continues to be the great obstacle to peach culture. The inference from reports of correspondents is that "yellows" is just about holding its own over the State; increasing in some parts, while in others it is less prevalent. The correspondents from Bedford, Bradford, Lawrence, Mercer and several other counties don't know of this disease in their localities. Some report trees dying from neglect, others report serious ravages by the San Jose Scale.

Feeding and cultivation are indispensable conditions to successful peach culture.

Mr. Day reports peaches a failure in his county, except for one man, who was all right. He sprays and cultivates and has good
crops. He is rarely affected by climatic conditions. I shall pass over the varieties mentioned as giving best results in different parts of the State.

Two varieties proving exceptionally valuable in Lebanon and Schuykill counties are hardly mentioned. They are the Fox Seedling and Iron Mountain. Both are white peaches of good quality, very productive, ripen late. Trees are strong growers. Many mention the Brandywine, a yellow peach, as fully the equal of the Late Crawford in every particular and of somewhat better quality. Ripens about same time as the Crawford.

**PLUMS.**

This fruit was a light crop, claimed by some as being due to the heavy yield of the previous year. As usual, heavy charges are entered against the curculio and rot.

Vigorous jarring and destroying the "Little Turk" is the remedy for the former, while spraying thoroughly with the Bordeaux mixture and other fungicides will largely control the rot.

An application of the lime, sulphur and salt wash in March proves valuable for a fungicide as well as for the control of the San José Scale.

With the free-bearing varieties of plums, thinning the fruit, as well as the pruning of the tree should be resorted to, to attain best results from spraying.

The Japan varieties should be sprayed cautiously. The foliage is tender, as much so as the peach, and the solution must be diluted to avoid damage. The Japans are planted most extensively. This is due largely to the fact that they are practically exempt from the black knot, are thrifty growers, and bear early and abundantly. For some of the Japan varieties, where thinning is not practiced, the curculio is a blessing. One correspondent says: "We get plums when it just so happens." Before leaving this fruit let me put in a good word for the class known as German Prunes. Plant them, feed them, care for them, and when they produce you will be rewarded with the best of this fruit.

**QUINCES.**

It appears that this fruit is receiving less attention every year. Worms and blight coupled with neglect are the cause of failure. To succeed with it the soil must be peculiarly adapted, and insects and fungi most vigorously combated. Only a few report its cultivation successfully.
This crop was variable over the State, depending upon the weather at the time of ripening. This fruit succeeds well only, especially the sweet varieties, when the atmosphere is clear and dry.

Rainy and murky weather sometimes ruin the entire crop inside of twenty-four hours. Spraying with Bordeaux mixture just before ripening is beneficial. The sour varieties are the most reliable.

There is still complaint of the birds taking an undue share of the early sweet cherries. The remedy is, more cherry trees. I have no fault to find with the birds eating cherries, but I shall, later in this report, pay some attention to the robin.

GRAPES.

The grape appears to be an uncertain crop in this State, except in what is known as the grape belt on the shore of Lake Erie. Fine fruit, as per reports, is grown in nearly every county; but spraying and bagging must be resorted to, to assure a crop. There appears to be less experimenting with the newer introductions than formerly. This is probably due to the fact that most of them have shown no merits to commend them, and often proving less valuable than the old standard varieties. A number of varieties are mentioned as doing well, but the Concord is still the old standby. The Campbell is reported by some as disappointing.

SMALL FRUITS.

There is a marked increase in the production of strawberries in some parts of the State, while in others there is a decline. The southern counties of the State are thrown into strong competition with this fruit from Delaware and Maryland and fruit grown farther south. Of the varieties as "doing best" may be mentioned, the Sharpless, Haverland, Clyde, Cumberland, Gandy, Bubach, Bismarck, Poocomoke, Dunlap, Beder Wood, Brandywine, Sample, Marshall, Glen Mary, Kentucky, Splendid, Crescent and some more.

Raspberry culture is holding its own. Cuthbert of the red varieties is still the leader, while Kansas, Gregg and Cumberland are the favorite black caps.

Blackberries are not cultivated extensively. Those named as the hardiest are, Snyder, Taylor, Minnewaski and Erie. Rathbon, Oh-mer and Kittatinny are favorably mentioned.

Some correspondents report currant culture as being profitable, while gooseberries receive but little attention.
VEGETABLES.

Except for a drouth in the early part of the summer, vegetables were successfully grown. A few complain of too much rain during the fall months.

SHRUBBERY PLANTS AND FLOWERS.

A number of correspondents report increased interest in the ornamental side of horticulture. This is commendable, for well-tilled fields and well-tilled garners do not alone betoken progress. It is well to have an abundance of the useful, but as we progress we want to cultivate the beautiful as well as the useful. Every house, yard or lawn on the farm should have its assortment of shrubbery and flowers to serve as companion pictures of the fruit and vegetable gardens and orchards. The absence of fruits and flowers on the farm can not but suggest a life of exile to the young, and human nature revolts against such banishment.

Let the farmers' boys and girls live up to their opportunities, and the brighter and better portion will become attached to country life.

NATURE STUDY.

A year ago among the inquiries sent out was this: "Is this subject (Nature Study) receiving increased attention in your section?" The answers were then almost invariably, "no." Possibly a little progress may be noted this year, but not equal to the importance of the subject.

A correspondent from one of the most populous counties in the State reports that only eighteen teachers are interested; that in only eighteen schools is this subject receiving attention. This is perhaps the best showing of any county in the State.

Our neighbors across the northern border, as I pointed out a year ago, have taken hold of this matter in earnest, are doing the work systematically, and will keep the best blood and brains on the New York farms.

Life and love will characterize the young man and the young woman on the farm when put in touch and sympathy with their environments. They will live, not merely exist. They will love, because they are in sympathy with their work. They will

"Find tongues in trees, books in running brooks,
Sermons in stones and good in everything."
They will see that
"On every thorn, delightful wisdom grows,
In every rill a sweet instruction flows."
SPRAYING.

Failure to protect and insure the crop against insects and fungi is, in a large measure, the rule in Pennsylvania. In nearly every locality it is practiced by some, and invariably with beneficial results. Spraying fruit trees has passed the experimental stage and all successful horticulturists recognize it as one of the essentials to successful fruit growing. It must be borne in mind that it will not make up for lack of fertilizing or tillage. A starved tree will not produce fruit. It will even cease to live, though it be exempt from insects or fungi.

Successful spraying presupposes a number of other essentials, such as adaptability of varieties to localities, pruning, feeding and cultivation. These are all co-ordinate and the overlooking of one or more impairs the chances of success.

SAN JOSE SCALE.

This pest is scattered over a large portion of the State and its work of destruction is hardly recognized, nor is the future damage that is sure to follow, dreading as it should be. The means of dissemination are many. Nursery stock, whether grown in this or brought in from other states must have a certificate attached that it is not infested.

Presuming that this "clean bill of health" is always right and that all nursery stock is entirely free from scale lice, the fact stares us in the face that the pest has taken a foothold in many localities. It is here to stay, to spread and to destroy. Other pests have impaired our fruit trees, but none that infested them in the past did their work of destruction so rapidly as this pest.

Our winged friends, the birds, stand at the front as means of spreading and infested the trees. Where robins are numerous, they will not only infest an orchard in a single year, but carry the young louse to neighboring orchards.

While I prefer friendship for the robin and while he has on his side the protecting arm of the law, I can not but give him a black mark for the mischief he is engaged in and the damage he is doing in infesting our fruit trees with this most pernicious of insects.

One of the remedies mentioned is the destruction of the trees. This is a heroic remedy, certainly the shortest cut, and effective, but too costly. Only when trees are very badly infested, or when of no special value, should they be destroyed. A good tree is worth saving, and this can be done at reasonable expense. Several years ago the oil sprays were mostly recommended, and trees were treated with varied success. The lime, sulphur and salt mixture has been
used almost, if not altogether, as successfully in the eastern part of the country as on the Pacific Coast, notwithstanding the adverse conditions of heavy, driving rains during the season when applications should be made. An application of this mixture carefully applied not only effectually controls the scale louse, but proves one of the best and most valuable fungicides. It can be applied without any fear of damage to tree or fruit buds.

FEEDING.

While this is done by some in a systematic way, the great mass of fruit trees are not receiving any special attention as to the feeding. Often the orchard is to produce crops in the farm rotation, with only about as much plant food as the rest of the farm receives. This is better than no feeding, for the trees will appropriate to themselves at least a portion. Too often orchards get about the same attention as forest trees.

Many of the correspondents say that stable manure has proven the most satisfactory. This may be due to the fact, that by the use of it both humus and plant food are given to the soil. There may be soils in Pennsylvania so rich in plant food that fertilizing would be wasteful, but they are unquestionably rare. Heavy crops of fruit are a severe drain upon the fertility of the soil. Full crops are the ones that make fruit growing profitable, and unless the fertility is maintained exhaustion will follow and the result will be unproductive orchards, and of course unprofitable. The soil may be likened to a manufacturing plant. In each case raw material is used, with labor added, to turn out the finished product. Give to the soil such plant food as is required for the development of the plant or tree and the fruit and the feeding question is solved.

In this connection, it should be said that soil rich in all the elements of plant food, but deficient in humus or neglected as to cultivation will not bring the desired results. To supply humus and fertility, nothing excels the leguminous plants.

TILLAGE.

As to tillage there is a diversity of opinion. About all are agreed that the orchard should be cultivated up to bearing age, and peach orchards all the time. Some assert that an apple orchard in sod will do as well, if not better, than when cultivated. This is likely true if the matter grown on the ground is left to decay and supply humus. Many are agreed that larger fruit can be grown in cultivated orchards, but question the keeping qualities.

It is asserted that if a sufficient quantity of mulch or cover-material were available it would be preferable to cultivation for apple orchards.
NOTES AND OBSERVATIONS.

Austin Wright, of Bedford county, reports having tested some new things in plums, apples and pears. Of the Japan plums only the Abundance, Burbank and Wickson succeed well.

Of apples, he has rejected the following: Walbridge, Spitzenberg, Belmont, Dickinson, Fanmuse, Delaware, Winter and Early Strawberry. He says a good many of the old varieties are now being planted. The mistake of quantity against quality has been made. Planters are already realizing that before long there will be Ben Davis apples and Kieffer pears to spare. Fruit growing on the increase but a lamentable carelessness to combat insect and fungous troubles; but with greater interest in this industry the means to keep orchards in healthy condition will be better understood.

Oliver D. Schock, of Berks county, says the year was remarkable in many respects. The season opened with myriads of tent caterpillars, that threatened serious destruction. Their disappearance was almost phenomenal, as they vanished immediately after a heavy thunder and rain-storm and did not reappear. Peaches and plums are becoming more profitable and are being more largely planted. Ornamental horticulture is receiving increased attention. More spraying than heretofore with very good results.

R. M. Wells, of Bradford county, reports the apple crop unusually good and unusually large and fine. Thousands of bushels were shipped from the county. Price of apples delivered in Towanda, 30 cents to 35 cents per bushel.

Jos. W. Thomas, of Chester county, mentions a peculiarity of the York Imperial by bearing full on only portions of the tree. Practice spraying with good results.

Henry A. Brinkman, of Carbon county, says that in winter, December and January, when trees are dormant, he sprays twice with soap-suds. This he claims kills all the insects on the trees. In March or April sprays with Bordeaux mixture, and again after the blossoms fall. Only the aphides trouble after this and these he combats by spraying every five days with a strong decoction of tobacco stems. He cultivates and uses stable manure.

Gabriel Hiester, of Dauphin county, reports the Champion peach as rotting badly. Not only did the peaches rot but the small twigs that bore the peaches died. (I had the same experience with this variety in 1901, but in the spring of 1902 the trees were sprayed with the lime, sulphur and salt mixture, and the crop was a fine one. Some of the fruit was left on the trees overripe but did not
rot, nor did the twigs die.) He says, for lack of thorough spraying in spring, due to rains, was troubled more with fungi on fruit and foliage than usual.

L. G. Youngs, of Erie county, says the season of 1902 was the wettest known. Excessive moisture and high winds caused a good deal of damage. Fruit rotted some, especially the grape. Too wet to cultivate properly. Strawberries and raspberries good yields. Prices good.

He sprayed with pure kerosene oil in February, which killed the scale and without injury to the trees.

Daniel N. Pershing, of Fayette county, says all kinds of fruit was scarce. Wet weather and frost the cause.

Calvin Cooper, of Lancaster county, says the season has been one of excesses all through, dry and cool in early spring, wet and warm in midsummer, and very dry and cool during the fall months. Believes that the cool, dry weather had much to do with the imperfect setting of apples.

Jno. P. Freels, of Montgomery county, says, he would like to sound a note of warning in reference to the San José Scale louse. It is a terror, and if something is not done to exterminate the pest, fruit growing is doomed in this State. In this and the neighboring county of Chester, hundreds of trees have been destroyed by this insect. Whole orchards of peaches have been so badly affected that the owners have been compelled to dig up and burn them.

J. Q. Atkinson, of Montgomery county, says the Wakefield (Red Cider) seems to be their best winter apple, with York Imperial as a close second. Ward’s Late proves so far the best and most profitable peach.

Dana’s Hovey promises with him the finest and best pear. Quality nearly equal to Seckel; one month later. Retains foliage till winter. Barabank plums best, but not badly. Abundance, fine. The pears of a large Kieffer orchard, 18 miles from Philadelphia, did not pay for the picking and were left to drop on the ground.

R. F. Schearz, of Monroe county, mentions a new apple to him, the Surprise, a large red, fall apple, something like the King of Tompkins Co.

J. K. Murray, of Montour county, says there is little or no attention paid to the care of orchards in his neighborhood. “I am the only one I know of who sprays trees regularly. My apples this year were of superior quality, much better and finer and keep better than my neighbors, who took no special care.

“Most people here farm their orchards along with the rest of the field, thus expecting two crops at same time, with generally less fertilizer than other parts of the farm.”

D. C. Young, of McKeon county, says he has three orchards
(apple orchards I suppose). The one he cultivates and thus produces much finer fruit than the others. Will cultivate all in the future. Borers and other insects do less injury in cultivated orchards. Fruit growing badly neglected. The trees are set out and left to grow as nature directs. "It is a wonder we get any fruit."

A. B. Peet, of Potter county, says that "never in my remembrance have we come as near having an absolute failure of all fruits in this county as the past season. This was principally due to extremely cold weather during blossoming period or immediately after."

No apples, pears or plums except on elevated situations (2,000 feet or more). Strawberries only on high elevations or on old unmulched beds. The best cultivated beds returned the smallest yield. Fungal diseases of all kinds very bad. No San José Scale. Has many new varieties of trees and small fruits but nothing to report on account of the bad season.

R. S. Searle, of Susquehanna county, reports an immense crop of apples but of poor quality. Fruit largely injured by a fungus, which caused it to rot under the fungus spots. The only salable apples were the varieties that would do well in cold storage. "There is no doubt this is one of the very best sections for all kinds of fruit raising; it only lacks some wide-awake, stirring workers, who know how and will stick to it. One great trouble is lack of suitable workers."

S. M. Baker, of Tioga county, says that by spraying he got a fine crop of plums. Heretofore his fruit dropped. Spraying is necessary to success.

Theodore Day, of Wayne county, would plant the Rome Beauty in preference to the Ben Davis. Stayman's Winesap does well. Few apples colored or matured just right for lack of sunshine.

DISCUSSION.

PROF. JOHNSON: It seems to me that papers of this kind are among the most valuable presented at our meeting. I had the pleasure of hearing a similar report by Mr. Suavely two years ago, and was very much interested in it. These reports usually contain practical information and facts that will benefit members very much. They are the more valuable because given by counties, and showing how varieties are adapted to special localities.

In regard to "yellows." I am interested to learn that some counties in the State are apparently exempt. You are no doubt aware that there are certain belts or zones where this disease has never been found. We all know of its ravages in the Maryland Peninsula, and that there is still a belt there in which it has never been known
to exist. Two years ago in Georgia, I was told that "yellows" had never been found there, but the "rosette," a similar disease, is frequently seen.

The reference in report, to a York Imperial tree which bears a full crop on one portion of the tree, and few or none on the other, is not unusual, as I have seen this condition frequently. In New York State I saw an orchard of 900 trees in which all the Baldwins and part of the Greenings showed the same tendency. The orchard had been abandoned and rejuvenated, and now the 900 trees are more valuable than the rest of the farm.

Another case I will cite, is that of a single tree in Columbia county, New York. The fruit is of the York Imperial type, but was bought for Wealthy. It would bear regularly while Wealthy would not. Col. Brackett considered it new and worth propagating. Similar "sports" are often found, and by propagating from them, valuable types might be established.

Another interesting statement, was that of Mr. Hiester in reference to rot on Champion peach. While he had serious loss by rot, Mr. Snavely saved his crop and had fine fruit by applying lime, salt and sulphur. The point is that we have come to a place in fruit culture where we must practice more intensive culture. Under certain conditions we can get the same amount of fruit on six acres as we can on ten. By working apples on Doucain stocks the trees can be dwarfed and kept low, and this object is aimed at by many growers in New York. Size of trees can be reduced and most of the fruit can be picked from the ground. In Mr. Hale's peach orchard of 250,000 trees, all can be picked without a ladder. Trees are 13 feet apart. He is now clearing up 200 acres near Hartford, Conn., on which he will plant from 150 to 170 trees to the acre, peaches and pears.

As fruit growers we must also realize that San José Scale has come to stay, and we must arrange to fight it vigorously. The first 5 or 6 years are most important, and the pest must be kept well in check. The most effective method with bearing trees is with cyanide gas in a gas-proof box or tent. Up to 6 years of age trees can be treated by this method at a cost of about 3 cents per tree. In the Southern and Western states it is advisable every other year, say 2, 4 and six years after planting.

In reply to an inquiry, Prof. Johnson stated that the custom of some nurserymen in fumigating nursery stock in cars, when ready for shipment, is of very doubtful utility, and likely to be unsatisfactory. To be successfully done, trees should be piled loosely on a slat floor under which the gas is generated. Trees packed in cars are usually tied tightly in bundles and well encased with packing material, all of which make thorough fumigation impossible.
MR. MOON: In advocating the dwarfing of trees for intensive culture, I can see how dwarf pear can be kept in this habit, but with peaches it seems to me the severe pruning would result in reduced crops of fruit.

PROF. JOHNSON: Not necessarily, because so many more trees can be grown on same space. We simply take the terminal buds and branches off, and grow the fruit spurs on or near the trunk of the tree. Mr. Morrell, of Michigan, is the most successful intensive peach grower in the country, and he goes to Texas to intensify 10,000 acres. I saw in his orchard seven year old trees from which I could pick a bushel of peaches each sitting on the ground.

MR. WERTZ: In my experience the best and finest colored peaches always grow on the extremities of the branches. Those on the lower limbs are pale and green and of inferior quality.

MR. SNAVELY: Are apples on Doucain stocks as long-lived as on their own roots?

PROF. JOHNSON: I cannot see why they are not nearly as long-lived as ordinary trees, though the question has not yet been fully tested, and the point is well taken. When we dwarf any plant we necessarily impoverish its physical condition.

The following paper was then read:

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THE FRUIT GROWERS' GREATEST ENEMY.

BY W. H. STOUT, Pinegrove, Pa.

(Suggested by Experience and Observation.)

Although it may be true that the enemies of the fruit grower are blessings in disguise, the successful orchardist pays dearly for the same in trouble, annoyance and hard labor. The smaller and more numerous insects are often the most difficult to combat. While laws have been enacted to protect the fruit grower against some of the most dangerous and destructive foes, there yet remains one to whom reference is seldom made, the largest and most destructive of all. Of vegetable origin, bacteria, fungoids, mildews, spores of various kinds, microscopic objects disseminated all around, wafted in all directions on summer breezes producing blights, smuts and decay upon fruit and foliage, are constant dangers and every-
where present, in the development of leaf blight, bitter and brown rot, black, knot, crown gall, anthracnose, yellows and rosettes. The more animate, aphides, the wooly, the black and green, the oyster shell, the scurfy, and various other scales, with that worse pest, the San José Scale, are some of the insects, taxing the patience and industry of the horticulturist. Adding to these, the round and flat-head borers, bag worms, leaf crumplers, fall and tent caterpillars, tree hoppers, katydids, yellownecks, canker worms, codling moth, apple maggots and curculios, are enough to tax the time and ingenuity of the most industrious to make fruit growing a success. Referring again to anthracnose, seldom mentioned, yet in some sections, quite prevalent and damaging to trees and fruit, the specimens at hand plainly show its effects, and a bulletin issued by the Oregon Station several years ago was the first observed to illustrate and describe it as apple tree anthracnose.

There is another more serious enemy abroad than any of those enumerated, in the form of a biped class, vertebra, genus homo, evolved from a tribe of anthropoids. Given a little time and an axe as an outfit, will do more damage in a short time than all the rest, and there is no law yet enacted, but there should be, to restrain this species from continuing the destruction of fruit trees so much in evidence throughout the country. The same species is also found in towns and cities many times absorbing the profits to which the producer is entitled, posing as dealers, transient and irresponsible, obtaining supplies from the unsophisticated, for which account of sales rendered may be entirely omitted or ostensibly absorbed in expenses, commissions and freight charges, ending in partial or total confiscation. Considered from all points of view, the tree butcher is the most destructive being, his work past and present being in evidence in all sections of Pennsylvania, next to the irresponsible commission merchant.

The following paper was read:

THE EVOLUTION OF THE PEACH.

BY WM. M. DICKSON, WOODSBURG, DEL.

Having all my life been connected with agriculture and its interest in the Delaware Peninsula, my desire to meet in this Capital City of a great State with an assemblage met, not for civic, political
or religious purposes, but to consider that deeper and broader subject, horticulture, in its phases of culture, refinement, pleasure and profit, caused me to accept your kind invitation with alacrity, that it will be hard to maintain in the handling of the subject assigned to me.

The Evolution of the peach, the luscious fruit which alone of all others, is medicine to the sick, nourishment to the convalescent, and luxury to the well. One of Longfellow's verses, slightly transposed, fully describes it:

"For richness of feast
Is the peach of the East,
That grows by the Delaware River;
Whose sweet perfume
Fills all the room
With a benison on the giver."

The growing of peaches, like all other pursuits, has made rich and made poor, it has made two blades of grass grow where one grew before, and also impoverished the land where it grew. All according to the grower.

Its evolution then must be considered in the abstract as well as the literal sense, because of its rise, its reign of supremacy, and decline. The latter period, without any extreme optimistic view. I believe to be past for the Delaware Peninsula and confident it is for Pennsylvania, and base the view entirely on the assumption that progressive horticulturists will make diligent use of the knowledge obtained by sad experience. Perhaps there is nothing from military strife to the invasion of political adventurers that has been so potent in the formation of opinions and adoption of methods on the Peninsula as horticulture, chief of which is both king and queen, the peach.

It marks an epoch in history from the time when a meager livelihood was obtained by plain agriculture and the supply of timber lands to rapid gains from fruit growing. That accounts, in a great measure, for the inconsiderate and reckless horticulture practiced. The one idea with the great majority was to set fruit trees, and vines, for the money there was in it solely, there being little regard for the kind of land on which they were set, kind of trees, or varieties used, except, however, the same rule applied to trees that was used by the man ordering boots, viz: Get them as big as you can for the money. The varieties were chosen to commence the season as soon as possible and continue it as long as possible. The kinds predominating were those which some one had made the most out of on lands and under conditions in every way different from the one who was setting them. "Get the lands in trees." was
the watchword. Buy them as cheaply as possible from any Jack-leg propagator regardless of whether he gathered his pits from the canning factory and cut the scions from the nearest old moss-covered, diseased, fence-row seedling tree. Or stretch out a little and listen to the silver-tongued and golden stories of the tree nomad whose sole possession on earth was a place to get his mail and no hope for the future, and buy of him at a good price, provided he hurries forward the discarded trees collected from some reputable nursery-man. Then set them in a mere plow-cross because of lack of time to dig holes, start them high for ease of cultivation, grow corn in them until the starved land will do no more. This, gentlemen, is not an overdrawn picture nor is it confined to isolated cases, but more often the rule. This is not criticism.

Under this system the evolution of the peach becomes retrogressive, augmented and intensified by increasing prices obtained for fruit. As the population increased and the markets broadened by the great transportation companies annihilating distance, we reviled then in the thought that we had God's chosen place, and we were the people to grow fruit. You cannot wonder at this when I tell you that 86 cents was the average price. We marvel now as much that such a system was in any degree profitable as we wonder how anything was ever accomplished without the modern appliances of business. It can only be explained by the fact that the natural enemies were not present owing to the newness of the industry. Insects and fungi had not appeared to partake of the bountiful repast we had prepared for them; but they learned of our generosity and they came by legions, invited their friends and kindred to forsake their lowly life on weeds and brambles to take a place at the bountiful fruit table spread for them. That this will be the case in the new countries now growing and commencing to grow fruit is possible. To dispute it is to dispute the natural law from man to the lowest insect to supply himself with the best from the nearest and greatest source of supply. We wonder again that we can grow fruit at all with this army of invasion, but all invaders have their periods of prosperity, and comparative obscurity, through the agency of their enemies and lack of food supply, as instanced by that dread scourge, the yellows, in its southern journey. Striking the Peninsula in the northern part where there was the most orchards and passing on to the lower counties so rapidly that it transferred the peach center from the northern county (New Castle) through Kent, the middle county, to Sussex, the lower one, in a period of twenty years.

Behind this force of natural results there has been a strong helping hand in the persons of the untiring, ever zealous, far-seeing scientific workers of the agricultural colleges and the strong-
minded, industrious horticulturist. Scoffed at as theorists and book-farmers, they have persevered to know the why and how, fully believing it their duty and privilege to supply the great population with fruit until by their works shall you know them. Re-inforcing them has been the honest, conscientious nurserymen, compelled as they have been, to compete with the irresponsible vender and meet the clamorous hobbyisms of senseless theorists, still believed in the law of atavism and have put out the best trees and vines that skill could produce until they have stamped their impress on the orchards of American fruit growers.

Allow me here to digress long enough to mention one, properly fitting this description in every phase, formerly from this county (Dauphin), but now of Denton, Md., Mr. J. W. Kerr. If you have any more such we will gladly receive them.

From these classes of yeoman horticulturists, to whom all should doff the hat of courtesy and bend the knee of gratitude, have we learned to scrutinize closely the conditions of soil on which we set trees, and that the large over-grown tree, when cut back to start the head will, the following year, if examined, show a blackened pith showing unhealthfulness, not to be found where a medium size is used. By this is not meant the dwarfed insect-covered tree simply because it is small, but a perfectly healthy one from a reliable source where the volume of business and business standing will not permit of any misrepresentation. When set they should be started not more than two feet from the ground (18 inches preferred by some) and kept well topped out so that the fruit will grow down as near the source of food supply as possible to increase its size and color and also to economize in the harvest. We can no longer afford to use the ladder in the peach orchard, from both an economical standpoint and point of protection to the fruit. Thorough culture to preserve soil moisture and make available latent plant food is imperative and should be assisted by the lavish use of leguminous cover-crops. The variety should be selected to avoid as far as possible the gluts of other fruit growing sections.

I have refrained from the use of figures to show either the growth or decline of this industry, assuming that the great questions with you in Pennsylvania are those that will give the practical results under the conditions surrounding you. This brings us to the point where evolution becomes a prophecy. Prof. Powell said at our meeting the other day that every section which he had visited claimed to be the one and only peculiarly adapted place to grow fruit. It reminds me of when at the World's Fair in '93 we took on our train 1,000 baskets of fine peaches which were distributed on Delaware Day in front of the Delaware building. We had always realized the small area of our section and tried to make
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it up in claims, but never suspected there was any one who did not know where it was. But the question was asked, "Where is this Delaware that grows such fine peaches?" When, to our consternation, a Pennsylvanian claimed the whole outfit for Delaware county, Pennsylvania.

We had no objection to being adopted ourselves at that time because the fruit growing was precarious, but we could not spare the peaches. I believe, however, that most sections of this country can grow to perfection many kinds of fruit not now grown, if the proper conditions are complied with. The State of Pennsylvania on its side-hills, caps and rocky tops can grow peaches that will color much better than ours, owing to the lower temperature you have. This was fully demonstrated with us the past summer, it being the coolest one for many years, consequently the fruit come to full maturity instead of prematurering, before it was colored, from the extreme heat. These conditions you always have on the caps and tips of the mountain ranges. Neither are fungus diseases with you to the extent they are with us, consequently your fruit will carry longer than ours. Our peaches use to carry for five days even when shipped in the ordinary ventilator car, now it takes the refrigerator car. The same conditions will be with you no doubt when your orchards become as thick and grown as long as ours. You, however, will grow it on land that is practically useless for anything now but grazing, while we will have to use our best, level agricultural land, and grow those varieties that will come between those of the South and the mountain regions of West Virginia, Western Maryland and Pennsylvania.

A close study will show the best varieties for you to grow to avoid the glut from other sections and suitable to the soil on which you grow them. The teeming millions of cities and interior towns will be supplied with healthful fruit. The painstaking, careful horticulturist and his children after him will receive their reward, while the communion with Nature and nature's God will produce a higher standard of citizenship.

Adjourned.

AFTERNOON SESSION—2.00.

Thursday, January 22, 1903.

After calling the meeting to order, and before the regular program was taken up, the President announced the resignation of Mr. Snavely as Chairman of the General Fruit Committee, owing to ill health. Mr. Snavely had decided to resign in November last, but at the urgent solicitation of the President and Secretary of the Association concluded to continue until this meeting.
The President bore testimony to his efficiency, and to the able manner in which his reports were prepared, and regretted that he was obliged to accept his resignation. He announced also, that Prof. R. L. Watts, Scalp Level, Pa., had been named as his successor.

MR. MOON: I think Mr. Snively's report, which was read this morning, was the best I ever heard before this Association. I consider him an ideal chairman, and while I do not want to place any unnecessary burdens upon him, I am sorry to see him resign.

REPORT OF COMMITTEE ON NOMENCLATURE AND EXHIBITS.

Your committee begs to report that they find on exhibition the following:

3 plates apples, H. C. Wallize, Sunbury.
8 plates apples, W. H. Stout, Pinegrove.
14 plates apples, C. P. Scholl, Fisherville.
6 plates apples, Hon. W. T. Creasy, Catawissa.
6 plates apples, D. C. Rupp, Shiremanstown.
7 plates apples, Gabriel Hiester, Harrisburg.
1 plate apples, Calvin Cooper, Bird-in-Hand.
12 plates apples, L. M. Simons, Piketon.
2 plates apples, A. W. Root, East Petersburg.
11 plates apples, J. H. Bartram, West Chester.
1 plate apples, W. H. Hefflefinger, Greenvillage.
9 plates apples, W. P. Bolton, Bonview.
3 plates apples, John G. Engle, Marietta.
2 plates pears, L. F. Haehnlein, Harrisburg.

Mr. Simons' exhibit of apples deserves special mention, being entirely free from blemish of any kind.

The exhibit of 5 plates cultivated chestnuts, including one plate of a new spineless variety, and the display of palms and ferns by Mr. G. Hanson, or Harrisburg, were particularly attractive, as also the display of carnations grown by J. J. Styer, of Concordville.

In conclusion, your committee desires to make commendable mention of the entire exhibit.

Respectfully submitted,

J. HIBBERD BARTRAM,
JACOB L. RIFE,
T. C. FOSTER.
The subject of "Crown Gall" was next taken up, and the following paper was read by the Secretary:

SHALL WE PLANT TREES VISIBLY AFFECTED WITH CROWN GALL?

BY A. C. RICHARDS, NEW PARIS, PA.

Emphatically, no; for several reasons. My first acquaintance with this disease was made four years ago, in a bunch of 1,000 or more apple trees from a firm in Ohio.

Although they bore the usual inspection tag, I noticed a fungous growth of peculiar character on the crowns of quite a number of trees that both puzzled and alarmed me. Fearing it was some dangerous growth, I sent samples to Prof. Butz at State College, who pronounced it the new, dangerous and mysterious disease "Crown Gall." I planted and marked a few of those affected, the larger part of which are now dead.

While, on account of limited time, my observations have not been what I desired, as to the nature and effect of the disease, I am convinced that it so destroys the vigor of the tree as to give it a hopeless future, because of which, as well as the danger from infection, I am digging out affected trees and destroying them.

In every shipment of trees since received, I aim to throw out all affected trees, and I have not found a large percentage affected, until the past fall, when the apple trees bought were badly affected, near 30 per cent. Another party selling for a Pennsylvania nursery found about 40 per cent. affected, though he knew nothing was wrong with his stock till the large part had been delivered to purchasers.

Many persons are selling fruit trees who know nothing about the disease and others who do, fail to cull out for reasons best known to themselves.

I saw the past summer a few trees on exhibit at a large gathering, and on one of these trees a gall. I quietly called the attention of the exhibitor to the fact, and was surprised that he was not informed as to the dangerous character of the disease, though he makes large sales and seemed an honest fellow.

While I do not consider it so highly contagious in our fruits as in the citrous fruits of the Pacific slope, yet the rapidity with which it spreads and the dangerous character of the disease, makes it essential that no trees visibly affected should ever be planted, except for experimental purposes.
With this view, both Profs. Butz and Van Deman, with many other authorities agree.

Not only should affected trees not be planted, though thousands are, but radical measures should be taken to stop the reckless shipment and sale of diseased trees, for without such measures the country will soon be flooded with this dangerous foe to fruit growing, doubly dangerous because underground. In our dread of San José Scale let us not overlook a disease equally dangerous.

The following letter on the same topic was also read by the Secretary:

"Washington, D.C., Jan. 16, 1903.

"Mr. Enos B. Engle, Harrisburg, Pa.:

"Dear Sir: I am in receipt of your letter of January 14, and shall look forward to receiving the additional material.

"Relative to the question of planting trees that are visibly affected with crown gall, you will find, of course, a great deal of difference of opinion among scientific and practical men on this point; some hold that if the gall is very small and can be cut off before planting, painting the wound with a little copper sulphate diluted in water at the rate of about one quart of sulphate to 25 parts of water, that the tree will sufficiently recover to make it reasonably safe to plant. Among those who hold this view, therefore, it is the custom to throw out all badly diseased trees and those where the trouble can not be remedied as suggested, and plant the others, those apparently healthy and those where the trouble can be remedied. So far as the scientific study of the disease has gone, however, it does not appear that the treatment suggested rids the tree of the disease, as it nearly always breaks out again on the edges of the old wound and grows gradually larger until the vitality of the tree is seriously impaired. The gall after it reaches a few years age begins to decay and offers an entrance for root rot fungi and insects, which have to be considered as well as the weakening effects of the gall. The disease is so widespread through the country that it is difficult to find a nursery where there is not more or less of it. It would, therefore, be impracticable to boycott nurseries where the disease is found, if the nurserymen do everything in their power to eradicate the disease and use uninfected land as far as possible for the growth of new stuff. We advise, unqualifiedly, however, the discarding of every tree that is decidedly diseased, and we feel that it is very desirable to go even a step further than this and discard every tree that shows any evidence whatever of the disease. In such a case as you mention, where 95 out of 141 trees show the disease, it is evident that the nursery must have been very seriously infested with the trouble, and in such cases we would discard the whole shipment."
"This latter proposition of course is radical and is going perhaps to the extreme of caution, still if a man is setting out an orchard on good land he very naturally wants to take every precaution to get healthy trees. The Department, as well as some of the Stations, is studying this disease along the same lines as Prof. Toumey, and we hope to obtain some more definite information than we have at present. The practice of grafting on pieces of root so that the callus is about on or below the surface of the ground, is probably responsible for a great deal of crown gall. We have observed, and I think it is the general conclusion of all who have studied the question, that the callus offers a most favorable location for the development of this crown gall parasite. In fact, the parasite seems to get in nearly always through some serious wound at this portion of the tree, or through the callus made by grafting. It seems quite likely, though the matter has not received sufficient investigation yet to make a definite statement, that if whole roots could be used and budded instead of grafted, that there would be less danger of the development of this disease and especially less danger of its obtaining a foothold in the more vital portions of the tree.

"In conclusion, therefore, you will see that no fixed and positive statement can be made regarding the question of using or discarding the trees. For my own part, if I were to answer your question No. 23 in the program, I should say, "No, do not plant trees that are visibly affected with crown gall."

"Trusting this information may be of some service in your discussion, I am,

"Very truly yours,

"A. F. WOODS,

"Pathologist and Physiologist,

"U. S. Department of Agriculture."

Mr. Wertz asked Prof. Johnson's views on the subject under discussion.

PROF. JOHNSON: The question has been so ably answered in the paper just read, and my views are so fully embodied in Prof. Woods' paper, that but little need be added. As stated by Prof. Woods the subject is being investigated by the Department of Agriculture at Washington, and in his opinion it may be eliminated or controlled.

It is almost impossible to find a locality where this disease does not exist. Its nature and origin seem considerable of a mystery. In Central Illinois it is a very serious matter, and some may be obliged to go out of business. I have made some experiments with infected trees, and the results show that they are dwarfed in growth and shorter lived. It is most likely to attack trees at the point of union between graft and root. A two and one-half per cent. solution of formalin used as a dip, has given satisfactory results.
It must be remembered also that “wooly aphis” is similar in appearance and sometimes mistaken for crown gall in its effect upon the roots.

In reply to topic No. 24, “Is the Custom of many Nurserymen in Cutting Buds and Scions Continually from Nursery Rows to be Commended?” Mr. Calvin Cooper said:

MR. COOPER: In my opinion most emphatically, no; first, because the young scions are too soft and, as a rule, not sufficiently ripened to make a good connection with the stock upon which the graft is placed. I have frequently found them browned in the centre more than one foot from the top, thus leaving a dead spot which lessens the chances for perfect connection. The young wood, as in nursery rows, is usually a forced growth made too rapidly, late in season, consequently cannot ripen before frost kills the foliage, hence is trash and immature; while those cut from bearing trees, or trees that have not been forced to make excessive growths usually pass through the winter season solid and green to the tips. In addition to the above, when cutting from bearing trees, we should be absolutely sure that the desired variety is surely obtained, which cannot always be gotten from nursery rows. While it is true that each variety has its habits of growth, color of bark, etc., of its kind (but mixtures do occur even with the most careful persons), I have never felt satisfied in cutting from nursery rows, unless the work was done by myself, and even then have occasionally erred.

In budding, the situation is somewhat different. The buds must necessarily be taken while the sap of tree is flowing freely, and the stock must (for the greatest success) be in vigorous growth. This method makes the most handsome trees, because the stock has had one year to establish itself and after having been budded and cut back send up long straight stems as a foundation for the future tree. It has been my practice for years, and have traveled many miles to procure buds from bearing trees of the very best strain, and the trees in the most healthy condition. Hence, I am fully convinced that to practice the cutting of scions and buds is not to be commended, and if persistently done for a number of years the time of fruiting will be delayed, and the trees shorter lived.

My observation for years has been, that scions and buds taken from young bearing trees and not driven to make the most vigorous growths, will be longer lived and more productive.

PROF. JOHNSON: This is a very interesting problem and should be freely discussed. I would rather hear from practical nurserymen than discuss it myself.
MR. MOON: I do not see that I can add anything of interest to what has been read. I heartily coincide and agree with the views advanced. It has been our experience to travel miles for scions from good types of fruits and trees.

The PRESIDENT: There is no doubt that the bud or scion, in a measure, controls the root, hence it is important to get them from healthy stock and true to name. I would regard the cutting of buds and scions year after year from nursery rows as not only careless, but criminal. There may be local conditions affecting trees; but conceding all that, I prefer taking buds as far as practicable from well-established types of bearing trees. It is my theory also that by careful selections from bearing trees we are likely to produce more and earlier fruit. This is not always practical in large commercial nurseries, but, where possible, it should be done.

The following address was delivered:

BEAUTIFICATION OF WASTE PLACES.

BY S. MENDELSON MEEHAN, Germantown, Philadelphia.

It is my intention to at once dispel any impression you may have that I am going into the mysteries of landscape gardening, to name a lot of rules you should follow, and give other specific advice, or that I intend naming lists of desirable plants, describing their merits, etc. Such things are details that should be worked out to fit the individual needs. But rather, I wish to reveal some common opportunities by which we may brighten our lives through the medium of Dame Nature and as students of ornamental plant life. There is no question but that all country and suburban places have their waste places; waste because they have either had all the beauty crowded out of them or have been utterly neglected.

A dwelling-place should be made a home in every sense of the word. The grounds immediately surrounding the house and beyond should be made attractive and lovely to those who live right on the spot. But then we must think of others, too. We want to please
our visitors, friends and neighbors, and in fact, every one that passes by. It is rightly a matter for personal pride that our surroundings be made to speak our appreciation for the beauties of Nature. Therefore we shall be careful to view whatever plans we may make from the two points.

Have you ever stopped to consider how badly proportioned our average country places are, having in mind those where farming, fruit growing or similar rural work is carried on? Fortunate indeed is the 50 or 100-acre place that has half an acre of home grounds about the house. Even there the chickens and other animals are frequently allowed to hold possession to the destruction of any pretty gardening plans. In comparison with the owner of city property, what a much better opportunity has the countryman and fruit grower with an abundance of low-priced land to have a beautiful garden home with little expense and accompanied by greater personal interest.

But few country homes exist where from one to five acres could not be set aside for lawn and flower gardens. "It would not pay," I hear some one say. Perhaps the balance in dollars and cents would be a little less, but is the pleasure and comfort to count for nothing? If the financial results are to be considered above everything else, and the loss of that much ground is serious, then the owner must be working the remainder of his property on very close margins, and his methods need investigating.

A good expanse of lawn may be considered one of the chief aims, because when that is set apart, it offers many opportunities for development in detail and striking effects. Above all, set out with the determination it is to be a good lawn of good grass. To be half-hearted in home-making is to create waste places, and those we have no use for.

Decide to have, if possible, a flower garden, not simply flower beds and border around the grounds, but something of an enclosure into which one may pass and feel that he is in a different atmosphere, where flowers are on every side inviting admiration and interest. I know of no phase of gardening that is more delightful, invigorating and care-destroying than that which relates to the hardy flowers. A carefully selected assortment gives a profusion of flowers all the year, from the very earliest spring days when some will open their adventurous blossoms almost out from the snow, to the time when some will defy the lighter frosts of the autumn.

A rose garden, which may be made a section of a general flower garden, is much more pleasing than where roses are simply scattered here and there. They are not fitted for promiscuous planting, and always respond better to definite treatment. If a fine lawn offers
opportunities for detailed development, equally so does the flower garden. There may be bower, turf walks and rustic seats; trellises, vine-covered archways and what not. Utility need not be dismissed entirely, for some of the handsomest flower gardens are merely generous borders to vegetable patches. Or where the owner is concerned in marketing, cut-flowers offer opportunities for quite a neat recompense for labor and expenditure. Would not this idea also add to the various profited solutions of the farm question: How shall we keep the boys on the farm?

Having determined to beautify our home grounds, to have a fine lawn well-planted, a flower garden and handsome shade and ornamental trees, what is the best course to pursue in securing them?

Right here let me say that unless the ideas are well thought out and right plans laid, it would be most unsatisfactory to do anything unusual. To plan ground for ornamental effect and permanency requires just as much and more care and intelligent judgment as to plan out a large fruit orchard or piece of farm land. A good knowledge of plants and their characters must be had. The effect they will produce in position both at the start and in the future must be recognized.

The smallest place should have a plan made for it, put roughly on paper, or kept well in the head if not intricate; the former method is much the most satisfactory. Make this plan just as complete as possible. Allow for every little embellishment, though the minor details may be subject to change when the work is taken up. The economy of a plan is in its perfection. Mistakes are not so likely to occur, and everything is located in harmony.

Above all, such a plan can be carried out one part at a time without the danger of having something interfere with some idea that might otherwise have presented itself at a future time. The lawn could be started the first year, and a few trees planted as desired about the house and at the driveway entrance, with perhaps sufficient properly grouped in intermediate positions to relieve any bareness that might exist. The next season shrubbery borders and groups might be planted with additional trees on the lawn for ornamental purposes. The flower garden need not follow till later. Meanwhile, the pleasure accompanying development would be going on with always some little thing to look forward to.

If you have the time to study all these things out properly it will be a source of satisfaction and pleasure, and you have but to show the completed scheme to some one competent to criticise it; if you have not that time, it will be to your profit to spend a few dollars on expert advice.

Plant trees and shrubs that have permanent value and not too ordinary. Avoid the cheap, quick-growing trees which are invaria-
bly less satisfactory in the end and are short-lived. I will only name the oaks as being especially worthy trees, and ones that will never bring regret. A few really rare plants will increase the interest in your place wonderfully. Such beautiful things as the Yellow Wood, Gingko, Sophora and Japanese Varnish tree are not difficult to obtain, yet they are not common.

This paper has dealt with waste places in a rather broad sense. There are many little places that would seem to come more strictly under that heading that I have not mentioned. There may be an old stump of a tree which would be beautified if a vine were allowed to clamber over it.

An unused piece of swampy ground could be made beautiful by planting in it some flags and Japanese iris, Mallows, Lythrum, Coreopsis, and even many swamp-loving shrubs like the common elderberry, White Fringe and Swamp Magnolia. The walls of your house would likely be very much improved by a clinging vine. The fence along the front of your property could have a few vines placed at some of the posts. Many similar places will suggest themselves to you when you give it thought and it is unnecessary for me to attempt further detail. My greatest fear is that we men of business allow waste places to locate in our minds. We think of utility, what we can plant here for profit and there for profit. Everything must pay in dollars and cents. These waste places, I hope my hearers will plant up at once with thoughts of the beauties of nature. All else that I have suggested will then be carried out in a natural course.

The following is a synopsis of the remarks by Prof. Wells W. Cooke, Washington, D. C.

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**SHALL WE FERTILIZE THE LAND OR THE CROP.**

**BY PROF. WELLS W. COOKE, Washington, D. C.**

Several theories have been advanced as to the proper principle that should underlie the fertilization of the crops. One of the best known is called the Stockbridge theory. According to this, we should apply to the land each year or during each rotation what we expect the crops will remove of fertilizing ingredients. This rule might hold good if we started out with a first class productive soil in fine mechanical condition and full of plant food. But such a
problem is rarely presented to the horticulturist. Most persons are asking how to improve, by fertilization, a soil that they know is not sufficiently rich in plant food. The belief is quite current among farmers that the chemist can analyze the soil and tell them what it needs. Unfortunately, this is not true. The chemist can ascertain the total amount of nitrogen, phosphoric acid and potassium a soil contains, but he cannot tell how much of that is in such a form as to be available to the plant.

Still a third method has been advocated, called the plot system. The principle of the test is simple and the details are not difficult to carry out. The plot is divided into several long narrow strips of equal size. Some receive no fertilization, some nitrogen alone, some phosphoric acid alone, some potash alone, others mixtures of two of these and some all three; that is a complete fertilizer. The field is all sown in the same crop and at harvest each plot is harvested and weighed separately. The applications that have given the largest yields show what the soil needs most. The objections to this are twofold. In the first place, results obtained with one crop have but a limited application to a crop of another nature. In the second place, the results show what the land needed at the beginning of the season, and not what it is going to need for the next crop. In other words, the results tell you what you want to know, one year after it will do you any good.

To my mind both these latter theories are based on an entirely wrong idea of the proper use of the plant food already in the soil. In both, the idea is to add to the soil as little new plant food as possible, and to make the fullest possible use of the plant food already in the soil.

My own belief is that the proper theory of fertilization should be based on the idea that all of the plant food of the soil should be considered as so much working capital and enough added so that this working capital shall be continually increased. In other words, I believe that the only proper method of fertilization is to fill the soil so full of plant food that there is no possibility of the plant lacking in nourishment.

In this same line I might say just a word about the use of lime. Most persons use lime in order to make available the otherwise unavailable plant food of the soil, consequently, any crop grown by the use of lime alone leaves the soil just so much the poorer in plant food and is, therefore, directly opposite to what I have just stated as what I believe should be the proper idea of crop fertilization. The fact is that any and all crops need at their command a great deal more of plant food than they are to remove from the soil.

Some common crops remove the following amounts of plant food in pounds per acre:
The above figures show that the fruits need much more potash than phosphoric acid. On the other hand most commercial fertilizers reverse this proportion. The fact of the matter is that practically all the soils of Pennsylvania are deficient in phosphoric acid, and for an original application, enough phosphoric acid should be given for several years' crops so as to make sure that there will be a sufficient.

In the light of the figures given, a liberal supply of potash is sure to be a necessity. All fruits need phosphoric acid to ripen both the fruit and the wood. Potash gives color and sweetness to the fruit while the phosphoric acid gives size, maturity and firmness. Nitrogen helps to develop the leaves, but too much delays ripening, and in the case of strawberries, makes the fruit soft. If there is a lack of nitrogen the leaf growth will be small and consequently the crop be decreased.

In general, a good rule for the fertilization of fruits is to obtain the needed nitrogen by the growth of clovers or other legumes and then add phosphoric acid and potash in the form of mineral fertilizers. In beginning a system of fertilization on most farms, it is well to add at first twice as much phosphoric acid as potash, due to that fact already stated that most Pennsylvania farms are sadly deficient in phosphoric acid. Later, for several years, add the two in equal quantities. Eventually, when the ground soil has become well-filled with plant food, the potash can be twice the amount of the phosphoric acid.

In reply to an inquiry, Mr. Simons stated that he does not use commercial fertilizers generally in fruit culture. Prefers barnyard manure and ashes and has had satisfactory results.

Mr. Foster offered a series of resolutions, which were subsequently withdrawn, whereupon, the Association was declared adjourned.

ENOS B. ENGLE,
Secretary.
PROCEEDINGS OF THE FORTY-FIFTH ANNUAL MEETING
OF THE STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA.

HELD AT LANCASTER, PA., JANUARY 19 AND 20, 1904.

PROGRAM.

Tuesday, January 19, 2 P. M.

1. Opening announcement.
2. Reading minutes of previous meeting.
4. Election of officers.
5. Reports of officers.
6. Reports of special committees.
7. Reports of standing committees, including report of General Fruit Committee.
   Prof. R. L. Watts, Chairman.
8. Appointment of committees.

Evening Session, 7.30.

10. Address of Welcome.
    Hon. Wm. H. Brosius, Drumore, Pa.
11. Response and President's Address.
12. "Ornamental Horticulture for Fruit Growers."
    Samuel C. Moon, Morrisville, Pa.
13. General Discussion: "What Legislation for San José Scale?"
    Opened by Prof. H. A. Surface, Economic Zoologist, Department of Agriculture of Pennsylvania.
Morning Session, Wednesday, January 20, 9 o'clock.

15. Reports of Committees.
17. New Business: Selection of place for next annual meeting.
21. Question Box.
22. Adjournment.

Afternoon Session, 2 o'clock.

23. New and Unfinished Business.
27. Adjournment.

Evening Session.

30. Final Resolutions.
31. Adjournment.
REPORT OF THE FORTY-FIFTH ANNUAL MEETING OF THE
STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA, HELD AT LANCASTER, PA., JANUARY 19 AND 20, 1904.

Owing, doubtless, to the deep and general interest felt not only by horticulturists and fruit growers, but by the community at large, in city and county on the subject of San José Scale, and best methods of combating this dangerous pest, the attendance at this meeting was unusually large. Great interest was manifested in the papers and discussions generally, and particularly in everything pertaining to injurious insects and diseases.

The following new members were enrolled during the meeting:

F. E. Traver, Wyebrook, Pa.
Amos B. Denlinger, Iva, Pa.
A. H. Yeager, Lancaster.
Wm. Warner Harper, Chestnut Hill, Phila.
Wm. F. McSparran, Furniss.
D. W. Graybill, East Petersburg.
H. H. Snively, Lancaster.
David S. Herr, Mountville.
S. Morris Jones, Westgrove.
Hon. N. B. Critchfield, Harrisburg.
H. M. Mayer, Rohrerstown.
Dr. I. H. Mayer, Willow Street.
Dr. J. H. Funk, Boyertown.
F. S. Stover, Bowmansville.
Enos H. Hess, Lancaster.
C. P. Barnard, Northbrook.
P. R. Nissley, Mt. Joy.
S. S. Kraybill, Mt. Joy.
Prof. H. A. Surface, Harrisburg.
Jas. A. Patterson, Stewartstown.

The meeting was held in court room No. 2, and was formally opened for business on Tuesday afternoon, January 19 at 2 o'clock, by President Howard A. Chase.

Minutes of previous meeting were read by the Secretary and approved.

After a recess of five minutes, President Chase, before resuming the work of the meeting, announced the death of a former President
of the Society, Mr. Josiah Hoopes, of West Chester, Pa., who died on Saturday last and was being laid to rest today.

Mr. Hoopes was one of the founders of this Association, one of the few members remaining who was present at its organization. All who knew him felt a deep personal sorrow in his death, and it can be said of him that he was true to his God, his country and his fellow-man.

Calvin Cooper, W. H. Moon and J. G. Reist were appointed a committee to nominate officers for the coming year.

Treasurer Edwin W. Thomas made his report as follows: Receipts for the year $154.00; expenses, $142.29, leaving on hand a balance of $11.71.

J. G. Engle, J. F. Boyer and J. W. Root were appointed a committee to audit the account and reported the same correct.

Mr. Hiester, as chairman of Committee on Legislation, submitted the following report:

REPORT OF COMMITTEE ON LEGISLATION.

To the President and Members of the State Horticultural Association of Pennsylvania:

Gentlemen: I have the honor to report, on behalf of the Committee on Legislation, as follows:

In accordance with a resolution passed at our last meeting, your committee prepared an act, entitled "An act to establish a Division of Horticulture in the Department of Agriculture, and to provide for the appointment of a Commissioner of Horticulture, and a clerk, and to fix their salaries," and succeeded in having it passed by both Houses of the Legislature, but the Governor vetoed the bill without granting us a hearing on the subject, although requested to do so by letters from our President, our Secretary, and the chairman of the Legislative Committee.

Your chairman desires to express his appreciation of the valuable assistance rendered, in the passage of the bill through the Legislature, by Messrs. Crone, of Schuylkill and Rahausen of Franklin counties, members of the House, and Senators McConkey of York, and Snyder of Chester counties.

Respectfully submitted,

GABRIEL HIESTER.

Chairman.

MR. HIESTER: As a representative of this society, I attended also a meeting of the Allied Agricultural Associations, through
whose efforts a bill was passed by the last Legislature appropriating $12,000 for the maintenance of an Agricultural Department at State College, and another bill giving $100,000 for the erection of a dairy building and apparatus, including a proviso, obligating the next Legislature to appropriate $150,000 for its completion. This bill passed both Houses without a dissenting voice and shows what can be accomplished for our farming interest by united effort.

The Chair called attention to the excellent work being done by the Forestry Department of the State, and commended the suggestion recently made by Forestry Commissioner Rothrock, that the Department be permitted to sell forest tree seedlings to such citizens of Pennsylvania as would desire to plant them.

The following letter from the Secretary of the American Pomological Society was read by the Secretary:

"Mr. Enos B. Engle, Waynesboro, Pa.:

"My Dear Sir: Let me offer you, and through you, the members of the Pennsylvania Horticultural Society, greeting on behalf of the Executive of the American Pomological Society. Let me wish you, also, a successful and profitable meeting. Let me also ask you to draw the attention of the members of the Pennsylvania Horticultural Society to some of the purposes and functions of the American Pomological Society. It stands for the improvement of horticultural practice; for the classifying of the principles underlying the practice; for the development of systematic pomology, which includes descriptions and nomenclature; and, finally, for the elevation of horticultural ideals.

"All these features are combined in the report of the proceedings of the meeting of the Society recently held in Boston and now in press. The code of nomenclature adopted by the Society will undoubtedly be accepted as the authority on such matters by the fruit growers of the United States and Canada. For these and many other reasons, the report is unusually valuable. A larger edition than usual is being printed to meet the expected demand. Should members of your Society wish to secure the report and at the same time membership in the international society, they can do so by remitting the biennial membership fee of two dollars ($2) to the treasurer, Professor L. R. Taft, Agricultural College P. O., Mich., or to the undersigned.

"Thanking you for your consideration in bringing this matter before your members, and hoping that your conference will amply realize the ideals of Pennsylvania horticultural councils, believe me

"Yours faithfully,

"JOHN CRAIG."

"Ithaca, N. Y., January 13, 1904."
The PRESIDENT: Next in order is the report of the General Fruit Committee, but in the absence of the chairman, Prof. Watts, we will be obliged to postpone this paper to a future session. Mr. Cooper, who is on the program for tomorrow morning, has consented to take the place assigned to Prof. Watts, and will now give us his "Reminiscences of Fifty Years Among Fruit Trees."

REMINISCENCES OF FIFTY YEARS AMONG FRUIT TREES.

By Calvin Cooper, Bird-in-Hand, Pa.

I had hoped that after passing my seventieth birthday I might be excused from the work assigned me, but having been granted the privilege of choosing my own subject. I have considerable latitude in addressing you.

I have been interested in fruit and fruit culture since I was five years of age, and I sometimes think we do not know much more than we did 50 years ago. There have, however, been great advances in the increased number of varieties of fruit. Then, it was not necessary to spray and wage a continual warfare against insects and diseases as is the case now. The leading varieties of apples were Smokehouse, Rambo, Early Harvest, Sweet Bough, Red Streak, Green Pippin and Pennock. Of pears, there were but three or four varieties before 1840. Peaches were nearly all seedlings, some, of course, were of good quality. Of grapes, the only varieties known in my youthful days were Isabella and Catawba, and the wild Fox grape, and about 1855 the Concord was introduced, and for quality and an all-purpose grape, it has, in my opinion, never been surpassed.

In recent years sprayers have come into use and my first experience with them convinced me of their value. I had two Rambo trees, one of which I sprayed with Bordeaux mixture, and to my surprise, instead of falling off, the fruit on the sprayed tree remained until most of the other winter apples were ready to pick. They hung like Winesaps, and held their foliage until late in the fall. Since then I have sprayed regularly until last year, when for want of help I did not get a tree sprayed, and yet I had the finest apples I ever grew. We knew nothing of the peach borer until about 1860, since when it has caused considerable trouble. I have, in a measure, kept them in check by placing ashes around the trees until about five years old, after which they will resist their attacks.
PROF. SURFACE: Last fall I heard of another remedy for borers. I have seen it tried and can vouch for its efficacy. The formula is as follows: One pound of concentrated lye dissolved in 20 gallons boiling water. Make a funnel-shaped receptacle at base of tree, and pour therein 1 quart of the mixture while hot. Care must be taken not to injure the roots or bark of tree when removing the soil. This remedy is used only for the peach borer, as the apple and pear borer are quite distinct and usually enter the bark of the tree higher up.

A method of treating apple trees to protect them from the attack of borers and vermin has recently been published by Prof. W. B. Alwood, of the Virginia Agricultural Experiment Station, and is vouched for by him. It consists of painting the trunks of the trees with a mixture of pure linseed oil and white lead. He has tried this on thousands of trees and has not injured a tree, and has kept them practically free from borers.

MR. CREASY: Has not the time of year when application of the hot lye is made, something to do with it? I think borers are more difficult to reach at some seasons than others?

PROF. SURFACE: The application I have referred to was made about September 1st. I consider the best time from the middle to the latter part of summer.

The following address was delivered:

RECENT HORTICULTURAL INTRODUCTIONS OF MERIT.

By Prof. H. E. VanDeman, Ex-Pomologist, U. S. Department of Agriculture.

Many varieties of fruits in the United States have been known for years in some localities, while in a general way they are new. There are many varieties of this kind, and as the apple is by common consent the most useful of our American fruits, it will have first attention.

Some of our new apples are the product of seeds that have been planted by design and are the result of hybridizing or cross-fertilization. Some are only chance seedlings that have been found in the edge of the forest or in a fence corner. Among those of this character, one that is much talked about and worthy of trial, is "Stayman," introduced by Dr. J. Stayman, of Leavenworth, Kansas, and is the most valuable of his seedlings. It is about same character and shape as Winesap, though not quite so highly colored.
In quality it is the equal of its parent and will keep until spring in this latitude. The tree exceeds the old Winesap in vigor, is round-headed and upright in growth, and is better in its root system. I would say, grow Stayman instead of Winesap for trial at least. Another variety, comparatively new, is from the State of Arkansas. I have been in the vicinity of where it originated, but have not seen the original tree. It is named the "Senator" or "Oliver." It is good size, even and uniform in shape, and well worthy a trial in this State. "Clayton" is an old apple, but little known, which originated near Clayton, Indiana. It is of good quality, red-striped, but not brilliant, somewhat similar to Rome Beauty in shape and one of the best keepers.

"Sol. Edwards" originated in Kansas from seeds brought from New York in 1850 to 1855. It is a red apple, very handsome and of excellent quality. Its flesh is deep yellow, but how long it will keep here I cannot say. It is an apple that deserves attention and can be procured from B. F. Pancoast, Iola, Kansas.

"Palouse," a seedling which originated in Palouse, Washington, bears heavily, is a fruit of excellent quality and of handsome appearance. It has been tested in Maryland and is much liked there. A good keeper in the West and here also far as tried.

"Virginia Beauty," from Virginia, is a large red apple of good quality, and is coming into prominence as a market apple. It is a good bearer and makes a good, healthy tree.

"Bonum," is an old apple, but has not been generally planted. It is a red apple of medium size, and a good shipper. It is one of the most prolific and regular bearers in Virginia.

"Poor House," from Tennessee or Georgia, is a medium sized yellow apple, of excellent quality, somewhat like Grime's Golden, and well worthy of trial.

"Red Cathode," from Canada, is one of the most brilliant red apples I have ever seen. It is medium size, of excellent quality and a good bearer.

"Delicious," origin, Iowa. Size medium, in shape somewhat angular or ribbed. Skin, yellow with light red stripes. In quality, it is equal to anything I have ever eaten. It is a good orchard fruit, bears well and is worthy of trial in an amateur way.

MR. HERR: What about "Black Ben Davis?"

PROF. VAN DEMAN: I consider the Ben Davis type of apple almost a curse to the apple business. A red-hot discussion is now going on as to whether "Black Ben Davis" and "Gano" are identical, and each side of the controversy has strong advocates. I have studied the two varieties very closely and critically, and in my opinion they are not identical. I think "Black Ben Davis" is more bril-
liant in color than Gano, and if I wanted to plant apples of that type, I would prefer it to Gano. The two varieties, however, have been badly mixed by nurserymen, and it is very difficult to get scions that are distinct.

PEARS.

Of pears, there are not many new varieties. "Rossney," which originated in Utah, is large and similar to Kieffer in shape, but no kin to that variety. It is yellowish green, with red blush, ripening about with Kieffer, or later than Bartlett.

"Philopemia" originated in Putnam county, Indiana, with Reuben Ragan, a pioneer fruit grower of the Mississippi Valley. It is a pear, of medium size, tender, melting, juicy and of good quality. It is well worthy of trial.

PEACHES.

Of new peaches, "Belle of Georgia" is a recent introduction from Marshallville, Georgia, from the same lot of seed that produced Elberta. It is a distinct free-stone, creamy white, tinted with red, a little earlier than Elberta. It is better in quality than Champion and less liable to rot. It does well in Connecticut and in the Peninsula and is one of the coming peaches.

"Hiley" is another Georgia seedling, ripening just before Mt. Rose. It is a distinct free-stone, creamy white, good color and of handsome appearance. It is considered one of the best of the new varieties.

"Sunrise" is a chance seedling from West Virginia. It is a cling, of the type of Heath Cling, of which it is a seedling. It has considerable color and is quite late.

PLUMS.

Those who want a hardy type of plums from the Northwestern states should plant some of the Prunus Americana seedlings. "Brittlewood" is about the best of that type and is a seedling by Theodore Williams, of Iowa. It was introduced in the East by J. W. Kerr, Denton, Md. For that type it is a large plum, one and one-fourth to one and one-half inches in diameter, and free from the bitterness of skin so common in native plums. When fully ripe it is sweet, melting and good, not much subject to curculio.

"Wyant" is another of the same type of plums, not quite so large as the first named, round, very rich, and red in color.

"Stoddard" is also of same type, not so large as those already named, very productive and a good grower. Of the European type, one introduced by Mr. Burbank, of California, is the "Miracle." This is strictly a novelty, being stoneless. There is nothing of Prunus Sirconi in its pedigree.
"Thanksgiving" belongs to the "Prune" class of plums so popular wherever known. It originated in Western New York and is being largely planted in that section. It is mealy and of good quality and not much affected by currulio. It is not liable to rot, and I have seen them after Thanksgiving.

CHERRIES.

"Yan" is a variety of the "Heart" type which originated in Oregon. It is a large, sweet cherry, black when fully ripe, and bears heavy crops. It is a good shipper and comes East in fine condition. It is one of the best varieties on the Pacific Coast, but has not yet been tested in the eastern part of the United States.

"Bing" is a large, late black sweet cherry from the same place, a good shipper, and trees are productive, thrifty and vigorous.

"Lambert" is also from Oregon, and is the largest cherry that grows. I have myself measured specimens one and one-fourth inches in diameter. It is very late, dark red, solid and, among sweet cherries, one of the good ones.

GRAPES.

Among the grapes of recent introduction is "McPike" which originated in Alton, Illinois. It is a black grape of large cluster and berry, and very good quality, by some, considered superior to Concord. The vine is strong and thrifty, and well worthy of trial.

"Charlton" is a comparatively new variety of grape originated by John Charlton, Rochester, N. Y. It is about the color of Catawba, and I have never tasted its equal in the Eastern United States. It has vinefera blood, and as a table grape is par excellence. The berry is about as large as Concord, and in health and vigor the vine is claimed to be all right. I first saw it in 1897 at Madison Square Garden in New York City. How it will do throughout the country at large I cannot say.

BLACKBERRIES.

Of the newer blackberries, "Mersereau" and "Rathbun" are worthy of trial. The former is similar to Lawton and Kittatinny, while "Rathbun" is one of the low growing type, about half trailer. It is similar to Wilson's Early, but not so tender and a little later.

CURRANTS.

Of newer currants, "Chautauqua" is worthy of trial. It originated with Mr. Fay, in Chautauqua county, New York. The bush is thrifty and peculiar in its habit of growth. It is sometimes called the "Climbing Currant," and I have seen plants as high as the ceiling. Its season is long, extending weeks after other varieties are gone.
"White Imperial" is a splendid white variety. While not in demand for market, white currants are superior to red varieties for table use.

STRAWBERRIES.

Of recent strawberry introductions, "Cardinal" and "Ryckman" deserve attention. "Cardinal" is a berry of good size and color, and a good shipper. It is somewhat similar to Gandy. "Ryckman" is a very excellent berry of brilliant color and delicious flavor. While not soft, it is not as firm as Gandy.

DR. FUNK: In reference to "Senator" apple referred to by Mr. Van Deman, would say, in my experience, it is subject to stem blight, probably 5 per cent, being subject to that trouble. As to "Black Ben Davis," I have tested it, and consider it identical with Gano. I do not think that we have any apple that will yield the amount of fruit that "Stayman" does.

The PRESIDENT: I can confirm what has just been said about the "Stayman." Have fruited it 4 years in Monroe county, and it has produced more apples than any other variety.

Adjourned.

EVENING SESSION.

Before taking up the work of the evening program the following committees were announced by the Chair:


In the absence of Hon. Wm. H. Brosius, who was expected to deliver an address of welcome, that pleasant function was performed by Mr. W. F. McSparran, who cordially welcomed the members to the city and county of Lancaster, which would be found a good place to come to, and a good place to stay. He stated that in our agricul-
tural and horticultural operations, we need all the information and
talent that may come, and we know we will all be benefited by your
presence. It is always possible to get the advice and practical in-
formation that we hope to glean from your personal association with
us, and we again bid you a hearty welcome.

In behalf of the Association, the President extended thanks for
the hearty welcome tendered. He said: We come among you not as
teachers, but as students, and before our final adjournment, we hope
to learn much from your store of practical knowledge.

We have with us this evening Mr. Cyrus T. Fox, of Reading, who
has charge of Pennsylvania's Horticultural Exhibit at St. Louis Ex-
position. He will tell us something of the work in which he is en-
gaged.

ADDRESS OF MR. FOX.

Mr. President and Members of the State Horticultural Association
of Pennsylvania: I am not in condition to talk much this evening,
but will try in a few words to tell you what Pennsylvania wants to
do for horticulture at St. Louis.

During the few weeks since I have been appointed to take charge
of this work, I have sent requests to fruit growers, horticulturists
and friends throughout the State, and notwithstanding the delay
in starting this work, the indications are that we will have a good
display. It is our purpose to have a continuous display during the
six months of the Exposition, and will have, not only fruits, but
vegetables and flowers. There will be a display of winter fruit of
1903 crop at the opening, to be followed in May, June and July by
berries, cherries and such summer fruits as are in season. Later,
peaches, pears and apples will be placed on exhibit until the close.
We expect also to make a display of root crops.

The Horticultural Building will cover 6 acres of ground and there
will be a total of 67 acres devoted to plants, trees and shrubbery. It
is hoped that nurserymen will assist, and that owners of private col-
lections will make contributions, and that Pennsylvania will have
occasion to be proud of her exhibit.

I cannot close without expressing my pleasure in coming back to
Lancaster county to meet the members of this Association. Here, in
former years, I met with Mr. Rathvon, Mr. Stauffer, Mr. Hiller, Mr.
Engle and other former members who did so much to build up our
local Horticultural Society in this county. In conclusion, I ask your
hearty co-operation in the work of making a large and creditable
exhibit at St. Louis.

49—6—1903
The President stated that the next topic on the program is one of the most important that has ever confronted the fruit growers of the State, and one in which every farmer and fruit grower has a deep personal interest. We have with us Prof. H. A. Surface, of Harrisburg, the Economic Zoologist of the State, who will address you.

WHAT LEGISLATION FOR SAN JOSE SCALE?


I admit the great importance of the subject as just indicated by our President, and the responsibility resting upon me in opening this discussion. I have never appeared before an audience when I felt so much at a loss as to the proper course to suggest.

It seems to me we are not so much in need of remedies as legislation, and I trust this discussion will bring out some hints as to what legislation is necessary and how it can best be secured.

I am here in Lancaster county because sometime ago I had an engagement to spray some trees for one of your citizens who had invited his friends to be present and see a public demonstration of the work, and which engagement I was very reluctantly compelled to cancel. I then promised the citizens of this vicinity special aid in suppressing the San José Scale as soon as possible. I am here, too, because as horticulturists and fruit growers we are “up against” the most serious and destructive pest we have ever known. I have with me some reports and papers from other states, and from Canada, showing how very destructive San José Scale is and how difficult, even with the greatest care and best cultivation, it will prove to save our trees and orchards from destruction. From Tennessee we have a statement that unless some relief be found, fruit interests will be seriously handicapped; and we have similar reports from more than half the states in the Union. Few fruit growers seem to realize its serious import, and consequently are giving it little attention.

One reason this pest is so destructive is, that it is so small that its presence is not noted until serious injury has been done, and its effects are not noticed until too late to apply successful remedies. It has few natural enemies. Another, is, that it multiplies with astounding rapidity, a single pair being able to produce over three billions of descendants in a season. The few natural enemies that
have been found thus far have not been able to keep it in check. The Chinese lady bugs have been imported, but with them have come parasites for their own destruction, offering but little hope for relief from that source.

Another reason why it is so difficult to control, is because it cannot be destroyed by ordinary insecticides. It is a suctorial insect, and Paris green or Bordeaux mixture have no effect whatever. It not only sucks the sap from the tree, but injects a poisonous liquid into the living tissue that probably does more damage than loss of sap. The scale attacks nearly all kinds of fruit trees and many kinds of shade and forest trees, and will kill a tree in from two to five years. It revels in the milky juice of the osage orange, and premises in proximity to osage hedges are in constant danger of infestation.

I am often asked how San José Scale is disseminated or carried from place to place? When in its young or free-moving stage it is readily carried by other insects, by birds, cats, squirrels, wind, by horses, and the clothing of workmen. It is not carried on fruit in shipment from place to place or to foreign countries, and laws prohibiting the importation of our fruits into foreign countries on account of San José Scale are unjust and based upon ignorance of biological facts.

As to remedies, the lime, salt and sulphur wash has proven safest and most satisfactory. It is cheap and will not only destroy San José Scale if properly prepared and applied, but is an excellent fungicide as well. The caustic soda and water application which has recently been recommended, must be abandoned. If strong enough to kill scale it will also injure the trees. Now, the question is what are we going to do? I have been trying to decide, after having corresponded with many of our citizens upon this subject and having studied their replies, my conclusion is that orchard inspection should be under the supervision of State officials, and that they should decide what shall be done. No infested trees should be permitted to stand without treatment. The next legislature should make an appropriation to defray the expense of such inspection, and enact a law providing for the examination of private orchards and premises, and when deemed necessary, authority should be given to order infested trees destroyed, with or without compensation, as the law may provide. It might be said, I have drawn a very gloomy picture of the future for the fruit grower. In a measure that is true, but withal there is still a promising outlook for profit and success in that line. The business will be more expensive and will entail more labor and trouble, and very close attention; but the prospect for a
profitable market will be correspondingly bright. The careless and indifferent persons who will not spray, or endeavor to keep the scale in check, will be driven out of business, while the enterprising orchard owner who sprays and adopts modern methods of controlling insect pests and fungous diseases, will reap, proportionately, greater returns. If trees are properly sprayed, one application will be effective for three years.

To nurserymen this is a question of great importance. Is it just or right that when one infested tree is found in their nurseries they must erect a fumigating house and fumigate their trees before sale or shipment, and their neighbor, who has San José Scale on adjoining premises, and whose trees are a constant source of infestation to the entire community, should not be compelled to remove them? I think we must admit that this condition of affairs is wrong, and that some legislation is needed to correct it.

To the man living in a city or village, and who has but a few trees, the question of destroying or controlling the San José Scale is a difficult problem. Aside from the fact that his trees are in constant danger of infestation and re-infestation from the premises of careless neighbors, the expense of a spraying outfit, and the time and trouble necessary to give his trees proper attention, are questions that are likely to be entirely neglected. It is tedious work to prepare the lime, sulphur and salt mixture properly, and its application is a most unpleasant duty. Some one in every community should own a spraying outfit, and be prepared to treat orchards and private premises, at so much per diem or per tree, whenever wanted. Many would patronize and pay liberally for such service rather than undertake it themselves. The probable effect of the matter may be to make fruit culture a profession separate from farming. The legislature should be asked for a large appropriation to fight the pest, and no one should be discouraged, but simply determined to fight on until the battle is won.

The present darkness is but to be compared with that "darkest hour" which precedes the dawn, and the brighter day for the Pennsylvania fruit grower is already breaking.

As Moses had to traverse the Valley of Moab before he could enjoy the heights of Pisgah, so may we feel that we have fairly crossed our valley of despondency and are now prepared, by the aid of the scientists and modern methods, to mount the promised land of success.

MR. HESTER: I feel that I am less qualified to speak on this subject than Prof. Surface. I think all orchards ought to be inspected; but the question is where to get competent inspectors? We have a "yellows" law, but there seems to be no disposition to enforce it. The
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selection of inspectors is made the duty of the supervision of the district, and in many districts it seems customary to elect as supervisor, the most ignorant man that can be found. Before we can properly enforce a law of this kind we must educate men to become competent inspectors.

DR. FUNK: Whatever is done in this matter should be done promptly, and a law of this kind may not become operative before two years. In the meantime the scale will be actively at work, and many trees will be killed. During the past year I had young apple trees that made a growth of over 2 feet and matured as fine fruit as I ever saw. Now on some of the trees the branches have been nearly killed by scale. In my travels through the State in Farmers' Institute work I have found it in many sections where its presence was unsuspected, in fact it is present in every section of the State, and in localities claimed to be entirely free. Yet, as stated by Prof. Surface, we should not feel discouraged because I know it can be kept in subjection.

MR. CREASY: I think the "yellows" law had a good effect wherever enforced, as it has been the means of clearing out many diseased orchards and trees. While we should have a law for the suppression of San José Scale, we should also endeavor to educate the people in the work of fighting it.

MR. MOON: I heartily endorse Mr. Creasy's views on this subject. It is better to educate fruit growers and nurserymen to the work of extermination than to depend upon the State to do it. About the only thing in horticulture that supervisors and county officials have ever learned, is "graft."

DR. FUNK: I don't think the method that has been suggested for one individual to spray a number of orchards in any neighborhood would be practical. It is a work that must be done promptly and thoroughly at the proper season, and that time is usually short, and the demand so great that it would not be feasible.

MR. MOON: How early do you begin spraying?

DR. FUNK: In fall soon as leaves drop, and in spring as early as I can get upon the ground.

MR. PETERS: This looks to me like a serious problem, and I think we should endeavor to have laws passed to assist us in the work. I think it would be possible to have inspectors appointed who are competent to examine and condemn, and who would require infested trees to be taken out.

MR. WERTZ: There is an old saying that two things are certain,
"Death and Taxes." I think we may now safely add San José Scale as the third. While we are talking, the scale is at work, and if we wish to make any headway in controlling it, we too must work. It is a condition almost as dangerous as smallpox, and it should be visited and condemned by the proper official and promptly treated or destroyed. The law should be strict and severe. It strikes me as an exceedingly important question, and whatever is to be done, should be done promptly and by some State official. It has about, been decided that the best remedy is lime, salt and sulphur, and there are several questions in relation to this treatment in which I am specially interested, as no doubt many others present are. The best method of preparing the spraying material, the most satisfactory pump, and what number of trees will justify a power pump; also what is the best motor or power for a spraying outfit. All these are important questions which could be discussed with profit.

MR. CHASE: I am hardly prepared to express an opinion as to what should be done, but I think the laws should be enforced by the highest police powers of the State.

MR. HIESTER: Dr. Armsby has just suggested that the careless man who has infested trees might be proceeded against as a nuisance. I think the best way to get this matter in practical shape is to refer it to a committee with power to report at a subsequent session, and I move that the Chair be authorized to appoint a committee of five for that purpose.

The motion was adopted.

DR. ARMSBY: I have listened with much interest to this discussion. The great difficulty seems to be the almost omnivorous habits of this insect. It is hardly possible to exterminate it and we must fight it. I take it that the nurseryman and enterprising fruit grower is willing to fight it, but wants to be protected from his neighbor who will not do so. Might he not be punishable under the general law as a nuisance.

The Chair appointed the following committee as provided in the above resolution:

Messrs. Creasy, Moon, Peters, Armsby and Surface.

Adjourned.

Wednesday Morning, January 20, 1904.

President Chase called the meeting to order at 9.30 and stated that the report of the General Fruit Committee would be first in order.
The following report has been compiled from notes received from nearly every county in the State.

APPLES.

The apple is the most important fruit grown in Pennsylvania. It is the most highly valued for home consumption and is generally the most profitable for commercial purposes. This fruit is grown on almost every farm. It attains a higher state of perfection in some counties than others, but with good care and a judicious selection of varieties, good apples are produced in every county. The apple crop in 1903 was much larger than the preceding year; but when the entire State is taken into account there was only a fair yield the past season. A good or very good crop is reported by 20 correspondents. Twenty-eight growers report a fair or medium crop, while 15 write that the yield was poor. The crop seemed to be heaviest in the southeastern portion of the State. The York county crop was very heavy. Adams, Montgomery, Lancaster, Lebanon, Dauphin and Franklin counties report full crops. The yield was generally light in the central and western counties. Failures are attributed to various causes. Unfavorable seasonal conditions have received most of the blame. The spring was late, cold and wet, preventing the proper setting of fruit. Late spring frosts destroyed the blossoms in many orchards. The want of tillage, farming, fertilizing and spraying were potent factors in the failure of hundreds of orchards.

The quality of the 1903 crop was generally good. Twenty-eight correspondents report that the crop was good or excellent in quality. Twenty-two state that the quality was fair or medium and only two report poor quality. The absence of injurious insects, particularly the codling moth, was noticable in many orchards, and this was attributed by some to the cold, wet weather that prevailed during and immediately following the blossoming period.

The reports on varieties are interesting, although no startling facts are revealed on this important phase of apple culture. The old tested varieties are still in the lead and there is little danger of
the newer sorts superseding them in the near future. Although there are several very promising, but comparatively new or little known, apples now offered by nurserymen, it will require years of testing to establish sufficient confidence for these sorts to be largely planted. The establishment of an orchard requires time and money and growers are becoming more and more reluctant about planting new varieties until their real merit is fully determined. The Baldwin is reported by 38 growers as one of the best varieties. York Imperial is favorably mentioned 31 times. Northern Spy 18, Smith's Cide 17, Ben Davis 13, Fallawater 7, Grime's Golden 6, Smokehouse 5. The York Imperial is planted most largely in commercial orchards, particularly in the southeastern countries.

PEARS.

The 1903 pear crop was unsatisfactory. Thirty-one correspondents report a light yield, eleven a medium crop, and only four a good crop. The quality was generally fair or medium, although quite a number report good quality. The late yield was generally caused by late spring frosts.

There is great difference of opinion regarding different varieties. Bartlett receives favorable mention 43 times, Kieffer 34, Seeke1 19, Clapp's Favorite 15, Duchess 6. If the blight could be fully controlled the Bartlett would occupy a much more prominent place in pear culture. Kieffer has been most largely planted for commercial purposes, but its inferior quality is a serious objection. Pears are not grown as extensively as they should be, either for home use or for market. The great barrier to increased planting is the blight. But it is encouraging to note that its ravages the past few years have not been so serious as formerly. Many growers call attention to this fact, although a number of orchardists complain bitterly of this disease.

PEACHES.

The peach crop the past season was a disappointment. Sixty-six correspondents report on the yield. Eighteen report a total failure, 38 a light crop, 7 a medium crop and only 3 a good crop. Winter freezes and late spring frosts were the most potent factors in causing failure. Scale insects, borers and diseases are mentioned as having an influence on the small yield. The use of the knife and wire are universally recommended to control the borers. Trees should be examined in May, and again in September or October. Mounding about the tree with ashes or soil is an excellent preventive measure practiced by some growers. No definite conclusions can be drawn from the reports regarding the yellows. A few counties are probably free from the disease. Ten correspondents state that the disease is on the decrease, while 11 say it is increasing.
As to best varieties, Crawford's Late is named by 20 growers, 15 growers report Elberta, 13 Old Nixon, 10 Mountain Rose, 9 Smock, 6 Fox's Seedling. A large number of varieties receive favorable mention from 1 to 3 times. Every farmer should plant a few peach trees to supply or partly supply the demands of his family. But for commercial purposes extensive planting should be limited to districts having the most favorable soil and climatic conditions. Thousands of peach trees are planted in this State from which no profit is derived, when a series of years are taken into account.

PLUMS.

The 1903 plum crop was not a universal success, although many growers had fine crops. Thirteen correspondents report a very good yield, 10 a medium crop, 21 a light crop and 10 no fruit. Some growers report that the crop was very large. Failures were due to late spring frosts, wet weather during the blooming period, black knot, curculio and rotting of the fruit.

The Japan class is very much the most popular for extensive planting. The trees come into bearing early and are very productive. Burbank and Abundance are the leading varieties, although the Japan plums are receiving marked attention. The value of the Domestica class is not discontinued. The large luscious fruit of the Domestica, as the German Prune, find ready sale at remunerative prices, and the trees are longer lived than the Japan sorts. Some growers are abandoning the culture of Japan plums and planting largely of the Domestica type and also the Wild Goose.

Abundance is favorably mentioned 18 times, Burbank 14, Lombard 13, German Prune 7, Bradshaw 7, Green Gage 7, Damson 6, Wilson 6 and Red June 4.

The knife is the only effective means to control black knot, but it should be used more frequently and thoroughly than is the practice in many orchards. The rot may be and is controlled by some by spraying, while jarring seems to be the usual method to check the ravages of the curculio.

QUINCES.

Very few commercial orchardists are giving the quince any attention. A limited market for this fruit, a narrow range of soils adapted to its culture, and the serious depredations of various insects and diseases account for its unpopularity. Borers, blight, codling moth, curculio and blight are the most prevalent and destructive pests. Twenty-one correspondents report that it is successfully grown in their counties, mainly for home use.

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CHERRIES.

Forty-three correspondents report a successful crop. The February freeze and late spring frosts reduced the yield, but very few report a total failure. Reports show that it is not planted extensively for market. With the proper selection of varieties, cherries are, undoubtedly, profitable in many localities and there are evidences of increased interest in this delicious fruit. The depredations of insects and diseases can be controlled. Some complain of the birds getting a large percentage of the crop. We can do nothing better than repeat the good advice of the former chairman of this committee, Mr. Snavely, namely, to protect the birds and produce enough cherries to satisfy the owner as well as the birds.

The sour varieties are the most generally successful. The Early Richmonds heads the list, being favorably mentioned by 23 correspondents. Ten growers report Montmorency as an excellent sour cherry. Black Tartarian is the most popular sweet cherry, being mentioned 19 times. Governor Wood is also a favorite. Napoleon, May Duke and Windsor are named as excellent varieties by a number of correspondents.

GRAPES.

The past season was unfavorable to the development of grapes. Late spring frosts, early fall frosts and cold wet weather at various periods reduced the yield. Notwithstanding these facts many correspondents report satisfactory crops. Erie county and the Chautauqua belt produced large crops. Many growers complain of the rot and mildew.

Concord is grown more largely than all other varieties combined; practically every correspondent gives it favorable mention. For certain profits it easily takes first place. Niagara is mentioned 25 times, Worden 18, Moore’s Early 13 and no other variety is favorably mentioned more than 4 times.

SMALL FRUITS.

Reports show that the culture of small fruits is only slightly on the increase. They may be grown with entire success in every county, but notwithstanding this fact, hundred of farmers do not produce enough to supply the home table. The small fruits are not appreciated as they should be and greater efforts should be made to extend their culture.

More than 30 varieties of strawberries are mentioned as succeeding well. Sharpless is named the most frequently, followed by Bubach, Clyde, Cumberland, Wm. Belt, Gandy, Sample, Nick Ohmer, Bismarck and Tennessee.
Gregg heads the list of black cap raspberries. It is mentioned by 23 correspondents. Kansas is second in popularity, although only 8 correspondents mention it. Cuthbert is the leading red raspberry. Snyder is far the most and profitable blackberry. Kittatinny takes second place. Erie, Wilson, Taylor and Ancient Briton are also favorite varieties. Currants and gooseberries are little grown for market.

VEGETABLES.

The past season was not favorable for the production of vegetables. Late frosts, early drouth, followed by very cold, wet weather, reduced the yield. Nearly all the reports concerning the profits of market gardening are favorable and some are very enthusiastic. There are many towns in the State, however, where only a small percentage of the produce consumed is supplied by local growers.

ORNAMENTALS.

It is a pleasure to note that nearly all the correspondents report a decided increase in the planting of ornamentals. This is particularly true in and about the towns and cities.

NATURE STUDY.

Twenty-five correspondents report that Nature Study is receiving attention in the public schools and an equal number report that it receives no attention. By referring to former reports of this committee, there is reason to believe that this branch of study is receiving increased attention.

SPRAYING.

Reports show that spraying is not generally practiced. Most of the large growers find spraying absolutely necessary to protect both tree and fruit from the ravages of insects and diseases, but those growing fruit for home use and some for market give the subject very little attention.

SAN JOSE SCALE.

Thirty-five correspondents report that this scale insect is known to be present in their counties and it is possible that there are but few counties in the State where the insect is not at work. Comparatively few people are able to detect its presence, for they have no knowledge as to the appearance of the scale. Many growers complain of its serious ravages. Entire blocks or even orchards have been destroyed by this pest or by the owner to get rid of the scale. One firm in Berks county has lost 5,000 trees through the ravages of the San José Scale.
In practically every instance the scale is brought into the community on infested nursery stock and when introduced, it is spread by winds, birds, insects and workmen.

Extensive growers are falling into line very rapidly to stop the onward march of the San José Scale. Small growers, however, do not, as a rule, have sufficient interest in the warfare to even examine the trees for this enemy. This is one of the most discouraging features in a general movement to combat the San José Scale. The sulphur, lime and salt treatment is used most frequently, and when properly prepared and applied it has been found very successful.

FEEDING.

The feeding of fruit trees is receiving more attention. Growers realize as never before that trees demand skillful feeding to secure the best results. The supply of humus as well as the various elements of fertility must be maintained.

TILLAGE.

Tillage is generally practiced by commercial growers and is recognized by many to be necessary in the production of choice fruit. Mulching is practiced by a few and it is especially practicable on rough, hilly or stony land.

NOTES FROM CORRESPONDENTS.

The following notes are condensed from a few letters received from fruit growers in different parts of the State.

J. Q. ATKINSON, Three Tuns, Montgomery Co.: "We fear the Japan plums are too tender and delicate for our county. Bartlett pears still hold their own in this county as market fruit. Kieffers lost their leaves early and pears were consequently worthless. Asparagus came through the summer without rust and bids fair to regain its lost vigor. All of our peach trees will be destroyed in the near future unless the San José Scale can be controlled, which is hardly possible."

GABRIEL MLESTER, Harrisburg, Dauphin Co.: "This has been a very trying season in many ways. First, came two late frosts, the last about the first of May, that killed all the peach buds, many of the pears and nearly all the cherry buds. This was succeeded by an exceedingly dry spell, then came rain just when the sprayer
should have been at work and the material was washed off as fast as we could put it on. Between showers the sun came out hot making conditions ideal for the growth of fungi. Weeds grew so rapidly on cultivated ground that we were obliged to let the spraying go and fight weeds or they would have smothered everything. In spite of all this and the unusual scarcity of help, we were able to keep our grapes free from rot and mildew, but considerable leaf blight made its appearance on the apples and pears, and we had more cloudy fruit than usual. Fall apples colored up nicely and sold well; but a heavy storm blew off three-fourths of the Baldwins and York Imperials about October 13, just as we were getting ready to pick and store for winter. We gathered up all that did not show injury from bruising and stored them in cellar from which they were sold a little earlier than they otherwise would have been and, consequently at a lower price. There was also some lost from rot, as many bruised apples were picked up in spite of all the care that could be exercised. Scarcity of barrels prevented our reaching some of our best markets at a time when good prices prevailed. York Imperial should be marketed now (December 10), but dealers do not want them while Baldwins are in the market. Our markets are still full of second-class fruit that has been shipped in bulk and is selling very low from wagons on the streets which has a depressing effect on the price of first-class fruit. It is hard to sell a yellow apple at any price. Even Yellow Belleflowers are a drug. Baldwin, King and Rambo are the only apples that will command more than one dollar per bushel at retail at this writing, December 10.

"I am more than ever impressed with the uncertainty of the fruit business and with the importance of proper climatic conditions. I do not mean the above as a complaint, notwithstanding all the drawbacks mentioned, and the loss of my entire peach crop which should have amounted to eight thousand baskets at least. I find I shall come out 'ahead of the game' and see no reason for the Pennsylvania fruit grower to be discouraged."

L. G. YOUNGS, North East, Erie Co.: "We had a good year except grapes, this being the lightest crop in twenty years. A severe sleet storm late in the spring froze three-fourths of the grape buds and also destroyed the fruit buds of the currants and gooseberries. Peaches were good where sprayed early for the curl and those not sprayed were a failure. Spraying also controlled the plum rot. We sprayed three times and had something over a thousand bushels. We use the J. B. Johnson curculio catcher, of Geneva, N. Y. We have found spraying too uncertain so far to destroy the curculio. I drafted the black knot law of the State, and we see that it is enforced here so that we havn't scarcely any trouble with this disease."
AUSTIN WRIGHT, Alum Bank, Bedford Co.: "Bedford county is in the fruit belt of the State and the yield and quality of the fruit grown here are as good as in most other sections of the State and better than in some. There has been quite an unusual interest manifested in this county in the planting of apple and peach orchards for commercial purposes, but as our market facilities are poor very little attention is given to the cultivation of the small fruit."

JOSEPH W. THOMAS, King of Prussia, Chester Co.: "The season has been peculiar and unusual for the growth of vegetable matter. The month of March came with April or May weather, with a torrid atmosphere that brought vegetation forward rapidly so that the pear, peach, apple and plum trees all bloomed together and nearly a month too early. The consequence was that when late frosts came many of the blooms were killed. We had no peaches, plums and cherries, and only a fair crop of pears and apples. In regard to insect pests we feel sure that it has been a good year for their propagation. We observe in many places a great luxuriance of oyster shell scales attacking soft maples, Persian lilacs and other plants. This insect is not confined to any particular section. In some cases we know of efforts being made to check the ravages of this insect by spraying with whale oil soap."

OLIVER D. SCHOCK, Hamburg, Berks Co.: "It was the writer's pleasure to judge the fruit display at the famous Inter-State Fair at Trenton, New Jersey, Lehigh county fair at Allentown, Pa., and the York county fair at York, Pa., the three largest and finest collections of fruit in this section of the country in 1903.

"A most gratifying feature of these exhibitions is the fact that the nomenclature of fruit is becoming better understood, and that exhibitors have a better knowledge as to how to display their products more intelligently and successfully. The interest manifested exceeds that of previous years. It is also a notable fact that the number of those who grow fruit for the market and the profit that can be derived from that source is constantly increasing. All united in the claim that the markets will always absorb all the first-class fruit that can be grown, but that buyers will hesitate to buy inferior products even at concessions.

"The amount of money paid out as premiums by these agricultural societies, as well as many other such organizations throughout Pennsylvania, is very large, and the management deserves the thanks of the public and a still larger share of patronage for what they are accomplishing in this beneficent direction."

H. C. SNAVELY, Cleona, Lebanon Co.: Mr. Snavely, former Chairman of the General Fruit Committee, has given so many practical
points in his letter that it is published in full as follows: "I have about forty varieties of apples in my best orchard. It is almost certain that if we want long keepers we must plant the best they have to the south of us. I find the Langford and Nero, now in full bearing age, profitable varieties. Lawver is a long keeper but not always prolific. This and Delaware Winter are identical.

"The Clairgeau pear is a profuse bearer and very attractive. It is not so good as the B. Anjou but bears earlier and sells better. The Bartlett has not been superseded yet and, if one has cold storage to prolong the season of this fruit, it is the variety to plant. People know it and want it.

"My peaches were a failure. Frost in spring and low temperature in February did the damage. There is an orchard of several thousand trees in the northeastern part of the county that bore a full crop, the only one in the county that I know of which was a success the past season. It is planted mostly with Elberta, the buds of which are not very hardy.

"I never had a larger yield of plums. The Wild Goose sold readily at ten cents a quart, while prunes later in the season brought only five and six cents a quart. Wild Goose plum trees are practically exempt from diseases and insects and the trees bear abundantly, if the Miner is grafted over a portion of the tree to insure pollination. The flowers of the Wild Goose are rarely self-fertile. We never spray the Wild Goose, except for the San José Scale. The Japans will go by the board whenever the peach suffers. I think all of the Domestica have hardy buds.

"I am giving less attention to the small fruits now, for several reasons. The tree fruits require all my time and the southern berries have demoralized the markets. The Cuthbert raspberry leaves one a nice profit. My soil is suitable to its culture.

"The early part of the summer was very dry and vegetables fared badly, but the latter half was wet and later crops succeeded well. I saw late cabbage heads as big as a half-bushel and solid and heavy. The potatoes rotted some, but notwithstanding this, the yield was very good, averaging about 200 bushels per acre. All the potato vines in this section went down with the blight. Those on low ground and shallow planted tubers, suffered most from rot. For early, I grow Early Fortune, Irish Cobbler and Boston Market. For late, Carman No. 3 and Rural New Yorker No. 2.

"I wish I could report an advance in Nature Study taught in the public schools. Parents and school officers are indifferent about it and teachers say they have no time, but most of them are not qualified to interest the children.

"As long as spraying was practiced to combat the codling moth and fungi, the wide-awake fruit growers derived benefits and the in-
different fellows had their trees even if they had very little good fruit. But since the San José Scale has made its appearance the lazy fellows will lose their trees unless they fight. Those of us who combat the scale must endure this negligence for awhile or until the neglected trees are dead, for the scale is carried considerable distance by birds and short distances by winds.

"The fruit grower who neglects either fertilizing or cultivating his orchard takes a big risk. The one who does this work judiciously can wear a broad smile at harvest time. His bank account grows and expands.

"The necessity of intelligent work on the farm becomes greater every year. We have farmers and farmers, but to my mind the man on the farm is the greatest need of our times. The man on the farm has a knowledge of the soil. He knows why he tills it. He knows how to feed it. He knows how to select crops and varieties adapted to his soil and environment. He studies the markets. In short, he is a man, a business man."

**DISCUSSION.**

A Member: In destroying trees infested with San José Scale is it necessary to burn them?

PROF. SURFACE: It is not essential except in cases of diseases such as blight, yellows and black knot. When trees infested with scale are cut down the scale will perish when the sap in the tree is exhausted.

PROF. VAN DE MAN: Are we to understand there is no danger in infested scions?

PROF. SURFACE: Only on living twigs or other wood that is to be used for propagation.

DR. FUNK: One week after pruning I find the scale dead on branches that have been cut off.

MR. CHASE: While this may be true, I would, nevertheless, burn them up to enforce the idea that the work had been thoroughly done.

A brief discussion followed on the question of best varieties of cherries and blackberries for general planting. Mr. Chase considered the Montmorency cherry the most desirable and profitable. Would plant in the proportion of 5 Montmorency, 3 English Morello and 2 E. Richmond. Mr. Moon and Dr. Funk also spoke favorably of Montmorency, while Mr. Creasy condemned it, and has cut down his trees of that variety. He admitted, however, that they may not have been true to name.

Prof. Watts has found Snyder blackberry most profitable, but would like to hear of a better variety.
Mr. Chase considered Snyder and Taylor the best varieties.

Dr. Mayer inquired about Minnewaski.

Prof. Watts stated that with him it is not productive. It is all right in quality, but does not produce the bushels.

After brief discussion, Harrisburg was selected as the place for holding next annual meeting.

The following address was then given:

WHAT NEXT?

BY GABRIEL HIESTER, HARRISBURG, PA.

This is a question which confronts the horticulturist on every hand. Last season was one of the most trying ever experienced, and many established theories of the past seem to have been overthrown. After each new trouble I have asked myself, "What Next," and I have concluded to take this text as a basis for a few remarks.

The question of proper altitude for orchard planting has been frequently discussed, and the conclusion arrived at was that just above the fog line of our valleys was the ideal location for orchards, and that a northern exposure would protect from late frosts. This, however, did not hold good the past year, as a majority of the orchards that were a success, were below the fog line. This shows that we cannot lay down any rule that will always work out.

The question of spraying also presents new problems. Liquid spraying is troublesome to prepare and disagreeable to handle. Dust spray has been highly recommended, and if it proves satisfactory, can be applied more conveniently and cheaply, and in one-third of the time. My experience with it during the past season was not satisfactory, as it was too wet and the material was washed off. I would like to have this question further discussed.

No less important is the problem of farm help. Never, in an experience of 30 years, have I had so much trouble in securing satisfactory help. It is almost impossible to get native help, and we may yet be compelled to employ foreigners. Some of them are trustworthy and industrious, but they do not understand our ways of living and could not be taken into our homes. If adjoining farmers would unite and build cheap dwellings for small colonies their help might be secured as needed.

50—6—1903
Another important question to the fruit grower is that of fruit packages. It occurs to me there should be some system of uniformity in the packages we use for marketing our fruit. I never saw so many different styles and sizes of packages as during the past year. This causes misunderstanding on the part of sellers and dealers, because quotations are often misleading. For peaches, I think the 20-pound basket has come to say. They pack easily, are convenient to handle and pack to great advantage on wagons or cars. We can pack 200 on a 2-horse spring wagon, while only 80 of the round or Delaware baskets can be put on same wagon. For apples and pears I think barrels are best, but they are hard to get. Bushel boxes are convenient to handle, but cost much more to pack, as the fruit must be carefully arranged in layers and fitted up. There is a limited demand for nice apples, wrapped in paper and packed in boxes. If barrels are not available I would use Michigan bushel baskets.

For some fruits, cold storage is necessary and will prove profitable. The question as to ownership of the cold storage buildings is an important one. At present they are owned chiefly by dealers, but I believe they should be owned by the growers on the co-operative plan. Our leading winter apples here are York Imperial, Ben Davis, Gano, York Stripe; and the question is do we need artificially cooled houses to keep them? They usually hang late and keep well without artificial storage.

Closely connected with the storage question is that of marketing our fruit. We can grow fall and early winter apples of better quality and color than in New York, and our Spy, King and Baldwin, can be gathered and marketed so as not to come in competition with those grown in New York.

In conclusion, I want to say that our Department of Agriculture has given us a valuable assistant in Prof. Surface, and has also given us substantial aid in other ways. This is very good and we appreciate it highly, but our horticultural interests deserve and should have more. We want to investigate further and find what soils, altitude and conditions are best for different fruits and where to find our best markets, so we may plant intelligently and reap the highest possible reward for our labor. Those investigations were started 2 years ago, and if continued, thousands of acres of choice fruit lands would be planted, and we would take rank as the leading fruit producing state in the Union. We have with us to-day Mr. Critchfield, our Secretary of Agriculture, and I know his heart is with us. I hope we may have the pleasure of hearing from him.
HON. N. B. CRITCHFIELD, Secretary of Agriculture: It is to me a great pleasure to be able to meet with you today. I am glad to see so many able and practical horticulturists present, and I feel sure that good must result. I have listened with much pleasure and interest to Professors Watts and Surface and Mr. Hies-ter and others, and I know we all have heard their remarks with profit. I am not able to say what the Department can do. Our appropriation is small and ought to be increased, and with the aid and influence of this Society we may have it increased by the next legislature.

I know that some varieties of fruits do not do as well as others, and the question of locality and adaptation should be well studied. King, with us is a fall apple and not to be recommended as a good keeper. I can see the importance of such investigation, and think it should be continued. This is a great and wealthy State, and we should call the attention of our legislators to these needs.

I am interested in your handsome display of fruit which I shall be glad to examine more carefully, if opportunity occurs. I shall also be glad to become a member of your Association.

MR. CREASY: The question of packages is a very important one, especially for apples. I lost several sales last fall for want of proper packages. As to fall apples, I do not consider it safe to plant them for market. There is but a limited demand at that season, and that is usually supplied by farmers. They must be promptly disposed of as they will not keep. In my experience, winter apples pay best.

The CHAIR: On the subject of fruit packages, the Secretary has received a communication from the Department of Agriculture at Washington, D. C., which he will read.

"Washington, D. C., August 5, 1903.

"Dear Sir: Perceiving the importance of a definite understanding among producers, dealers and consumers, concerning the size or weight or quality of commercial packages of fruits, vegetables, berries, dairy products and other products of the farm and orchard, and concerning their qualities or grades, this Department would like to ascertain what standardization has been adopted by your Association."
"If you will confer the favor of an answer, I beg that you will cover the ground concerning the various standard packages sold by your Association far enough to give me the name of each package, size or dimensions of box, crate, bale, basket, etc., weight (net), or measure or number contained, and a description of what constitutes the different commercial grades of the articles sold by your Association.

"In addition to the foregoing, please add any other information in print and by letter pertinent to this inquiry.

"The inclosed envelope may be used for sending your answer without payment of postage.

"Very respectfully,

" GEORGE K. HOLMES,

"Chief, Division of Foreign Markets.

"Mr. Enos B. Engle, Sec. Pa. State Hort. Ass'n, Waynesboro, Pa."

PROF. VAN DEMAN: I would like to say a word about packages. I find the box is becoming more and more popular, though it may not always be practical. On the Pacific Coast they never use barrels as they are not made there.

I believe the bushel box is the practical package, and the time will come when it will be made cheaply by machinery. Stave lumber is getting scarce and apple barrels commanded 75 cents each in New York last fall. Owing to scarcity of barrels, hundreds of cars of apples were shipped in bulk and in bad condition. If the use of boxes will drive the lower grade of apples out of market, they cannot be adopted too soon. The best place for poor apples is the pigpen and cowyard. It is a crime and a sin to send inferior fruit to market. Better pay a dollar a box for good fruit that $1.50 a barrel for inferior grades. I have known choice apples in New York to sell at $2.50 per box, and our foreign markets want them in that shape. Ocean freights are estimated by bulk rather than weight, and boxes pack much better than barrels. There are plenty of people who will buy a bushel that will not buy a barrel, and I believe a demand could be established for them in a few years.

PRESIDENT CHASE: I heartily agree with Prof. Van Deman as to the use of the bushel packages. I would pack first-quality fruit in baskets and boxes, and send second-qualities to the pigs.

DR. MAYER: I have had some experience with boxes. Had 500 made at a cost of 10½ cents each, while barrels cost 33 cents apiece. The only difficulty I have had with boxes was in cold storage. They pack solidly, and do not cool so rapidly. They should be stored with air-space between them.
PROF. BUTZ: The letter in reference to fruit packages, from the Department of Washington, which was read by the Secretary, should have some attention by this Association. I move that a committee of three be appointed by the Chair to draft resolutions and submit them to the Society for approval.

The resolution was adopted and Messrs. Butz, Hiester and Peters were appointed.

The CHAIR: Will Prof. Butz give us some information concerning the "dust spray" recently introduced?

PROF. BUTZ: These sprays have been upon the market several years. If the proper materials are used, and results prove satisfactory they ought to be adopted. They are more easily prepared and much less bulky and troublesome to handle than the liquid sprays, and this is a great point in their favor. In practice, however, they have not proven so effective as the liquid sprays.

I was interested in some vineyard spraying that was done in Erie county last summer, and in no instance was dry spray used. In two adjoining vineyards one was sprayed, the other not. In the one sprayed there was no rot, while in the other nearly all rotted. The grapes from the one went to a good market, the other to the vinegar factory. The liquid spray dried on the leaves and kept the fungus down. I doubt whether dust spray will be as effective, and the matter can only be decided by experience.

PROF. SURFACE: I felt interested in this spray and, for information, wrote to the parties in Missouri who introduced it. It is claimed to be effective as against codling moth, but not effective as a preventive of plant diseases. In its preparation, a new compound was formed which was not copper sulphate, and consequently not a Bordeaux mixture. We need a dust spray in which we preserve the copper sulphate, and which should be made according to a formula which I will publish in my March or April Bulletin. I have great hope for it as an efficient spray.

A recess of 5 minutes was taken after which the Committee on Legislation submitted the following report:

"Whereas. A most destructive insect pest known as 'San José Scale' has appeared in three-fourths of the counties of Pennsylvania, and

"Whereas. This serious pest attacks all varieties of fruit trees and many other trees and shrubs, including ornamental shrubbery and hedges, killing them in from one to five years, and

"Whereas. The habits, enemies of, and remedies for this pest need further investigation and careful experimentation in order to give us simple and effective means for its suppression, and
“Whereas, The important horticultural interests of this great State, ranking among the first in the Union in this regard, are thus being fatally attacked by a foe more insidious and destructive than are all other fruit pests combined, and thousands of orchards are at present being destroyed, values annulled and revenues reduced, because many orchard owners and farmers do not recognize the presence and the evil effects of this destructive pest, and do not understand the proper methods for its suppression:

“Therefore, be it hereby resolved by the State Horticultural Association of Pennsylvania: That we, the producers, whose interests are being thus so seriously attacked, do hereby ask the Legislature of the State of Pennsylvania to appropriate to the Agricultural Experiment Station for investigations and experimentation on this matter of the San José Scale, the sum of $2,500, annually, and the sum of $10,000.00, annually, for the next two years, to be appropriated to the Department of Agriculture for the use of the Economic Zoologist, for the suppression of the San José Scale and other injurious insects.

“And be it further resolved, That we hereby petition the State Legislature to modify the present law relating to the San José Scale, in order to secure greater effectiveness of the same, especially in regard to preventing its dissemination upon nursery stock and to secure its suppression on private premises.”

MR. McSPARRAN: In view of the grave importance of this question, I do not think we are asking enough money. This State can afford to give more money for such an important work.

MR. PETERS: I think it is a small beginning to ask for $10,000. There are individual orchards that have cost that much. It would not be too much for Lancaster county alone.

MR. HIESTER: We cannot ask the Legislature for money to do the work that orchardists and farmers should do themselves. We can only ask for such assistance as will demonstrate to fruit growers how to spray.

MR. CREASY: I think with proper management $10,000 will be ample. It is best to ask for just what you want and insist upon it.

MR. MOON: I think Mr. Creasy's advice is best. It is useless to expect money to treat commercial orchards.

The preamble and resolutions were adopted unanimously, after which the following paper was read:
PRUNING, FERTILIZING AND THINNING.

By Dr. J.H. Funk, Boyertown, Pa.

These three are each a sermon in themselves, and happy is the fruit raiser who intelligently performs the task. He will have the most luscious fruit in abundance and have the market at his own door and pleasure and riches will be his boon companions. Never were the Scriptures better illustrated than by quoting, "To him that hath shall be given and to him that hath not shall be taken, even that which he hath." for the faithful horticulturist, who attends carefully to the minor details and looks well after his trees, will have a constant increase in quantity and quality and good returns for his product. While the careless, indifferent, good-enough-sort of a being (it would be a slur on good language to call him a horticulturist) who neglects his trees, thinking that nature will take care of him, he also gets his reward in poor, insipid, ill-colored, knotty, scabby fruit in great numbers, but small in quantity, and that little not marketable, and his trees soon become forlorn, sickly looking objects with their trunks tunneled by borers, their foliage eaten by the tent caterpillar, and the little life that remains is sucked out by the San José Scale and their dead trunks stand as monuments of a lost hope.

We have an instance similar to the above in my own neighborhood. A man of fair intelligence but with an inordinate bump of conceit, one who knows it all, several years back planted several hundred peach trees, some plum and other trees in a slipshod manner and gave them the same kind of attention. Many soon died of yellows and were left standing as a source of contagion. For a couple of favorable years he received fair crops.

About three years back he came to my place bringing some peaches well covered with San José Scale. I advised him to spray and try to get rid of them. The other day the same man came riding in to where I was mounting a gasoline engine on a wagon to rig up a power-spraying outfit. After saluting, he said he thought he would come and tell me that he had just heard that kerosene emulsion was good for San José Scale. I told him that had been tried for several years, but that it had not given satisfaction; that the lime, salt and sulphur had superseded it and with very good results.
He remarked he had tried it but had left out the sulphur as that was too expensive, so he was using the lime and salt, but found that it did no good. The scale had about killed all of his peach and plum trees and they had now got on his large apple trees and he thought of cutting them down. On parting, he said, "Doctor, if you were to furnish free, enough trees to plant an orchard I would not give the ground." This is a case of lost faith in a good cause on account of mismanagement and misplaced confidence.

But to get back to our subject, and we will start with pruning, as this is the first and one of the most important branches of fruit raising. If pruning is neglected the tree becomes worthless; if properly pruned it becomes a thing of beauty and usefulness. It is as susceptible to good training as a child, in fact, more so, as you can form a tree as you desire. To trim intelligently you must trim or prune with certain objects in view. You can trim for shape, for wood growth, and for fruit.

First, we must prune for tree formation. This commences with planting, and in planting never accept a peach tree beyond one year old, or an apple tree beyond two years old (one year preferred), a straight whip four to six feet high. This is the cream of the nursery and model stock with which to start an orchard. In planting you begin with the roots, trim off all torn or mutilated roots and cut with a sharp knife from below, outward. When the tree is set the cut surface will be downward, granulations will be thrown out and a series of small roots will then shoot downward from the outer surface of this cut, soon anchoring the tree with a new set of roots. If you get a tree thickly studded with fine roots at the color, look closely for woolly aphis or crown gall, and in most instances you will find them; and if so, better throw the tree away as in most cases it will make a poor tree.

Having planted the trees, your next step is to cut off the tops at a uniform height of 18 inches to 2 feet. Do not form your tops too high. A low spreading tree will make you a stronger, more hardy tree, capable of withstanding heavy winds, remaining more straight and making it a much easier task gathering the fruit, which can be done much cheaper from the ground and step-ladder than if you must pick from a long ladder. As warm weather comes on you find young shoots coming out in regular order around the entire length of the stock. When these are about one-half inch long you count from top downward 6 buds. These you leave to form the head of your tree. Those below you rub off by catching around the tree with the hand and stripping downward which effectually trims off all shoots and is quickly done. If your soil is in good condition and cultivation well attended to, your tree makes rapid growth; very little more trimming will be needed the first year. An occasional
shoot must be removed, and sometimes the young tree shoots upward so rapidly as to become top-heavy. If such is the case you must trim back or your tree will become permanently crooked. In doing this trim to an outside bud, which gives your tree an outward spreading habit as the top bud always becomes the leader and always starts with an outward curve. The following spring you go over the entire orchard treating every tree to a careful inspection. If you find the tree is shooting up too much, and this is mostly the case the first few years, trim to an outside bud, as some trees naturally spread too much so; such being the case you trim to an inside or one on the upper side of the limb when the new shoot will be upright. It sometimes happens that one of the young shoots or limbs has been broken off or the bud failed to develop, thus leaving an open space on one side; if so, in pruning the limbs on each side nearest the space, trim to a bud on that side, the new shoots will then curve toward the open space soon filling it up. It may also happen the stem of your tree may have an unsightly crook; if so, you can remedy this by making two or three cuts with a sharp knife up and down the entire length of the crook, as nature in her effort to repair the injury throws out granulations, forming wood faster here than elsewhere and soon remedies the crook. As the growing season advances you will find too many shoots spring out from the cut back limbs which if left, makes too much wood, much to the detriment of the tree. By removing these at once you save your tree and throw the growth where it will do the most good.

The third spring is one of the most critical in tree formation. In most instances your tree will have too much wood and it is sometimes difficult to know which limb should come away. Yet come away they must or in after years you must cut away many large limbs, often causing a severe shock to the tree. You may find the tree has become too spreading; if so, resort to inward trimming and draw the top together. You can with a sharp knife and good judgment shape a tree as you will. From this time on the tree needs careful watching, cutting out all crossing limbs and any limb you think may eventually come in the way. Cut out all the water sprouts, but do not cut off the fruit sprouts. These are what bears the fruit and these you want to nurture and care for.

Many a fine orchard is ruined by some professional tree butcher who claims to know it all, starts out with a hatchet or hand axe cutting off all the fruit spurs and at the same time cuts many a gash into the limb. Your tree was perhaps a little slow coming into bearing. Your professional told you there was too many little stubby limbs on the larger ones and that they took the strength away. Now since he removed the cause you wait anxiously for them to begin. At last after several years your tree begins bearing, but all the fruit
is at the outside and top of the tree. If they have a fair load the limbs bend and unless thinned, break. Whereas, if the tree had had proper pruning it would have borne much sooner and carried twice the load of fruit without breaking a limb. Experiment with yourself. Extending the arm at full length you can hang a 50 pound weight at the elbow and hold it; but remove the weight further from the body and you find when you reach the hand 25 pounds is as much as you can hold. So with the tree when the fruit is distributed through the entire tree it will bear double the weight without breaking. If you have a tree that makes too much wood growth prune in June; this will develop fruit buds and check wood growth.

FERTILIZER.

This is another important factor in the proper development of the tree. Should the soil in which the orchard is to be planted be very poor or deficient in plant food and humus, it would be well to give a good covering of well rotted stable manure in the fall and plow in. This will furnish the necessary humus and nitrogen and sufficient phosphoric acid and potash for the early stages of the orchard. When the principal function it has to perform is wood-making, before setting the trees, harrow the ground thoroughly, as cultivation is next to food and is an auxiliary to it. When you have nothing else to do cultivate your orchard and if you are busy, cultivate it anyway. It will pay you in the thrift of your trees. The first few years you can put some hoed crop between your trees, such as potatoes and fertilize them well with some complete manure, and that means one with at least 10 per cent, of potash; and while you are feeding and cultivating your potatoes you will be feeding and cultivating your trees and they will respond accordingly and the potatoes will pay the bill. The more you will cultivate the more it will pay and the better the growth of the trees. In my orchard of 6 to 8 years of age the trees run from 6 to 8-inch stem diameter from 16 to 20 feet high and 20 feet across the tops. I have no trouble of adding one inch stem diameter each year. Many people who see my orchard remark if they would have such luck they would plant. There is no luck about it. It is done by giving close attention to the minor details; little things that are trivial for most people, by giving the proper food in sufficient quantities and keeping the soil constantly stirred until about July when I stop all cultivation to give the wood time to ripen and develop fruit buds. As long as you continue cultivating, your trees will continue growing and go into winter with too soft undeveloped or ripened wood, when both buds and tree suffer from freezing. I have young apple trees that are 8 years old this coming spring that gave me over 6
bushels of apples per tree. I have peach trees the same age with a diameter of from 30 to 33 feet that bore me 10 bushels of peaches this past season and have borne me annual crops since their second summer. Is this luck? Not a bit of it. If you wish to raise a 600 pound hog you must feed it well, never leaving it to get stunted. So with a tree, feed it well and as it attains age stop all cropping, but don't stop the feed.

But you must change the diet as you have a different object to attain. In the early stages you wanted wood growth. You wanted a tree and for that you needed more nitrogen, but now having the tree you want fruit and for this you need potash and phosphoric acid; the latter to develop the kernel, the true seed, and the potash to develop and harden the wood. Develop fruit buds. Give to the fruit its color, its flavor, to develop the saccharine matter. And if all these things are properly attended to, you will have no off-year. This I know is contrary to the opinions of most people, but is not contrary to the laws of nature. In fact nature calls for an annual reproduction, and to accomplish this it must develop seed and with proper care you develop the edible part at the same time. You do not expect the grape, or corn, or cereals to fruit only on alternate years, neither should you expect the apple to fail in fulfilling the mission required by nature. The only reason they do fail is that they produce such enormous crops that it completely exhausts the energy of the tree, depriving it of its vitality to such an extent that it is unable to store up enough strength in its buds to develop a crop the following year. It may bloom just as full but there is not enough vitality in these blossoms to give fruit. The result is they nearly all drop. It is then called the "off-year," whereas, if the trees had been fed sufficient available food, for both tree and fruit, and the tree had been properly thinned, the tree would have brought as large and better paying crop, and at the same time stored up vitality enough in its fruit buds and its sap to have developed a full crop the following season and performed the functions required by nature.

THINNING

This is the third essential to large perfect well-developed fruit of high quality. In its effort of reproduction the tree has little regard for the edible portion of the fruit. The seed or kernel is the part upon which it expends all its energies. The peach in its original state was not an edible fruit. It was only after years of high culture and cross fertilization that it became the fine luscious fruit it is at the present time. The outer or edible part is nearly all water and can be developed to very large size. By thinning or removing the larger proportion of the fruit set, you relieve the tree of its burden-
some task of developing so many seeds when it expends its surplus energies upon the development of the fruit remaining. If you but try a few trees, removing fully three-fourths, leaving no two touching, and if it be the peach, leave no two closer than 5 to 6 inches, you will indeed be astonished with the results.

If these three essentials are carefully and conscientiously carried out you would no longer hear the oft-remark that fruit raising does not pay; but the horticulturist would then take the position his profession merits, the seat of honor.

The Chair announced that at 1.30 P. M. Prof. Surface would give a practical demonstration of how to prepare a solution to kill San José Scale that could be quickly and easily prepared without boiling.

Adjourned.

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Afternoon Session, 1.30 P. M.

At 1.30 o'clock this afternoon, Prof. H. A. Surface demonstrated to a large number of interested spectators how to prepare a solution to kill the San José Scale which would be immediately ready for use. The solution now used is the lime, sulphur and salt wash, but on account of its being disagreeable to handle and the necessary prolonged boiling in making, it is not readily accepted as an insecticide.

The new solution which Prof. Surface showed how to make is composed of lime, sulphur and soda. It is composed of 33 pounds of unslacked lime, 17 pounds of sulphur, 4 1/2 pounds of caustic soda and 50 gallons of water.

First, the caustic soda is dissolved in water and then one-half the lime is placed in enough water to shake it, but not to burn it. After the lime is slaked, one-half the sulphur is gradually added and the solution stirred. Then the remainder of the lime is added, and while the boiling is continued from the slaking of the lime the balance of the sulphur is put in. While it is yet steaming add one-third of the caustic soda, and when the boiling has ceased add another third of the soda. When the boiling caused by this addition ceases add the remainder of the soda and by the time the boiling has ceased it will have assumed a brick red color. It should then be applied to the trees while hot, as it will run through the nozzle more freely. He recommended the use of the Vermeere nozzle. The sulphur used should be flowers of sulphur.

The Professor said he would not recommend this wash for orchards over half an acre in size, but would use the lime, sulphur, salt wash, as the former is more expensive to prepare and it is doubtful if it is as effective as the latter mixture.
The Professor added that he is making a trial of the lime, sulphur, soda solution at present, but is unable now to tell the result, as his experiment is not finished. This remedy should not be used in summer, but whale oil soap or kerosene solution should be used then.

The regular program of business was resumed at the close of the experiment made by Prof. Surface.

Inquiry having been made concerning crown gall, the Secretary read the following letter:

"Washington, D. C., Jan. 18, 1904.

"Mr. E. B. Engle, Secretary State Horticultural Association of Pennsylvania, Box 607, Harrisburg, Pa.:

"Dear Sir: Mr. Woods has referred to me for attention your letter of January 13, relating to crown gall.

"While we have been studying this disease to some extent and are planning some experiments directed toward its control, there has been no very material progress during the past year. However, I might call your attention to some matters in relation to this trouble. In our Eastern orchards and nurseries most of the crown gall is on the apple, while in the South and West, especially in the far Southwest, the disease is very serious on the stone fruits as well as the apple. To the orchardist we may say, reject all crown gall nursery stock. Do not plant them in the orchard. Make a careful inspection or examination of all trees, especially apples, to avoid letting any of the gall slip in. There is another trouble with apples, resembling somewhat crown gall in its effects, which is probably related to it. This is the so-called hairy root of the apple. The typical hairy root has an extra number of fibers growing directly out of the crown of the tree or the main tap root, sometimes scattered on the tap root, but more frequently originating from little clusters which seem to start from a warty growth or perhaps from a small crown gall. In some cases there is a large crown gall covered with these fibrous roots. There are all grades between the clean, smooth galls and the typical hairy root. We think all this kind of stock should be rejected in planting orchards.

"The problem, then, is for the nurseryman to grow clean stock. Since crown gall stock will be rejected by the State inspectors or the orchardist, it falls upon the nurseryman to avoid this disease as much as possible in his nursery blocks. We regret to say that we can give little assistance at the present time to the nurseryman on this problem, but suggest that nurserymen give special attention to the source of supply of their seedlings. Notice the condition carefully of these seedlings, especially the presence or absence of
crown gall or hairy root on the seedling stocks for grafting or budding. Second, we have advocated in a recent paper before the Apple Growers' Congress the trial of disinfection of apple seedlings before grafting. This matter has not been put to the test as yet and, therefore, too new to recommend in commercial work. The material which we shall try for disinfecting consists of formalin diluted at the rate of one pint to thirty gallons of water. Third, apple nurseries should be planted out on land which has not been in nursery stock for several years, or, if possible, land which has not been planted to the apple or perhaps other fruit trees for some time previous.

"Yours very truly,

"M. B. WAITE,

"Pathologist in Charge of Investigations of Diseases of Orchard Fruits."

PROF. VAN DEMAN: In some parts of the West nurserymen have had serious trouble with crown gall. Trees may be infected when grown in nursery blocks, and even in seedling beds. I have seen the disease on seedlings when brought to the grafting table, and it may be transmitted from root to root by the grafting knife. The union of root and graft is the most vulnerable point, and if germs are in the soil, the trouble will likely first manifest itself at that point. Again, a tree may be entirely free, and if set in an orchard where infected trees have stood, it will readily take the disease.

DR. FUNK: Where the hairy root is in evidence do we not usually find wooly aphis?

PROF. VAN DEMAN: The knots or growth caused by wooly aphis are distinct from crown gall. I do not think wooly aphis causes hairy root.

PROF. BUTZ: You can always satisfy yourself whether it is crown gall or woolly aphis, by cutting with a knife. In the former the gall is hard and woody, in the latter it is soft. Hairy root is most likely to be found in wet soil, but we do not find any enlargement except where crown gall exists.

MR. BRINTON: Some 45 years ago Mr. Thos. M. Harvey conducted a nursery and had some of the worst cases of crown gall I ever saw. He sold trees all over Chester and Lancaster counties, and some of the best orchards grew from those trees. His manager said the trees would come all right and they apparently did. I saw in West Chester nurseries 20 years ago the worst cases of woolly aphis I ever saw, and the following year there was none to be seen. It seems to be the case with insects frequently, that they come and go without any apparent cause, or effort to destroy them.
PROF. VAN DEMAN: One word of caution to nurserymen. In grafting apple roots if any are found with crown gall throw them out and burn at once. Have carbolic acid on the table, and wipe blade of grafting knife with it frequently and any germs present will be destroyed. I have never noticed any difference between grafted or budded trees. It cannot be killed with sulphate of copper (blue stone).

ELECTION OF OFFICERS FOR 1904.

Mr. Cooper of Committee on Nominations submitted the following list of officers for the current year:

President, Howard A. Chase, Philadelphia.
Vice Presidents, Gabriel Hiester, Harrisburg; Hon. W. T. Creasy, Catawissa; D. C. Rupp, Shiremanstown.
Recording Secretary, Enos B. Engle, Waynesboro.
Corresponding Secretary, Wm. P. Brinton, Christiana.
Treasurer, Edwin W. Thomas, King of Prussia.

On motion, Mr. Cooper was authorized to cast the ballot of the Association, and the aforenamed were declared elected.

The following resolution was offered by Dr. Funk and unanimously adopted:

"Resolved, That having learned that the office of the Economic Zoologist is not regularly equipped with a stenographer, and as it is very important that we as practical producers be promptly supplied with full and complete information from that important office, both by personal correspondence and through the publications, we, the members of the State Horticultural Association of Pennsylvania do hereby respectfully request the Governor of this Commonwealth and the Secretary of Agriculture to aid us by trying to find a means of engaging a stenographer for the office of Economic Zoologist until the next session of the Legislature, when proper appropriation should be made for the same. We ask this in order to receive full benefit of the efficient work of this Division of the Department of Agriculture.

Prof. Butz, of Committee on "Fruit Packages," stated that said committee was not ready to report at present and asked permission to hold over until next annual meeting. There being no objection the request was granted by the Chair.

REPORT OF COMMITTEE ON NOMENCLATURE AND EXHIBITS.

Your Committee on Exhibits begs leave to report the following:

Apples, 9 plates by J. G. Rush.
Apples, 6 plates by Danl. Smeych.
Apples, 7 plates by A. W. Root & Bro.
Apples, 7 plates by C. P. Scholl.
Apples, 5 plates by D. C. Rupp.
Apples, 10 plates by Mayer & Son.
Apples, 2 plates by John G. Reist.
Apples, 3 plates, by Dr. J. H. Funk.
Apples, 3 plates by Wm. T. Creasy.
Apples, 3 plates by W. P. Bolton.
Apples, 3 plates by J. B. Lindeman.
Apples, 3 plates by Valentine Wise.
Apples, 3 plates by John Kready.
Pears, 1 plate by Daniel Smeych.
English Walnuts, 1 plate by J. G. Rush.
Shellbarks, 1 plate by J. G. Rush.
Pecan, 1 plate by J. G. Rush.
Buffalo Berry, 1 plate by John Kready.

In a general way the exhibit was a very creditable one.
Special mention is made of "Oliver Red," "Stuarts Golden," and "Stayman Winesap," exhibited by Dr. Funk, of Boyertown.

Respectfully submitted,

(Signed.)

D. M. WERTZ.
D. D. HERR,
W. P. BOLTON.
Committee.

The following paper was then read:

FACTS ABOUT GINSENG CULTURE FOR FRUIT GROWERS.

BY PROF. GEO. C. BUTZ, STATE COLLEGE, PA.

The enthusiast on ginseng culture is looked upon as a crank; but one who is an experimenter is not permitted to become an enthusiast for he must confine himself to the bare facts, and what I shall have to say is not to be taken in the way of a recommendation that any of you should engage in the culture of this very special crop.

I wish to say at the outset, however, that while farmers are being induced to grow this crop, I believe that nurserymen and fruit growers are better qualified to succeed with it than is the average farmer, for it requires more of this sort of attention that horticulturists are trained to give. The seed must be stratified between
the time of ripening and planting just as many horticultural seeds are handled. The lath house so essential to the growing of the root is just such a house as commonly used to shelter and shade azaleas, rhododendrons and other shade-loving plants during the hot months of summer. Under the lath house it is very cool and owing to the partial shade the weeds do not grow as thriftily as in the full sunlight, but the ginseng thrives under these conditions. If it is planted in the open field it would grow for a few weeks then as the sun becomes warm the leaves would turn yellow and the plant eventually would die.

One of the first questions arising when one considers the culture of such a crop, is whether there is a market for it. I take it for granted that you are aware of many facts about ginseng, having read more or less of the literature on the subject recently distributed. The dried root is all exported to China, where 400,000,000 Chinamen are using this drug as commonly as we Americans use tobacco, and though our physicians count it worthless as a medicine, it is no more likely to be dropped by the Chinaman than that the American will drop tobacco. The collected wild root of America has been exported ever since the middle of the 18th century and in recent years has amounted to about $1,000,000.00 worth of dried root. Owing to the eager search for the wild root the native product is rapidly diminishing and the price per pound is correspondingly increasing, so that the profitableness of the garden culture of this plant is pressing it hard upon the attention of those interested in the plant, and since it is not likely that the Chinaman will ever discard it, the market for the cultivated root will exist as long as the Chinaman exists.

Owing to the high price obtained for ginseng, immense profits are estimated upon its culture. When the wild root was first collected in this country 150 years ago it sold to the exporters for 50 cents per pound. As its value became known and the wild product began to diminish the price rose to $2.00, $3.00 and $4.00 per pound, when ten years ago the early attempts at cultivation were made. Now $6.00 is being paid for the wild root and for the cultivated root, which is much superior to the wild root, such prices as $8.00, $10.00 and $12.00 are realized, and last fall the price of $13.00 per pound, was paid for 344 pounds of dry cultivated root grown in the old gardens of Geo. Stanton, at Apulia, N. Y. This was sold at auction, several exporters bidding and cost the successful bidder close on to $5,000.00. This quantity of root was grown on one-eighth of an acre, making the probable income from an acre nearly $40,000.00. It requires 5 years to grow a crop from two-year old roots. In the small experiment conducted at the State Experiment Station, which was the first official experiment in the United States, about 6

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pounds of cultivated root was sold to an exporter and $8.50 per pound was received for the root. On the basis of this experiment I estimated the cost of planting an acre, figuring liberally on the preparation of the land, erecting a substantial lath house, weeding, mulching, etc., paying for the two-year old roots (then 10 cents each), cost of planting, etc., and it summed up to $10,000. Estimating the product of roots in five years time and selling at $8.50 per pound, gave an income of $25,000, deducting the total expense of $10,000, leaves $15,000 as a conservative estimate of clear gain for an acre in five years, which is at the rate of $3,000 per acre annually. The report of this experiment is published in Bulletin No. 62, of the Pennsylvania Experiment Station, and those of you who have not already received a copy, may obtain one by writing to the Station for it.

I would caution you against the planting of small wild roots. Cultivated wild roots at 20 cents each are worth more than wild roots at 5 cents each. (Samples of each were displayed.) Wild roots are stunted, wrinkled and in cultivation can make only a slow growth. They are usually from 5-15 years old, and occasionally 40 years old, through in size they are smaller than good 2-year old cultivated roots from the seedbed. The cultivated roots are long, white, smooth, and bear a large, vigorous bud close to the root and when planted make a quick and rapid growth. The age of a root can be determined by the number of scars on the "neck" between the root and head or bud. Each scar represents a year, for it marks the place of the attachment of the annual growth of each season.

A word of caution about seeds. Ginseng seeds must never be allowed to become dry. They lose vitality quickly when they dry. A packet purchased in a seed store of Philadelphia contained 11 seeds, costing 50 cents, and when thrown in water to test them, all floated on top of the water, showing them to be worthless. When seeds are obtained they should be tested in this manner with water. It is known as the "water test" and every reliable dealer will sell upon the water test. Be particular to get American seed. During the past two years Japanese seed, which could be obtained cheaper than American seed, was imported and sold as American seed. It produces an inferior grade of root and therefore should be avoided. An expert can readily detect the foreign seed as it has ridges over its surface not possessed by the American seed. Great efforts are being made to obtain Manchurian or Korean seed, because the species of ginseng grown in those countries is superior to the American. It is claimed, however, that it is impossible to secure such seeds. Samples of seeds claimed to be Manchurian have been sent to me for examination and by subjecting them to
The microscopical test I have found that while they closely resembled the Japanese seed, there was one character constant with the Manchurian sample that was not observable upon the Japanese seed. Such Manchurian samples have come to me from totally different sources and resembled each other. I am endeavoring to get guaranteed samples of the foreign seeds through official channels for purposes of identification. Meanwhile it is safer for beginners in ginseng culture to use only American seed and roots. The price of fresh seed is $80.00 per pound, containing about 8,000 seeds. When seed has been held for a year in stratification it is sold at from $160.00 to $240.00 per pound. At the rate of the price paid for the packet of seeds purchased in a Philadelphia seed store, 50 cents for 11 seeds, the price per pound would be $400.00.

PROF. VAN DEMAN: I have been cultivating ginseng about three years experimentally. All that Prof. Butz has claimed for it I can corroborate from what I have seen. So far as I know the root has no value under the sun. It has no medicinal value but is used only as a charm by the Chinese. The biggest humbug in ginseng is, in the business. There is a firm in New York offering Manchuria seed at big prices when there is not any such seed in North America. I would advise the ordinary man to let it alone. If you have good soil and climate you may be able to grow it by carefully shading the plants and waiting five years for a crop of roots. If you want to make sure of your crop you will want your garden strung with wires and guarded with loaded guns and watch dogs. It is not a business that I would advise a friend to embark in.

The following paper was read by Prof. S. H. Fulton, Department of Agriculture, Washington, D. C.:

FRUITS IN COLD STORAGE.

By Prof. S. H. Fulton, U. S. Department of Agriculture, Washington, D. C.

The history of the development of the fruit growing industry in the United States is a record of the rapid and extensive growth of a highly specialized branch of American agriculture. A half century ago fruits were raised in limited quantities for home use only,
ANNUAL REPORT OF THE

commercial orcharding being almost unknown. Within the past few years whole sections of the country have become famed for large orchards and extensive production of fruit that meets with regular demand in the city markets of this country and abroad. In these well-defined fruit growing areas the small plantings for home use have given way to large commercial orchards not infrequently of hundreds of acres in extent.

At the present time there are in this country more than 200 million apple bearing trees producing in a normal season, from 120 to 180 million bushels of fruit. This represents an increase of about 80 million bearing trees in the past decade. Georgia with her 16 millions of peach trees, Texas and several of the Southwestern states with their enormous commercial peach orchards rapidly developing, afford illustrations of the growth of the peach business. In other lines of fruit growing the development has been proportionally as rapid though not quite so extensive.

This rapid growth of the fruit industry has called for the highest development of means for handling and distributing the crop and for preserving it in sound condition until it can be placed in the hands of the consumer. The recent application of cold temperatures to the preservation of fruit, both in the transportation and in the store-house, is a very important factor in this connection. The refrigerator car and the cold storage house have developed with the growth of the fruit industry and are now indispensable to the successful handling and distribution of the crop. No complete statistics of the American warehouse business have been compiled, but it is probable that there are from 700 to 1,000 cold storage warehouses in the United States that store apples and other fruits to a greater or less extent and the number is rapidly increasing. This system of warehouses, cooled by mechanical methods of refrigeration, has largely been developed since 1890. Time is required to reduce a business of this kind to the best working basis and naturally many problems relative to the proper treatment of fruit for cold storage still confront the warehousemen, the fruit handler and the orchardist who stores his fruit. Some of these problems have received consideration through the pomological investigations of the Bureau of Plant Industry during the past two years. In these investigations the fruit has been under observation in the orchard as well as in the warehouse, so that a full record of the life history of the fruit has been obtained.

The experiments which have thus far been conducted all point toward the fact, that so far as the keeping of fruit in cold storage is concerned, as much or more may depend upon the conditions and environment under which the fruit is grown as upon the treatment it receives in the warehouse. For example, take the case of fruit
from young rapidly growing trees which is apt to be overgrown and less firm in texture than from old trees. It passes through its life history rapidly and in the storage house frequently breaks down several weeks or even months before the same variety from old trees begins to deteriorate. King and York Imperial apples from young trees stored last October in Jersey City, N. J., have already passed their best commercial condition, while from old trees the same varieties are still firm and sound. Last fall a carload of West Virginia York Imperial apples was placed in cold storage in Martinsburg for experimental export shipment during the winter. In the carload there were 40 barrels of large fruit from thrifty 7-year old trees, while the remainder was from slow growing trees 25 years of age. On January 12, when these apples were removed from storage, the fruit from young trees was found to have developed 10 per cent. of scald and fully 50 per cent. of it was mellow. On the old tree fruit no scald had developed, and the apples were still firm and sound. It should be stated in this connection, however, that the vigor rather than the age of the tree determines the keeping quality of the fruit. Old trees supplied with moisture and plant food to such an extent to induce unusual vigor and growth, may produce fruit as much lacking in firm texture and durability as the average young tree fruit. This condition, however, is not often met with.

The character of the soil may influence the keeping of the fruit to a very marked extent. The Baldwin apple grown upon sandy land colors more highly and grows to a larger size than the same variety upon clay land. It is more attractive and is worth more money in the market, but it will not keep so long as the smaller, less highly colored Baldwin from clay land. The Greening, which has been under observation from both sandy and clay soils, behaves similarly.

Experiments have been made with a large number of varieties picked at two degrees of maturity, first, when nearly full grown, but only one-half or two-thirds colored, and second, when fully grown and highly colored. The results obtained indicate that the more mature fruit usually keeps fully as well as the immature, and is worth more money because of larger size and better color. Mature, well-colored fruit is less subject to scald than immature, light-colored fruit. An exception to the above exists, however, in the case of large fruit from young trees. Since its development is rapid, it may become too mature if left upon the trees late in autumn, and when placed in storage, its period of safe-keeping will be found to be correspondingly shortened. Such fruit should be picked while still somewhat immature.

The method of handling fruit after picking, also very largely de-
terminates its life period in cold storage. A delay of two weeks in storing winter apples after picking may result in two months shorter keeping time in storage, particularly if the weather is warm at picking time. Sutton Beauty apple from Eastern New York, delayed two weeks before storing was mellow on entering the storage house and by December 22d was badly decayed, while the same variety stored immediately after picking will doubtless keep in perfect condition until spring. Grime's Golden, from West Virginia, delayed a similar length of time was past commercial use by December 21st, while the same variety immediately stored was still in perfect condition. Bartlett pears from Western New York delayed four days between the time of picking and storing began to break down in the storage house within two weeks, while the same variety stored at once after picking was in good condition for two months.

The effect of the package upon the keeping of fruit in cold storage is an important factor, particularly in the case of the more perishable fruits. The larger the package the more slowly does the content cool down and the faster the ripening progresses before checked by the cold temperature. With Bartlett pears stored in barrels, a core of ripe fruit is frequently found to develop in the center of the package where the fruit has given up its heat slowly. Such fruit should be stored in boxes or ventilated crates of smaller capacity than the barrel. Winter apples or other fruits which are to remain a long time in cold storage keep best in tight packages which prevent free circulation of air and thus check evaporation. In ventilated crates the fruit may shrivel, particularly, if the air in the store-room is dry.

Wrappers have a beneficial effect upon the keeping of fruit, prolonging its season frequently beyond the normal limit. The spread of rot spores is largely prevented, and mechanical injury to the fruit in handling is largely averted. In the case of peaches and berries the wrapper prevents the absorption of odors likely to be present during the summer when a variety of commodities are stored in the same room. The more impervious the paper, the better it is for such purposes.

As to temperatures, it may be stated as a general principle, that the lower the temperature within the limit of safety to the fruit stored, the longer will the fruit keep. This is explained by the fact that the lower temperatures retard the life processes of the fruit to a much greater extent than do the higher. Bartlett pears stored in a temperature of 36 degrees F. in 1902, and again in 1903, reached their commercial limit within four weeks, while in a temperature of 32 degrees F. the fruit was still firm and sound at the end of six weeks to two months.
Kieffer pears stored in October, 1901, in 36 degrees F., were discolored and worthless March, 1902, while the same variety in 32 degrees F., was sound and in good condition until April 1. Low temperatures are more necessary for the quick ripening summer fruits than for the winter fruits because of the rapidity with which they pass from ripeness to decay under normal conditions. For winter apples a temperature of from 30 to 32 degrees F. is the most approved, but this low temperature is necessary only to overcome the effect of delays and severe handling to which the fruit is frequently subjected. If the fruit could be picked, carefully handled and placed in cold storage immediately, it would keep very satisfactorily in a temperature several degrees higher.

There are numerous diseases and affections common to stored fruits which tend to shorten their time of keeping. Scald is one of the most pronounced of these troubles. It is not well understood, but is due to one of the normal oxidizing ferments which manifests itself in an injurious way only when the life history of the fruit is well advanced. Scald develops upon the least mature side of the fruit, and is particularly apt to appear upon fruit picked before it is well-matured. Since highly colored, well-matured fruit is least subject to the trouble, this point has a very practical bearing in orchard management. Growers should aim to produce fruit of this character.

Black mould is the most troublesome disease to contend with in the storage of strawberrys, raspberries and blackberries. It is very apt to appear within from 48 to 72 hours in the case of raspberries, while upon blackberries and strawberrys it is almost certain to manifest itself within a week or ten days from the time of storing. No method of preventing this trouble is known aside from careful handling and quick storing of the fruit.

In the storage of cherries, brown rot is apt to be troublesome. Cold temperatures retard its development to a very great extent, but do not effectually check the spread of the disease.

Bitter rot and pink mould of apples are quite effectually checked in the cold storage house, but the blue mould and other fungi frequently manifest themselves to the injury of the fruit.

The behavior of fruit when removed from cold storage depends upon how far it has already progressed in its life processes, and upon temperature into which it is removed. Fruit which is nearing the end of its life history, when withdrawn, cannot be expected to hold up long after removal from the storage house.

The following tabulation shows the development of scald in different temperatures upon the York Imperial apples from old and young trees before alluded to. The young tree fruit was mellow when removed from storage while the old tree fruit was still firm and sound.
Scald Developed in Different Temperatures upon York Imperial Apples from Old and Young Trees when Removed from Cold Storage.

<table>
<thead>
<tr>
<th>Age of Trees</th>
<th>Date removed from storage</th>
<th>Date inspected</th>
<th>Thirty-two.</th>
<th>Fifty.</th>
<th>Sixty.</th>
<th>Seventy.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old,</td>
<td>Jan. 12</td>
<td>Jan. 12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Young,</td>
<td>Jan. 12</td>
<td>Jan. 12</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Old,</td>
<td>Jan. 13</td>
<td>Jan. 13</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Young,</td>
<td>Jan. 13</td>
<td>Jan. 13</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>Old,</td>
<td>Jan. 14</td>
<td>Jan. 14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Young,</td>
<td>Jan. 14</td>
<td>Jan. 14</td>
<td>11</td>
<td>23</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Old,</td>
<td>Jan. 15</td>
<td>Jan. 15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Young,</td>
<td>Jan. 15</td>
<td>Jan. 15</td>
<td>14</td>
<td>55</td>
<td>70</td>
<td>83</td>
</tr>
</tbody>
</table>

Another tabulation is here given which shows the amount of decay in Baldwin apples after removal from storage and subjected to different temperatures.

Amount of Decay After Removal from Storage to Different Temperatures. 1903.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Date removed from storage (1903)</th>
<th>Date inspected</th>
<th>Per Cent. Rot.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan. 29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baldwin</td>
<td>Jan. 29</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jan. 29</td>
<td>Jan. 29</td>
<td>Per Cent. Rot.</td>
</tr>
<tr>
<td></td>
<td>Feb. 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feb. 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feb. 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feb. 23</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mar. 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above tables illustrate the fact that the higher the temperature into which the fruit is removed, the more quickly will it break down.
THE QUESTION BOX.

A number of questions were submitted through the "Question Box." Among those discussed were the following:

1. "I have 12 acres of ground suitable for pears. Can any one name a variety that will make me more money than Kieffer?"

   PROF. VAN DEMAN: There is perhaps more money in Kieffer pears than in any other variety. "Garber" is no better in quality.

   PROF. BUTZ: There are some "Garber" pear trees near the college buildings, where there are 600 boys, and they seldom touch them.

   DR. FUNK: If budded or grafted on French roots they are nearly equal to Bartlett.

2. "Name best method of pruning a 5-year old bearing peach orchard."

   DR. FUNK: If the orchard has been neglected the best way is to cut back and make a new top.

   MR. PETERS: Best plan is to cut to a crutch. The growth will then even up all over the trees.

3. "How many peach and apple trees should a grower have to justify his having a power sprayer? What should that power be, and who are the firms manufacturing such machinery, more especially to control the San José Scale?"

   DR. FUNK: It will pay a man with 5 acres, especially if he has San José Scale. He must have strong, uniform pressure and that can hardly be maintained without steam or similar power. I use a No. 6 Morrill & Morley pump. I use a middling fine nozzle, and can throw spray 40 feet with a Seneca nozzle.

   PROF. SURFACE: Dr. Funk will give a public demonstration of his method of spraying on his premises at Boyertown, this spring. The time will be announced in the Monthly Bulletin.

4. "In view of the serious pests that now discourage the fruit grower, and induce him to inquire 'What next,' will you advise a man with a growing knowledge of horticulture to embark as an apple grower? If so, what two or three varieties of winter apples would you advise him to plant?"

   MR. HIFESTER: I would not advise any man on such a matter unless I knew the man. There is every chance for a man like
Mr. McSparran to go into it. As to varieties, I would not like to advise. Those in your neighborhood who have been growing apples can give that information better than I.

6. "What varieties of trees and shrubs are attacked by San José Scale? What varieties are most and what least injured?"

PROF. SURFACE: This is a very important question, but one which I am not prepared at present to answer in detail. I would like to hear from persons who have experience in this direction. I am working upon this subject and will prepare a list showing the relative degrees of attack upon different kinds of trees and plants, and when this is properly completed will publish it in the Monthly Bulletin of the Division of Zoology.

DR. FUNK: Everything is grist that comes to their mill.

MR. HOOVER: I have never had any trouble with the Scale on Kieffer pear.

Adjourned.

EVENING SESSION.

Mr. Hiester, of Committee on Necrology, submitted the following which was unanimously adopted:

The members of the State Horticultural Association of Pennsylvania have learned with profound sorrow of the death of Josiah Hoopes, and desire to express their grief at his loss. He was a charter member of the Association and served as president for a longer term than any other man. He was an active, energetic member, an indefatigable worker, deeply interested in everything pertaining to our work, an eminent botanist and author, of genial personality; he was the warm friend of every member. He will be missed and mourned by us all.

Resolved, That this expression be entered upon our minutes, and a copy be sent to his family.

GABRIEL HIESTER,
GEO. C. BUTZ,
J. W. PYLE,
Committee.

ADDRESS BY J. HORACE McFARLAND.

An interesting talk on "Fruit Trees and Plants for Beauty," was then given by J. Horace McFarland, President of the American
League for Civic Improvement, of Harrisburg. As the subject implies, he pleaded for the beautiful in both city and rural life, at the same time advocating with equal emphasis the utilitarian and economic point of view. Instead of planting a superabundance of ornamental trees along roadways and gardens, he argued in favor of fruit trees. They serve both purposes, being both a delight to the eye and a joy to the palate. Fruit trees, he said, cost no more to raise than ornamental trees. Why not, then, plant them along the highways, and permit their products to be enjoyed by the passerby, the same as the present shade tree. Even in the yards, useful plants and vines would serve a material as well as aesthetic purpose. Trees were meant to beautify and to be enjoyed. They tend to better things, beside adding comfort and pecuniary wealth to the beholder and owner.

Plant trees about your homes and you will not only enjoy them yourselves, but they will be a source of pleasure and utility to those who come after. The beautiful is never forbidden or frowned upon in the Bible. Whatever is useful and beautiful elevates character and makes better, happier citizens.

The CHAIR: For many years in the history of this organization we had the counsel and assistance of Prof. Thomas Meehan, of Germantown, Philadelphia. Until recent years he was always present at our meetings, and his delightful talks entertained us as no other man could, on topics pertaining to horticulture and floriculture. We have with us this evening his son, Hon. W. E. Meehan, Commissioner of Fisheries of Pennsylvania, who will address us on "Fresh Water Fish and Fish Culture."

ADDRESS OF MR. MEEHAN.

He spoke first of the value of the fish as an article of food, the large percentage of phosphorus it contains, making it valuable as a brain nutriment. A fish was defined as a creature possessed of gills, fins, etc., and generally adapted to the water. Many creatures are classified as fish, improperly, as, for instance, the whale, which was originally a land animal.

Mr. Meehan traced the history of the finny tribes from their earliest beginnings. He told an interesting story about the sturgeon. In the Devonian Age, or age of fishes, the water inhabitants were so numerous that many of the species were supplied with peculiar devices to protect them from their voracious enemies. The stur-
sturgeon was covered with a very hard shell-like affair, with sharp edges. It resembled armor plate, and the fish was given that nickname. In the course of time, when the waters became greatly depleted of their inhabitants, the sturgeon had no further need for the protection, and it has gradually disappeared, save a little sharp ridge on the back.

The speaker explained the difference between the fin and finless fish. The latter propel themselves by undulations of the body.

In dwelling upon present conditions in Pennsylvania, he said that here, as well as elsewhere, the fish are disappearing with alarming rapidity through the use of illegal fishing devices. The Commission is doing an excellent work in its hatcheries, from which the eggs are developed to maturity and the streams restocked. The hatcheries of Pennsylvania this year turned out over 125,000,000, less than 10,000,000 of which were for game purposes. The Department is steadily endeavoring to increase the number of fish in Pennsylvania, but it sorely needs more protection, especially for lake fish, shad, herring, salmon and trout. The present number of fish wardens is insufficient to control the illegal fishing.

Mr. Mechan's talk was made additionally interesting because of its stereopticon views.

Mr. Peters offered the following preamble and resolutions, which were unanimously adopted:

"Whereas, We are about to close one of the most successful meetings in the history of the Pennsylvania State Horticultural Society; and,

"Whereas, We feel ourselves, as a society, deeply indebted to those who contributed to our success; therefore, be it

"Resolved, That we heartily thank the county commissioners of Lancaster county for the use of the court room, and the press of Lancaster for their faithful report of our proceedings and friendly notices previous to our meeting, and to the lecturers and speakers and exhibitors who have aided so materially in making our meeting a success; also, to the people of Lancaster and vicinity who have kindly assisted us by their attentive attendance."

Adjourned.

ENOS B. ENGLE,  
Secretary.
SIXTH ANNUAL MEETING

OF THE

Pennsylvania Dairy Union

HELD AT

LOCK HAVEN, PA., DECEMBER 2 AND 3, 1903.
OFFICERS OF THE PENNSYLVANIA DAIRY UNION, 1904.

Dr. H. P. Armsby, President, State College, Pa.
Austin Leonard, First Vice President, Troy, Pa.
Rev. J. D. Detrich, Second Vice President, West Chester, Pa.
Wm. E. Perham, Treasurer, Niagara, Pa.
Dr. M. E. Conard, Secretary, Westgrove, Pa.

EXECUTIVE COMMITTEE.
Hon W. C. Norton, H. W. Comfort, M. F. Reeder; President and Secretary, ex-officio.

Wednesday, December 2, 1903, 10 A. M.

PROGRAM.

Address of Welcome. .................................Mayor Jno. T. Cupper.
Response, ..............................................Dr. H. P. Armsby.
Address, ..............................................Hon. N. B. Critchfield.
Secretary of Agriculture of Pennsylvania.

General Business and Appointment of Committees.

Wednesday, December 2, 1.30 P. M.

"Sources of Nitrogenous Foods in the Dairy,"

Dr. A. T. Neal, Director of Delaware College Agricultural Experiment Station.

Discussion.

"Twenty Years' Experience in the Science and Art of a Dairy Herd,"

Rev. J. D. Detrich, Flourtown, Pa.

Discussion.

Wednesday, December 2, 7.30 P. M.

An Illustrated Lecture on "Dairying in this and Foreign Countries,"

Major H. E. Alvord, Chief of Dairy Division of the Agricultural Department, Washington, D. C.
Thursday, December 3, 9.30 A. M.

"Immunization of Cattle Against Tuberculosis,"
Dr. Leonard Pearson, State Veterinarian.

Discussion.
"The Silo and Silage Crops,"
Prof. Geo. C. Watson, Professor of Agriculture, Pennsylvania State College.

Discussion.
Election of Officers.

Thursday, December 3, 1.30 P. M.

"Work of the Dairy and Food Division,"
Dr. B. H. Warren, Dairy and Food Commissioner of Pennsylvania.

Discussion.
"Development of Dairy Cattle,"
Prof. H. H. Wing, Professor of Animal Industry and Dairy Husbandry, Cornell University, N. Y.

Discussion by M. M. Hollingsworth, Landenberg, Pa.

Adjournment.


Very few members were present at the time announced for the formal opening of the meeting, and it was, therefore, postponed until 1.30 P. M.

December 2, 1903, 1.30 P. M.

The meeting was called to order by the President, Dr. H. P. Armsby, of State College. The following address of welcome was delivered by Hon. John T. Cupper, Mayor of Lock Haven.

ADDRESS OF WELCOME.

BY THE HON. JOHN T. CUPPER, MAYOR.

Gentlemen of the Pennsylvania Dairy Union: I have the honor to welcome you to our city and to extend to you the freedom and privileges it affords. I trust that you will not hesitate in asking
for any assistance which may contribute to your pleasure or aid in your work. Not only our citizens, but the people in the community are very much interested in your work, and are ready and anxious to assist you in any manner they may.

We were much gratified with the result of the work done by the State Dairy Commissioner in Lock Haven for the analysis of the milk served by the local dealers. Whether the honor of your presence is the effect of this or not, we are happy to have you with us, and wish for you a pleasant and profitable session.

RESPONSE TO THE ADDRESS OF WELCOME.

BY DR. H. P. ARMSBY, President.

As President of the Pennsylvania Dairy Union and on behalf of the members, I desire to thank you for the words of welcome. I understand, sir, that so far as we are concerned, your town is now wide open, and that we are entirely at liberty to call upon the government of the city for any aid and comfort that may be necessary, and that if any of us should be tempted too far by the attractions of your city, your officers will play the part of the Good Samaritan, in binding up our wounds and pouring in oil and butter-milk, perhaps, bring us back safely to the Fallon House and take care of us. Whether you will follow the example of the Good Samaritan any farther and make a deposit with the host for our benefit, we should hardly presume to suggest.

I feel that it is a fortunate thing for any permanent organization to meet occasionally in a city and come in contact with city conditions. I think it is good for both parties. I think there is apt to grow up a feeling among the dwellers of the cities that the farmer is rather an unimportant member of society, good to raise corn and potatoes, but not of very much account otherwise; and, on the other hand, the farmer is perhaps apt to look upon the city residents as being ornamental rather than useful, or else as being the sharp men who get their living at the expense of the farmer. It is a good thing for both parties to come together and to get better acquainted.

Neither of these views, of course, represents the truth, as we all understand. Neither the farmer nor the city dweller can do without
the other. To use a Scriptural citation: "We are members, one of another." The farmer has, primarily, the great function in society of producing food; secondarily, clothing, for the human race. If he stops his activities, everything stops. Agriculture lies at the base of all the industries of civilized life. On the other hand, the farmer cannot prosper, unless he has a market for his products. That market is furnished largely by the city and village communities. He can, of course, live without this market. He can live and support himself, but neither the farmer nor the city dweller can thrive or grow rich without the other. So, I think these meetings serve to emphasize the mutual importance of the farmers, and dairymen particularly, as part of the farming world, and of the city dwellers to each other.

I am glad, therefore, that we meet in this place of whose hospitality many of us know, personally, in past years through meetings of other organizations. I again thank you, sir, for the very hearty welcome which you have extended to us.

REPORT OF THE SECRETARY.

Mr. Chairman and Fellow-Members: Your Secretary begs to make the following partial report. Since our last annual meeting held at Harrisburg, we procured, after some delay, copies of nearly all of the papers read on that occasion, and had them printed in bulletin form, making three thousand copies, which were distributed to farmers, dairymen and creamerymen throughout the State, sent direct to their home or business address. We have also arranged the program for the present meeting, which you now have.

The cost of printing 3,000 copies of bulletin was .......... $57 00
For wrapping and mailing same, ...................... 35 35
Cost of printing 2,000 copies of program, .......... 34 00
For wrapping and mailing, ......................... 7 00
Cost of printing letter heads and envelopes, .......... 9 00

$142 35

Cash received for ads. in program, ............... $24 50
For ads. to be collected, ......................... 55 00

$79 50

Deficit to date, ........................................ $62 85

And, furthermore, your Secretary wishes to state in the recent chances of officers, all records of previous meetings, together with
the Constitution and By-laws of the Union, seem to have been lost, and we find ourselves without the proper evidence of organization; so we recommend that this meeting make and adopt a Constitution and By-laws, and that in so doing we carefully consider the advisability of fixing some central point where the annual meeting shall always be held, and that semi-annual meetings, should there be such, could be held at such places as may be selected from time to time, by the proper authority. Also, that the officers consist of a president, two vice presidents, one secretary, one treasurer, and an executive committee of three, and that it shall be one of the duties of said executive committee to appoint exhibit committee consisting of one dairyman, one creameryman and one commission merchant, who shall have charge of obtaining exhibits, and offering and awarding prizes at the annual meetings. The president and secretary to be members ex-officio of both committees.

We make the foregoing suggestions with a hope, in a measure, of dividing the work without sufficiently shifting the responsibility from anyone to make them neglectful of their duties.

M. E. CONARD,
Secretary.

It was moved and seconded, the report of the Secretary be adopted as read. Carried.

REPORT FROM THE TREASURER.

MR. W. C. NORTON: Mr. Perham’s wife was taken very sick last Saturday and died on Monday morning, and until Saturday night he had expected to be present. He had not time to send his book as treasurer to me and, therefore, I have no statement to make, except that which he gave me over the telephone, that there were $2 left in the treasury, and that he wished that the dues be paid to Dr. Conard, who would keep a record and forward the same to him.

The PRESIDENT: I would suggest the propriety of the Dairy Union taking some action in expressing the sympathy of the Society with Mr. Perham in his bereavement.

MR. W. H. COMFORT: I move that the President, on behalf of the Pennsylvania Dairy Union, send to Mr. Perham an expression of the sympathy of the members in his sudden bereavement.

Seconded and carried.

The PRESIDENT: A subject which emphasizes to my mind the progress which has been made in agriculture and agricultural educa-
tion in the last 25 years, is the discussion of the sources of protein on the farm. Twenty-five years ago a speaker on such a topic would not have been present in such a society. The intelligent farmer of to-day is perfectly familiar with such questions, and the interest taken in these somewhat technical matters is very significant of the advance that has been made.

Dr. A. T. Neal, Director of the Delaware Agricultural Experiment, Station, read a very excellent paper on, "Sources of Nitrogenous Foods in the Dairy," but it is to be regretted that his paper was not furnished for publication, though requested to do so, by the Secretary.

The PRESIDENT: Before calling for the discussion of this paper, there is a matter of business to be attended to. Mr. Susendorf, in charge of the Dairy Exhibit at St. Louis, is here and desires to be heard in regard to this subject.

MR. SUSENDORF: I want to say that I am here, first and last, in the interest of the Louisiana Purchase Exposition, to extend to the Pennsylvania Dairy Union the most cordial invitation to take part in our dairy exhibition. The applications for space are numerous. I find that we have only two places left in our space, and our chief, Mr. Taylor, tells me that we cannot do well without Pennsylvania. Yours is the second largest dairy state in the Union. The Exposition is providing show-cases, refrigerators, with places in the cold storage department for butter that may come for storing, and also furnishes space for fancy butter, showing what the State can do. Almost all the states have taken space and intend having a superintendent present.

In looking over the census reports I find that Pennsylvania is the second largest dairy state in the Union. The returns from its milk and cream in 1899 amounted to thirty-five million dollars; those of New York amounted to fifty-five million dollars. Your horticultural products amounted to twelve million dollars in 1899 against thirty-five million in dairy products. Consequently, your dairy industry is approximately three times as large as the horticultural. Your cows of Pennsylvania earned $37 per capita against those of Iowa at $19 per capita and of Illinois at $29 per capita. With a display at the Exposition and a superintendent who could call the attention of the people to this fact the result would be, more dairy-ing business in Pennsylvania.

The Exposition furnishes only floor space. We are having the cases built at the very lowest figures and the cost, including refrigerating, for eight foot spaces is $350 and $500 for the entire term of the Exposition. This includes room in the cold storage for the butter that comes for storing. Each show case will be 8 feet on
the front, 8 feet deep and 8 feet high, and of the best plate glass. We would like to see you represented and hope that you will be able to arrange with the Commission to set aside enough money to make a creditable showing there.

The PRESIDENT: The subject seems like an important question, whether a business of thirty-five million dollars a year should not be represented at this latest, and I suppose, the largest of the International Expositions. The question is before you for consideration.

A Member: I would like to ask whether the appropriation made for this State is in part available for the purpose.

COL. J. A. WOODWARD: The Commission has not yet made any appropriation for the Dairy Exhibits. The attitude of the Commission is that it looks upon dairying as a manufacturing enterprise like the other manufacturing enterprises of the State, and for these they have not made any appropriation. I have been instructed by the executive officers to ascertain the sentiment of the Pennsylvania Dairy Union upon the question. I do not think I am authorized to make any promises for the Commission, but they have requested me to ascertain the mind of the Dairy Union upon the matter of making an exhibit. Concerning the inquiries I have made I do not find much of a spirit in the direction of making the exhibit. People seem to think that the dairy business is one that goes itself and that it does not need any advertising there. I would like to ascertain the sentiment of this society in order to report to the Commission. Up to this time there has been no appropriation made; certainly none made in the general agricultural appropriation that would be available for this purpose. Whether or not one could be made if the Dairy Union were willing to make the effort, I do not know. Perhaps the Commission might find some one to aid the enterprise. I hope I have made myself clear, that the Commission simply authorized me to come and inquire of the official dairymen of the State the sentiment in the state, and whether they had any request or recommendation to make to the Commission. The Commission has expressed a very great deal of interest in the matter, and hopes that the dairymen are going to take the matter up and make an exhibit.

MR. W. C. NORTON: I do not believe that the individual dairymen of the State will take up this matter. I see no reason why the appropriation should not be used to further the dairy interests of this State. If my recollection serves me right, there was an appro-
priation, altogether, to the World’s Fair of $300,000. I would recommend that the Commission take up this display at St. Louis and appropriate whatever amount they see fit to give. If it is not done by the Commission it will not be done at all. It seems to me that out of $300,000 there should be enough to make a dairy exhibit. I do not know how one is going to get the individual dairymen to take hold of this.

COL. WOODWARD: I remember hearing one member of the Commission express himself to the effect that he thought the dairy associations of the State would take up the matter in an official way. He was not, however, speaking authoritatively.

MR. NORTON: I fail to see why the Dairy Union should take up this matter. We as a Dairy Union, or the Live Stock Breeders’ Association were unable to get any appropriation at all. I think it is the place of those who got the appropriation through the Department of Agriculture to push it forward. They have the money. We never have been able to get any appropriation. I would make that as a motion.

Seconded by Major Wells.

The PRESIDENT: Is it the sense of the Dairy Union that an appropriation should be made by the State Commission for a representation of the dairy interests of Pennsylvania at the Louisiana Purchase Exposition?

COL. WOODWARD: I would like to know precisely what is meant by the expression “taking up the matter and pushing it” used by Mr. Norton. Mr. Susendorf said that refrigerator spaces and cases would be provided at a cost of from $350 to $500. Suppose the Commission would provide that, would the Dairy Union, or some other union or a union of the organizations of the State undertake to see to the details of the exhibit, getting the material there and putting it on exhibition and displaying it. I would like to know precisely what is the sense of the Dairy Union on this question.

MR. NORTON: I would say, as one of the officers of the Dairy Union, I fail to see where the money is coming from to do this work. It looks to me as if the Commission would have to pay for the space and also for the man to look after the details. Plenty of dairymen will be glad to furnish the goods, if they are taken care of.

The PRESIDENT: I fail to see, personally, why the dairymen of the State should be on any other footing in this matter than those engaged in other branches of farming. As I understand, the Commission has made an appropriation for representing the general agricultural interests of the State. That provides for collection of exhibits, for execution of the work and puts at its head Col. Wood-
ward. I fail to see why the individual dairyman or the dairymen as an organization should in any way be expected to assume this work. I fail to see any reason why the dairy interests of the State should not be considered in substantially the same way as the general agricultural interests. If any one voluntarily takes it up they take it up without authority, and it seems to me that some one would have to do a lot of hard work for the honor, with a considerable expense, which certainly the treasury of this organization, if the preliminary report be correct, is hardly in a position to assume. There was reported a balance of two dollars in the treasury. So, in brief, my feeling is, individually, that the Commission ought to take up the dairy interests of the State in substantially the same way as it has taken up the general agricultural interests of the State. The dairy exhibit should have the sanction of the State, be under the authority of the State as certainly as the agricultural exhibit.

MR. SUSENDORF: In sending the butter you really need some one to look after it. Quite a few entries will be made individually from Pennsylvania. There are a number of creamerymen who will send butter there and also dairymen. My experience at the World's Fair, Chicago, was that when no one was sent in charge of the material it stood about and was delivered in poor condition. With the exhibit that took all the honors, there was a superintendent on hand to look after it. A number of states are making arrangements to have their butter consigned and all sent to one central place, and sent to St. Louis in a refrigerator car. Unless you make arrangements with some one to look after it in this way you will have a poor display.

A Member: If the State is going to make an exhibit it ought to be a representative exhibit. As stated by Colonel Woodward, the general impression is that the dairy interests do not need advertising. You will find that men making the best brands of butter in Pennsylvania will not take any interest in this matter. They have all the trade they want. Advertising will not help trade, but that is the very butter that ought to be represented there. Colonel Woodward as head of the Department of Agricultural Exhibits, will want to get a representation of the very finest products of the State, and it seems to me that the Commission ought to be as much in favor of, and as much determined that the butter interests of the State should be represented in the same way. I do not think that can be done in any other way than by the Commission finding the best butter men and seeing that exhibits are made from this class. I exhibited butter at the Chicago Exhibition and nearly all was scored "off flavor." I suppose this was because of delay at the express station.
COL. WOODWARD: The scoring of "off flavor" mentioned by the last speaker I think was due to the butter being sent in the ordinary express train by the individual exhibitor, and not in the way Mr. Susendorf speaks of. It has been stated that the very best butter makers would not take much interest in the matter. I would like to ask, and I am not authorized to speak for the Commission; suppose that the Commission should undertake to provide the refrigeration and possibly provide a proper person to take care of the exhibits, would these men who make the butter supplied to Pennsylvania have sufficient interest to send their exhibit to the place of consignment from which point it would be sent to the Exposition.

A Member: I think you would have to bring some persuasion to bear in Chester county.

MR. NORTON: I don't believe there would be any trouble. There are a few men who have pride enough to furnish butter if the men and means are furnished.

MR. W. H. COMFORT: It does not seem to me possible that the Commission, representing the agricultural interests, would allow the dairy interests not to be represented. The Commission is aware of the condition of the Dairy Union, that it is an organization not entirely representative and that it has never been able to get any assistance. The Commission has the sinews of war and it has a pride in the State, and so has Col. Woodward. I believe that the Commission should take up the matter, and make an effort to appropriate enough money to enable suitable men to get up the exhibit and put Pennsylvania in the Exposition where she belongs as the second dairy state in the Union. I do not think that the Commission can believe that a little organization like this would assume the expense of appointing some one to look the matter up and take charge of the exhibit. I presume that the Commission will do this for the State. It seems to me that we should recommend them to put forth their best efforts to have us properly represented at St. Louis.

MR. JONES: Dairymen who are getting the top prices in the Philadelphia and New York markets cannot send 50 pounds of butter and have it arrive in as good condition as that from Wisconsin and states nearby; therefore, they are at a decided disadvantage, and it will take the utmost care on the part of the Commission to provide the best means possible to get the butter to St. Louis in the best condition.

MAJOR WELLS: It is better to do nothing than to make a blunder of it. It is folly to expect any individual dairymen or creameryman to look after the matter. I think it should be done by the Commis-
sion. Some arrangement should be made for collecting this butter through central points and seeing that it gets to St. Louis in proper condition. I think the dairymen will furnish the goods, if the assurance is given that they will be properly handled.

MR. AUSTIN LEONARD: If dairying is represented at St. Louis it will have to be done through the Commission. How many of us are here today, and why? Why have we not 500 here in attendance? If we as dairymen of this State have not enough interest to attend this meeting we have not enough interest or money to carry on an exhibit at St. Louis, and although we do make in this State as fine butter as is made, we cannot get it to St. Louis unless the Commission puts it there.

The PRESIDENT: I should not like the suggestion to be understood as pointing toward any diminution in the amount that has been appropriated for the representation of the general agriculture of the State. That is a mere pittance at best. What the Dairy Union wants is not to divert some of the funds already appropriated, but the appropriation of an additional contribution for a specific dairy exhibit. I take it that that is the sentiment of all who have spoken.

As I understand the question, it is the sense of the Dairy Union that the State Commission should provide in such ways as they deem best for the expense of an adequate representation of the Pennsylvania dairy interests at St. Louis.

COL. WOODWARD: I would like to have the wording of the resolution so complete and full that it will express the sense of the organization and that I shall not be obliged to put any interpretation upon it.

The PRESIDENT: Mr. Norton, I am sure, will express in writing that which we all understand the sense of the Dairy Union to be. Unanimously agreed to.

DISCUSSION OF DR. NEAL'S PAPER.

MR. H. W. COMFORT: I would like to ask whether crimson clover is a palatable food and easily made? There was a feeling that the heads of crimson clover were very poor feed, especially for horses.

DR. NEAL: Our people have learned to make the crop earlier in the year when they intend to feed it to horses. The hull makes an indigestible mass which, when moistened, distends the stomach of the horses. In some cases the horses were found dead and an immense mass was taken from the stomach. It has been many years since the occurrence of a case of that kind, but the lesson taught has been to cut the grass when it is young.
The PRESIDENT: Have there been any ill effects like that observed in cattle?

DR. NEAL: None whatever. The horses alone seem to have this difficulty. Good paper has been made from the manure of horses on account of the presence of the fibrin which they cannot digest. Cows do not have this difficulty.

DR. CONARD: I was much interested in the Doctor's statements about the packing down of the clover, and it suggested a question. We have but one silo which is pretty well filled with silage, and we have some corn fodder which we want to use as the Doctor is using it, soften it and use every bit of it. It was my plan to make a vat or trough about 3 feet wide, 8 or 10 feet long and a couple of feet deep, and to have a false bottom 1 or 2 inches above the other bottom. I would pack that full of shredded or cut fodder, put a lid down tightly upon it and introduce steam under the false bottom, leaving it covered over night or until the next feeding time. In our case the steam would cost us nothing. Will that answer the same purpose in the absence of the silo or not?

DR. NEAL: Will Dr. Armsby explain the difference between cooking and fermentation; that is, the fermentation taking place in the silo.

The PRESIDENT: It is easy to state the chemical difference. Fermentation means a breaking down of the more easily soluble constituents of the body with more or less formation of acids and other aromatic products which would add to the flavor of the fodder and the qualities that contribute to its more complete consumption. Cooking simply makes it more digestible, but I take it that you do not get the flavor that you do by fermentation.

DR. NEAL: Has it been demonstrated that cooked food is not desirable to the dairy cow?

The PRESIDENT: Cooking adds nothing, except that it may conduce to the more complete consumption of the food. There is a certain amount of food in the cornstalk, but if your cow don't eat it, it neither does her nor her owner any good. If by some sort of treatment you can get her to eat that the probabilities are that it will be digested and perform its nutritive function. Other things being equal, however, the cooking is likely to diminish the quality of the food rather than improve it. The practical experience of a great many men is that the advantage of cooking food is not great enough to pay for the cost.

DR. NEAL: There is one thing that can be purchased to make the shorter fodder more palatable; a low grade molasses which you
can buy for 7 or 8 cents a gallon. It is a black and bitter stuff as it comes to you, but when diluted with water it becomes sweet, and when the water that is used to soften the fodder is sweetened with this molasses, I have noticed quite an increase of eagerness on the part of the stock to take it. My men have said, "Why don't you sweeten the water before putting it into the silo?" There would be fermentation and some alcohol. It is not in keeping with temperance principles, but it is very good for young cows.

MR. THOMPSON: Would it increase the flow of milk?

DR. NEAL: I have made no observation. I only notice that they eat it better.

The PRESIDENT: In regard to the home production of protein, looking at it upon the commercial side, it would seem that if we can buy it cheaper than we can raise it that we would not be warranted in raising it. I had a feeling that there is a good deal of sentiment in the advocacy of raising everything on the farm, and especially in raising our own protein. I am aware, however, that there is the question of the fertilization and the value of the residue in the soil. It is, however, a question whether under many conditions it is not cheaper to buy protein than to raise it. If we can raise 16 to 25 tons of silage to the acre, even if there is no protein in it, from the feeder's standpoint it is a question whether we are not going to make more money so that we can afford to buy our extract proteids. It seems to me that this is the side of the question not usually considered.

DR. NEAL: The question of the provisions for the future is the point. Some of us can remember a decade ago when bran sold at $10 a ton and some of us have paid from $21 to $23 this year. We know that the dairymen of Minnesota and Wisconsin are putting butter into the Philadelphia markets and they are using bran at the price at which we used to secure it. At a recent agricultural meeting held at Atlanta, I attempted to buy between 60 and 70 tons of cotton seed meal for a little circle of farmers in our neighborhood. I made a rather close study of the markets around Atlanta and I found that I could not possibly buy cotton seed meal in Georgia and send it up to Philadelphia. We were driven to other parts of the South to get our cotton seed; and, throughout the session whenever I approached a Southern man about buying cotton seed I was told that every effort was being made to utilize it at home. What we got later in the year we got from tidewater; where it came from I do not know; some from Nashville and some from Texas. We must make some arrangement whereby we can supply our own protein. Sugar beet is a good product and a good cattle food. When one
thing goes beyond us, another comes within our reach. It is our business to look after alfalfa, crimson clover and the soy bean, not forgetting the pea, which gives us the richest of all foods; but somehow it does not satisfy us. We must get somebody to take up these things and find how they can get into our agriculture in a business way. We have to search all over the country for the thing that suits our purpose. If we can make money by buying it, buy it. Don't buy bran at $22 a ton when you do not get your money back, when your trade won't allow you to use it.

MR. THOMPSON: We are told bran is worth §16 a ton for fertilizing.

DR. NEAL: I know this, that when you put it on the ground, you cannot go there and get it right back again. At the same time, you are renewing the farm and trying to get more profit. I do not feel that it is mine if I cannot get it back. There is many a dollar goes out as feed that is balanced by what goes into the land, and you are benefited by it. We want the improvement of the land thrown in. We want to see the land coming up all the time, but want something in the bank. The value is there, but I doubt if we utilize it so as to get it out.

MR. THOMPSON: Can Dr. Neal tell us explicity how to select our seed corn?

DR. NEAL: I am not an expert, but in a general way it may be said, that in taking a kernel of corn you will see a mass of white substance that is starch. If this crown of starch is large the percentage of protein is high, if it is small the percentage is low.

MR. THOMPSON: Would not hominy meal be a good feed for cows? It has a good deal of proteids.

DR. NEAL: The name hominy meal, may be applied in different sections of the country to different products.

MR. THOMPSON: I mean the part that contains the germs.

DR. NEAL: It is not a bad food. I used it years ago. It has a tendency to become rancid and you can therefore use it only in small quantities. It is rich in oil proteid and rich in starch.

The SECRETARY: Certain conditions are confronting us that it will be well to make public to the organization and I wish to make a recommendation. Because of changes in the offices that have occurred during the past year, it seems that all records of previous meetings, together with the constitution and by-laws have been lost. I would recommend that this meeting make and adopt a constitution and by-laws and in so doing carefully consider the advisibility of
fixing upon some central point at which all annual meetings will be held; and, that semi-annual meetings, should they be held, take place at some point to be selected from time to time.

You will notice that in the official staff there is no change, except in the board of directors of six, which is changed to an Executive Committee of three. It is impossible to get six members together. Three would feel the responsibility more than six and this would mean a little more active management than heretofore.

The PRESIDENT: It seems that we have neither Constitution nor By-laws and apparently we are not thriving under that state of health. What action shall be taken?

MR. JONES: Owing to the importance of the matter, would it not be better to appoint a committee to consider the subject and to report at a future session? With that idea in view I would make a motion that the Chair appoint a committee of three, or such number as seems best, to report at a future session of this meeting.

Seconded by Mr. Norton.

The PRESIDENT: Is it the intention that this committee include in its report a draft of by-laws?

MAJOR WELLS: It should be a committee on reorganization.

The PRESIDENT: Should this committee when it reports, report a draft of constitution and by-laws?

MR. JONES: I question whether there is time to properly do that. I will include that in the resolution, if that is thought best.

The PRESIDENT: It seems to me that it might be done. It is certainly desirable.

MR. NORTON: The committee should report early in the morning, because we want to elect officers.

MR. JONES: I would change the motion to that effect. I think that the Chair should be a member of the committee.

The PRESIDENT: The Chair is ready to give any assistance, but I think it is just as well not to have him included in the committee.

It is moved and seconded that a committee of three be appointed on re-organization, with the understanding that a draft of a new constitution and by-laws be reported at the morning session to-morrow.

The Chair would suggest that there might be included in this motion a resolution to take into consideration the future of the organization. It is a serious question that confronts us. We have simply mustered a handful here. I feel that we ought to make a strong effort to arouse more interest and get better representation
of the dairy interests of the State. Possibly this committee in the course of its duties can suggest some measures conductive to that end.

Motion carried.

Messrs. Jones, Comfort and Leonard were named by the Chair.

MAJOR WELLS: I move that the President and Secretary be made members ex officio of the committee of three.

Seconded and carried.

MR. NORTON: I move that a Committee on Nominations of Officers, and a Committee on Resolutions be appointed by the Chair, consisting of three each.

Carried.

The PRESIDENT: The Chair will announce the committees at the evening session.

Adjourned to 7.30 P. M.

December 2, 7.30 P. M.

The following committees were announced by the President:

Committee on Resolutions: Messrs. Norton, Jones and Conard.
Committee on Nominations: Messrs. Leonard, Wells and Thompson.

The report of the Committee on Organization:

MR. JONES: The committee met and after considering the matter, came to the conclusion that it was absolutely impossible to draft a constitution and by-laws that would be suitable for this association, and that it was much better to recommend that a committee be appointed to draft these resolution and present to our society at the next annual meeting. We also agreed to make the following suggestions in regard to the organization and appointment of officers for this year: 1. That a temporary organization be effected by the election of the following officers: President, two vice presidents, secretary, treasurer, and an Executive Committee consisting of three elected members and the president and secretary ex officio.

2. That the Executive Committee be instructed to make arrangements for the next meeting in accordance with the practice of previous years.

3. We recommend that a committee be appointed to draft a constitution and by-laws to present to our next annual meeting.

It was moved and seconded that the report be accepted.
The PRESIDENT: This carries an affirmative action upon the recommendation in the report.
Agreed to.

The PRESIDENT: The committee already announced upon nominations of officers will govern itself accordingly in presenting the list of nominations.

The following illustrated lecture was delivered:

*DAIRYING IN THIS AND FOREIGN COUNTRIES.*

BY MAJOR H. E. ALVORD. Chief of Dairy Division of Agricultural Department, Washington, D. C.

Dairying is a prominent feature of the agriculture of France and the industry takes very different forms in different parts of the country. It is, therefore, necessary to travel about and often in paths not frequented by tourists in order to find the places of special dairy interest.

After a visit to the Channel Islands and the homes of Guernsey and Jersey cattle, one may cross the narrow strip of sea, only 15 miles wide, and land upon the west coast of France, in the old province of Normandy. Any one of a number of little towns, all noted as dairy centers, will answer as a standpoint from which to get a view of Normandy, its cattle and its butter-making, so we will locate at Carentan, a place of about 3,000 inhabitants, at the head of an inlet or arm of the sea, which is kept dredged so as to afford navigation for 12 miles down to the English Channel at Isigny.

The farms in this vicinity are quite large and mainly in grass. It is a tide-water region and much of the land is low. The pastures are permanent and the herbage superb. The very best of the Normandy cattle, of which France is so proud, the Cotentin strain, here abound. They are large, coarse, heavy-boned, but sleek and fat. In color they are red, brown and white, spotted and brindled. They have a very wide, heavy, homely face and muzzle, but good, full eyes. The udders are often large, but irregular in shape, with very large and puffy teats. Good cows average 8 to 10 quarts a day for 10 months, or 3,000 to 6,000 pounds of milk per year. It requires 12 quarts of milk in the winter and 15 in the summer to make one pound of butter. The butter product of good cows is, therefore, 200 to 225 pounds per year; ordinarily 100 pounds a week from 20 cows,

*This lecture was very generously illustrated with lantern pictures made from photographs collected by Major Alvord during recent visits to the places described. These cannot be reproduced here and interest in the subject, as presented, is thus reduced at least one half.
rising at times to 125 to 130 pounds. An American dairyman would see little about these cows indicative of economic dairy quality, and would hardly choose them for "dual purpose" animals, yet some cows among them are claimed to be very profitable. The calves are simply marvelous, in size, thrift, rapid growth and fatness, making veal of the highest quality and selling at prices which make one of the most important sources of farm revenue. Good calves, 6 to 8 weeks old, often sell for $25 to $30 each. I saw carcasses of veal several times which weighed 250 pounds and over; these calves, when alive, must have weighed over 400 pounds, and they were not two months old. The cattle roam in extensive pastures, often at some distance from the farmstead. During the very long pasture season, including parts of winter, the female members of the farmer's family, or laborers, usually women, may be seen twice a day traveling over the farm lanes and country roads, in little donkey carts or mounted on donkeys, and surrounded by numerous milk pots or cans, closely resembling those used in Jersey, but running in larger sizes. The cows are sought in the fields and often found much scattered. They are not called and do not come up to be milked. The milkers pass from cow to cow, and kneeling on the ground, or in the position known as "sitting on one's heels," milk with both hands or one, directly into the small mouth of the milk pot, or, in somewhat rare cases, onto a strainer cloth stretched over these openings. The can covers are carried along and when a can is full, the cover is put on, and the can left standing on the ground, perhaps in full sunlight, until the end of the milking. The hours from 5 to 7 form the milking period, at both ends of the day. When completed, the donkey (which has meanwhile been grazing and wandering about, perhaps carrying the cans to the most distant part of the field) is driven around to pick up the scattered vessels of milk, which are then carried to the farmhouse. The building is almost always of stone, and on a shady side a room has been set apart, with very thick walls, one or two small windows, and a stone floor, for keeping the milk. Often it is empty except for the supply of heavy, earthenware jars which hold from 12 to 20 quarts of milk apiece. These are called terrines (earthen jars) and chaudiers (warmers). These vessels stand upon the floor or on a permanent bench around two or three sides of the room. Into them the milk is strained on arriving from the field, and atmospheric temperatures alone depended upon for cooling. Natural ice and cold water are scarce articles hereabouts. These milk rooms are never cold, but, on the other hand, they never get very warm, even in mid summer. They are kept well whitewashed and scrupulously clean, in Normandy, and considering the large bulk of milk set in one vessel, and the want of care prior to straining away, the milk keeps sweet an aston-
ishingly long time. The milkers are by no means as clean as they might be, in person or dress, the metallic pots are never steamed and rarely scalded, but are washed clean and aired. The cows are in the best of health, with the purest of food, but they have poor water. Their bodies are clean and they are always milked in the open air, with cleanly surroundings. If the milk sours in less than 24 hours, as it seldom does, it is churned entire. Otherwise the milk is skimmed at the end of 24 or 36 hours, and the cream churned the same day, or the next. Churning ordinarily occurs every morning and early, while it is cool. The cream when churned has developed but little acidity, and the butter has a mild and rather flat flavor. Pure cultures, ferments and starters are unknown. Dash churns are used, both of vertical and barrel form. Some horizontal barrel churns are operated by a one-horse sweep-power. The butter is gathered in the churn, in mass, after very thorough washing, lifted out and worked in a wooden bowl or long tray, with the bare hands. Salt is never used, at least not at the farm dairy where churning is done. In cleaning the churn at the final rinsing, a bunch of the common nettle plant (Urtica Urens) fresh or dried, is shaken about in the churn. No reason is given for this, except that it has always been done; yet some, on being pressed, say they think it helps to cleanse the churn, and others that it “makes the butter come.” The churning seems to be exhaustive and the butter is generally well-made, although rather over-worked. No fat testing is known and no means exist of telling whether fat losses occur in the skim milk and buttermilk; these by-products are, however, judiciously fed to calves or pigs. The milk room is sometimes large enough to accommodate the churn and churning, but ordinarily this work and the general dairy cleaning is done in an adjoining room, where there are provisions for a fire, and set-kettle. The premises and utensils are usually kept very clean. The work is done by women and there is no stinting of labor. There is no scientific practice or study of problems involved, all is done according to traditional rules and habit. Yet the average butter of Normandy is well-made and good of its kind.

Twice a week the farmers’ wives or daughters take the butter to market at the neighboring town or village. It is prepared early in the morning, formed into big lumps, wrapped closely in large, coarse linen cloths and put into wicker baskets of the shape of a flower-pot. This form or lump of butter is called a motte. If quite warm, the mottes are made smaller than the baskets, and between cloth and baskets the space is filled with clean, unbroken wheat straw. Straw is drawn over the top, unless the basket has a good cover. These baskets vary in size and the mottes of butter weigh
from 8 to 10, to 50 or 60 pounds. They are carried to market in the one-horse farm road cart common to all Western Europe, or in a smaller donkey cart of similar pattern, or in paniers on a saddle animal. From ten o'clock until noon on the proper days, the roads leading to the market towns are filled with the neatly and plainly dressed country women of Normandy, carrying their butter to the sale.

About eleven o'clock the buying begins. In the market place, or on the village common, buyers have arranged receiving enclosures or booths, with provisions for weighing and for paying. These buyers represent Parisian or other merchants, or the large factories at which butter is manipulated and further prepared for market. The country women gather around the square with baskets on the ground. As a buyer approaches, the package is uncovered, the top of the motte exposed, and the buyer, with a peculiar knife or a little tryer, examines the butter and makes an offer for it, at the same time placing marks on the surface of the butter, indicating in characters secret to his house, the grade of the article and price offered. If the owner rejects the offer, these marks are obliterated, the top of the butter smoothed and another buyer awaited. If accepted, the basket is at once taken to the proper stall, the motte removed, unwrapped, weighed and reported to the bookkeeper and cashier at hand. The butter is weighed on a peculiar platform counter scale or by steelyards, and unprotected, exposed to sun and storm, dust or rain. The weigher picks up the lump of butter in his hands and sends it sailing through the air to an attendant with a very large, linen-lined basket ready to receive butter of the special grade to which this is assigned. The owner is paid cash at once, and retires with empty basket and plethoric purse, to gossip or "shop," or return to the farm.

This butter buying at local country markets in France, is done with remarkable rapidity. Of course the buyers know well the various makers and the usual quality of their butter. But every lot is tested and a decision as to grade and price must be stated and marked. At a market which I witnessed at Carentan, held on an August day in the shadow of the fine old church of the 14th century, which this little town possesses, there were twenty buyers, representing four purchasing firms or factories. In most cases the butter was examined by only one person, the sale being virtually fixed in advance, but very many mottes were tasted three or four times. The number of makers represented and the total number of mottes, could not be determined, arriving sellers so rapidly replaced those retiring, but there were several hundred. The cases were very few where one person offered over 50 pounds. The best buyers worked at the rate of 150 lots of butter per hour; and in two hours, that
day, an aggregate of over 100,000 pounds (or 50 tons) of fresh (un-salted) Normandy butter arrived, was tested, graded, sold, delivered and paid for. The sales at this town sometimes exceed 60 tons on Mondays, but are less in quantity on Fridays. The butter purchased was placed by the buyers in 13 different grades, with as many different prices, ranging from 15 to 30 cents per pound and averaging 24 or 25 cents.

Most of the butter bought at these country markets in Normandy is taken for the proprietors of large establishments which are really blending factories, a kind of butter factory hardly known in America. One of the oldest and best known of these is located at Carentan. It is a big concern, employing at least 600 persons altogether, receiving 25 to 40 tons of butter a day, in a dozen different grades, which is mechanically blended, repacked and sold in four commercial grades. Sales amount sometimes to 100 tons a day, although ordinarily only about 30 tons. The business of the year aggregates 9,000 to 10,000 tons of butter, worth from four to five million dollars.

South of Normandy is the old province of Brittany with its excellent little dairy cows, black and white, and its entertaining and picturesque peasantry. But the dairying of this region does not differ much in character from that of Normandy. It is not as well conducted and the butter product ranks lower in quality and price. There is an agricultural college with a dairy school annex in Brittany, and away to the west, not far from Brest, an excellent practical school of dairying for the daughters of peasant farmers. It is thoroughly a dairymaid's establishment.

Should one travel still farther south in France, keeping within fifty miles or so of the west coast, the old province of Poitou would be entered, lying between the rivers Loire and Gironde. In this district, and particularly in the Departments of Deux-Sevres, Vendee, Charente and Lower Charente, is to be found the best French development of the co-operative system of butter-making. The first factory under this system was organized in 1888, with 88 patrons, and produced that year 65,000 pounds of butter. There are now more than one hundred of these co-operative creameries in the region described, with 50,000 patrons, owning 125,000 cows and producing annually about 17,000,000 pounds of butter. Most of these establishments are less than 8 years old; they have organized in a strong association. The industry in this region has been developed in a former wine-making country, where the vines were destroyed, from ten to twenty years ago, by phyloxera. In the rest of France there are another hundred creameries, but most of these are proprietary. Half of them are in western departments and the rest are scattered through other portions of the country. There
is nothing instructive in these French creameries and they are hardly worth a visit.

Paris and its milk supply, with the producing farms, are the next form of dairying to be considered. The main point of interest is the endeavor to conduct the milk service of this great city almost entirely without provisions for cooling milk, on the farms, during transportation or in the city, either by dealers or consumers. Failure to give satisfaction to anybody is the natural result and sweet milk is a rare article in Paris, during warm weather, excepting two or three hours immediately after the deliveries, which take place twice a day and sometimes thrice. A few of the largest milk supply companies keep cool milk at their city depots when they succeed in bringing it sweet from the farms, and there are a very few milk farms, fairly up-to-date along some lines, within easy access from Paris. Such an one is the celebrated Farm of Arcy in Erié, where about 200 cows are kept, and which was the first, so far as known, to regularly deliver milk to city consumers in scaled glass or porcelain vessels of small size. The Arcy sealed jar of white opaque glass, holding one litre (or large quart) first appeared in Paris in the year 1873. This is still in use, notwithstanding its great weight and its clumsy metallic cover. At this farm and very generally in connection with the city milk supply of Paris, the chief reliance for preserving milk is pasteurization.

It is well worthy of note that at a special show of perishable dairy products held as an annex to the Paris Exposition, in July, 1900, just outside the city limits, where French producers had every opportunity of exhibiting their goods in the best possible shape (although under favorable local conditions after reaching the exhibit), there was a large collection of natural milk and cream. But the only samples of these products, absolutely free from chemical preservations, and uncooked, which were sweet and palatable after noon of the exhibition day, were from dairies in New York and New Jersey, then eighteen days from the cow! There was also in the United States dairy exhibit, natural milk and cream from a farm in Central Illinois, in bottles exactly as sent daily to Chicago families, which was only very slightly acid, although twenty days old. It had kept sweet until the day before this show, and even later it was better than the best normal French milk only twelve to twenty-four hours after milking. The American products had been preserved solely by cleanliness and cold.

In the northern part of France, or the territory lying between Paris and the Belgium border, the dairy industry is not especially developed and presents little of interest. Large farms abound in that region, with extensive cultivation of wheat, barley, grass, sugar beets and potatoes. Almost every estate has some industry,
like the making of sugar or starch or alcohol. There is also an active live-stock interest; but horses and beef cattle and sheep receive most attention. There are mines in this region also, coal, iron and lime, and numerous large manufacturing towns, such as Amiens, Arras, Douai, Lille and St. Quentin, so that there are large local markets for hay and all forage, and so far as there is dairying, it is nearly all for making milk for town supply. Yet this part of France, and particularly French Flanders, is the home of a race of cattle not widely known, which furnishes by far the best dairy cows in this part of Europe. These are the Flamanades, a large-framed, rangy, dairy type of cattle, uniformly dark brown or almost black in color, healthy, active but docile, good feeders and producers of large quantities of rich milk. These cattle justly won the sweepstakes prize for dairy animals at the Paris Exposition stock show. But it is said they always deteriorate rapidly when moved from the comparatively small district in which they had their origin or development, and this accounts for the breed being so little known elsewhere.

To find other interesting dairy districts in France one must, therefore, travel again to the south, and fully half way from Paris to the Mediterranean Sea. This brings one into the old province of Auvergne, that very beautiful mountainous district which covers the present departments of Puy-de-Dome and Cantal. It is an elevated territory, near the center of the country, with the great valleys of the rivers Gironde and Rhone on either side. It is a favorite region with tourists and with those who enjoy mountain air and mineral water. The attractions are picturesque hills and valleys, quaint towns and old castles, peaks like Mont Dore and Puy-de-Domo (with its 25 famous springs), and numerous health resorts, among which is Vichy, and its immense hot springs, whose waters are known the world over. The dairying is influenced by the typography of the country and the comparatively scattered population. Aside from supplying local wants, the chief dairy product is cheese and this is one of the only two parts of France in which a large cheese is made. This kind is called the Cantal; in shape it is like a cask, or an English Cheddar, often two feet high and eighteen inches in greatest diameter. It is solid, well-pressed, but the curd is not cooked and the body is soft and white, like an uncured cheddar. The exterior of these cheeses is dressed so as to have a white, chalky appearance; they weigh from sixty to one hundred pounds, and are regarded as of second quality in the Paris markets.

Passing still farther south, the Department of Aveyron is reached. Here the country is still more mountainous and very rough, rocky, bleak and unattractive. The high ridges are almost destitute of trees and but poorly covered with verdure; the valleys are deep,
narrow and sparsely settled. Miles can be traveled without seeing a human habitation. Yet all this apparently remote and unfrequented region is traversed by those wonderful public roads to be found everywhere in France, as substantially built, as smooth and as well-kept, although not as wide, as the Grand Boulevard and Riverside Drive in New York City. These magnificent highways wind around among the mountains, sometimes pass through them by tunnels, and are carved from the sides of the precipitous cliffs, so as to maintain easy grades, and often span deep chasms, or cross valleys from mountain to mountain, upon causeways of solid masonry, with long series of lofty arches. This grand public work, as complete when passing a hamlet as when approaching a city like Orleans, commands the admiration of the stranger for the engineering skill displayed, the evident durability of construction, the perfection of finish and maintenance, and the beauty of the numerous bridges and arcades.

Aveyron may also be approached from the south, by the Midland Railway, which, from the quaint old city of Cotte, on the Mediterranean shore, traverses miles of rock country filled with vast vineyards, the town of Narbonne being a great wine producing center, and then climbs and winds through the hills and a coal and iron mining district, until it enters the desolate country already mentioned. Descending from the carriage of the iron road—as the Frenchman says—at the station of Tournemire, a hamlet only, upon the little stream called Soulzon, in a deep valley, one sees clinging to the face of lofty limestone cliffs what looks at a distance much like an ancient cliff town in a canon of Arizona. This is the village of Roquefort, appropriately so called, and which has made its name known throughout the civilized world, by the unique variety of cheese which now, as for many generations, if not centuries, has constituted the sole industry of this little town and the only raison d'être for its existence in that peculiar location.

Following a good highway, winding up the face of the mountain from the valley, the climb of 2,000 feet is easily made, a pair of horses carrying a strong vehicle and six men at a trot much of the way. Then a snug little town is found, solidly built of stone, upon terraces. It has a fixed population of about 800, temporarily increased to 1,000 in the busy season. The buildings are severely plain, many old, and nearly all have one side attached to the cliff. They are two, three and sometimes four stories and most of the houses are but one room in depth, as light and air are available only on one side, overlooking the valley. The rocks tower above the little town 1,000 or 1,200 feet or more, like a lofty rear wall, and the face of the mountain has a crescent shape, with this queer settlement clinging to the deepest part of the concave surface, and
with a northeast outlook, so that the village experiences a very short day, and lies in the shadow of the cliffs most of the time. This adds to the sombre, damp and chilly aspect and feeling of the place. As often occurs in limestone formations, the mountain behind the town is full of fissures, caverns and passages. And through these caves there are strong currents of cool, moist air, and little streams of water. The temperature of these caves is about 45 degrees F., varying only a few degrees throughout the year. The water flowing from numerous springs, sometimes passing through dwellings or factories, has just about the temperature that is ordinarily recognized as "icewater."

These natural caves, and their uniform atmospheric conditions, explain the location of this unique town. The circumstances appear exactly suited to the slow-curing process and the growth of the blue mold (Penicillium Glacorum) which give the characteristics to the famous cheese of Roquefort. Perhaps it would be more correct to say that these local conditions create or make possible the peculiarities of Roquefort cheese. But the important fact must also be taken into account that this cheese is made from the milk of ewes instead of cows. The milk of sheep contributes additional peculiarities, being especially rich in fat, abundant in casein and having characteristic flavors.

Roquefort is said to have been first settled in the time of Charlemagne. It is certain that cheese was made by many peasants in this region, from sheep's milk, in the early centuries, and carried to the caves of Roquefort to be finished and cured for market. The history of the industry from the 11th century to the present time seems to be unbroken and indisputable. Nor has time made great changes in the process of making and the character and quality of the cheese itself. Economies in production have been developed, however. Formerly 3,000 or more peasants, or owners of sheep, made the cheese in as many dairies, scattered over a wide area. These cheeses were taken to Roquefort and cared for by the inhabitants of the little village in an unsystematic way, in the mountain caves of various sizes, numbering altogether perhaps two hundred. Gradually, there has come about a union of the cave owners and managers, until the business of Roquefort is practically controlled by two large companies. Only four of the largest of the natural caves are now used, these being supplemented by several ponderous buildings of stone, several stories in height, and which include immense vaults or artificial caves, tier upon tier, to which the air currents from the mountain caverns are admitted by tunnels, in ways which secure some desirable difference in temperature and moisture, in different apartments. At the same time co-operation has been effected in the early stages of manufacture. Dairies (lai-
teries), or, as we would call them, cheese factories, have been built all through the surrounding country until there are over 100 of these. To them the peasants carry the milk every morning and the factory work is under the supervision of the Roquefort companies. In many cases the companies buy the milk at the factories, paying from $1.75 to $2.50 per 100 pounds, or 16 to 24 cents per gallon, according to the season and consequent solid contents of the milk.

The sheep maintained for this dairy industry are a big-bodied, long-legged, white-faced breed, called the Larzac. Heads, legs and bellies are bare and the animals yield fleece of medium wool averaging about five pounds. Their tails are never cut and the longer they are the more the animals are esteemed for milk producers. Lambs are dropped in mid-winter and the ewes are milked until July or August. The active cheese-making season is thus limited to five or six months and the rest of the year the sheep recuperate, while the Roquefort caves and villagers are busy curing, packing and shipping cheese. Good flocks of ewes yield an average of one quart of milk a day per head, during the season. The cheese product is estimated at 25 to 30 pounds per year to the ewe. The sheep contributing to this Roquefort industry are mainly owned within fifty miles, although some of them are double that distance. Altogether, there are at least half a million (500,000) ewes milked every year in this region for the purpose of making cheese.

The Roquefort cheese is quite common in American markets. The details of its manufacture need not be given here. It is usually about 8 inches in diameter and 3\(\frac{1}{2}\) or 4 inches thick and weighs 4 pounds, or a little more. At the cave a good cheese is worth at least one dollar. It generally comes to this country closely wrapped in tin-foil. The total annual production of Roquefort proper, approximates 12,000,000 pounds, and when I visited the caves, in the month of August, they contained nearly three millions of these rich, highly prized, and high priced cheeses, in various stages of curing, finish and preparation for market.

The labor of hauling all this cheese from the distant factories, over and through mountains and valleys, up to the town and the caves, and down again to the railway station, is a heavy tax upon the industry, but seems to be regarded as a matter of course. The work is performed with very long-bodied, two-wheeled vehicles and heavy non-descript horses, hitched tandem or tridem. The loads are sometimes very large and curiously balanced by several hundred-weight of stone, hung in chains, to different parts of the cart.

From Roquefort in Aveyron, the next move to be made, and the last, to study French dairying, will be northeasterly to the Jura
Mountain region. In the territory to the east of the old province of Bourgogne (Burgundy) were formerly the district or subprovince called the Franche-Comte and the duchy of Savoy. Here are now to be found the Departments of Doubs, Jura, L'Ain, Savoy, and Upper Savoy. These are all cast and a little north from the city of Lyons and not far west from the Swiss cities of Geneva and Neuchatel. This region is the seat of activity in the manufacture of Gruyere cheese, and is full of interest not only as to present conditions but as regards the history of associated dairying. It is essentially a mountain industry; mountain pastures, mountain cattle and a comparatively scattered mountain population, contribute to its characteristics. The cattle of the country have been for centuries a large, coarse, red-and-white variety, known by the name of Montbeliarde; this is a regional type, if not a breed, resembling its neighbor the Simmental breed of Switzerland.

The most notable feature of the cheese-making of the French Jura region is that it has been carried on from a very early period under a well-defined local system of co-operation among the milk producers and cheese-makers. It has been claimed and believed that the plan of associated dairying originated in the United States near the middle of the XIXth century and was first developed in the form of the co-operative cheese factory. Collectively, the cheese factories and butter factories or creameries of this country have been designated as "the American system." But whatever honor or credit attaches to the origin of this idea and practice of co-operation in dairying, must be surrendered to Eastern France. The plan has been known and followed continuously in this mountain region between France and Switzerland for several centuries. It undoubtedly originated in that region, but how long ago, no one knows. There exists a historical record of co-operative cheese-making in the XIllth century, in the present Department of Doubs, and no document of like age is known which refers to a like industry in any other country. In the middle of the XIVth century little associations for cheese-making were numerous and active in Upper Jura. In the XVIIIth century, their number and work were so important in the Franche-Comte as to be subject of special laws. These associations became well organized and quite numerous two hundred years ago. Examples of the articles of association and of contracts between the society and its several members, as to contributions or sales of milk, and also as to cheese sales, are still preserved, which are 200 years old or more. It is hardly expedient to further follow here the history of these little factories, or their present organization and operations, interesting as they are.

Although the variety of cheese for which the whole Jura region has been noted, is not believed to have been materially changed in
character during all these centuries, it has changed its name. It was at first and for some hundreds of years known as vachelin. But at the beginning of the XIXth century, the home supply of cheese was insufficent for France, and importations from Switzerland rapidly increased. The cheese of the French Jura seems to have been "not without honor save in its own country," and that of the Swiss Jura practically the same thing, became such a favorite in France that its Swiss name, Gruyere, was adopted as a substitute for vachelin, and has been in use ever since.

The name Gruyere comes from a small but very old village in the canton of Fribourg, Switzerland, situated only a few miles northwest from Lake Geneva. This little place was formerly the capital of the county of same name. The castle of the Counts of Gruyere is an ancient one, overlooking the village. They were powerful noblemen, possessing a wide territory extending from the lake well into the Alps. But the last Count of Gruyere was a prodigate and spendthrift and in the year 1554 the possessions of the family were divided and dispersed and the title ceased to exist.

The Departments of Jura and Doubs lead in this industry but it is also active in L'Ain, Savoy and Upper Savoy. These five departments produce about 40 million pounds annually, and the same variety is made more or less in at least 30 other departments. The total yearly product of Gruyere cheese in France is, therefore, 45 million pounds, sold by the makers for over five million dollars. (The average price for the last five years has been rather more than 11 1/2 cents per pound.)

The importance of the dairy industry in Eastern France has resulted in the establishment of several institutions in its interest. There are thirteen (13) practical schools of cheese-making in this region, the most important of which is located at Poligny in the Department of Jura. The only National Dairy School of France is also in this part of the country, being located at Mamirolle, in the Department of Doubs. This is a well-organized establishment, in good hands and, although not largely attended, it is doing excellent work. Central dairy instruction is given, but the specialties of the school are the manufacture of Gruyere and Emmenthal cheese. These two kinds resemble one another closely and yet there is a distinction. Just as the cheese-makers of the French Alps years ago borrowed the name Gruyere under pressure of Swiss competition, so, in recent years, what may be called an improved Gruyere, has come into France from Switzerland and won an enviable reputation under the name of Emmenthal. Nearly all Swiss cheese imported is now of this variety. To meet this new, or renewed competition, the school at Mamirolle is leading in a movement to improve the Gruyere of Eastern France and to adopt
the latest Swiss name. The Emmenthal cheese differs from the average Gruyere in these particulars: Less cream is taken from the night's milk and the skimming better regulated according to the season, so that the fat content of the milk made into cheese is greater and more uniform. Gruyere is usually made from milk carrying little more than 3 per cent. of fat and often less; milk for Emmenthal should have 3.6 to 3.7 per cent. of fat. Of course the cheese produced is richer and better. Very strong rennet is used, prepared with extra care. The separation of the whey is very complete before cooking. The pressing of the cheese is stronger and longer. After pressing, there is a brine bath for two days. The curing room is held at a higher temperature—from 68 degrees to 72 degrees F. The Emmenthal is made considerably larger (170 to 200 pounds) and with more finish. Altogether, it is a Gruyere (or Vachelin) or Switzer-kase, of high grade.

The pictures which were shown illustrated fully and graphically the various portions of the subject above described, as well as parts necessarily omitted here. There were, in addition, a considerable number of interesting views representing scenes, special features and peculiarities, of the dairy industry in Switzerland, Sweden, Denmark, Holland and Great Britain.

December 3, 1903, 9 A. M.

The meeting was called to order by the President.

The PRESIDENT: I would like to call attention to a matter without leaving the Chair regarding the action of the last Legislature in providing for the construction of an agricultural building at the State College. I think it particularly appropriate to call the attention of this organization to the matter, because the movement of the farmers and agriculturists and the dairymen of the State which culminated in the passage of that act, really had its inception in the meeting of the Dairy Union at West Chester. "Some of you will recollect that at that meeting a committee was appointed to consider the state of dairy education in Pennsylvania. Later in the same year other agricultural organizations, the Grange and the State Board of Agriculture, took similar action with regard to agricultural education in general, and the State Board of Agriculture finally took the initiative in calling the conference in what has come to be called the Allied Organizations. So, I think the Dairy Union can take just pride in having focused this sentiment of the State in agricultural education. As you know, the last Legislature appropriated $100,000 to begin the erection and equipment of an agricultural building and accompanied that with provisions, which virtually pledge, $150,000 more to
complete the structure. That is intended to house all the agricultural interests of the institution so far as they relate to instruction. It was the understanding that this building was for purposes of instruction in the varied branches of agriculture, including forestry. In view of the manifest importance of the dairy interests of the State, I would like to make two suggestions:

1. It seems to me that the Pennsylvania Dairy Union ought to recognize in some formal way the action of the Legislature and of the Governor in passing and approving this bill which has proved for this State Dairy Building, which we believe will be the equal, if not the superior of any dairy building in the country. The Legislature and Governor treated us very generously and we shall put ourselves in a false position, if we adjourn without some expression of appreciation. Possibly the Committee on Resolutions may think it well to bring in a resolution bearing upon this matter.

2. I think it would be very appropriate for the Dairy Union to be officially represented at the dedication of this building, which we expect will take place in January or February. I think some arrangement can be made for an official delegation of the Pennsylvania Dairy Union to be present at the dedication of this dairy building which we have done so much to secure.

The Nominating Committee asked that the reading of the report and election of officers be postponed until the close of the session.

REPORT OF THE COMMITTEE ON RESOLUTIONS.

"Resolved, That it is the sense of the Pennsylvania Dairy Union that adequate and ample provision should be made by the Pennsylvania Commission for a full representation of the dairy interests of this Commonwealth at the Louisiana Purchase Exposition, and that to this end the Commission be urged to provide sufficient space at the Exposition and to arrange for securing typical specimens of the best dairy products of the State, and for their transportation to and reception at the Exposition under such conditions as shall ensure their being exhibited in prime condition."

The resolution as read by Mr. Norton was considered the official expression of the sense of the Dairy Union upon the matter discussed the day previous.

"Resolved, That the Pennsylvania Dairy Union hereby expresses its great satisfaction at the unanimous passage by the Legislature and the approval of the Governor of a bill appropriating $100,000 for beginning the construction at the Pennsylvania State College of an agricultural building.

"Resolved, That a copy of these resolutions be sent to the Governor and to the chairmen of the Senate and House Committees on Appropriations."

It was moved and seconded that the resolution be adopted. Carried.

"Resolved, That the executive committee be empowered and instructed to officially represent the Pennsylvania Dairy Union at the dedication of the
new Dairy Building at The Pennsylvania State College, and that they be authorized to add to the delegation such other members of the Union as may be practicable."

Moved, seconded and carried.

"Resolved, That the Pennsylvania Dairy Union hereby records its commendation of the active and efficient administration of the dairy and pure food laws of the Commonwealth by the present Dairy and Food Commissioner, Dr. B. H. Warren, and pledges its support to every effort to secure the suppression of fraud in the sale of these products and the impartial and thorough enforcement of the laws upon this subject."

Moved, seconded and carried.

DR. CONARD: Mr. Perham has asked that I receive the dues and forward them to him. The Dairy Union will be at considerable expense, not only for the cost of the meeting, but for the publication of the transactions, which I hope will be accomplished in a short time. Since the statement was made yesterday of there being two dollars in the treasury, I have received a letter from Mr. Perham stating that he has received from our former secretary, thirty-six dollars, giving us thirty-eight dollars. I hope that those who are present will pay their dues promptly.

The PRESIDENT: If the Dairy Union is to accomplish anything it must have a moderate sum of money. We cannot do this work for nothing. I certainly hope that all members of the association will feel that it is not a duty but a pleasure to contribute the small amount of dues, a dollar a year, to the support of this organization.

MR. JONES: Might we not add that we would like to have others join the association also?

The PRESIDENT: That should be made very emphatic.

REV. MR. DETRICH: I would not become a member of this organization for fear you would make me an officer. I find, however, that you have made me an officer without my becoming a member, but I shall be glad to pay the dollar.

The PRESIDENT: I do not see how the gentleman can very well help it.

The following paper was then read:

NOTE: The Reverend Mr. Detrich delivered this address without notes or manuscript. It is a stenographic report, but we all feel that much of the valuable address has been lost, as Mr. Detrich, while a clear and distinct speaker, has a rapid utterance and thoughts flow so readily from one sentence to another that little or no time elapses between sentences, and the stenographer has never been found who has been capable of making a verbatim report of Mr. Detrich's addresses.

It is to be regretted, in this instance, as in many others, that such is the case.
Two very noted reporters in 1903 at the State Dairy meeting held in Hartford, Connecticut, tried to get Mr. Detrich's memorable address on that occasion, but failed in their attempt. We publish the stenographic report, with the explanation that we have given above, as being due both Mr. Detrich and the reporter.

TWENTY YEARS' EXPERIENCE IN THE SCIENCE AND ART OF A DAIRY HERD.

BY REV. J. D. DETRICH, WEST CHESTER, PA

I am very glad to speak this morning upon this subject. Scientific knowledge is only attained by the rudimentary knowledge given us by scientific men. It is the foundation of agriculture to-day. It is folly not to make use of the present day literature upon these matters. The knowledge which has been brought to us by scientific men through chemistry in the last twenty-five years has taught us more about the earth and Nature, and the growing of crops than that taught in the whole previous history of the world. That which had been done before was done by guesswork. Nearly every person planted according to the signs, and it was not strange to find persons superstitiously believing that if crops or seeds were not planted on such a day they would not grow, and that if a cow did not have a pink string tied to its ear or its horns bored, it was likely to have all sorts of evils befall it. This knowledge gained in the last 25 years is invaluable to the man living on the farm and handling the dairy animal according to the most recent facts obtained.

We knew nothing about the animal until we took up the matter and studied it as a layman can. Books on the subject can be had for the asking; but there is really no good book on feeding or breeding, for such rapid progress is being made that no man could keep pace with it and put in book form that which he had written and be satisfied to see his name attached to it two years afterward. It is this rapidly acquired knowledge that the Dairy Union should spread before the community. There is not a farmer but what would be benefited by the knowledge given out in such bulletins. We preach to-day that there is nothing so grand as the earth. It is the source of an immense amount of pleasure, and strength and thanksgiving, whether we study the rocks, the plants, the soil or the farm. The earth is filled with wisdom by the Deity who made it, and made you and made me.
Consider the dignity of the farmer; He can turn to a bit of soil and have it bring forth crops. In proportion as he complies with the law of the Deity is he a man successful with his farm and flock. If a man does not follow these laws he is doomed to have but 1,000 instead of 15,000. God is not going to feed a man's flock which the man has neglected to do himself.

The system employed at the Flourtown farm is the soiling system and we have found it satisfactory, because the animal is kept from breaking up the field and because you can take your by-products and foods grown and so balance them that some of the cows will milk 330 days in the year. Who heard of a balance ration 35 years ago? Who heard of a silo 50 years ago? Who heard of our breeding of cattle until a few years ago? Some persons say that we do not hear of the 36 and 49 pound cow in these days. What we want is to improve our breed of cows that we may have a number of milkers that will give us 20 quarts a day instead of having one or two that will give more. We do not want to raise a stock of corn 20 feet high, but such corn from which you can raise 100 bushels to the acre; not one stalk of grass above the rest, but the whole crop of a good quality and 4 tons to the acre.

In handling our herd, we keep the cows in the dairy barn and only exercise them by leading them out with a halter. A well-fed animal will not work, as a rich man will not walk much. You must work according to the laws of Nature and use your good judgment. The intelligent brain of man, choosing the animal, has improved over the native animal of the plain and forest. As man comes into knowledge of the laws of his Maker he improves his powers of mind and is enabled to add to his crop and to his herd. We know that these laws have been laid down for us and we have tried to conform to them. Instead of making an animal more wild we have made her more domestic. We are, however, obliged to know the secrets so that we do not damage her health and retard her product. Every animal in its natural state is in the open air and when you bring her within the walls of a building you have to watch her that you do not weaken powers contributory to the purpose for which she was intended. In order to do this we have watched the temperature of a dairy barn carefully. It is singular how the wind affects animals. An east wind will always take cattle off their milk. You will find that the milk flow will be lessened, no matter how you feed or water or care for the cows. The cold northwest wind seems to be bracing to them. The south and west winds have no effect. You should be careful not to allow any draught from an east wind come over the cattle. Why this is so it is difficult to say. You should be very particular about the ventilation of a dairy barn. It is ten times better to keep a thermometer in the barn than to expose the herd
to an unknown temperature at this time of the year. Yesterday I saw plenty of animals out on these cold hills. Take an animal that has been out a day like yesterday, put her in a dairy barn and leave the windows open and nothing will sooner produce tuberculosis. I have noticed that when you and I catch cold it is when we are exposed to the cold, contrary to our general habits. We will find that animals standing in the drenching rains are the ones that develop disease. You can scarcely make be believe, after 15 to 20 years experience with dairy animals in stalls, that domesticity weakens the constitution and produces disease. The temperature of a dairy barn should not be up to day and down to-morrow. When the stables are being cleaned both doors should not be open. From the 1st of October no two doors should be open at the same time. The stable should be cleaned every day, and there should be disinfection and whitewashing. The comfort of the animal should be considered just as carefully as the food. You cannot make me believe that there is any use in allowing an animal to go out over a number of acres of ground and try to make a living for one's family. The dairy animal is intended as a milk producer. Domestication has changed the animal and has changed everything, houses, railroads, etc., and are we weakening? No, there are more brains in America than ever. The dairy business has become a science, and we must have agricultural colleges and educate our farmers if we expect the State of Pennsylvania to hold her position in the raising of animals and crops for the good of its many citizens.

It requires a wider range of knowledge to be a farmer than a lawyer or a preacher. One of the difficulties about the dairy barn is to keep the atmosphere pure. There are different views about the carbonic gas formed. If you lie down flat in the barn you will find out that there seems to be a difference in the atmosphere than when you stand erect. The getting up and lying down of the animal raises the gas to the top of the barn.

In the production of animals, I have not tried to get phenomenal milkers, but profit-makers. We study to know each animal individually and try to meet its needs.

The care of the manure from the dairy barn is as important as the care of the milk. If the milk is not cared for my customers find fault; if the manure is not cared for my fields will not be satisfied. Fermentation in the manure acts upon the most volatile part, and if it is put on as a top dressing after being exposed for five or six weeks, the loss is in proportion to the amount of fermentation and the land suffers accordingly. Experts in the testing of soil have told me that my soil is three inches deeper than my neighbors, the finest soil they had ever examined, and that it had five million bacteria to the 1-30 of a cubic inch, four times as many more than the best soil
the chemist had ever examined. This result has been brought about by starting on this little farm on the basis of science and putting that science into practice. We raise all our head fodder, because we would much rather buy feed than commercial fertilizers. These experts are trying to find what kind of bacteria are in the soil. Consider the value this knowledge will be to the agricultural world. Here is a farm which originally had one horse and two cows and bought hay, to-day the soil is marvelled at for its richness. These bacteria will never be found in poor soil. This is the scientific knowledge that we have of the soil to-day. What did our forefathers know about the bacteria of soils? They would talk about poor and rich soil, but they never knew of the life that was in the earth. We know of it to-day. Therefore, the position which I hold in relation to the world about us is that we should know the laws of Nature and obey them. Farming then will never be guesswork but will be founded on a scientific basis.

DISCUSSION.

MR. AUSTIN LEONARD: I am not a speaker, but I wish to relate an observation verifying the force of Mr. Detrich's remarks. I have a friend in New York State whose two sons preferred to stay at home on the farm rather than seek positions in railroad and other business offices. They were graduated from their high school, and afterward went to Cornell Agricultural College. They didn't buy commercial fertilizers, because they had learned how to make them. To show what education will do, these boys asked their father what he would rent them the five-acre orchard for for five years. It had been rented for several years for half the product. The father agreed to rent it to them at $50 a year. They plowed the ground, harrowed it, sprayed the trees, and last year they sold 600 barrels of apples. They went through the same operation last spring and sold 1,100 barrels of apples at $2 a barrel. The father said, "I guess it was for three years that you rented the farm?" But they said, "No, it was five years, father." They raised potatoes and cabbage and other agricultural products, wheat and oats. Their potato business amounted to something. They asked their father what he would give them for spraying his potatoes and he said he didn't think it amounted to much, but that he would give them the amount of the result of the spraying. This increase amounted to 64 bushels to the acre. If such advances can be made in agriculture, why not in ours?

I might tell you some of my work in the dairy. When I was a youngster my father thought I was not strong enough for farming and he brought me up as a school-teacher but afterward I went back
to the farm. The first year the dairy yielded an average of 125 pounds of butter to the cow. Butter was high at that time and the returns were good. We did not have the advantages of the dairy schools then, but I began to test the milk, not with a Babcock test, but by raising the cream and finding the per cent. of cream which a cow gave. I had one beautiful short-horned cow, but she gave only a two per cent. of cream. This I had an opportunity to trade and I bought a Jersey bull. This helped considerably and I got a separator and I think my best yield was 352 pounds to the cow a year; 6 pounds of butter to the 100 pounds of milk the year through. Lots of dairymen exceed that, but this illustrates what I have done with just the little opportunity I had. Anybody can do it if they try.

QUESTION: At what temperature do you keep the stable?

MR. DETRICH: At 59. Some persons say, "Oh, yes, you can do this; you have a small farm." A gentleman saw me nine or ten years ago. He was not satisfied with his results and began observing my methods. Every now and then he would adopt this and that plan and it turned out all right. This spring he told me that before he met me all he could sell of his dairy products was $900 worth, and that this year he had sold to the amount of $1,900.

QUESTION: You did not tell us the kind of cattle you have.

MR. DETRICH: Jerseys.

QUESTION: What is the number of tons of silage you average per acre?

MR. DETRICH: Thirty tons to the acre. We sow rye broadcast and harrow it and top-dress it.

QUESTION: What time in the year?

MR. DETRICH: Anytime. The rye is never sowed later than the 15th of October. We put in the rye, top-dress it and keep on top-dressing it until the field is needed and then go elsewhere and top-dress. The rye will be very heavy. We never sow timothy with it, and there is nothing but rye stubble when we cut the grain.

MR. NORTON: How much ensilage is a ration?

MR. DETRICH: About 35 pounds a day. We always have a mixed feed and mix the ration every time, so much ensilage and so much cut hay.

MAJOR WELLS: Did you ever experiment with two feedings or three?

MR. DETRICH: By feeding three times a day we get more milk in the evening.
QUESTION: In the dry products, what have you found to be the most successful ration, and in what proportion do you give them?

MR. DETRICH: We try to mix a ration to suit the cow's lactation. We give a cow all she will digest, and of this the manure is the best test. If the manure is right, the cattle and milk are right. We give a quarter of a pound of salt a day and we use table salt; they take this in preference to the coarse. Dairy animals are creatures of habit to a large extent. We know just when they are going to lie down and when they get up.

The PRESIDENT: In making this difference in ration for the heavy or light milker, do you feed more grain?

MR. DETRICH: We make the mixture to suit the herd. We use the cotton seed meal, and always give more when the cow is fresh. This, with linseed and gluten, we use for animals in full lactation. We regulate the amount of cotton seed largely by the manure.

The PRESIDENT: What do you use for the basis of your cut feed?

MR. DETRICH: We always use some cotton seed and some gluten and bran.

QUESTION: Do you depend upon the mixture, or add water?

MR. DETRICH: In mixing the feed the ensilage goes to the bottom. We sprinkle the water over the top and give that one mixing before putting in the by-products.

MR. JONES: What is the proportion of ensilage and hay?

MR. DETRICH: We feed about 35 pounds of ensilage a day and we like to feed a cow about 5 pounds of hay a day. It is surprising how much more milk we get when we milk three times a day. All the energies of the cow are directed to that udder, and as long as she does not have pain she will secrete the milk. Thirty days before the cow is fresh and thirty days afterward will tell what the cow will do in the year.

PROF. WATSON: Mr. Detrich says that 30 days before and 30 days after the cow is fresh will tell what she will do. I would like to ask whether he does not think there are other conditions affecting her, entirely independent of proper feeding and proper care?

MR. DETRICH: Yes, the individuality of the animal enters into the consideration.

PROF. WATSON: I believe we take the best care of the animals, but sometimes they will do better than others. They will start in better. I am unable to offer any explanation why that is so, but there
is some physiological reason beyond my understanding. There is a good deal, I believe, in starting in right.

MR. HERR: I would like to ask Mr. Detrich what special treatment he gives the cow 30 days before she is fresh.

MR. DETRICH: A man ought to be particular about those things. A good dairyman always marks down his service and he will know whether the cow is right. The important thing in caring for a dairy cow is to get her dry. Plenty will not go dry by the method of some dairymen. The proper thing is to give timothy hay and water, give exercise by the halter and skip teats in milking. On this treatment a cow will go dry in six days. People will tell you that they do such things, or that the hired man does them, but I know that people tell a great many things that are not exactly so. The cow must be perfectly dry, not so that she gives a little bit of milk. The whole thing is to feed her. Give her the exercise, feed her the bran and commence to feed her linseed by the hand. When she is fresh, give her salts. Give her 3 pints of water at 165 degrees F. as a drench and feed her pretty much as before she was fresh. The third day she will refuse the water and bran. We give three to four quarts of cold water as soon as the cow is fresh and one pint of bran five to six times a day. Add the linseed. On the fourth and fifth day add more linseed until you give half a pound at a time. On the sixth day give her gluten meal, linseed and hay. Do not feed her cotton seed until the fourth or fifth week after she is fresh.

DR. CONARD: I would like to ask Mr. Detrich whether he thinks it is just as practicable to keep 200 cows on 100 acres as two cows on one acre?

MR. DETRICH: Every dairyman should keep a record of which cows are going dry. They should be named and numbered and there should be kept also the name and number of the sire. If there is a re-service, that too is marked down. We have a gestation table and the mark is put down opposite the name.

MR. JONES: I would like to ask Mr. Detrich how much help he keeps?

MR. DETRICH: A boy and a man.

DR. CONARD: What is the average per year?

MR. DETRICH: We expect a cow to milk about six or seven quarts; that is, the run of the herd.

The following paper was read:
THE SILO AND SILAGE CROPS.

By Prof. George C. Watson, Professor of Agriculture, State College.

The history of the silo in the United States, in many respects, resembles that of other new and important inventions which have tended more or less to revolutionize well-established practices and customs of the agricultural people. Many new contrivances are used by some, successfully, by others with a less degree of satisfaction, and are thoroughly condemned by the most unsuccessful. In view of this, it has seemed to me that we can study the development of the appliances and practices which have to do with the preservation of that which we now recognize as a most important stock food—silage—in order to determine, in some degree at least, whither we are drifting, to discover if we can the direction of modern progress, and to discover if possible some of the forces which are most potent in shaping the development of modern agriculture. Without attempting to analyze this question sufficiently in detail to determine the slight distinctions between different causes and different effects, it is the object of this paper to note, if possible, a few of the general tendencies.

When I accepted an invitation to prepare a brief paper on the subject of silos and silage crops, my thought was to present some phases of the silo question, which may be only suggestive, as to the changes which are indicative of advancement or of retrogression or both.

There seems to be a general law in nature that marked changes which we recognize as improvements, cannot be obtained without some corresponding sacrifice. That is, we cannot build something out of nothing. Nature has not provided man with means of building without destroying; so the balance between the constructive and the destructive will determine whether progress or retrogression has resulted. Can we not therefore with profit look for the changes in American agriculture which have come with the silo, and study as best we can the tendencies that are for good and those that are not so pronounced as to their desirable effects? We are accustomed to judge material things by their effects. We ask of a man what he has done, signifying our willingness to accept his record as a guarantee for future performances. While it is undoubtedly true that we are often misled by this method of reason-
ing, as men who improve by experience are enabled to perform better work and to give more satisfactory service, yet the words of the distinguished statesman who judged the future by the past may give us the key to the situation as to the future uses and development of the silo.

As one studies the history of the silo in the United States he cannot fail to be impressed with the idea that man makes many mistakes in dealing with the unknown. When the silo was first placed before the American people as a means of satisfactorily preserving forage crops, its advantages were set forth and even highly lauded without announcing the disadvantages, objections and even dangers, besetting the advent of the new custom. As with many other new inventions, we heard a one-sided report only. The newspapers and other publications set forth the advantages without presenting objections. It is possible, however, that the most serious ones may not have been known at that time. However, the interested agriculturists were evidently over-confident. Those who have studied the people of various nations recognize that the American people are intensive, eager to improve, willing to take risks, and even make great sacrifices in order to achieve distinction and advancement. Consequently we should not be surprised to find the existing conditions pertaining to many new things comparatively unstable and changing. American people without doubt stand in marked contrast to the older European nations as regards the eagerness with which new enterprises are taken up and old habits and appliances discarded. The Englishman and the German adhere to the old with contentment. The former accepts new inventions from this country, which he calls "The 'Yankee' patent things," as the onward march of progress compels him to accept them. In America, however, many new things are tried, some of which are failures, but the trial enables the farmer to select the worthy and to reject that which is unfit for his use. Many farmers who have had comparatively little knowledge of silos or of feeding silage have constructed silos in an endeavor to make silage an important part, and in some cases the major part of the ration of various classes of domestic animals. Failures have resulted; expensive lessons have been learned. Not only did these farmers not know how to harvest and preserve most efficiently and cheaply, but they did not understand how to feed to the best advantage that which they had preserved. Consequently, the silos have been praised and condemned as their uses have been advantageous or detrimental. The silo has been the means of furnishing examples of both extremes—failure and success. Some who maintained that only a good crop of corn and the silo were necessary have learned bitter lessons when they have attempted to maintain on silage alone
productive flocks and herds through the long, severe winters of this latitude. Some farmers of Pennsylvania or rather some managers of extensive farms attempted to carry through the winter large flocks of sheep on silage alone, and, of course, failed miserably.

With the advent of the silo, the American farmer came to a fuller realization of the importance of providing some succulent food for dairy cattle. Those who preferred to raise mangels appreciated them more on account of the experience of their neighbors who were adherents to the silo. Corn silage undoubtedly helped the farmers to understand better than ever before the true value of mangel-wurzels and it was those who persisted in raising mangel-wurzels for dairy cattle who first learned the true value of succulent food and the manner in which it should be fed. The feeders of roots learned a lesson that was not learned so early by those who fed corn silage, and even yet corn silage is not understood and appreciated in its true sense by the majority of feeders. Those who have been feeding roots for years have learned that the value of this food is due, in a broad sense, to its relation to other foods. The value of roots as a food is not considered alone, neither is it compared to other foods entirely different in composition and character, but when fed with others its value is most marked and most appreciated. Roots are not placed in a ration to take the place of other and perhaps more expensive food, but to increase the effect of other foods and to promote the general health of the animal, and to place the animal in a better condition for usefulness. Leaders among feeders long ago learned that the value of roots is not estimated by the value of digestible constituents which this food contains. On the other hand, the silage feeder has too often considered the value of silage wholly from the commercial value of its food constituents as compared with corn and other commercial products. Corn silage was formerly compared to cured field corn, and we have not gotten very far away from this comparison at the present time. In a general way, one product was considered to be about as digestible as the other, and one was harvested about as cheaply as the other. So many farmers held that there was not very much difference between the two as to their feeding value.

Unless some decided gain is likely to be made, the expenditure of any considerable amount of money should be regarded with suspicion. Agriculturists are becoming more and more like business men in looking for profitable returns on investments. If such returns seem doubtful the investment is not made. With improved machinery for harvesting and handling the silage crop, the advantage has turned somewhat in favor of the silage when compared with field-cured corn on the basis of digestible nutrients alone.
The many questions asked of the Experiment Station as to the feeding value of roots and silage, clearly indicate that the value of succulent food for dairy cattle is not fully appreciated by many of the leading farmers in Pennsylvania to-day. While feeding standards are probably used to-day with a broader and more general application than formerly, yet the value of corn silage has been estimated largely on its constituents as given in the feeding standards. This has had the effect of eliminating largely the proper consideration of the value of silage as a succulent food when fed in combination with other dried coarse fodders and concentrates, both carbonaceous and nitrogenous. The modern tendency has been to supply that form of food which will give the greatest immediate returns for the least expenditure of money and effort without duly considering the effect that the practice may have on the future usefulness of domesticated breeds, which a few master breeders have produced at a great sacrifice.

The dairy cow by nature is fitted to use to the best advantage large quantities of unripe fodder material in a fresh condition. This, in a general and rather indefinite way, we have termed "succulent food." Dairy animals may be said to be especially prepared to use this juicy and tolerably dilute food to the best advantage, not only for the production of milk and the many milk products, but for the promotion of the general health of the animal which best fits it for the propagation of the breed or species as the case may be. Practice has unmistakably shown that the flush of June feed approaches most nearly the ideal food for dairy cows.

Man in his intense struggle for improvement finds many things in nature that for his purposes may be improved upon. He therefore changes and shapes them that they may better conform to his uses. In other matters he tries to imitate nature and approach the natural as his highest standard. In supplying the wants of the dairy cow he tries to imitate nature at its best, and thus far he has not been able to make marked improvements on that which nature provides.

The standard conditions as to food and temperature, for which the dairyman is continually striving to obtain for his herd, is best provided by nature in May and June.

It is said, with a good deal of emphasis by those to whom we look for authority, that every breeder who has made marked improvements in our domestic animals, those who have added something material to that which they were dealing, or in other words, have made some breed of live stock better than they found it, have had a clear-cut standard or ideal toward which they were continually striving.

High standards, better standards continually kept in mind are
essentials to systematic improvement. We have gone too far, have improved too much to secure further improvement without system. Haphazard work will not do. As improvement progresses, each step in progress becomes more difficult. A better knowledge and a closer application of principles is required at the present time to secure advancement than was required generations ago.

If we have not erred in selecting our standard or ideal as to that which is best adapted for the production of milk and the promotion of the general health and vigor of the animal, we will fundamentally fail if we neglect to provide a liberal allowance of succulent food. Not wholly because the animal system uses it to the best advantage, considering its feeding value when taken alone, but also to ameliorate those conditions which an artificial and unnatural diet tends to produce.

In very recent times marked changes have been made as to the kind and quality of food provided for dairy stock. The inventive American in his efforts to produce something new has placed on the market a large number of food products for the human family that only a few years ago were entirely unknown. The manufacturers of these new foods have placed before the dairymen a vast number of by-products of varying usefulness for his use as stock foods. Probably never before has there been consumed by the dairy stock of this country so large a proportion of by-products as at the present time. This means a great change, and great changes bring somewhere great disturbances—what the outcome will be no one can foresee. Is this tendency one of progress or one of retrogression? Will the good that is obtained by the new order of things outweigh the undesirable? The effect on the vigor and constitution of the animals cannot be determined by a few experiments. Generations of time alone will record the results. The gain of a few dollars will not compensate for the loss if the usefulness of our stock is impaired. The onward march of by-products is undisputed and recognized by all. If I can read the signs of the times aright, the use of these foods is practically sure to increase, but is it not the part of wisdom to feed with these artificial products a liberal allowance of that food which most nearly approaches the ideal?

As a basis, conservative Americans will adhere to that which has been proven to be wholesome and economical. It is often remarked that the success of many individuals is due in a large measure in their ability to use most advantageously the comparatively cheap material at their command. Many thrifty farmers use profitably that which the less provident will permit to waste or to bring comparatively slight returns. The case with which corn is produced make it one of the cheapest of stock foods that can
be universally provided on the farms throughout Pennsylvania. In my judgment the safest and most successful feeder of the future will be he who will make the best use of America's most abundant and cheapest food—plant corn.

The English farmer imports American corn and sorely laments the fact that he is unable to produce that which is produced abundantly with so much ease in America. During the past three years repeated efforts have been made to secure seed corn from Northern Minnesota, that will sufficiently mature in Great Britain to produce good silage, hoping to procure for the English farmer that which is so valuable in this country.

The Holland farmer has successfully made silage of grass in earthen pits for many generations. From an almost exclusively grass-diet he has produced a most productive and sturdy breed of dairy cattle. His endeavor has been to approach that condition which we have selected as our ideal or "nature's best." He cuts his grass for hay while it is immature, yet nutritious, and provides warm stables for his cattle in winter, placing them in comfortable stalls in the same building that provides shelter for himself and family. Probably there is no advanced dairy country where the farmers for centuries have maintained their dairy cattle on whole plant natural food to a greater extent than those of Holland; and nowhere do we find a more vigorous, productive and strong constitution breed of cattle.

Of all forage crops produced abundantly on the farms throughout Pennsylvania that are consumed in a succulent condition there is none that so nearly approaches the ideal food that nature so abundantly provides in the forepart of the growing season than good corn silage. In view of the facts pertaining to this food, which we have been able to gather, that is, those which may be considered essentials as to economical dairy feeding, as, cheapness, wholesomeness, value as a food product alone, the effect on the ration when combined with other foods, as well as the unknown effects of the vast amount of by-products that are now consumed, it seems to me that the dairymen of Pennsylvania to-day cannot afford to omit from the winter ration, which is provided for dairy cows, a liberal amount of good corn silage.

MR. DETRICH: I am so well pleased with the paper that I have no questions to ask.

DR. CONARD: I would like to ask Professor Watson whether he considers it practicable to make silage of rye and crimson clover mixed, cutting both at the same time, and if so, what would be the feeding value of it?
Prof. Watson: I do not believe I can answer that, never having tried it: I cannot speak from experience, and if I were to speak from abstract knowledge, perhaps the doctor's reasons would be as good as mine.

The President: You would not hesitate to try it?

Prof. Watson: No; I have enough American spirit to try most anything that presents a reasonable chance for improvement. I should want the rye not overripe. I have a feeling that there is danger in putting the rye into the silo if the stem is very ripe.

Mr. Detrich: I was in Delaware last week on Bancroft's farm where this feeding was being tried and it makes a magnificent silage. Rye is as good as clover when it is coming into head and has the same feeding value. When it commences to get woody it makes a poor feed.

Dr. Conard: Do they ordinarily ripen together?

Mr. Detrich: Yes.

Major Wells: I would like to ask Professor Watson if he is familiar with, or can give the value of dried beet fibre?

Professor Watson: We have made no experiments, though I know that experiments have been made. The results of these, however, I do not know. The results of some experiments in which it has been fed in the fresh condition have not been satisfactory.

Major Wells: There are factories along the border-line of New York State where this dry feed is made, but I have been unable to learn the value of it.

The President: As I understand it, it is simply the beet dried, with sometimes the addition of lime. The pulp dried down with some of the waste molasses has been used in European feeding with satisfactory results. Allowing for the water contents it will have about the same feeding value as the fresh pulp, but without the advantage of its succulence. The dried foods in foreign countries has been very satisfactory.

Mr. Herr: In making silage of rye and clover, would you put it up in the condition it is, or would you have the rye cut?

Prof. Watson: I should have it cut by all means.

Mr. Comfort: Last fall at the Trenton Fair a gentleman told me that he had been making a satisfactory silage of wheat and clover, and that in his experience the results were very much more satisfactory with grass for ensilage than rye; for, unless the rye were cut at exactly the right time it was woody.
I was also speaking with a man with a large herd of cattle, a very careful and successful feeder. As a business proposition we must see where the profit is coming from, and I would like to ask Mr. Detrich whether he could tell us whether he can produce a quart or a pound of milk as economically as the average farmer; or, whether he can tell us what it costs to produce a pound of milk under his plan of farming.

MR. DETRICH: I never weighed a pound of stuff raised on the field, and never bothered about what it cost me to raise it, because I am convinced that it pays to feed the dairy, bearing in mind the value to the land of the manure. I do not believe a man can afford to feed bran, and throw the manure into the barnyard. I pay $640 for concentrated foods in a year for horses and cattle.

The PRESIDENT: No wonder your land it getting rich.

MR. DETRICH: Yes, but crops will grow again.

The PRESIDENT: Most of your crops go back there finally.

MR. DETRICH: Yes, 365 cart loads of manure, of cotton seed, linseed, gluten, but we don't buy commercial fertilizers. By the use of these foods I can get two products.

ELECTION OF OFFICERS.

The Nominating Committee made the following report:

President, Professor H. P. Armsby, State College, Pa.
First Vice President, Mr. Austin Leonard, Troy, Pa.
Second Vice President, Rev. J. T. Detrich, Flourtown, Pa.
Treasurer, W. E. Perham, Niagara, Pa.
Secretary, Dr. M. E. Conard, Westgrove, Pa.

EXECUTIVE COMMITTEE.

Hon. W. C. Norton, H. W. Comfort, M. F. Reeder. President and Secretary, members ex-officio.

Mr. Jones moved that the Secretary cast the ballot for the officers named in the report. The ballot was cast.

MR. NORTON: In regard to the By-laws and Constitution, reported to have been lost, I am almost sure that I have several copies at home. I think the Constitution should be changed from having a Board of Directors of five to an Executive Committee of three.

This motion was made, seconded and carried.

MR. DETRICH: I would like to ask whether the Pennsylvania Dairy Union is a voluntary organization, a State organization, or
whether the different farmers' clubs throughout the country send delegates to the meeting?

The PRESIDENT: It is entirely a voluntary organization; has no official character; has never been recognized as an official organization, that is, it has never had an appropriation made by the State for its support.

MR. THOMPSON: Would it not be well for the President to state the object of this organization. There may be some present who would like to join.

The PRESIDENT: While I have not been so closely in touch with the organization as some others, I am glad to state my understanding, subject to correction. As I understand it, it is a voluntary organization of those interested in the promotion of dairy interests of the Commonwealth, which is a very right interest when we consider that last year the dairy interests of the State amounted to thirty-nine million dollars. Primarily and centrally the idea is to bring together the opinions and interests of the dairymen of the State so that they may have their proper influence upon legislation affecting dairy interests; upon the better education in dairy matters through the various instrumentalities throughout the State, such as the public schools, farmers' institutes and meetings of various organizations; and, finally, and perhaps the most important of all is the development of the individual dairyman through the contact with each other and with experts brought about by meetings of this sort, and by the publication of proceedings in the farm bulletins and tracts which has already been begun. It seems to me that a progressive dairyman of the present cannot afford to cut himself off from these sources of knowledge. He cannot afford it any more than a manufacturer in other lines.

We may say what we please about the importance of legislation in the interests of dairying; but, after all, you can no more make a dairyman successful by legislation than you can make people honest by legislation. It comes like everything else, to the individual. Such an organization helps the individual dairyman to raise himself to a higher level of knowledge and practice. The organization is open to all, and we hope that all will come in and help to make the sessions of this Dairy Union, and its bulletins as valuable to the dairy interests of Pennsylvania as possible. This will only be accomplished when the dairymen of the State as a whole take hold of this matter. I hope we shall have a large increase in membership.

MR. DETRICH: I think what the President has stated is exactly correct about the Dairy Union. It seems to me that every farmers' club of Pennsylvania ought to send a delegate to the Dairy Union. I think this is the only way we can get this dairy business carried out in different local sections and the only way in which the dif-
Different local sections will come into close touch with each other. It seems to me rather unfortunate that in a State having a dairy business of $39,000,000 per year, we should have such a small number present at this meeting. There are sections of this State that ought to be interested in this Dairy Union, and we ought to recognize the farmers' club; for you know there is coming gain from contact. There is a friction that brings about good results.

MR. NORTON: I think I cannot add anything to what has already been said. My idea has been that we should allow every creameryman in the State to send a delegate by paying their dues; also that the farmers' clubs should become members and be entitled to one vote through a delegate. This has never been carried out.

Another thing we ought to do is to become an incorporate body, so as to be a responsible body. Under the present system the Dairy Union is not such a body. I think this should be done and before next year. I also believe that every creameryman should be urged to become a member by paying his dues and be allowed to send one 'delegate; also every farmers' club in this State. We should work hand in hand. There is no use in jealousy between dairymen and creamerymen.

The Department of Agriculture has been very liberal with us; had they not, we would not have seen a Dairy Union meeting here. There are not enough dues collected to run the organization. The Department of Agriculture stands ready to help us to-day. I understand also that according to the new Constitution that if we got an appropriation from the State it would have to go through the Department of Agriculture. There can be no State appropriation to any society unless it comes under the supervision of the State officials.

MR. HERR: I think Mr. Norton has touched the keynote. An organization which the State recognizes has some foundation. Unfortunately the different farmers' clubs throughout the State have no connection among themselves. It is unfortunate that the State Grange has its meeting at the same time as this Dairy Union.

MR. JONES: I would make a motion that the President and Secretary and the Executive Committee be appointed a committee to look over the Constitution and make some recommendations to come before our next annual meeting with reference to incorporation of the society; that the recommendations shall be published before our next annual meeting so that members shall understand what they are expected to vote upon.

Seconded by Mr. Norton.
MAJOR WELLS: The great difficulty here is lack of interest among the dairymen of the State. We ought to correct that apathy. There can be no better investment for a dairyman than to be present at the presentation of the able articles to which we have listened to-day.

The PRESIDENT: It has been moved and seconded that this subject be referred for consideration to the Executive Committee.

Carried.

MR. JONES: I would move that if in the opinion of the President and Secretary it would seem better to change the date of the annual meeting, that they be authorized to make that change.

The PRESIDENT: Is it not understood that the Executive Committee fixes the date of meeting?

MR. JONES: As I understand it we are living under the old Constitution, which I think fixes the time of the meeting.

MR. NORTON: Our Constitution calls for a meeting the same week as the State Grange. Last year a motion was made that the time and place of meeting be left with the Board of Directors and the Secretary and President. I would make a motion that the time be left with the President and Secretary and Executive Committee.

MR. C. P. FAUCETT: Yesterday there was something said of a regular time and place for the annual meeting and then of having other meetings at local points. I think we could not have the annual meeting at a better time than this. While willing to abide by the decision of the committee I would dislike to see the time changed. Early in December is a time suitable to almost every one. The committee might decide upon the time of the local meetings; but I hope they will see their way clear not to change the time of the annual meeting.

The motion to refer the time of the next annual meeting to the Executive Committee was carried.

Adjourned to 1.30 P. M.

No afternoon session held.

M. E. CONARD,
Secretary.
APPENDIX.
LIST OF PUBLICATIONS OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

*Report of the State Board of Agriculture, 336 pages, 1877.
*Report of the State Board of Agriculture, 625 pages, 1878.
*Report of the State Board of Agriculture, 360 pages, 1879.
*Report of the State Board of Agriculture, 616 pages, 1881.
*Report of the State Board of Agriculture, 645 pages, 1883.
*Report of the State Board of Agriculture, 648 pages, 1884.
*Report of the State Board of Agriculture, 645 pages, 1885.
*Report of the State Board of Agriculture, 646 pages, 1886.
*Report of the State Board of Agriculture, 650 pages, 1887.
*Report of the State Board of Agriculture, 650 pages, 1889.
*Report of the State Board of Agriculture, 594 pages, 1890.
*Report of the State Board of Agriculture, 600 pages, 1891.
*Report of the State Board of Agriculture, 604 pages, 1892.
*Report of the State Board of Agriculture, 713 pages, 1893.
*Report of the State Board of Agriculture, 646 pages, 1894.

*Note.—Edition exhausted.

**BULLETINS.**

No. 1.* Tabulated Analyses of Commercial Fertilizers, 24 pages, 1895.
No. 2.* List of Lecturers of Farmers' Institutes, 36 pages, 1895.
No. 3.* The Pure Food Question in Pennsylvania, 38 pages, 1895.
No. 4.* Tabulated Analyses of Commercial Fertilizers, 22 pages, 1896.
No. 5.* Tabulated Analyses of Commercial Fertilizers, 38 pages, 1896.
No. 6.* Taxidermy; how to collect Skins, etc., 128 pages, 1896.
No. 7.* List of Creameries in Pennsylvania, 68 pages, 1896.
No. 10.* Prepared Food for Invalids and Infants, 12 pages, 1896.
No. 11.* Tabulated Analyses of Commercial Fertilizers, 22 pages, 1896.
No. 12.* Road Laws for Pennsylvania, 42 pages, 1896.
No. 15.* Good Roads for Pennsylvania, 42 pages, 1896.
No. 16.* Dairy Feeding as Practiced in Pennsylvania, 126 pages, 1896.
No. 17.* Diseases and Enemies of Poultry, 128 pages, 1896.
No. 18.* Digest of the General and Special Road Laws for Pennsylvania, 130 pages, 1896.
No. 19.* Tabulated Analyses of Commercial Fertilizers, 40 pages, 1896.
No. 20.* Preliminary Report of Secretary, 126 pages, 1896.
No. 21.* The Township High School, 24 pages, 1897.
No. 22.* Cider Vinegar of Pennsylvania, 28 pages, 1897.

*Note.—Edition exhausted.
No. 23.* Tabulated Analyses of Commercial Fertilizers, 31 pages, 1897.

No. 24.* Pure Food and Dairy Laws of Pennsylvania, 19 pages, 1897.

No. 25.* Farmers' Institutes in Pennsylvania, 8 pages, 1897.

No. 26.* Farmers' Institutes in Pennsylvania, 74 pages, 1897.

No. 27.* The Cultivation of American Ginseng, 23 pages, 1897.

No. 28.* The Fungal Foes of the Farmer, 19 pages, 1897.

No. 29.* Investigations in the Bark of the Tree, 17 pages, 1897.

No. 30.* Sex in Plants, 17 pages, 1897.

No. 31.* The Economic Side of the Mole, 42 pages, 1898.

No. 32.* Pure Food and Dairy Laws, 30 pages, 1898.

No. 33.* Tabulated Analyses of Commercial Fertilizers, 42 pages, 1898.

No. 34.* Preliminary Report of the Secretary, 150 pages, 1898.

No. 35.* Veterinary Medicines, 23 pages, 1898.

No. 36.* Constitutions and By Laws, 72 pages, 1898.

No. 37.* Tabulated Analyses of Commercial Fertilizers, 40 pages, 1898.

No. 38.* Farmers' Institutes in Pennsylvania, 8 pages, 1898.

No. 39.* Farmers' Institutes in Pennsylvania, 88 pages, 1898.

No. 40.* Questions and Answers, 206 pages, 1898.

No. 41.* Preliminary Reports of the Department, 189 pages, 1899.


No. 43.* The San José Scale and other Scale Insects, 22 pages, 1899.

No. 44.* Tabulated Analyses of Commercial Fertilizers, 62 pages, 1899.

No. 45.* Some Harmful Household Insects, 13 pages, 1899.

No. 46.* Some Insects Injurious to Wheat, 24 pages, 1899.

No. 47.* Some Insects Attacking Fruit, etc., 19 pages, 1899.

No. 48.* Common Cabbage Insects, 14 pages, 1899.

No. 49.* Methods of Protecting Crops, etc., 20 pages, 1899.

No. 50.* Pure Food and Dairy Laws of Pennsylvania, 33 pages, 1899.

No. 51.* Tabulated Analyses of Commercial Fertilizers, 69 pages, 1899.

No. 52.* Proceedings' Spring Meeting of Round-up Meeting, Farmers' Institute Managers, etc. 296 pages, 1899.

No. 53.* Farmers' Institutes in Pennsylvania, 1899-1900, 94 pages, 1899.

No. 54.* Tabulated Analyses of Commercial Fertilizers, 165 pages, 1899.

No. 55. The Composition and Use of Fertilizers, 126 pages, 1899.

*Note.—Edition exhausted.
No. 60.* List of Creameries in Pennsylvania, 33 pages, 1899.
No. 61. The Use of Lime in Pennsylvania Soils, 170 pages, 1900.
No. 64. Nature Study Reference Library for Use in the Public Schools, 22 pages, 1900.
No. 65. Farmers' Library List, 28 pages, 1900.
No. 66. Pennsylvania Road Statistics, 98 pages, 1900.
No. 67. Methods of Steer Feeding, 14 pages, 1900.
No. 68.* Farmers' Institutes in Pennsylvania, 90 pages, 1900.
No. 69. Road Making Materials of Pennsylvania, 104 pages, 1900.
No. 70.* Tabulated Analyses of Commercial Fertilizers, 97 pages, 1900.
No. 71. Consolidation of Country Schools and the Transportation of the Scholars by Use of Vans, 89 pages, 1900.
No. 72.* Tabulated Analyses of Commercial Fertilizers, 170 pages, 1900.
No. 73. Synopsis of the Tax Laws of Pennsylvania, 132 pages, 1901.
No. 74.* The Repression of Tuberculosis of Cattle by Sanitation, 24 pages, 1901.
No. 75.* Tuberculosis of Cattle, and the Pennsylvania Plan for its Represssion, 262 pages, 1901.
No. 76. A Co-operative Investigation into the Agricultural Seed Supply of Pennsylvania, 50 pages, 1901.
No. 77. Bee Culture, 101 pages, 1901.
No. 78.* List of County and Local Agricultural Societies, 10 pages, 1901.
No. 79. Rabies, 28 pages, 1901.
No. 82.* Containing the Law Creating a Department of Agriculture in Pennsylvania, and Giving the Various Acts of Assembly

*Note.—Edition exhausted.
Committed to the Department for Enforcement; Together with Decisions and Standards Adopted with Reference to the Pure Food Act of 1895. 90 pages, 1901.

No. 83.* Tabulated Analyses of Commercial Fertilizers, 132 pages, 1901.

No. 84. Methods of Steer Feeding; the Second Year of Co-operative Experiment by the Pennsylvania State Department of Agriculture and the Pennsylvania State College Agricultural Experiment Station, 16 pages, 1901.

No. 85.* Farmers' Institutes of Pennsylvania, 102 pages, 1901.

No. 86.* Containing a Complete List of Licenses granted by the Dairy and Food Commissioner, from January 1, 1901, to July 1, 1901, etc. 422 pages, 1901.

No. 87. Giving Average Composition of Feeding Stuffs, 42 pages, 1901.

No. 88. List of Creameries in Pennsylvania, 33 pages, 1901.

No. 89.* Tabulated Analyses of Commercial Fertilizers, 195 pages, 1901.

No. 90. Treatment for San José Scale in Orchard and Nursery, 33 pages, 1902.


No. 92.* List of Licenses Granted by the Dairy and Food Commissioner, 193 pages, 1902.


No. 94. Phosphates—Phosphatic or Phosphoric Acid Fertilizers, 87 pages, 1902.

No. 95.* County and Local Agricultural Societies, 1902, 12 pages, 1902.

No. 96. Insects Injurious to Cucurbitaceous Plants, 31 pages, 1902.


No. 98. Bacteria of the Soil in their Relation to Agriculture, 88 pages, 1902.


No. 100.* Containing Statement of Work of Dairy and Food Division from January 1, 1902, to June 30, 1902, 223 pages, 1902.

No. 101.* Tabulated Analyses of Commercial Fertilizers, 137 pages, 1902.

No. 102. The Natural Improvement of Soils, 50 pages, 1902.

No. 103.* List of Farmers' Institutes of Pennsylvania, 67 pages, 1902.


No. 105. Potato Culture, 96 pages, 1902.

*Note.—Edition exhausted.
No. 106. The Varieties of Fruit that can be Profitably Grown in Pennsylvania, 50 pages, 1902.


No. 108. The Hessian Fly in Pennsylvania, — 1903. (Not out of press.)


No. 110. Containing Statement of Work of Dairy and Food Division from July 1, to December 31, 1902, 248 pages, 1903.


No. 112. List of County and Local Agricultural Societies, 10 pages, 1903.

No. 113. Methods of Milking, 96 pages, 1903.


No. 117. Potash Fertilizers—Sources and Methods of Application, 46 pages, 1903.

No. 118. Containing the Laws Creating the Office of Dairy and Food Commissioner in Pennsylvania, and also a Digest of the Acts of Assembly Committed to his Administration; 63 pages, 1903.

No. 119. Tabulated Analyses of Commercial Fertilizers, 115 pages, 1903.

No. 120. The Apple-tree Tent-caterpillar, 46 pages, 1903.

FERTILIZER VALUATIONS—1903.

The object of an official valuation of commercial fertilizers is to enable the consumer to judge approximately whether he has been asked to pay for a given brand more than the fertilizing ingredients it contains and market conditions prevailing at the time would warrant. It is clear, therefore, that no attempt is made in this valuation to indicate whether the fertilizer valued possesses a greater or less crop-producing capacity than another fertilizer; but only whether it is higher priced than another of the same general composition.

For this purpose it must be so computed as to include all the elements entering into the cost of a fertilizer as it is delivered to the consumer. These elements may be conveniently grouped as follows:

1. The wholesale cost of the ingredients.
2. The jobbers' gross profit on the sale of the ingredients; this includes office expenses, advertising, losses, etc.; for the purpose of the present computation it may be assumed that the sum of this gross profit and the wholesale cost of the ingredients, is equivalent to the retail price of the single ingredients near the wholesale markets in ton lots of original packages for cash.
3. The expense and profit of mixing: This item applies only to complete fertilizers, rock and potash, and ammoniated rock; not to dissolved or ground bone, or to dissolved rock.
4. The expense and profit of bagging.
5. Agents' commission: This item includes not only the commission proper, but every advance in price due to the sale of the goods through an agent in small quantities on time, rather than directly to the consumer in ton lots for cash.
6. Freight from the wholesale market to the point of delivery.

The valuations for 1902 were based:
1. Upon the wholesale prices from September 1, 1901, to March 1, 1902, of the raw materials used in fertilizer manufacture, the quotations of the New York market being adopted for all materials except acidulated phosphate rock and ground bone.
2. Upon an allowance of 20 per cent. of the wholesale prices, above mentioned, to cover jobbers' profits.

By adding the 20 per cent. allowed for jobbers' gross profit to the wholesale price of the several raw materials, the retail price in original packages at the jobbers' warehouse is obtained.
Since the amount of the several valuable fertilizing constituents in the various raw materials is known, it is a simple matter to determine the corresponding retail value per pound of the valuable fertilizing constituents yielded by each raw material. A schedule of these pound values affords a convenient basis of computation of the value per ton of various fertilizers, whose composition is ascertained by analysis.

The values assigned, for the present, to the other elements in the cost of the fertilizer at the point of delivery are:

3. For mixing, $1.00 per ton.

4. For bagging, $1.00 per ton, in all cases except those in which the article was sold in original package; the cost of the package being, in such cases, included in the wholesale price.

5. For agents' commissions, 20 per cent. of the cost of the goods f. o. b. at the jobbers' or mixers' warehouse.

6. For freight, $2.00 per ton; the cost of the freight in lots of twelve tons or over, from the seaboard to Harrisburg, averaging $1.88 per ton.

The following valuation of dissolved South Carolina rock illustrates the method:

<table>
<thead>
<tr>
<th></th>
<th>Per cent.</th>
<th>Weight per ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphoric acid.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soluble</td>
<td>11.50</td>
<td>230 lbs. at 3c.</td>
</tr>
<tr>
<td>Reverted</td>
<td>2.50</td>
<td>50 lbs. at 21/2c.</td>
</tr>
<tr>
<td>Insoluble</td>
<td>1.00</td>
<td>20 lbs. at 11/2c.</td>
</tr>
</tbody>
</table>

Retail cash value of ingredients, .................................. $8.45

Bagging, ................................................................. 1.00

Cash value of goods ready for shipment, .......................... $9.45

Agents' commission, 20 per cent., ................................. 1.89

Freight, ................................................................. 2.00

Commercial value per ton, .......................................... $13.34

It is not to be expected, of course, that the valuations thus computed will precisely represent the fair price to be charged for a brand in each locality and in every transaction. Market conditions, competition, distance from factory, all introduce minor variations. Nevertheless, to make the approximation reasonably close, the average valuation of a given class of goods ought to agree closely with its ascertained average selling price. Whenever such an agreement is no longer obtained by the use of a schedule, it is evident that the schedule of retail values of the constituents, or the added allowances for mixing, etc., requires revision.
It is needful to note here another factor greatly affecting the practical accuracy of these approximations. Their computation would offer little difficulty and their usefulness be far greater, if, by the ordinary methods of analysis, the exact nature of the ingredients used to supply the several fertilizer constituents, were capable of certain determination. This is, however, possible, to-day, to only a limited extent. The valuations are, therefore, based on the assumption that the fertilizers are uniformly compounded from high quality ingredients, such as are commonly employed in the manufacture of fertilizers of the several classes. Consumers should carefully avoid the error of accepting such valuations as infallible; they are not designed to be used for close comparisons of single brands, but only to indicate whether the price asked for a fertilizer is abnormal, assuming good quality for the ingredients used. From this it is clear that, except as high freights may require, the selling price of a brand should not far exceed the valuation; but that a fertilizer may be made of inferior materials and yet have a high valuation.

The valuations used during 1901 were modified for use during 1902 in accordance with the changes in wholesale prices of fertilizing ingredients and to make the valuations more closely follow the selling price.

The following comparative statement shows the valuations and selling prices of the several classes of fertilizers during 1900 to 1902:
### Fertilizers

<table>
<thead>
<tr>
<th></th>
<th>Number of samples</th>
<th>Valuation</th>
<th>Selling price</th>
<th>Difference of valuation from selling price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spring, 1900</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>276</td>
<td>24.61</td>
<td>23.38</td>
<td>-0.77</td>
</tr>
<tr>
<td>Rock-and-potash</td>
<td>46</td>
<td>11.71</td>
<td>17.25</td>
<td>-5.54</td>
</tr>
<tr>
<td>Dissolved bone</td>
<td>2</td>
<td>30.87</td>
<td>26.00</td>
<td>4.87</td>
</tr>
<tr>
<td>Ground bone</td>
<td>59</td>
<td>25.38</td>
<td>28.41</td>
<td>-2.87</td>
</tr>
<tr>
<td>Dissolved rock</td>
<td>66</td>
<td>13.48</td>
<td>13.57</td>
<td>-0.09</td>
</tr>
<tr>
<td><strong>Fall, 1900</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>130</td>
<td>24.06</td>
<td>23.22</td>
<td>0.84</td>
</tr>
<tr>
<td>Rock-and-potash</td>
<td>33</td>
<td>11.63</td>
<td>13.11</td>
<td>-1.48</td>
</tr>
<tr>
<td>Dissolved bone</td>
<td>2</td>
<td>23.74</td>
<td>23.50</td>
<td>-0.24</td>
</tr>
<tr>
<td>Ground bone</td>
<td>17</td>
<td>26.57</td>
<td>28.75</td>
<td>-2.18</td>
</tr>
<tr>
<td>Dissolved rock</td>
<td>51</td>
<td>18.11</td>
<td>13.96</td>
<td>-4.15</td>
</tr>
<tr>
<td><strong>Spring, 1901</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>291</td>
<td>24.75</td>
<td>23.39</td>
<td>1.36</td>
</tr>
<tr>
<td>Rock-and-potash</td>
<td>60</td>
<td>14.60</td>
<td>16.29</td>
<td>-1.69</td>
</tr>
<tr>
<td>Dissolved bone</td>
<td>1</td>
<td>20.00</td>
<td>20.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Ground bone</td>
<td>44</td>
<td>26.71</td>
<td>27.59</td>
<td>-0.82</td>
</tr>
<tr>
<td>Dissolved rock</td>
<td>49</td>
<td>13.51</td>
<td>12.90</td>
<td>-0.61</td>
</tr>
<tr>
<td><strong>Fall, 1901</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>179</td>
<td>23.75</td>
<td>22.28</td>
<td>1.47</td>
</tr>
<tr>
<td>Rock-and-potash</td>
<td>42</td>
<td>11.55</td>
<td>16.69</td>
<td>-5.14</td>
</tr>
<tr>
<td>Dissolved bone</td>
<td>5</td>
<td>22.36</td>
<td>22.91</td>
<td>-0.55</td>
</tr>
<tr>
<td>Ground bone</td>
<td>33</td>
<td>27.63</td>
<td>25.94</td>
<td>1.75</td>
</tr>
<tr>
<td>Dissolved rock</td>
<td>49</td>
<td>13.82</td>
<td>13.18</td>
<td>0.64</td>
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<tr>
<td><strong>Spring, 1902</strong></td>
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<td></td>
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<td>1.13</td>
</tr>
<tr>
<td>Rock-and-potash</td>
<td>65</td>
<td>15.65</td>
<td>16.45</td>
<td>-0.80</td>
</tr>
<tr>
<td>Dissolved bone</td>
<td>65</td>
<td>15.65</td>
<td>16.45</td>
<td>-0.80</td>
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<td>Ground bone</td>
<td>22</td>
<td>26.80</td>
<td>28.52</td>
<td>-1.72</td>
</tr>
<tr>
<td>Dissolved rock</td>
<td>59</td>
<td>13.49</td>
<td>13.73</td>
<td>-0.25</td>
</tr>
<tr>
<td><strong>Fall, 1902</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>229</td>
<td>23.31</td>
<td>21.53</td>
<td>1.78</td>
</tr>
<tr>
<td>Dissolved bone</td>
<td>6</td>
<td>27.08</td>
<td>25.30</td>
<td>1.78</td>
</tr>
<tr>
<td>Ground bone</td>
<td>27</td>
<td>27.31</td>
<td>28.60</td>
<td>-1.29</td>
</tr>
<tr>
<td>Dissolved rock</td>
<td>56</td>
<td>13.70</td>
<td>15.47</td>
<td>1.77</td>
</tr>
</tbody>
</table>

The general tendencies of the wholesale market may be judged from the following comparative statement, obtained from the weekly reports of the *Oil, Paint and Drug Reporter*, of New York City, showing the average wholesale prices of fertilizer raw materials from September 1, 1901, to March 1, 1902, and from September 1, 1902, to March 1, 1903.
Wholesale Prices of Fertilizer Ingredients, New York: Oil, Paint and Drug Reporter.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Amount per</th>
<th>Average price Sept. 1. to March 31st.</th>
<th>Average price Sept. 1. to March 31st.</th>
<th>Prices, Sept.-Feb. 1902-3, in per cent. of prices 1911-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfate of ammonia</td>
<td>Cwt.,</td>
<td>2.8324</td>
<td>3.484</td>
<td>107.6</td>
</tr>
<tr>
<td>Nitrate of soda</td>
<td>Cwt.,</td>
<td>1.9889</td>
<td>1.5673</td>
<td>99.9</td>
</tr>
<tr>
<td>Dried blood, H. G.</td>
<td>Unit (20 lbs.)</td>
<td>2.2375</td>
<td>2.4569</td>
<td>111.5</td>
</tr>
<tr>
<td>Concentrated tankage</td>
<td>Ton,</td>
<td>16.25</td>
<td>15.50</td>
<td>95.4</td>
</tr>
<tr>
<td>Rough bone</td>
<td>Ton,</td>
<td>18.25</td>
<td>17.00</td>
<td>88.2</td>
</tr>
<tr>
<td>Ground bone</td>
<td>Ton,</td>
<td>20.50</td>
<td>20.50</td>
<td>100.0</td>
</tr>
<tr>
<td>Bone meal</td>
<td>Ton,</td>
<td>17.72</td>
<td>17.72</td>
<td>111.3</td>
</tr>
<tr>
<td>Fish guano (dry)</td>
<td>Ton,</td>
<td>24.50</td>
<td>27.25</td>
<td>111.6</td>
</tr>
<tr>
<td>Fish guano (acid)</td>
<td>Ton,</td>
<td>13.25</td>
<td>14.23</td>
<td>107.4</td>
</tr>
<tr>
<td>Refuse bone-black</td>
<td>Ton,</td>
<td>19.60</td>
<td>18.06</td>
<td>95.1</td>
</tr>
<tr>
<td>Phosphate rock (Charleston)</td>
<td>Ton,</td>
<td>7.48</td>
<td>9.125</td>
<td>122.0</td>
</tr>
<tr>
<td>Phosphate rock (Tennessee)</td>
<td>Ton,</td>
<td>3.533</td>
<td>3.813</td>
<td>115.8</td>
</tr>
<tr>
<td>Acid phosphate</td>
<td>Unit (20 lbs.)</td>
<td>0.625</td>
<td>0.675</td>
<td>109.0</td>
</tr>
<tr>
<td>Double manure salts</td>
<td>Cwt.,</td>
<td>1.13</td>
<td>1.1525</td>
<td>97.6</td>
</tr>
<tr>
<td>Sulfate of potash</td>
<td>Cwt.,</td>
<td>2.125</td>
<td>2.11</td>
<td>99.3</td>
</tr>
<tr>
<td>Kainit</td>
<td>Ton,</td>
<td>9.05</td>
<td>9.05</td>
<td>100.0</td>
</tr>
<tr>
<td>Muriate of potash</td>
<td>Cwt.,</td>
<td>1.8175</td>
<td>1.8525</td>
<td>99.2</td>
</tr>
<tr>
<td>Sulfuric acid 66 deg. B.</td>
<td>Cwt.,</td>
<td>1.575</td>
<td>1.319</td>
<td>83.3</td>
</tr>
</tbody>
</table>

In ammoniates, such as dried blood, the unit is of ammonia, of which 82.35 per cent. is nitrogen; in acid phosphates the unit is of phosphoric acid (phosphorus pentoxide).

The nitrogenous materials and animal sources of phosphoric acid show considerable variations from last year's prices. Sulfate of ammonia, dried blood, and fish guano have advanced markedly, while in the case of concentrated tankage, refuse bone-black and rough bone there has been a distinct falling off; nitrate of soda and ground bone have remained stationary. Bone meal prices have advanced 11 per cent. over last year's figures. The following data are from the monthly reports of Thos. J. White & Co., fertilizer brokers, Baltimore, Md., giving wholesale quotations upon ammoniates:
Wholesale Prices of Ammoniates: Reports of Thos. J. White & Co., Baltimore, Md.

<table>
<thead>
<tr>
<th></th>
<th>Prices, Sept. to March, 1901-1902</th>
<th>Prices, Sept. to March, 1902-1903</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfate of ammonia, per cwt.:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign, f. o. b. Baltimore,</td>
<td>2.70</td>
<td>$3.05</td>
</tr>
<tr>
<td>Nitrate of soda, per cwt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground blood, f. o. b. Chicago, per unit ammonia,</td>
<td>2.615</td>
<td>2.265</td>
</tr>
<tr>
<td>Concentrated tankage, f. o. b. Chicago, per unit ammonia,</td>
<td>1.375</td>
<td>2.065</td>
</tr>
<tr>
<td>Crushed tankage, f. o. b. Chicago, per ton:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10% per cent. ammonia, 65 per cent. bone phosphate,</td>
<td></td>
<td>$22.75</td>
</tr>
<tr>
<td>10 per cent. ammonia, 15 per cent. bone phosphate,</td>
<td></td>
<td>20.67</td>
</tr>
<tr>
<td>15 per cent. ammonia, 10 per cent. bone phosphate,</td>
<td></td>
<td>19.49</td>
</tr>
<tr>
<td>Crushed tankage, c. a. f. Baltimore, per unit ammonia,</td>
<td>2.26</td>
<td></td>
</tr>
<tr>
<td>9 per cent. ammonia, 20 per cent. bone phosphate,</td>
<td></td>
<td>2.665</td>
</tr>
<tr>
<td>Crushed tankage, f. o. b. Kansas City, per unit ammonia:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 per cent. ammonia, 25 per cent. bone phosphate,</td>
<td></td>
<td>11.95</td>
</tr>
<tr>
<td>Ground tankage, f. o. b. Chicago, per ton:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10½ per cent. ammonia, 15 per cent. bone phosphate,</td>
<td></td>
<td>$24.53</td>
</tr>
<tr>
<td>10 per cent. ammonia, 10 per cent. bone phosphate,</td>
<td></td>
<td>**22.00</td>
</tr>
<tr>
<td>6 per cent. ammonia, 2½ per cent. bone phosphate,</td>
<td></td>
<td>11.75</td>
</tr>
<tr>
<td>9½ per cent. ammonia, 20 per cent. bone phosphate,</td>
<td></td>
<td>**22.75</td>
</tr>
<tr>
<td>Dried fish, f. o. b. factory, per unit ammonia,</td>
<td>12.275</td>
<td></td>
</tr>
<tr>
<td>Hoof meal, f. o. b. Chicago, per unit ammonia,</td>
<td></td>
<td>2.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.36</td>
</tr>
</tbody>
</table>

*Quotations for September only.  
**Quotations for September and February lacking.  
© Quotations for September and October lacking.

These figures show a marked increase in the price of ammoniates over last year.

The *Engineering and Mining Journal*, of New York City, gives quotations of nitrate of soda for January, 1902, $1.95 to $1.97½ per cwt. Following this, prices increased, reaching a maximum in April of $2.40 for spot and $2.05 for futures. From this time on prices became lower, the year closing at $1.97½ for spot and $1.85 for futures. In case of sulfate of ammonia, the average price for the year (1902) was $3.00 for spot and $2.97 for shipments. These figures confirm those previously quoted.

The following summary from the *Engineering and Mining Journal* shows the prices of rock phosphates. The general tendency to centralize management has been in evidence in the phosphate industry, and, as a result, important changes have been brought about. During 1902 there were produced 1,580,997 long tons of all grades of...
phosphates as against 1,506,623 tons in 1901. The shipments for 1902 were almost 50,000 tons larger than the production. The export trade in 1902 amounted to $27,230 long tons, as compared with 750,000 tons in 1901.

Florida Phosphates.—The year 1902 shows an increase in production of about 11.6 per cent. over 1901. The exports of high grade rock in 1902 were 481,000 long tons, as against 424,120 tons in 1901. None has been sent to domestic markets. The average price for the year f. o. b. Fernandina was $6.95, as against $6.83 in 1901.

The production of land pebble was about 368,845 long tons, an increase of 115,887 tons over the previous year. Land pebble was quoted at $3.00 to $3.25 throughout the year, making an average of $3.13, as compared with $3.79 in 1901.

During January and February of this year, high grade rock was quoted at $6.00 to $6.50 and land pebble at $3.00 to $3.25.

Peace River phosphate was produced to the extent of 20,000 to 25,000 tons, the American Agricultural Chemical Company controlling the field and taking the bulk of the output.

Tennessee Phosphates.—The total shipment in 1902 was 437,500 tons, of which 139,500 tons were for export. Owing to an understanding between the larger companies in the Mt. Pleasant fields, prices f. o. b. were better than in 1901. Export prices, owing to keen competition with Florida rock, have suffered somewhat. In January to April export rock (78-82 per cent. bone phosphate of lime) was quoted at an average of $3.50 per ton f. o. b. Mt. Pleasant; in May, at $3.75; June, $3.25 to $3.75, and thereafter at $3.25 to $3.50, making an average for the year of $3.47 as against $3.33 in 1901.

Domestic high grade rock (78 per cent.) sold, f. o. b., Mt. Pleasant, between $3.00 and $3.25, making an average of $3.13, compared with $2.97 in 1901. Domestic 75 per cent. rock brought $2.75 to $3.00, or an average of $2.88 f. o. b., as against $2.74 for the previous year.

The 70-74 per cent. grade sold at $2.10 to $2.40, which compares with $2.00 to $2.75 in 1901.

Prices on export rock for January and February of this year were $3.25 to $3.50, and for domestic grades $3.00 for 78 per cent., and $2.75 to $3.00 for 75 per cent. rock.

In South Carolina production has been curtailed owing to smaller consumption and the dismantling of large works. Shipments have decreased as compared with 1901. Prices f. o. b. Ashley River, for land rock, averaged $3.25 per ton; river rock, $1.75 to $3.00, both prices showing a decrease from last year. During January and February of this year, land rock was quoted at $3.25 and river rock at $2.75 to $3.00.

Raw Materials of Acid Manufacture.—The Engineering and Mining Journal comments as follows:
Brimstone.—Consumption in the United States has increased. It is estimated that the annual imports of crude brimstone into this country amount to 36 per cent. of the total exported from Sicily. The demand for brimstone in the fertilizer acid trade is being satisfied by pyrites, which furnishes the sulphur at a lower cost. Prices in 1902 show an increase over those for the previous year. The average price of spot brimstone was $23.54 for best unmixed seconds and $21.65 for best thirds, being an increase of 59 cents per ton for best unmixed seconds and 95 cents for best thirds.

Pyrites.—The high price of brimstone has caused increased consumption of pyrites. Domestic production and imports have increased, prices continuing firm. The total imports of pyrites in 1902, according to the Engineering and Mining Journal, were about 410,500 long tons, an increase of 3 per cent. Spanish pyrites fluctuated between 12 and 13$\frac{1}{2}$ cents on the basis of 46.51 per cent. of sulphur. Domestic pyrites sold at $5.00 per ton for lump ore and 10 cents per unit for “fines,” f. o. b. Mineral City, Va., or Charlestown, Mass. The American pyrites contains on an average 42 to 44 per cent. of sulphur. The price of raw materials for acid manufacture have apparently changed but little.

Sulphuric acid has remained firm throughout the year. Wholesale price quoted by the combination have been, for 66 degree acid, $1.20; 60 degree, $1.00 to $1.05 per 100 lbs., f. o. b. New York, for 50 degree acid in bulk, $13.50 to $14.00 per ton; 60 degree, $18.00; 66 degree, $21.00.

New York wholesale quotations for acid phosphate, per unit of available phosphoric acid, were, according to the Oil, Paint and Drug Reporter, during 1901-2, 62.5 cents; during 1902-3 this price remained stationary.

Potash Salts.—The reports of the U. S. Bureau of Statistics show the following entries for consumption during the fiscal years 1901 and 1902:

<table>
<thead>
<tr>
<th></th>
<th>1901</th>
<th>1902</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muriate (pounds)</td>
<td>135,561,091</td>
<td>140,124,418</td>
</tr>
<tr>
<td>Kieserit, kalnit, etc. (tons)</td>
<td>167,470</td>
<td>228,112</td>
</tr>
</tbody>
</table>

The community of interest agreement between the German Kali Syndicate and the Virginia-Carolina Chemical Co., makes it possible, according to the Engineering and Mining Journal, for the latter company, as well as the American Agricultural Chemical Company, to obtain supplies of potash salts at advantageous rates. These two concerns, being the largest consumers in America, no
change has been made in the published schedule of prices from 1901. On the basis of large lots sold through brokers for cash and delivered at Boston, New York or Philadelphia, the schedules of the syndicate on the same basis as heretofore are as follows:

<table>
<thead>
<tr>
<th></th>
<th>February, 1902</th>
<th>After March 1, 1902</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Salt.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muriate:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(60 to 65 per cent., 80 per cent. basis), cwt.,</td>
<td>$1.50</td>
<td>$1.83</td>
</tr>
<tr>
<td>(65 per cent., 90 per cent. basis), cwt.,</td>
<td>1.58</td>
<td>1.80</td>
</tr>
<tr>
<td>Sulfate:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(60 per cent., 90 per cent. basis), cwt.,</td>
<td>2.00</td>
<td>2.11</td>
</tr>
<tr>
<td>(65 per cent., 90 per cent. basis), cwt.,</td>
<td>2.11</td>
<td>2.14</td>
</tr>
<tr>
<td>Double manure salt (48 to 55 per cent. basis), cwt.,</td>
<td>1.09</td>
<td>1.12</td>
</tr>
<tr>
<td>Kainite (12.4 per cent. actual potash) per ton at point of shipment,</td>
<td>$8.88</td>
<td></td>
</tr>
<tr>
<td>Sylvinitc (per unit potassium sulfate),</td>
<td>38.39</td>
<td></td>
</tr>
<tr>
<td>Manure salt (20 per cent. potash), per unit potash,</td>
<td>62.61</td>
<td></td>
</tr>
</tbody>
</table>

This trade is so managed that, before March 1, nearly all wholesale deliveries of the year are contracted for.

Composition of Raw Materials.—In order to form a correct idea of the cost per pound of the fertilizer constituents of these materials, it is needful to determine their composition; or, in other words, the quantities of valuable constituents each contains. The following table shows the composition of the raw materials used in the manufacture of fertilizers. Very few analyses of these materials, with the exception of ground bone and dissolved rock, have been made in Pennsylvania. The figures in the following table include the averages of the results of analyses made in Connecticut, Massachusetts, New Jersey and Pennsylvania during the past year, except in the case of ground bone and dissolved rock phosphates, where Pennsylvania results alone are included.
Composition of Non-Acidulated Fertilizer Ingredients (Per Cent.).

<table>
<thead>
<tr>
<th>Composition</th>
<th>Number of samples analyzed</th>
<th>Nitrogen</th>
<th>Potash</th>
<th>Total Phosphoric acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfate of ammonia</td>
<td>3</td>
<td>26.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate of soda</td>
<td>12</td>
<td>13.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dried blood</td>
<td>5</td>
<td>11.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground bone</td>
<td>27</td>
<td>3.23</td>
<td></td>
<td>23.47</td>
</tr>
<tr>
<td>Tankage</td>
<td>15</td>
<td>5.41</td>
<td></td>
<td>12.57</td>
</tr>
<tr>
<td>Ground fish</td>
<td>22</td>
<td>7.37</td>
<td></td>
<td>7.29</td>
</tr>
<tr>
<td>Cotton-seed meal</td>
<td>58</td>
<td>7.03</td>
<td>1.50</td>
<td>3.15</td>
</tr>
<tr>
<td>Castor pomace</td>
<td>3</td>
<td>5.24</td>
<td>1.00</td>
<td>1.90</td>
</tr>
<tr>
<td>Sulfate of potash, high grade</td>
<td>3</td>
<td></td>
<td></td>
<td>49.6</td>
</tr>
<tr>
<td>Murate of potash</td>
<td>25</td>
<td></td>
<td></td>
<td>59.34</td>
</tr>
<tr>
<td>Kainite</td>
<td>3</td>
<td></td>
<td></td>
<td>13.74</td>
</tr>
<tr>
<td>Double sulfate of potash and magnesia</td>
<td>5</td>
<td></td>
<td></td>
<td>23.32</td>
</tr>
</tbody>
</table>

Composition of Acidulated Fertilizer Ingredients (Per Cent.).

<table>
<thead>
<tr>
<th>Acidulated Ingredient</th>
<th>Number of samples analyzed</th>
<th>Total Phosphoric acid</th>
<th>Soluble phosphoric acid</th>
<th>Reverted phosphoric acid</th>
<th>Insoluble phosphoric acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissolved bone-black</td>
<td>2</td>
<td>17.13</td>
<td>13.42</td>
<td>1.59</td>
<td>1.73</td>
</tr>
<tr>
<td>Dissolved bone,*</td>
<td>16</td>
<td>15.9</td>
<td>12.65</td>
<td>7.22</td>
<td>4.59</td>
</tr>
<tr>
<td>Dissolved rock phosphate</td>
<td>15</td>
<td>16.00</td>
<td>3.61</td>
<td>4.89</td>
<td>1.59</td>
</tr>
</tbody>
</table>

*Also contains 2.5 per cent. nitrogen.

Comparing these figures with those of previous years and considering only those cases where a considerable number of analyses are available, the results seem to indicate no great change in the composition of raw materials used in fertilizer manufacture.

Cost per Pound of Fertilizer Constituents.—With the composition of these raw materials and their price per ton, hundred weight, or other unit of measure as a basis, the wholesale cost per pound of the valuable constituents can be readily calculated. In many cases the ammoniates are quoted "per unit of ammonia," the term unit being equivalent to per cent.; in goods sold by the ton of 2,000 lbs., the unit is equal to 20 lbs., and 20 lbs. of ammonia contain 16.47 lbs. of nitrogen.
In the case of refuse bone-black, unacidulated, the mean, 28.25 per cent. of phosphoric acid, is assumed to represent the average material on the market.

Phosphate rock is sold by the ton of 2,240 lbs., and on the basis of the bone phosphate of lime it contains, with drawbacks for injurious constituents. Bone-phosphate of lime contains 45.8 per cent. of phosphoric acid; therefore, each per cent. of bone phosphate in a long ton is equivalent to 22.4 lbs. and contains 10.26 lbs. of phosphoric acid.

In the wholesale trade, dried blood, azotine, concentrated tankage and hoof meals are usually sold on the basis of ammonia, disregarding the phosphoric acid present.

Insoluble phosphoric acid in dissolved rock is likewise omitted from consideration, contracts being based solely upon the "available" phosphoric acid; nor in rock phosphates is any claim made for the small quantities of nitrogen and potash they contain, nor in dissolved bone for the potash present.

Under these conditions, the wholesale cost per pound in New York of the valuable constituents of such materials as furnish but a single fertilizing element, these materials being assumed to be in the state of preparation and in the packing in which the manufacturer purchased them, are given in the following table; also, a figure representing a fair retail price at the factory, the materials having undergone no change in treatment or packing and the allowance for expense and profit in retailing being 20 per cent.:
Wholesale Cost Per Pound of Fertilizer Constituents (New York).  
I. Ingredients Supplying One Constituent. 

<table>
<thead>
<tr>
<th>Material</th>
<th>Constituent Valued</th>
<th>Wholesale price—cents.</th>
<th>Wholesale price plus per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfate of ammonia</td>
<td>Nitrogen</td>
<td>14.58</td>
<td>17.50</td>
</tr>
<tr>
<td>Nitrate of soda</td>
<td>Nitrogen</td>
<td>12.73</td>
<td>15.28</td>
</tr>
<tr>
<td>Dried blood, high grade</td>
<td>Nitrogen</td>
<td>15.36</td>
<td>18.19</td>
</tr>
<tr>
<td>Concentrated tankage</td>
<td>Nitrogen</td>
<td>9.41</td>
<td>11.29</td>
</tr>
<tr>
<td>Refuse bone-black</td>
<td>Phosphoric acid, total</td>
<td>3.20</td>
<td>3.84</td>
</tr>
<tr>
<td>Phosphate rock*</td>
<td>Phosphoric acid, total</td>
<td>3.75</td>
<td>.45</td>
</tr>
<tr>
<td>(Peace river, 60 per cent.)</td>
<td>Phosphoric acid, total</td>
<td>15.5</td>
<td>.7</td>
</tr>
<tr>
<td>(Tennessee, 78 per cent.)</td>
<td>Phosphoric acid, total</td>
<td>18.19</td>
<td>.45</td>
</tr>
<tr>
<td>(South Carolina, 60 per cent.)</td>
<td>Phosphoric acid, total</td>
<td>11.29</td>
<td>3.13</td>
</tr>
<tr>
<td>Acid phosphate</td>
<td>Phosphoric acid available</td>
<td>3.26</td>
<td>4.26</td>
</tr>
<tr>
<td>Double manure salts</td>
<td>Potash</td>
<td>4.26</td>
<td>4.26</td>
</tr>
<tr>
<td>Sulfate of potash</td>
<td>Potash</td>
<td>3.56</td>
<td>4.27</td>
</tr>
<tr>
<td>Muriate of potash</td>
<td>Potash</td>
<td>3.56</td>
<td>4.27</td>
</tr>
<tr>
<td>Kainit</td>
<td>Potash</td>
<td>3.56</td>
<td>4.27</td>
</tr>
</tbody>
</table>

*The prices of phosphate rock are f. o. b. at the respective points of shipment, not New York, and are taken from the reports of the Engineering and Mining Journal. The prices for potash are taken from the schedule of the Syndicate and those of the remainder from the Oil, Paint and Drug Reporter.

The quotations for bone are given without specific reference to quality, so that it is impossible from these data to fairly apportion their several wholesale values to the nitrogen and phosphoric acid contained in this material. As compared with tankage, the general tendency is to assign a higher commercial rating to the phosphoric acid in bone and to the nitrogen a rating not very different from that given in tankage. The quotations of Thos. J. White & Co. show an average wholesale rate in Baltimore during September, 1902, to March, 1903, for crushed tankage to have been $2.50 per unit of ammonia and $.10 per unit of bone phosphate of lime. This is equivalent to $3.04 per unit of nitrogen and $.218 per unit of phosphoric acid. The average composition of the ground bone and bone meal samples analyzed last fall in Pennsylvania was: Phosphoric acid, 23.47 per cent.; nitrogen, 3.23 per cent. The prepared bone contains less fat and moisture and often less nitrogen than the ordinary "rough bone," but these differences tend, in a manner, to neutralize each other.

Assuming for the rough bone quoted in the New York market the same composition as the bone meal sold in Pennsylvania and for the value of the nitrogen $3.04 per unit, the values per pound of the several constituents would be:
## Wholesale Cost per Pound of Fertilizer Constituents, New York

### II. Bone

<table>
<thead>
<tr>
<th>Grade</th>
<th>Constituent Valued</th>
<th>Wholesale price</th>
<th>Wholesale price, plus 30 per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough bone,</td>
<td>Nitrogen,</td>
<td>15.2</td>
<td>15.21</td>
</tr>
<tr>
<td></td>
<td>Phosphoric acid,</td>
<td>1.53</td>
<td>1.81</td>
</tr>
<tr>
<td>Ground bone,</td>
<td>Nitrogen,</td>
<td>15.33</td>
<td>22.0</td>
</tr>
<tr>
<td></td>
<td>Phosphoric acid,</td>
<td>1.58</td>
<td>2.22</td>
</tr>
</tbody>
</table>

The method of computation here used, applied to the present case in which a drop in the price of the entire raw material is noted, with a concurrent rise in the value of the nitrogen, judged by the quotations for tankage, results, of course, in an abnormal depression of the cost value computed for phosphoric acid. It must not be overlooked, therefore, that this indirect method of computation has very pronounced limitations to its use.

The average ground bone and bone meal on the retail market are probably inferior in composition to the rough bone on the wholesale market, hence, these figures tend to be too high. Direct estimation of the wholesale pound values of acidulated bone (animal bone) cannot be made, as there are no wholesale data available for this purpose; for this computation dependence must be placed upon the retail selling prices.

### Valuations in Neighboring States

It is desirable, from all points of view, that the schedules of valuation throughout a district in which similar market conditions prevail, should differ as little as possible. It has been our practice in the past, to conform our schedule to that adopted after very careful co-operative study of market conditions for each year, by the New England States and New Jersey, except where the peculiar conditions of our market have made the valuations diverge too largely from the actual selling prices, as in the case of ground bone and dissolved rock phosphates. The schedules for these states for 1902 and 1903 are as follows:
Trade Values Adopted by the New England States and New Jersey.

<table>
<thead>
<tr>
<th>Nitrogen:</th>
</tr>
</thead>
<tbody>
<tr>
<td>In ammonia salts,</td>
</tr>
<tr>
<td>In nitrates,</td>
</tr>
<tr>
<td>In dry and fine ground fish,</td>
</tr>
<tr>
<td>In meat, blood and mixed fertilizers,</td>
</tr>
<tr>
<td>In fine ground bone and tankage,</td>
</tr>
<tr>
<td>In coarse bone and tankage,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phosphoric acid:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water soluble,</td>
</tr>
<tr>
<td>Citrate soluble,</td>
</tr>
<tr>
<td>In cotton-seed meal, castor pomace and wood ashes,</td>
</tr>
<tr>
<td>In dry, fine ground fish, bone and tankage,</td>
</tr>
<tr>
<td>In coarse fish, bone and tankage,</td>
</tr>
<tr>
<td>In mixed fertilizers, insoluble,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potash:</th>
</tr>
</thead>
<tbody>
<tr>
<td>In forms free from muriate (chlorid),</td>
</tr>
<tr>
<td>As muriate,</td>
</tr>
</tbody>
</table>

Upon a careful consideration of the changes and tendencies of the wholesale prices of fertilizer ingredients and of the discrepancies occurring since the adoption of the 1902 schedule of valuation, it has been decided that the schedule for use during 1903 should be the same as that adopted for the use of New Jersey and New England except at two points.

For reasons fully discussed in earlier bulletins, it is needful to include in the Pennsylvania schedule of valuations, a distinct set of values for phosphoric acid derived from rock as contrasted with that derived from animal materials. Reference to the tables, given on an earlier page, showing the wholesale cost of a pound of phosphoric acid, will make it plain that when it comes from phosphate rock, it costs the fertilizer maker about one-half of a cent at the mines, on the Atlantic seaboard; when from refuse bone-black, delivered at New York, 3.2 cents; when from tankage, about 1.1 cents; and from bone 1.85 cents.

There is nothing to indicate that, after acidulation, the available phosphoric acid from bone is at all better for the crop than that from a good rock lime phosphate. But so long as the consumer is persuaded that bone phosphoric acid is worth more for his crop than an equal weight of rock phosphoric acid, just so long will the manufacturer of fertilizers be able to command a higher price for those fertilizers reputed to derive their phosphoric acid from bone, and
just so long will he, in turn, be obliged to pay more for it on the wholesale market. Now, in some states, the volume of rock phosphoric acid used is relatively small and the need for its separate valuation not apparent; in other states it predominates to the almost entire exclusion of bone phosphoric acid, so that no distinct valuation for the latter is required; but in Pennsylvania both occupy important positions upon the market and each requires its own set of values.

Despite the advance in the market quotations for phosphate rock, brimstone and pyrites, prices of sulfuric acid, though fluctuating less than during 1901, were on the average lower than in that season, and the New York quotations for acid phosphate remain unchanged. The fact that the two great fertilizer combinations mine a large fraction of their own phosphates, relieves their products from much of the speculative element of variation in value.

In view of this condition and of the close concordance of computed valuations of dissolved rock and the ascertained average selling price during the fall of 1902, the schedule of values used in 1902 for rock phosphoric acid have been adopted for 1903.

For similar reasons, nitrogen and phosphoric acid in ground bone are valued at lower rates in Pennsylvania than in New England. Owing to the slight changes in wholesale prices for rough bone and the fairly concordant agreement between the computed valuation for ground bone on the retail market last fall, and the ascertained average selling price, the schedule of valuations for bone constituents used in 1902 have also been adopted for 1903.

The schedule for 1903 as a whole is as follows:
Schedule of Values for Fertilizer Ingredients, 1903.

<table>
<thead>
<tr>
<th>Nitrogen:</th>
<th>Cents per pound</th>
</tr>
</thead>
<tbody>
<tr>
<td>In ammonia salts</td>
<td>17 1/2</td>
</tr>
<tr>
<td>In nitrates</td>
<td>15</td>
</tr>
<tr>
<td>In meat, dried blood and mixed fertilizers</td>
<td>17</td>
</tr>
<tr>
<td>In cotton-seed meal and castor-pomace</td>
<td>16 1/2</td>
</tr>
<tr>
<td>In fine ground bone and tankage</td>
<td>11</td>
</tr>
<tr>
<td>In coarse bone and tankage</td>
<td>9</td>
</tr>
<tr>
<td>Phosphoric acid:</td>
<td></td>
</tr>
<tr>
<td>Soluble in water, in bone fertilizers</td>
<td>4 1/2</td>
</tr>
<tr>
<td>Soluble in water, in rock fertilizers</td>
<td>3</td>
</tr>
<tr>
<td>Soluble in ammonium citrate, in bone fertilizers</td>
<td>4</td>
</tr>
<tr>
<td>Soluble in ammonium citrate, in rock fertilizers</td>
<td>3 1/2</td>
</tr>
<tr>
<td>Insoluble in ammonium citrate, in bone fertilizers</td>
<td>3</td>
</tr>
<tr>
<td>Insoluble in ammonium citrate, in rock</td>
<td>1 1/2</td>
</tr>
<tr>
<td>In fine bone, tankage and fish</td>
<td>2</td>
</tr>
<tr>
<td>In coarse bone and tankage</td>
<td>2</td>
</tr>
<tr>
<td>In cotton-seed meal, castor pomace and wood ashes</td>
<td>2 1/2</td>
</tr>
</tbody>
</table>

Potash:  
In high grade sulfate or in forms free from muriate. | 5 |
As muriate. | 4 1/2 |

Potash in excess of that equivalent to the chlorin present, will be valued as sulfate, and the remainder as muriate.

Nitrogen in mixed fertilizers will be valued as derived from the best sources of organic nitrogen, unless clear evidence to the contrary is obtained.

Phosphoric acid in mixed fertilizers is valued at bone phosphoric acid prices, unless clearly found to be derived from rock phosphate.

Bone is sifted into two grades of fineness: Fine, less than 1.50 inch in diameter; coarse, over 1.50 inch in diameter.

The result obtained by the use of this schedule does not cover the items of mixing, bagging, freight and agents' commission. To cover these, allowances are made as follows:

For freight, an allowance of $2.00 per ton on all fertilizers.

For bagging, an allowance of $1.00 per ton on all fertilizers, except when sold in original packages.

For mixing, an allowance of $1.80 per ton on complete fertilizers and rock-and-potash goods.

For agents' commission, an allowance of 20 per cent. is added to the cash values of the goods ready for shipment.

The mean quotation on freight from New York, Philadelphia and Baltimore to Harrisburg, in January, 1897, was $1.68 per ton, in lots
of twelve tons or over. In May, 1899, quotations by the Pennsylvania Railroad were: From New York, $2.40; from Philadelphia, $1.70; and from Baltimore, $1.55; mean rate from the three points, $1.88.

For the present year and under similar conditions of shipment, quotations by the Pennsylvania Railroad were: From New York, $2.40; from Philadelphia, $1.90, and from Baltimore, Md., $1.75; mean rate from the three points, $2.02.

FERTILIZER ANALYSES, JANUARY 1 TO AUGUST 1, 1903.

Since January 1, 1903, there have been received from authorized sampling agents eleven hundred and twenty-six fertilizer samples, of which five hundred and forty-two were subjected to analysis the remainder being rejected either because they represented brands analyzed last season, or because they were regarded as not certainly representative of the brand whose name they bore. When two or more samples representing the same brand were received, equal portions from the several samples were united and the composite sample was subjected to analysis.

The samples group themselves as follows, 365 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 3 dissolved bones, furnishing phosphoric acid and nitrogen; 82 rock-and-potash fertilizers, furnishing phosphoric acid and potash; 56 acidulated rock phosphates, furnishing phosphoric acid only; 27 ground bones, furnishing phosphoric acid and nitrogen; 5 miscellaneous fertilizers, which group includes potash salts, nitrate of soda and other substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phosphoric acid—total, that portion soluble in water, and of the residue, that portion not soluble in warm ammonium citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called "reverted" acid, which is the portion insoluble in water but soluble in the citrate. The sum of the soluble and reverted is commonly called the "available" phosphoric acid. (3) Potash soluble in water.—most of that
present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling.

(4) Nitrogen—this element is determined by a method which simply accounts for all present, without distinguishing between the quantities present in the several forms of ammonium salts, nitrates or organic matter. (5) Chlorin; this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid or muriate, the cheaper source. The computation is made on the assumption that the chlorin present, unless in excess, has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (7) In the case of ground bone, the state of subdivision is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone in the soil depends very largely on the fineness of its particles, the finer being much more quickly useful to the plant.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guaranties stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacturer in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown up among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of a valuable constituent ranging from a certain minimum to a much higher maximum; thus, "Potash, 2 to 4 per cent." is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guaranties filed by the maker of the goods, with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed. For compactness and because no essentially important fact is suppressed thereby, the guaranties for soluble and reverted phosphoric acid have not been given separately, but are combined into a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric acid, the sum of the lowest figures given by him for soluble and reverted phosphoric acid is used. The law of 1879 allowed the maker to express his guaranty for nitrogen either in terms of that element or in terms of the ammonia equivalent thereto; since ammonia is composed of three
parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen.

The law of 1901 abolishes this alternative and requires that the guaranty shall be given in terms of nitrogen. Many manufacturers, after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables.

A summary of the analyses made this season may be presented as follows, excepting the miscellaneous class:

### Summary of Analyses Made This Season

<table>
<thead>
<tr>
<th></th>
<th>Complete fertilizers</th>
<th>Dissolved bone</th>
<th>Rock and potash</th>
<th>Dissolved bone</th>
<th>Ground bone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of analyses</td>
<td>365</td>
<td>3</td>
<td>82</td>
<td>56</td>
<td>27</td>
</tr>
<tr>
<td>Moisture, per cent.</td>
<td>9.89</td>
<td>6.84</td>
<td>11.17</td>
<td>9.67</td>
<td>6.14</td>
</tr>
<tr>
<td>Phosphoric acid:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total, per cent.</td>
<td>10.47</td>
<td>17.30</td>
<td>14.61</td>
<td>15.02</td>
<td>22.46</td>
</tr>
<tr>
<td>Soluble, per cent.</td>
<td>4.84</td>
<td>3.32</td>
<td>4.54</td>
<td>5.20</td>
<td></td>
</tr>
<tr>
<td>Insoluble, per cent.</td>
<td>5.64</td>
<td>11.11</td>
<td>15.08</td>
<td>9.88</td>
<td></td>
</tr>
<tr>
<td>Potash, per cent.</td>
<td>2.09</td>
<td>3.87</td>
<td>2.38</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>Nitrogen, per cent.</td>
<td>1.40</td>
<td>3.09</td>
<td>2.38</td>
<td>2.29</td>
<td></td>
</tr>
<tr>
<td>Mechanical analysis of bone:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine</td>
<td>$21.29</td>
<td>$20.87</td>
<td>$14.73</td>
<td>$13.32</td>
<td>$29.70</td>
</tr>
<tr>
<td>Coarse</td>
<td>$21.57</td>
<td>$21.77</td>
<td>$17.29</td>
<td>$15.18</td>
<td>$25.67</td>
</tr>
<tr>
<td>Commercial valuation</td>
<td>30.84</td>
<td>30.87</td>
<td>14.71</td>
<td>13.34</td>
<td>27.25</td>
</tr>
</tbody>
</table>

The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which it amounted to two-tenths per cent., or more, were as follows:
Summary of Instances of Deficiency from Guaranty.

<table>
<thead>
<tr>
<th></th>
<th>Complete fertilizers</th>
<th>Dissolved bone</th>
<th>Rock and potash</th>
<th>Dissolved bone</th>
<th>Ground bone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficient in four constituents,</td>
<td>13</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Deficient in three constituents,</td>
<td>48</td>
<td></td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Deficient in two constituents,</td>
<td>76</td>
<td>27</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Deficient in one constituent,</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total samples in which deficiency occurred,</td>
<td>157</td>
<td>1</td>
<td>27</td>
<td>13</td>
<td>9</td>
</tr>
</tbody>
</table>

The cases of deficiency noted during the past nine seasons in the goods as compared with their guaranties expressed in percentage of the total number of goods of each class analyzed, are as follows:

**Percentage of Deficiency, 1899-1903.**

<table>
<thead>
<tr>
<th></th>
<th>Spring, 1899</th>
<th>Fall, 1899</th>
<th>Spring, 1900</th>
<th>Fall, 1900</th>
<th>Spring, 1901</th>
<th>Fall, 1901</th>
<th>Spring, 1902</th>
<th>Fall, 1902</th>
<th>Spring, 1903</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete fertilizers</td>
<td>38.4</td>
<td>33.7</td>
<td>42.8</td>
<td>32.8</td>
<td>31.6</td>
<td>31.6</td>
<td>49.0</td>
<td>35.7</td>
<td>37.0</td>
</tr>
<tr>
<td>Dissolved bone</td>
<td>50.6</td>
<td>11.3</td>
<td>11.3</td>
<td>37.3</td>
<td>21.7</td>
<td>29.2</td>
<td>30.6</td>
<td>30.0</td>
<td>33.9</td>
</tr>
<tr>
<td>Rock and potash</td>
<td>23.8</td>
<td>23.8</td>
<td>23.8</td>
<td>23.8</td>
<td>23.8</td>
<td>23.8</td>
<td>23.8</td>
<td>23.8</td>
<td>23.8</td>
</tr>
<tr>
<td>Dissolved rock</td>
<td>18.4</td>
<td>25.3</td>
<td>26.7</td>
<td>18.4</td>
<td>18.4</td>
<td>18.4</td>
<td>25.3</td>
<td>25.3</td>
<td>25.3</td>
</tr>
<tr>
<td>Ground bone</td>
<td>56.3</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
</tr>
<tr>
<td>All classes except lime fillers</td>
<td>59.3</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
</tr>
</tbody>
</table>

Marked variations in the general percentages of deficiency occur from year to year. During the past season, they have been somewhat above normal. In most samples which are found below guaranty at one point, there is an excess at some other point, indicating that the cause of the departure from the composition guaranteed lay not in the failure of the manufacturer to use the requisite components, but in his failure to secure a uniform mixture. Considering all cases of complete fertilizers in which guaranties...
were strictly comparable with stated analytical results and sufficiently complete for the purpose: Of the 137 samples in which there was deficiency at some point, there were only 26 in which there was not distinct excess above guaranty at some other point, though sometimes such excess was not sufficient to counterbalance the deficiency. Naturally, the tendency is toward excess of the cheaper constituent, phosphoric acid, and deficiency of potash or nitrogen, as appears below.

More than two-thirds of the brands were up to or above guaranty at all points. The true average condition of the market for complete fertilizers will be more fairly exhibited by a comparison of the average composition of all samples for which guaranties are recorded with the average of the corresponding guaranties; they are as follows:

Average Composition and Guaranty Compared.

<table>
<thead>
<tr>
<th></th>
<th>Average Composition</th>
<th>Guaranty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per cent.</td>
<td>Per cent.</td>
</tr>
<tr>
<td></td>
<td>201</td>
<td>1905</td>
</tr>
<tr>
<td></td>
<td>1903</td>
<td>1902</td>
</tr>
<tr>
<td></td>
<td>1903</td>
<td>1904</td>
</tr>
<tr>
<td>Phosphoric acid:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total,</td>
<td>11.51</td>
<td>10.50</td>
</tr>
<tr>
<td>Available,</td>
<td>10.60</td>
<td>9.65</td>
</tr>
<tr>
<td>Potash,</td>
<td>2.17</td>
<td>2.56</td>
</tr>
<tr>
<td>Nitrogen,</td>
<td>1.39</td>
<td>1.39</td>
</tr>
<tr>
<td>Spring, 1902.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphoric acid:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total,</td>
<td>10.50</td>
<td>9.29</td>
</tr>
<tr>
<td>Available,</td>
<td>9.25</td>
<td>7.83</td>
</tr>
<tr>
<td>Potash,</td>
<td>3.00</td>
<td>3.56</td>
</tr>
<tr>
<td>Nitrogen,</td>
<td>1.62</td>
<td>1.58</td>
</tr>
<tr>
<td>Fall, 1902.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphoric acid:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total,</td>
<td>12.55</td>
<td>11.49</td>
</tr>
<tr>
<td>Available,</td>
<td>9.95</td>
<td>9.23</td>
</tr>
<tr>
<td>Potash,</td>
<td>2.63</td>
<td>2.66</td>
</tr>
<tr>
<td>Nitrogen,</td>
<td>1.97</td>
<td>1.55</td>
</tr>
<tr>
<td>Spring, 1903.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphoric acid:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total,</td>
<td>11.59</td>
<td>10.67</td>
</tr>
<tr>
<td>Available,</td>
<td>9.36</td>
<td>8.73</td>
</tr>
<tr>
<td>Potash,</td>
<td>3.55</td>
<td>3.63</td>
</tr>
<tr>
<td>Nitrogen,</td>
<td>1.55</td>
<td>1.61</td>
</tr>
</tbody>
</table>

It is of interest to note how closely the system of valuations, based upon the wholesale prices of raw materials in the principal
markets during the most important buying season and upon certain average allowances for expenses and profit on the part of the mixer and jobber, coincides with the retail prices later ascertained. A comparison for several seasons past is given below:

Comparison of Selling Price and Valuation, 1899-1903.

<table>
<thead>
<tr>
<th>Complete fertilizers:</th>
<th>Selling Price</th>
<th>Valuation</th>
<th>Excess of valuation over selling price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1899, Spring,</td>
<td>$23.60</td>
<td>$24.70</td>
<td>$1.10</td>
</tr>
<tr>
<td>Fall</td>
<td>22.98</td>
<td>23.42</td>
<td>.44</td>
</tr>
<tr>
<td>1900, Spring,</td>
<td>25.26</td>
<td>24.61</td>
<td>-.57</td>
</tr>
<tr>
<td>Fall</td>
<td>22.16</td>
<td>22.84</td>
<td>.68</td>
</tr>
<tr>
<td>1901, Spring,</td>
<td>23.92</td>
<td>24.76</td>
<td>.84</td>
</tr>
<tr>
<td>Fall</td>
<td>22.28</td>
<td>22.75</td>
<td>1.47</td>
</tr>
<tr>
<td>1902, Spring,</td>
<td>24.10</td>
<td>23.33</td>
<td>1.33</td>
</tr>
<tr>
<td>Fall</td>
<td>21.83</td>
<td>22.51</td>
<td>1.48</td>
</tr>
<tr>
<td>1903, Spring,</td>
<td>24.57</td>
<td>24.15</td>
<td>-.42</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dissolved bone:</th>
<th>Selling Price</th>
<th>Valuation</th>
<th>Excess of valuation over selling price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1899, Spring,</td>
<td>21.75</td>
<td>21.51</td>
<td>.06</td>
</tr>
<tr>
<td>Fall</td>
<td>19.00</td>
<td>21.12</td>
<td>2.12</td>
</tr>
<tr>
<td>1900, Spring,</td>
<td>26.00</td>
<td>20.87</td>
<td>4.87</td>
</tr>
<tr>
<td>Fall</td>
<td>28.00</td>
<td>22.74</td>
<td>.76</td>
</tr>
<tr>
<td>1901, Spring,</td>
<td>28.00</td>
<td>22.90</td>
<td>1.00</td>
</tr>
<tr>
<td>Fall</td>
<td>21.91</td>
<td>23.36</td>
<td>-1.45</td>
</tr>
<tr>
<td>1902, Spring,</td>
<td>16.50</td>
<td>17.35</td>
<td>.85</td>
</tr>
<tr>
<td>Fall</td>
<td>25.30</td>
<td>27.08</td>
<td>1.78</td>
</tr>
<tr>
<td>1903, Spring,</td>
<td>31.17</td>
<td>30.87</td>
<td>-.30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rock and potash:</th>
<th>Selling Price</th>
<th>Valuation</th>
<th>Excess of valuation over selling price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1899, Spring,</td>
<td>16.83</td>
<td>15.15</td>
<td>-1.67</td>
</tr>
<tr>
<td>Fall</td>
<td>17.25</td>
<td>15.63</td>
<td>-1.30</td>
</tr>
<tr>
<td>1900, Spring,</td>
<td>17.93</td>
<td>14.71</td>
<td>-3.22</td>
</tr>
<tr>
<td>Fall</td>
<td>18.11</td>
<td>14.63</td>
<td>-3.48</td>
</tr>
<tr>
<td>1901, Spring,</td>
<td>16.20</td>
<td>14.00</td>
<td>-2.20</td>
</tr>
<tr>
<td>Fall</td>
<td>16.00</td>
<td>14.23</td>
<td>-1.47</td>
</tr>
<tr>
<td>1902, Spring,</td>
<td>16.45</td>
<td>15.05</td>
<td>-1.40</td>
</tr>
<tr>
<td>Fall</td>
<td>15.97</td>
<td>14.46</td>
<td>-1.51</td>
</tr>
<tr>
<td>1903, Spring,</td>
<td>17.20</td>
<td>14.74</td>
<td>-2.46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dissolved rock:</th>
<th>Selling Price</th>
<th>Valuation</th>
<th>Excess of valuation over selling price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1903, Spring,</td>
<td>13.36</td>
<td>14.03</td>
<td>.67</td>
</tr>
<tr>
<td>Fall</td>
<td>12.64</td>
<td>13.13</td>
<td>.49</td>
</tr>
<tr>
<td>1900, Spring,</td>
<td>13.29</td>
<td>13.48</td>
<td>.19</td>
</tr>
<tr>
<td>Fall</td>
<td>13.16</td>
<td>13.11</td>
<td>-.05</td>
</tr>
<tr>
<td>1901, Spring,</td>
<td>13.43</td>
<td>12.82</td>
<td>-.61</td>
</tr>
<tr>
<td>Fall</td>
<td>13.73</td>
<td>13.49</td>
<td>-.24</td>
</tr>
<tr>
<td>1902, Spring,</td>
<td>13.54</td>
<td>13.70</td>
<td>.16</td>
</tr>
<tr>
<td>Fall</td>
<td>15.13</td>
<td>13.34</td>
<td>-1.79</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ground bone:</th>
<th>Selling Price</th>
<th>Valuation</th>
<th>Excess of valuation over selling price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1899, Spring,</td>
<td>26.67</td>
<td>28.11</td>
<td>1.44</td>
</tr>
<tr>
<td>Fall</td>
<td>24.88</td>
<td>27.23</td>
<td>2.35</td>
</tr>
<tr>
<td>1900, Spring,</td>
<td>28.42</td>
<td>26.91</td>
<td>-.51</td>
</tr>
<tr>
<td>Fall</td>
<td>28.73</td>
<td>26.87</td>
<td>-1.86</td>
</tr>
<tr>
<td>1901, Spring,</td>
<td>27.59</td>
<td>28.71</td>
<td>1.12</td>
</tr>
<tr>
<td>Fall</td>
<td>25.94</td>
<td>27.60</td>
<td>1.66</td>
</tr>
<tr>
<td>1902, Spring,</td>
<td>28.82</td>
<td>24.60</td>
<td>-1.22</td>
</tr>
<tr>
<td>Fall</td>
<td>28.89</td>
<td>27.51</td>
<td>-1.38</td>
</tr>
<tr>
<td>1903, Spring,</td>
<td>28.67</td>
<td>27.35</td>
<td>-1.42</td>
</tr>
</tbody>
</table>
The schedule of valuation adopted for use this year has given valuations which run below the selling prices in all grades of goods, although the agreement between the computed value and selling price in case of complete fertilizers is closer than for several seasons. The true relation can be ascertained only by taking into account the average freight to points of sale from which samples were taken this year. Rock-and-potash selling prices are always high in comparison with those of complete fertilizers and the disparity this spring is greater than for several seasons. The most striking deficiency, in view of those observed in earlier seasons, is that in dissolved rock goods.

It has been thought that a study of the relation existing between the valuations and selling prices of fertilizers offered for sale in different sections of the State might prove of interest as affording an idea of the effect of freight rates in these sections and also the effect of remoteness from manufacturing centers. For this purpose the State has been divided into sections as follows: (I) The Southeastern section, bounded on the north by and including the counties of Centre, Snyder, Dauphin, Schuylkill and Northampton, and on the west by Huntingdon and Franklin. (II) The Northeastern section, bounded on the south as above and on the west by Tioga, Lycoming and Clinton counties. (III) The Southwestern section, bounded on the east as stated and on the north by and including Beaver, Allegheny, Indiana and Clearfield counties. (IV) The Northwestern section, including the remaining counties of the State.

The following table shows the average valuation and selling price on all grades of goods in each of these sections:

<table>
<thead>
<tr>
<th>Section</th>
<th>Seller price</th>
<th>Computed commercial value</th>
<th>Excess of selling price over valuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section I</td>
<td>$23.50</td>
<td>$23.29</td>
<td>$0.22</td>
</tr>
<tr>
<td>Section II</td>
<td>$22.90</td>
<td>$21.50</td>
<td>1.41</td>
</tr>
<tr>
<td>Section III</td>
<td>$23.50</td>
<td>$21.69</td>
<td>1.81</td>
</tr>
<tr>
<td>Section IV</td>
<td>$23.65</td>
<td>$20.38</td>
<td>3.27</td>
</tr>
</tbody>
</table>

It appears from these figures that in a large portion of the State the agreement between the valuations and selling prices is quite close. It is to be noted, however, that in case of Section IV there is a marked difference. A perfect analysis is impossible without a
careful study of freight rates to local centers, but the excess of average selling price over average valuation is probably more than increased freight rates can explain.

FERTILIZER ANALYSES, AUGUST 1 TO DECEMBER 31, 1903.

Since August 1, 1903, there have been received from authorized sampling agents nine hundred and twenty-nine fertilizer samples, of which four hundred and sixty-three were subjected to analysis, the remainder being rejected either because they represented brands analyzed last season, or because they were regarded as not certainly representative of the brand whose name they bore. When two or more samples representing the same brand were received, equal portions from the several samples were united and the composite sample was subjected to analysis.

The samples group themselves as follows, 264 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 11 dissolved bones, furnishing phosphoric acid and nitrogen; 74 rock-and-potash fertilizers, furnishing phosphoric acid and potash; 60 acidulated rock phosphates, furnishing phosphoric acid only; 49 ground bones, furnishing phosphoric acid and nitrogen; 5 miscellaneous fertilizers, which group includes potash salts, nitrate of soda and other substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phosphoric acid—total, that portion soluble in water, and of the residue, that portion not soluble in warm ammonium citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called "reverted" acid, which is the portion insoluble in water but soluble in the citrate. The sum of the soluble and reverted is commonly called the "available" phosphoric acid. (3) Potash soluble in water,—most of that present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling. (4) Nitrogen—this element is determined by a method which simply accounts for all present, without distinguishing between the quantities present in the several forms of ammonium salts, nitrates or or-
ganic matter. (5) Chlorin; this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid or muriate, the cheaper source. The computation is made on the assumption that the chlorin present, unless in excess, has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (6) In the case of ground bone, the state of sub-division is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone in the soil depends very largely on the fineness of its particles, the finer being much more quickly useful to the plant.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guaranties stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacturer in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown up among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of a valuable constituent ranging from a certain minimum to a much higher maximum; thus, "Potash, 2 to 4 per cent." is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guaranties filed by the maker of the goods with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed. For compactness and because no essentially important fact is suppressed thereby, the guaranties for soluble and reverted phosphoric acid have not been given separately, but are combined into a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric acid, the sum of the lowest figures given by him for soluble and reverted phosphoric acid is used. The law of 1879 allowed the maker to express his guaranty for nitrogen either in terms of that element or in terms of the ammonia equivalent thereto; since ammonia is composed of three parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen.

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The law of 1901 abolishes this alternative and requires that the guaranty shall be given in terms of nitrogen. Many manufacturers after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables.

A summary of the analyses made this season may be presented as follows, excepting the miscellaneous class:

Summary of Analyses Made this Season.

<table>
<thead>
<tr>
<th></th>
<th>Complete</th>
<th>Rock and potash</th>
<th>Dissolved bone</th>
<th>Dissolved rock</th>
<th>Ground bone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of analyses</td>
<td>204</td>
<td>74</td>
<td>11</td>
<td>60</td>
<td>49</td>
</tr>
<tr>
<td>Moisture, per cent.</td>
<td>10.69</td>
<td>11.73</td>
<td>7.72</td>
<td>10.01</td>
<td>5.82</td>
</tr>
<tr>
<td>Phosphoric acid:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total, per cent.</td>
<td>10.84</td>
<td>11.16</td>
<td>15.09</td>
<td>15.19</td>
<td>22.97</td>
</tr>
<tr>
<td>Soluble, per cent.</td>
<td>4.82</td>
<td>5.17</td>
<td>3.23</td>
<td>3.28</td>
<td></td>
</tr>
<tr>
<td>Reverted, per cent.</td>
<td>4.02</td>
<td>4.75</td>
<td>5.33</td>
<td>4.72</td>
<td></td>
</tr>
<tr>
<td>Insoluble, per cent.</td>
<td>1.99</td>
<td>1.24</td>
<td>5.76</td>
<td>1.36</td>
<td></td>
</tr>
<tr>
<td>Potash, per cent.</td>
<td>2.99</td>
<td>2.54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen, per cent.</td>
<td>1.37</td>
<td>2.15</td>
<td></td>
<td></td>
<td>2.13</td>
</tr>
<tr>
<td>Mechanical analysis of bone:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coarse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>79</td>
</tr>
<tr>
<td>Commercial valuation</td>
<td>$32.90</td>
<td>$14.45</td>
<td>$24.97</td>
<td>$18.13</td>
<td>$77.66</td>
</tr>
<tr>
<td>Average selling price</td>
<td>21.98</td>
<td>15.56</td>
<td>23.47</td>
<td>16.04</td>
<td>27.57</td>
</tr>
<tr>
<td>Commercial value of samples whose selling price is ascertained</td>
<td>23.77</td>
<td>11.64</td>
<td>21.87</td>
<td>18.12</td>
<td>27.07</td>
</tr>
</tbody>
</table>
The only noteworthy departure of valuation from selling price is in the case of dissolved rock. The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which it amounted to two-tenths per cent., or more, were as follows:

Summary of Instances of Deficiency from Guaranty.

<table>
<thead>
<tr>
<th></th>
<th>Complete fertilizer</th>
<th>Dried bone</th>
<th>Rock and potash</th>
<th>Dissolved rock</th>
<th>Ground bone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficient in four constituents</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Deficient in three constituents</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Deficient in two constituents</td>
<td>27</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Deficient in one constituent</td>
<td>67</td>
<td>26</td>
<td>12</td>
<td>12</td>
<td>8</td>
</tr>
</tbody>
</table>

Total samples in which deficiency occurred: 100 7 13 12 8
The cases of deficiency noted during the past ten seasons in the goods as compared with their guaranties expressed in percentage of the total number of goods of each class analyzed, are as follows:

Percentage of Deficiency, 1899-1903.

<table>
<thead>
<tr>
<th></th>
<th>Spring, 1899</th>
<th>Fall, 1899</th>
<th>Spring, 1900</th>
<th>Fall, 1900</th>
<th>Spring, 1901</th>
<th>Fall, 1901</th>
<th>Spring, 1902</th>
<th>Fall, 1902</th>
<th>Spring, 1903</th>
<th>Fall, 1903</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete fertilizers</td>
<td>38.4</td>
<td>33.7</td>
<td>42.0</td>
<td>48.8</td>
<td>31.6</td>
<td>21.6</td>
<td>40.0</td>
<td>36.7</td>
<td>37.5</td>
<td>37.9</td>
</tr>
<tr>
<td>Dissolved bone</td>
<td>56.0</td>
<td>11.3</td>
<td>*59.0</td>
<td>*59.0</td>
<td>*100.0</td>
<td>34.0</td>
<td>*100.0</td>
<td>34.0</td>
<td>*100.0</td>
<td>34.0</td>
</tr>
<tr>
<td>Rock and potash</td>
<td>35.1</td>
<td>31.3</td>
<td>21.5</td>
<td>33.3</td>
<td>31.4</td>
<td>25.2</td>
<td>30.8</td>
<td>33.5</td>
<td>32.5</td>
<td>42.2</td>
</tr>
<tr>
<td>Dissolved rock</td>
<td>35.8</td>
<td>14.5</td>
<td>5.4</td>
<td>9.4</td>
<td>22.5</td>
<td>8.2</td>
<td>15.2</td>
<td>8.9</td>
<td>21.0</td>
<td>21.0</td>
</tr>
<tr>
<td>Ground bone</td>
<td>18.4</td>
<td>25.3</td>
<td>36.7</td>
<td>31.3</td>
<td>34.3</td>
<td>38.2</td>
<td>37.2</td>
<td>35.9</td>
<td>37.3</td>
<td>37.3</td>
</tr>
<tr>
<td>All classes except miscellaneous</td>
<td>20.9</td>
<td>23.2</td>
<td>25.3</td>
<td>24.3</td>
<td>30.8</td>
<td>27.6</td>
<td>34.2</td>
<td>33.3</td>
<td>25.1</td>
<td>41.7</td>
</tr>
</tbody>
</table>

*Only two samples analyzed.

During the past season, the general percentages of deficiency have been high, although as heretofore, in most samples which are found below guaranty at one point, there is an excess at some other point. Of the 100 samples in which there was deficiency at some point, there were only 21 in which there was not an excess above guaranty at some other point.
A comparison of the average composition of all samples of complete fertilizers for which guaranties are recorded with the average of the corresponding guaranties, for several seasons past including those of this season follows:

Average Composition and Guaranty Compared.

<table>
<thead>
<tr>
<th>Season</th>
<th>Phosphoric Acid</th>
<th>Potash</th>
<th>Nitrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Available</td>
<td></td>
</tr>
<tr>
<td>Fall, 1901</td>
<td>11.51</td>
<td>10.60</td>
<td>2.17</td>
</tr>
<tr>
<td>Spring, 1902</td>
<td>10.80</td>
<td>8.25</td>
<td>3.59</td>
</tr>
<tr>
<td>Fall, 1902</td>
<td>12.78</td>
<td>9.65</td>
<td>2.60</td>
</tr>
<tr>
<td>Spring, 1903</td>
<td>11.90</td>
<td>9.76</td>
<td>3.65</td>
</tr>
<tr>
<td>Fall, 1903</td>
<td>10.76</td>
<td>8.54</td>
<td>2.30</td>
</tr>
</tbody>
</table>

A comparison of selling prices with the computed commercial value is presented in the following table:
Comparison of Selling Price and Valuation, 1899-1903.

<table>
<thead>
<tr>
<th></th>
<th>Selling Price</th>
<th>Valuation</th>
<th>Excess of Valuation over Selling Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete fertilizers:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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It is interesting to observe the fact that, despite the relatively high price of dissolved rock during the season, the selling price of rock-and-potash fertilizers exhibited, during this season, less excess above the commercial valuation than ever before.
LIST OF FERTILIZER MANUFACTURERS AND BRANDS OF FERTILIZERS LICENSED FOR SALE IN PENNSYLVANIA FOR THE YEAR 1903.

THE ABBOTT & MARTIN RENDERING CO., No. 232 N. High Street, Columbus, Ohio.

1. "Ideal Grain Grower."
2. "Peerless Bone and Potash."
3. "Harvest King."
4. "New York Special."
5. "Tennessee Phosphate."
6. "Hercules Phosphate."
7. "Universal Fertilizer."
8. "Fine Raw Bone Meal."


1. "Bone Meal."

ALLEGHENY CITY FERTILIZER WORKS, Allegheny, Pa.

1. "Pure Raw Bone Phosphate."
2. "Potato Raw Bone Meal."
3. "Potato Manure."
4. "Banner Phosphate."
5. "Dissolved Bone and Potash."
6. "Odorless Lawn and Garden Plant Food."
7. "Full Value Phosphate."
8. "Butcher's Bone Meal."
9. "Grain and Grass Phosphate."
10. "Special Potash Phosphate."
11. "Acid Phosphate."

THE ALLENTOWN MANUFACTURING CO., Allentown, Pa.

1. "High Grade Truck and Garden Phosphate."
2. "High Grade Potato Phosphate."
3. "Complete Bone Phosphate."
4. "Special $25.00 Phosphate."
5. "Phosphate and Potash."
6. "Pure Ground Bone."
7. "Acidulated Phosphate."
8. "Economical Phosphate."

THE ALLIANCE FERTILIZER CO., Alliance, Ohio

1. "Button Bone Special."
2. "Button Bone."
AMERICAN REDUCTION CO., No. 1942 Forbes' Street, Pittsburg, Pa.
1. "Pittsburg Guano."
2. "Iron City."
3. "Common Sense."
4. "Vegetable Manure."
5. "Fine Ground Bone."

THE AMERICAN AGRICULTURAL CHEMICAL CO., No. 326 Broadway, New York, N. Y.
1. "Pure Ground Bone."
2. "Fine Ground Bone."
3. "Muriate of Potash."
4. "Genuine German Kainit."
5. "Dissolved Animal Bone."
7. "Grove's Standard."
8. "Big Crop Phosphate."
10. "High Grade Bone and Potash."

THE A. A. C. CO., BRADLEY'S BRANCH, P. O. Box 217, New York, N. Y.
1. "Bradley's Dissolved Bone and Potash."
2. "Bradley's Bean and Potato Phosphate."
3. "Bradley's Soluble Dissolved Bone."
4. "Bradley's Niagara Phosphate."
5. "Bradley's Alkaline Bone with Potash."
6. "Bradley's B. D. Sea Fowl Guano."

THE A. A. C. CO., CANTON CHEMICAL BRANCH, P. O. Box 407, Baltimore, Md.
1. "Canton-Chemical C. C. C. Special Compound."
3. "Canton-Chemical Baker's Fish Guano."
4. "Canton-Chemical Potato Manure."
5. "Canton-Chemical Resurgam Guano."
7. "Canton-Chemical Harrow Brand Crop Grower."
8. "Canton-Chemical Dollar Phosphate."
9. "Canton-Chemical Soluble Alkaline Bone."
10. "Canton-Chemical Soluble Bone and Potash."

THE A. A. C. CO., CHICOPEE GUANO BRANCH, No. 88 Wall Street, New York, N. Y.
1. "Chicopee Farmers' Reliable."
2. "Chicopee Standard Guano."

THE A. A. C. CO., CLARK'S COVE BRANCH, P. O. Box 1779, New York, N. Y.
2. "Clark's Cove Triumph Bone and Potash."
3. "Clark's Cove Defiance Complete Manure."
4. "Clark's Cove King Philip Alkaline Guano."
5. "Clark's Cove Potato and Hop Grower."
THE A. A. C. CO., CROCKER BRANCH, Buffalo, N. Y.

1. "Crocker's General Crop Grower."
2. "Crocker's Universal Grain Grower."
3. "Crocker's Complete Manure."
5. "Crocker's Wheat and Corn Fertilizer."
6. "Crocker's Potato, Hop and Tobacco Fertilizer."
7. "Crocker's Ammoniated Bone Super-Phosphate."
8. "Crocker's Dissolved Bone and Potash."

THE A. A. C. CO., CUMBERLAND BRANCH, No. 27 William Street, New York, N. Y.

1. "Cumberland Dissolved Bone Phosphate."
2. "Cumberland Bone and Potash."
3. "Cumberland Hawkeye Fertilizer."
4. "Cumberland Guano."
5. "Cumberland Ammoniated Dissolved Bone."

THE A. A. C. CO., DETTRICK BRANCH, No. 26 Chamber of Commerce, Baltimore, Md.

1. "Detrick's Quickstep Bone Phosphate for Potatoes and Tobacco."
2. "Detrick's Kangaroo Komplete Kom pound."
3. "Detrick's Royal Crop Grower."
5. "Detrick's Corn and Oats Fertilizer."
6. "Detrick's Imperial Compound."
7. "Detrick's Paragon Ammoniated Bone Phosphate and Potash."
8. "Detrick's P. & B. Special Fertilizer."
10. "Detrick's Soluble Bone Phosphate and Potash."
11. "Detrick's Dissolved S. C. Bone."
12. "Orchilla Guano."

THE A. A. C. CO., GREAT EASTERN BRANCH, Rutland, Vt.

1. "Great Eastern Northern Corn Special."
2. "Great Eastern Vegetable, Vine and Tobacco."
3. "Great Eastern Wheat Special."
4. "Great Eastern General."
5. "Great Eastern English Wheat Grower."
6. "Great Eastern Soluble Bone and Potash."
7. "Great Eastern Dissolved Bone."
8. "Great Eastern Unammoniated Wheat Special."
9. "Great Eastern High Grade Cabbage Grower."

THE A. A. C. CO., LAZARETTO GUANO BRANCH, Merchant's Bank Building, Baltimore, Md.

1. "Lazaretto Crop Grower."
2. "Lazaretto Bone Compound."
3. "Lazaretto Special Potato Fertilizer."
4. "Lazaretto Ammoniated Bone Phosphate."
5. "Lazaretto Excelsior A. A. A."
6. "Lazaretto Dissolved Bone and Potash."
7. "Lazaretto Dissolved Bone Phosphate."
8. "Lazaretto H. G. Dissolved Bone and Potash."

THE A. A. C. CO., MARYLAND BRANCH, No. 30 S. Holliday Street, Baltimore, Md.

1. "Maryland Ammoniated Bone."
2. "Maryland O. K. Ammoniated Fertilizer."
3. "Maryland Alkaline Bone."
4. "Maryland Linden Super-Phosphate."
5. "Maryland Bono Super-Phosphate."
7. "Maryland Compound for Potatoes and Tobacco."

THE A. A. C. CO., MICHIGAN CARBON WORKS BRANCH, Detroit, Mich.

1. "Red Line Phosphate."
2. "Red Line Phosphate with Potash."
3. "Red Line Complete Manure."
4. "General Crop Fertilizer."
5. "Homestead "A" Bone Black Fertilizer."

THE A. A. C. CO., MILSOM BRANCH, East Buffalo, N. Y.

1. "Milsom's Erie King Fertilizer."
2. "Milsom's Wheat, Oats and Barley Fertilizer."
3. "Milsom's Buffalo Guano."
4. "Milsom's Buffalo Fertilizer."
5. "Milsom's Potato, Hop and Tobacco Fertilizer."
6. "Milsom's Corn Fertilizer."
7. "Milsom's Vegetable Bone Fertilizer."
9. "Milsom's Acid Phosphate."


1. "Moro-Phillips Pure Phuine."
2. "Moro-Phillips Soluble Bone Phosphate."
3. "Moro-Phillips Wheat Special."
4. "Moro-Phillips Farmers' Phosphate."
5. "Moro-Phillips Farmers' Potato Mixture."
7. "Moro-Phillips Special Fertilizer."

THE A. A. C. CO., NIAGARA BRANCH, P. O. Box 189, Buffalo, N. Y

1. "Niagara Grain and Grass Grower."
2. "Niagara Wheat and Corn Producer."
3. "Niagara Dissolved Bone and Potash."
4. "Niagara Dissolved Bone Phosphate."
THE A. A. C. CO., PACIFIC GUANO BRANCH, P. O. Box 2350 New York, N. Y.

1. "Pacific Dissolved Bone Phosphate."
2. "Pacific Dissolved Bone and Potash."
3. "Pacific A. No. 1 Phosphate."
4. "Pacific Nobsque Guano."
5. "Pacific Potato Phosphate."

THE A. A. C. CO., PACKERS UNION BRANCH, Rutland, Vt.

1. "Packers Union Gardeners' Complete Manure."
2. "Packers Union Animal Corn Fertilizer."
3. "Packers Union Potato Manure."
4. "Packers Union Universal Fertilizer."
5. "Packers Union American Wheat and Rye Grower."
7. "Packers Union Acidulated Bone."
8. "Packers Union Wheat, Oats and Clover."

THE A. A. C. CO., QUINNIPIAC BRANCH, No. 27 William Street, New York, N. Y.

1. "Quinnipiac Soluble Dissolved Bone."
2. "Quinnipiac Dissolved Bone and Potash."
3. "Quinnipiac Mohawk Fertilizer."
4. "Quinnipiac Climax Phosphate."

THE A. A. C. CO., READ BRANCH, No. 88 Wall Street, New York, N. Y.

1. "Read's Standard Super-Phosphate."
2. "Read's Leader Blood and Bone."
3. "Read's Farmers' Friend Super-Phosphate."
4. "Read's Acid Phosphate (14 Per Cent.)."
5. "Read's Bone and Potash."
6. "Read's Dissolved Bone."

THE A. A. C. Co., REESE BRANCH, Equitable Building, Baltimore, Md.

1. "Reese's Standard."
2. "Reese's Potato Phosphate."
3. "Reese's Mayflower."
4. "Reese's Potato Manure."
5. "Reese's Ammoniated Bone Phosphate Mixture."
6. "Reese's Harvest Queen."
7. "Reese's Pilgrim Fertilizer."
8. "Reese's Challenge Crop Grower."
9. "Reese's Half and Half."
10. "Reese's High Grade Potash Mixture, 12 x 3."
12. "Reese's Grass and Grain."
15. "Reese's Elm Phosphate."
ANNUAL REPORT OF THE

1. "Sharpless & Carpenter Corn and Truck Guano."
2. "Sharpless & Carpenter Gilt Edge Potato and Tobacco Manure."
3. "Sharpless & Carpenter No. 1 Bone Phosphate."
5. "Sharpless & Carpenter Soluble Bone and Potash."
8. "Sharpless & Carpenter No. 2 for Grain and Grass."
10. "Sharpless & Carpenter Acid Phosphate."

THE A. A. C. CO., STANDARD BRANCH, No. 40 Exchange Place, New York, N.Y.
1. "Standard Dissolved Bone Phosphate."

THE A. A. C. CO., SUSQUEHANNA BRANCH, Cor. South and Water Streets, Baltimore, Md.
1. "Susquehanna Potato Phosphate."
2. "Susquehanna Pure Bone Phosphate."
4. "Susquehanna XXV Phosphate."
5. "Susquehanna Crop Grower."
6. "Susquehanna High Grade Bone and Potash."
7. "Susquehanna Alkaline Bone Phosphate."
10. "Susquehanna Grain and Grass Grower."

5. "Tygert-Allen Star Bone Phosphate."
7. "Howitz’s Acid Phosphate."
9. "Allen’s Special Brand Potato Manure."

1. "Wheeler’s Corn Fertilizer."
2. "Wheeler’s Potato Manure."
3. "Wheeler's Superior Truck."

THE A. A. C. CO., WILLIAMS & CLARK BRANCH, No. 27 William Street, New York, N. Y.
1. "Williams & Clark Acorn Acid Phosphate."
2. "Williams & Clark Dissolved Bone and Potash."
3. "Williams & Clark Prolific Fertilizer."
4. "Williams & Clark Royal Bone Phosphate."
5. "Williams & Clark Americas High Grade Special."
7. "Williams & Clark Good Grower Potato Phosphate."

THE A. A. C. CO., ZELL GUANO BRANCH, No. 32 South Street, Baltimore, Md.
1. "Zell's Special Compound for Potatoes and Vegetables."
2. "Zell's Ammoniated Bone Super-Phosphate."
3. "Zell's Hustler Phosphate."
4. "Zell's Economizer Phosphate."
5. "Zell's Little Giant."
6. "Zell's Dissolved Bone Phosphate and Potash."
7. "Zell's Electric Phosphate."
8. "Zell's Dissolved Bone Phosphate."

ANSTINE, A., Stewartstown, Pa.
1. "Bone Phosphate."

THE ARMOUR FERTILIZER WORKS, No. 205 LaSalle Street, Chicago, Ill.
1. "Bone Meal."
2. "Raw Bone Meal."
3. "Phosphate and Potash."
4. "Wheat, Corn and Oats Special."
5. "Ammoniated Bone and Potash."
6. "Fruit and Root Crop Special."
7. "All Soluble."
8. "Bone, Blood and Potash."
10. "High Grade Potato."
11. "Grain Grower."
12. "Star Phosphate."
14. "Phosphate and Potash No. 2."
16. "Special Mixture."

AUCKER, R. S., Shamokin, Pa.
1. "Pure Bone Meal."
2. "Bone Meal with Potash."
910

ANNUAL REPORT OF THE

4. "Grade A. Bone and Slaughter House Phosphate."
5. "Grade B. Bone and Slaughter House Phosphate."
6. "Grade D. Bone and Slaughter House Phosphate."
7. "Grade E. Bone and Slaughter House Phosphate."
8. "Economy Potash Phosphate."
9. "High Grade Potash."

BALTIMORE FERTILIZER COMPANY, 206 Spear's Wharf, Baltimore, Md.

1. "Success."
2. "King of the Harvest."
3. "Homestead."
4. "Old Honesty."
5. "Soluble Bone and Potash."
6. "High Grade Acid Phosphate."

BALTIMORE PULVERIZING COMPANY, Nos. 13 and 15 North Street, Baltimore, Md.

1. "Penniman's Excelsior Fertilizer."
2. "Special Spring and Fall Mixture."
3. "Penniman's Special Guano No. 1."
4. "South Carolina Bone Phosphate."
5. "High Grade Wheat Compound."

BARTENSCHLAGER, J. H., Stewartstown, Pa.

1. "Bartenschlager's Champion Bone Mixture."

BAUGH & SONS COMPANY, No. 20 S. Delaware Avenue, Philadelphia, Pa.

1. "Baugh's Raw Bone Meal, Warranted Pure."
2. "Baugh's Pure Dissolved Animal Bone."
3. "Export Bone with Potash."
5. "Baugh's Double Eagle $25.00 Phosphate."
6. "Baugh's General Crop Grower—For all Crops."
7. "Baugh's Soluble Alkaline Super-Phosphate."
10. "Baugh's Corn Fertilizer—For Sugar Corn and Garden Truck."
12. "Baugh's Special Potato Manure."
13. "Baugh's High Grade Acid Phosphate."
15. "High Grade Vegetable Guano."
17. "Excelsior Super-Phosphate."
18. "Genuine Lobas Peruvian Guano."

BAUGHMAN, WILLIAM F., Rinely, Pa.

1. "Potato and Tobacco Special."
2. "Ammoniated Bone Phosphate."
3. "Harvest Queen Phosphate."
BAXTER, H. V., Chester, Pa.
1. "Pure Ground Bone."
2. "IXL Phosphate."

BEARD, A. H., & SON, Reading, Pa.
1. "A. A. Brand."

1. "Berg's Special Potato Guano."
2. "Berg's Lymph Guano for all Crops."
3. "Berg's $35.00 Potato Manure."
4. "Berg's Standard Bone Manure."
5. "Berg's Pure Dissolved Bone and Potash."
7. "Berg's Special $25.00 Bone Manure."

BERGER BROTHERS, Easton, Pa.
2. "Peerless."
3. "Wheat and Grass Special."
4. "Lehigh Superior Phosphate."
5. "Potato and Truck Special."

BIRELY, A. D. & SONS, Ladiesburg, Md.
1. "Ammoniated Bone Phosphate."
2. "Special Mixture for Wheat and Grass."

1. "Blaker's Acid Phosphate."
2. "Blaker's General Use."
3. "Blaker's Potato."

BONDAY, JAMES, JR., & CO., No. 302 Merchants' Bank Building, Baltimore, Md.
1. "Sulphate of Potash."
2. "Muriate of Potash."
3. "German Kainit—Old Reliable Brand."

BOWKER FERTILIZER COMPANY, THE, No. 43 Chatham Street, Boston, Mass.
1. "Stockbridge Potato and Vegetable Manure."
2. "Bowker's Potash or Staple Phosphate."
3. "Bowker's Sure Crop Phosphate."
4. "Bowker's Ammoniated O. I. O."
5. "Bowker's Super-Phosphate and Potash."
6. "Bowker's Apex Phosphate."
7. "Bowker's Dissolved Bone Phosphate."
8. "Bowker's 6 Per Cent. Potato Fertilizer."
9. "Bowker's Potash Bone."
10. "Bowker's Empire State Bone and Potash."
11. "Bowker's Hill and Drill Phosphate."
12. "Bowker's Farm and Garden Phosphate."
15. "Bone Meal."
16. "Soluble Bone."
17. "Corn and Grain Grower."
18. "Market Bone."

BRADLEY & GREEN FERTILIZER CO., Ninth Street and Girard Avenue, Philadelphia, Pa.
1. "Potato Guano No. 1."
2. "Harvest Home."
3. "High Grade Acid Phosphate."
4. "Popular Phosphate—Special for Wheat."

BRILLINGER, HORACE, Emigsville, Pa.
1. "Brillinger's Special Wheat, Corn and Grass Mixture."
2. "Standard High Grade Phosphate."

BRODBECK, S. M., Brodbecks, Pa.
1. "Standard."
2. "Reliable."
3. "Alkaline."
4. "Ruth Dissolved Bone."

BROWN, WILLIAM, No. 1 S. Front Street, Philadelphia, Pa.
1. "Grain and Grass Manure."
2. "Cereal Bone Phosphate."

BROWN, J. W., Tilden, York County, Pa.
1. "No. 7 Compound Fertilizer."
2. "Animal Bone Fertilizer."

BRUBACHER, ELIAS S., Millbach, Pa.
1. "Wheat and Grass Special."

BUCYRUS FERTILIZER CO., THE, Bucyrus, O.
1. "Buckeye Wheat Grower."

CAMBRIA FERTILIZER COMPANY, Johnstown, Pa.
1. "Pure Fine Ground Bone Dust."
2. "Lion Ammoniated Bone Phosphate."
4. "Corn and Potato Manure."
5. "B. & B. Phosphate."

1. "No. 1 Acid Phosphate."
2. "Bone, Blood and Potash."
3. "Potash Special."
4. "Corn and Wheat Special."
5. "Diamond Phosphate."
6. "Calumet Phosphate."
7. "Western Bone Black and Potash."
8. "New York Leader."

CINCINNATI PHOSPHATE CO., THE, Cincinnati, O.
1. "Capitol Wheat Grower."
2. "Capitol Dissolved Bone and Potash."
3. "Capitol Tobacco Food."
4. "Capitol Complete Fertilizer."
5. "Alkaline Bone."

COE COMPANY, E. FRANK, No. 133 Front Street, New York, N. Y.
1. "High Grade Soluble Bone."
2. "XXV Ammoniated Bone Super-Phosphate."
3. "Prize Brand Grain Fertilizer."
4. "Special Dissolved—Bone and Potash."
5. "High Grade Acid Phosphate."
7. "Columbian Corn Fertilizer."
8. "Columbian Potato Fertilizer."
9. "XXX Acid Phosphate."

CONTINENTAL COMMERCIAL CO., 33 S. Holliday Street, Baltimore, Md.
1. "Special Potato and Tomato Phosphate."
2. "Standard Dissolved Bone."
3. "Ammoniated Bone."
4. "Potashed Bone."
5. "High Grade Soluble Phosphate."

COPE, HENRY, & COMPANY, Lincoln University, Pa.
1. "Acid Phosphate."
2. "Soluble Bone and Potash."
4. "Pure Bone Phosphate."
5. "Potato and Corn Phosphate."
6. "Dead Shot Phosphate."
7. "Pure Ground Bone."
8. "Queen of Elk Valley."
10. "High Grade Soluble Bone and Potash."

COPE, JOSIAH, & COMPANY, Lincoln University, Pa.
1. "Pure Bone Phosphate."
2. "Try Me Bone Phosphate."

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4. "Wheat and Grass Special."
5. "Potato and Tobacco Phosphate."
7. "Soluble Bone and Potash."
8. "Steamed Bone."
9. "Ground Raw Bone."
10. "High-Grade Soluble Bone and Potash."

1. "Corson's Prepared Lime and Potash"

CRONISTER, W. M., Philipsburg, Pa.
1. "Cronister's Ammoniated Bone Fertilizer."

DARLING & CO., Union Stock Yards, Chicago, Ill.
1. "Darling's Farmer's Favorite Brand."
2. "Darling's Sure Winner Brand."
3. "Darling's Chicago Brand."
4. "Darling's Western Brand."
5. "Darling's General Crop Brand."
6. "Darling's Pure Ground Bone."
7. "Darling's Two and Twenty Bone."
8. "Darling's H. O. Acid Phosphate."

DARON, E., Dover, Pa.
1. "Daron's Harvest King Bone Phosphate."

DICKEY, J. SCOTT, No. 630 Prince Street Lancaster, Pa.
1. "Dickey's Tobacco Stem Fertilizer."
2. "Dickey's Wheat Brand."

DOWNWARD & COMPANY, JAMES G., Coatesville, Pa.
1. "Ammoniated Bone Phosphate."
2. "Soluble Bone and Potash."
3. "Special Wheat and Grass Fertilizer."
4. "High Grade Acid Phosphate."
5. "Royal Bone Phosphate."
6. "Special Potato Phosphate."
7. "Special Corn Manure."
8. "Pure Ground Raw Bone."
10. "Special Mixture."
11. "Special Bone Fertilizer."

DUNGAN, WALLACE, Doylestown, Pa.
1. "Pebel Hill Home-Made Animal Bone Mixture."
2. "Bone Flour."
EBY, AMOS, Lehman Place, Pa.
1. "Pequea Bone."
2. "Pequea Economy."
3. "Pequea Ammoniated."
4. "Pequea Bone for Potatoes."
5. "Farmers' Mixture."

EUREKA FERTILIZER COMPANY, Perryville, Md.
1. "Farmers' Favorite Bone Phosphate."
2. "Standard Bone Phosphate."
3. "Grain and Grass Mixture."
4. "Corn and Potato Special."
5. "P. & P. Super-Phosphate."
6. "Potato and Vegetable Fertilizer."
7. "Fish, Rock and Potash."
9. "Ground Bone."
10. "Eureka Complete Compound."
11. "Eureka Wrapper Leaf."
13. "Bailey's Special Mixture."
14. "High Grade Acid Phosphate."

EWING, WASHINGTON, Landenberg, Pa.
1. "Pure Raw Ground Bone."
2. "Eclipse Raw Bone."

FAIRLAMB, R. C., & SONS, Brandywine Summit, Pa.
1. "Potato Special."
2. "Corn Special."

FARMERS' FERTILIZER COMPANY, Westminster, Md.
1. "No. 3 Bone Phosphate."
2. "XX Bone Phosphate."
3. "Carroll Bone Phosphate."
5. "Acid Phosphate."
6. "No. 1 Bone Phosphate."

FARMER, W. S., & CO., No. 21 S. Gay Street, Baltimore, Md.
2. "Harvest Queen Phosphate."
3. "Clyde Brand Phosphate."
5. "Dissolved S. C. Bone."

FRETZ, MAHLON, Sellersville, Pa.
1. "Fretz's Standard Phosphate."

GAWTHROP, JOSEPH R., Kennett Square, Pa.
1. "Fine Ground Raw Bone Meal."
2. “Champion Bone Fertilizer for Wheat and Grass.”
3. “Complete Ammoniated Bone Phos. for Corn, Oats, Potatoes and Wheat.”
4. “Acid Phosphate Rock.”

GLICK, I. N., R. F. D. No. 6, Lancaster, Pa.
1. “Glick’s Up-to-Date Grain and Grass Grower.”
2. “Glick’s Up-to-Date Vegetable and Tobacco Compounds.”

GOODLEY & CO., CHAS. P., Brandywine Summit, Pa.
1. “Fish, Potash and Animal Bone Phosphate.”

GRIFFITH & BOYD, No. 9 S. Gay Street, Baltimore, Md.
1. “Cereal Bone Plant Food.”
2. “Valley Fertilizer.”
3. “Peerless Fertilizer.”
4. “High Grade Acid Phosphate.”
5. “Harvest Queen Fertilizer.”
6. “XX Potash Manure.”
7. “Original Super-Phosphate.”
8. “Farmers’ Potato Manure.”
10. “Farmers’ Improved Phosphate.”
11. “Spring Crop Grower.”
12. “Fish, Bone and Potash.”
13. “Special Grain Grower.”
14. “Royal Potash Guano.”
15. “Stable Manure Substitute.”
16. “Soft Ground Bone Meal.”
17. “Special Guano.”

HAGER, H. F., Quakertown, Pa.
1. “Hager’s Ammoniated Super-Phosphate.”
2. “Panic Phosphate.”
3. “Farmers’ Favorite Phosphate.”

HANOVER FERTILIZER COMPANY, N. E. Cor. Gay and Lombard Streets, Baltimore, Md.
2. “Royal Bone and Potash.”
3. “Farmers’ Crop Winner.”
4. “Blood and Bone Compound.”
5. “Excelsior Combine.”
6. “Klondike Special.”
7. “Pure Bone Meal.”
8. “High Grade Bone and Potash.”

HARDY PACKING COMPANY, THE, No. 189 Madison Street, Chicago, Ill.
1. “Hardy’s Crop Producer.”
2. “Hardy’s Tankage, Bone and Potash.”
3. “Hardy’s Potash Fertilizer.”
4. “Hardy’s Fort Dearborn Phosphate.”
5. "Hardy’s Security Phosphate."
6. "Hardy’s Corn and Wheat Grower."
7. "Hardy’s Imperial."
8. "Packers Raw Bone."

HARTRANFT, FRANK, Coatesville, Pa.
1. "Ground Bone."
2. "Ammoniated Bone Phosphate."
3. "Potato Phosphate."
4. "Special Phosphate."
5. "Acid Phosphate."
6. "Cook’s Bone Phosphate."
7. "Soluble Bone and Potash."

HASTINGS, WILLIAM S., & SON, Atglen, Pa.
1. "Clear Acid Phosphate."
2. "Soluble Bone and Potash."

1. "Ammoniated Bone Super-Phosphate."
2. "Keystone Bone Phosphate."
3. "Wheat and Grass Manure."
4. "Emperor Phosphate."
5. "Potato and Truck Manure."
6. "Ground Bone."
7. "Special Compound."
8. "Special Corn Manure."
9. "Special Potato Manure."
10. "Soluble Bone."
11. "Soluble Bone and Potash."
12. "Acid Phosphate."
13. "Fish and Potash Manure."
15. "Tobacco Manure."

1. "Pure Ground Bone."

1. "Potato Phosphate."
2. "King Phosphate."

HUBBARD, M. P., & COMPANY, No. 612 Equitable Building, Baltimore, Md.
1. "Celebrated Dissolved Bone Phosphate for General Use."
2. "Farmers’ Acme."
3. "Farmers’ Old Economy."
4. "H. S. Soluble S. C. Phosphate."
5. "Hubbard’s Harvest King."
6. "Hubbard’s Soluble Bone and Potash."
HUBBARD FERTILIZER COMPANY, THE, No. 708 Merchants' Bank Building, Baltimore, Md.

1. "Hubbard's Standard Bone Super-Phosphate."
2. "Hubbard's Royal Ensign—For Early Market Vegetables."
3. "Hubbard's Farmers' IXL Super-Phosphate."
5. "Hubbard's Oriental Phosphate."
6. "Hubbard's Columbia Gem Phosphate."
7. "Hubbard's Soluble Bone and Potash."
8. "Hubbard's High Grade Soluble Tennessee Phosphate."
10. "Hubbard's Crescent Soluble Crop Producer."


1. "Radix Fertilizer."
2. "Index Bone Phosphate."
3. "Index Ground Bone."
4. "Index Bone Meal."
5. "Index Bone Flour."
6. "Spiro Bone Meal."
7. "Michell's Bone Phosphate."
8. "Michell's Pure Bone Meal."

INTERNATIONAL SEED COMPANY, Rochester, N. Y.

1. "International Grain and Grass Fertilizer."
2. "International Potato and Truck Manure."
3. "International A 1 Special Manure."

JARECKI COMMERCIAL COMPANY, Sandusky, Ohio.

1. "Lake Erie Fish Guano."
2. "Fish and Potash Grain Special."
3. "Number One Fish Guano."
5. "Pure Ground Bone."
6. "Dissolved Bone Black Wheat Special."
7. "Fish and Potash Potato and Tobacco Food."
8. "O. K. Fertilizer."
9. "Dissolved Bone with Potash."
10. "Square Brand Phosphate and Potash."

JONES, W. C., SONS, Doe Run, Pa.

1. "High Grade Dissolved S. C. Rock."
2. "Dissolved Bone Phosphate."

JOYNT, JOHN J., Lucknow, Ontario, Canada.

1. "Canada Hardwood Ashes (Joynt Brand)."


1. "Kenderdine's Potato Phosphate."
2. "Kenderdine's Bone Phosphate."
3. "Kenderdine's A. Phosphate."
KEYSTONE FERTILIZER COMPANY, No. 405 Drexel Building, Philadelphia, Penna.

1. “Fish, Blood and Bone Guano.”
2. “Fox Brand Guano.”
3. “Old Pennsylvania Compound.”
4. “All Crop Guano.”
5. “Tip Top Brand.”
6. “Rock Potash.”
7. “Dissolved Bone Phosphate.”

KUHNS, DAVID, Lehighton, Pa.

1. “Pure Ground Bone Meal.”

KURTZ, D. S., New Holland, Pa

1. “Conestoga Regulator.”
2. “Conestoga Fancy.”

LACKAWANNA FERTILIZER & CHEMICAL CO., Moosic, Pa.

1. “Moosic Phosphate.”
2. “Special Manure.”
3. “Our Admiral.”
4. “Bone Super-Phosphate.”
5. “Alkaline Bone.”
7. “Acid Phosphate.”
8. “Big Yield.”
10. “Kali Chief.”

LANCASTER CHEMICAL COMPANY, Lancaster, Pa.

1. “Tobacco and Vegetable.”
4. “Rising Sun Animal Bone.”
5. “Pure Dissolved Animal Bone.”
6. “Flag Brand.”
7. “Hard Times Fertilizer.”
8. “Economist Fertilizer.”
9. “Acid Phosphate.”
10. “Keystone Brand.”
11. “Alkaline Bone.”
12. “Bone Meal.”
13. “Special Potash Manure.”
15. “General Crop Special.”

LEIB, J. C., & CO., Stewartstown, Pa.

1. “Gemmill’s Mixture.”

LEtherbury, D. A., Chester, Pa.

1. “Chester Brand Bone Phosphate.”
LEVAN, DANIEL, Lebanon, Pa.
1. “Wheat and Grass Special.”
2. “Keystone Bone Fertilizer.”
3. “Bone and Potash Compound.”
4. “Special Corn Fertilizer.”
5. “Wheat and Grass Fertilizer.”
6. “Lebanon Special Fertilizer.”
7. “General Crop Grower.”

LISTER’S AGRICULTURAL CHEMICAL WORKS, Newark, N. J.
1. “Lister's Animal Bone and Potash.”
2. “Lister's Animal Bone and Potash No. 2.”
3. “Lister's Corn and Potato Fertilizer.”
4. “Lister’s Success Fertilizer.”
5. “Lister’s Standard Pure Bone Super-Phosphate of Lime.”
6. “Lister’s Corn and Potato Fertilizer No. 2.”
7. “Lister’s Special Corn Fertilizer.”
8. “Lister's Special 16 Per Cent. Potato Fertilizer.”
10. “Lister’s Special Crop Producer.”
11. “Lister’s Ammoniated Dissolved Bone Phosphate.”
12. “Lister’s Harvest Queen Phosphate.”
13. “Lister’s Potato Manure.”
15. “Lister’s Alkaline Bone.”
16. “Lister’s Special Fertilizer for Wheat and Rye.”
17. “Lister’s Celebrated Ground Bone Acidulated.”
18. “Lister’s Pure Raw Bone Meal.”

McCALMONT & CO., Bellefonte, Pa.
1. “McCalmont & Co’s $25.00 Ammoniated Bone Super-Phosphate.”

MAPES FORMULA AND PERUVIAN GUANO CO., No. 143 Liberty Street, New York, N. Y.
1. “Mapes Potato Manure.”
2. “Mapes Tobacco Starter Improved.”
3. “Mapes Tobacco Manure (Wrapper Brand).”
4. “Mapes Fruit and Vine Manure.”
5. “Mapes Vegetable Manure or Complete Manure for Light Soils.”
6. “Mapes Average Soil Complete Manure.”
7. “Mapes Economical Potato Manure.”
8. “Mapes Cauliflower and Cabbage.”
9. “Mapes Corn Manure.”
11. “Mapes Complete Manure for General Use.”
12. “Mapes Ammoniated Dissolved Bone with Potash.”
13. “Mapes Cereal Brand.”
15. “Mapes General Crop Brand.”
16. “Mapes Top-Dresser Improved—Half Strength.”

MARKEL, NOAH, Seitzland, Pa.
1. “Markel's Ammoniated Bone Phosphate.”
2. "Markel's Potato Grower."
4. "Markel's Special Phosphate."

1. "Claremont Dissolved Bone and Potash."
2. "Pure Dissolved Animal Bone."
3. "Ground Bone."
4. "Gilt Edge Potato Manure."
5. "Corn and Oats Special."
6. "Organic Compound."
8. "Crop Producer."
10. "Martin's Complete Vegetable Manure."
11. "Acid Phosphate."

MEHRING, FREDERICK, Bruceville, Pa.
1. "Dissolved Raw Bone."
2. "Twenty-Six Dollar Phosphate."
3. "General Crop Grower."
4. "Acid Phosphate."

MILLER FERTILIZER COMPANY, No. 411 E. Pratt Street, Baltimore, Md.
1. "Ammoniated Dissolved Bone."
2. "Harvest Queen."
3. "Special Potato."
4. "Hustler Phosphate."
5. "W. G. Phosphate."
7. "Clinch Phosphate."
8. "South Carolina Rock."
10. "Ground Bone."

MORTIMER, EDMUND, & CO., No. 13 William Street, New York, N. Y.
1. "Genuine Peruvian Guano."

MOWREY-LATSHAW HARDWARE CO., THE, Spring City, Pa.
1. "Red Clover Brand."

1. "Special Compound for all Crops."

NASSAU FERTILIZER CO., No. 5 Beaver Street, New York, N. Y.
1. "Soluble Bone Phosphate."
2. "Grass and Grain Fertilizer."
3. "Potash and Phosphate."
4. "Wheat and Grass Grower."
5. "General Favorite."
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6. "Nassau Practical."
7. "Common Sense Fertilizer."
8. "The Harvester."
10. "Special Potato Fertilizer."
11. "Gladiator Truck and Potato."

NEWPORT, WILLIAM C., & CO., Willowgrove, Pa.
1. "Evan's Brand Potato and Tobacco Manure."
2. "Rectified Phosphate."
3. "Gilt Edge Potato and Tobacco Manure."
4. "Fish, Bone and Potash."
5. "Farmers' Ammoniated Bone Phosphate."
6. "Grain and Grass Special."
7. "Soluble Bone and Potash."
8. "Acid Phosphate."
9. "Bone Meal."
10. "No. 1 Bone Phosphate."
12. "Potato, Tobacco and Truck Guano."
13. "Special Compound."
14. "Top Notch Brand."
15. "Clear Acid Phosphate."
16. "Frog Brand Guano."
17. "Kainit."

OBER, G., & SONS, No. 33 S. Gay Street, Baltimore, Md.
1. "Ober's Special Plant Food."
2. "Ober's Farmers' Mixture."
3. "Ober's Dissolved Bone Phosphate and Potash."
4. "Ober's Dissolved Bone Phosphate."
5. "Ober's Independent Ammoniated Super-Phosphate."

OHIO FARMERS' FERTILIZER CO., Columbus, O.
1. "Superior Phosphate."
2. "Soluble Bone and Potash."
3. "General Crop Fish Guano."
4. "Corn, Oats and Wheat Fish Guano."
5. "Wheat Maker and Seeding Down."
7. "Alkaline Bone."
8. "Flusher Guano."
9. "Kainit."

OSCEOLA FERTILIZER COMPANY, Osceola Mills, Pa.
1. "Pie Brand Ground Bone."
2. "Ideal Manure."

OXFORD PACKING WORKS, Oxford, Pa
2. "O. P. W. Number One."
3. "O. P. W. Number Two."
5. "O. P. W. Number Four."

PATAPSCO GUANO COMPANY, P. O. Box 213, Baltimore, Md.
1. "Patapsco Pure Ground Bone."
2. "Patapsco Soluble Bone and Potash."
3. "Patapsco Fish Guano."
4. "Patapsco Special Wheat Compound."
5. "Sea Gull Guano."
6. "Coon Brand Guano."
7. "Baltimore Soluble Phosphate."
9. "Grange Mixture."
10. "Patapsco Grain and Grass Producer."
11. "Patapsco Early Trucker."
12. "Patapsco Tobacco and Potato Fertilizer."
14. "Patapsco High Grade Bone and Potash."
15. "Battle Axe Phosphate."

PATTERSON FERTILIZER CO., No. 4025 Market Street, Philadelphia, Pa.
1. "Patterson's Mineral Compound."

PENNSYLVANIA AMMONIA AND FERTILIZER CO., LIM., Harrisburg, Pa.
1. "Potato, Vegetable and Tobacco."
2. "Dauphin Brand."
4. "Royal Mixture."
5. "Soluble Bone and Potash."

PERKINS, J. DOUGLASS, Coatesville, Pa.
1. "Perkins' Monarch Phosphate."
2. "Perkins' Special Bone Manure."
4. "Perkins' Acidulated Phosphate."

PIEDMONT-MT. AIRY GUANO CO., THE, No. 109 Commerce Street, Baltimore, Md.
1. "Levering's Standard."
2. "Piedmont High Grade S. C. Bone."
4. "Piedmont Pure Raw Bone Mixture."
5. "Levering's Harvest Queen."
6. "Levering's IXL Phosphate."
7. "Diamondâ (S) Soluble Bone."
10. "Levering's Ammoniated Bone."
11. "Piedmont Bone Meal."
PITTSBURG PROVISION CO., Pittsburg, Pa.
1. “No. 1 Pure Raw Bone Meal.”
2. “Pure Raw Bone Meal.”
3. “Crescent Butchers’ Ground Bone.”
4. “Pure Bone with Potash.”
5. “Corn and Potato Fertilizer.”
7. “Guano Fertilizer.”
8. “Acid Phosphate.”
9. “Phosphate and Potash.”
10. “Tobacco Special.”

POLLOCK, R. H., No. 51 S. Gay Street, Baltimore, Md.
1. “Dissolved S. C. Bone.”
2. “Victor Bone Phosphate.”
3. “Superior Corn and Tomato Fertilizer.”
4. “Owl Brand Guano.”
5. “Special Potato and Tobacco Fertilizer.”
6. “Special Wheat Grower.”
7. “Ammoniated Bone Phosphate.”
8. “Soft Ground Bone.”

POWELL, W. S., & CO., No. 300 Water Street, Baltimore, Md.
1. “Dissolved S. C. Bone.”

1. “Ground Raw Bone.”
2. “Bone Phosphate.”

RAMSBURG FERTILIZER COMPANY, Frederick, Md.
1. “Excelsior Plant Food.”
2. “Old Virginia Compound.”
3. “Ammoniated Bone Phosphate.”
4. “Alkaline Phosphate.”
5. “Dissolved Bone Super-Phosphate.”
6. “Ramsburg’s Queen.”

RASIN-MONUMENTAL COMPANY, No. 300 Water Street, Baltimore, Md.
1. “Rasin’s Empire Guano.”
2. “Rasin’s Ammoniated Super-Phosphate.”
3. “Rasin’s Bone and Potash Fertilizer.”
4. “Rasin’s Acid Phosphate.”
5. “Rasin’s IXL Fertilizer.”
6. “Special Formula for Corn and Buckwheat.”
7. “Seawall Special.”
8. “XXV Fertilizer.”
9. “Potato Manure.”

RAUH, E., & SONS, No. 419 S. Penn Street, Indianapolis, Ind.
1. “Dissolved Bone and Potash.”
2. “Soluble Bone.”
3. “Ideal Phosphate.”
No. 6.

DEPARTMENT OF AGRICULTURE.

REESE, JACOB, No. 400 Chestnut Street, Philadelphia, Pa.
1. "Odorless Slag Phosphate."

1. "The Lehigh Potato Manure."
2. "Surpass Phosphate."
3. "Little Giant Phosphate."

ROCHESTER FERTILIZER WORKS, THE, Moosic, Pa.
1. "Blood and Bone Guano."
2. "Blood and Bone X. X."
3. "Genesee Guano."
4. "Vegetable Phosphate."
5. "Universal Phosphate."
6. "Pure Ground Bone."
7. "Alkaline Bone Guano."
8. "Dissolved Bone Phosphate."
10. "Bone and Potash."

SALE, GEORGE F. (Sandiford), Philadelphia, Pa.
1. "Geo. F. Sale's Special Manure for all Crops."

SCHAAL-SHELDON FERTILIZER COMPANY, Erie, Pa.
1. "Sheldon's Empire."
2. "Sheldon's Farmers' Favorite."
3. "Schaal's Standard."
5. "Schaal's Corn and Potato."
7. "Schaal's Pure Bone Meal."
8. "Dissolved Bone and Extra Potash."
10. "Dissolved Bone."
11. "Truckers' Manure."
12. "Onion and Cabbage."

SCHMUCHER, A. B., Hazleton, Pa.
1. "Hazel Brand."

1. "Scientific Corn and Grain Fertilizer."
2. "Scientific Economy."
4. "Scientific Potato Fertilizer."
5. "Scientific Dissolved Bone Fertilizer."
7. "Bone and Meat."
8. "Pure Raw Bone Meal."
12. "Patrons' Special."
1. "Sure Growth Super-Phosphate."
4. "Corn and Oats Grower."
5. "Tip Top Soluble Bone."
6. "Potato Grower."
7. "Wheat and Grass Grower."
8. "Tip Top and Potash."
10. "I'litch's Special for Grain and Grass."
11. "Grain Special."
12. "Potato and Truck Special."

1. "Ringtown Clover."
2. "Gold Eagle."
4. "Pure Ground Bone."
5. "Shenandoah Brand."

1. "Swift Sure Phosphate for General Use."
2. "Swift Sure Phosphate for Potatoes."
3. "Swift Sure Phosphate for Tobacco."
4. "Swift Sure Special 10 Per Cent. Potato Fertilizer No. 1."
5. "Swift Sure Special 10 Per Cent. Potato Fertilizer No. 2."
6. "Swift Sure Guano for Tomatoes, Truck and Corn."
7. "Swift Sure Guano for Fall Trade."
8. "Swift Sure New Jersey Special for Oats."
10. "Swift Sure Bone Meal."
11. "Swift Sure Dissolved Bone."
12. "Good Enough Phosphate."
13. "Echo Phosphate."
15. "Dissolved S. C. Rock."
16. "Pure Raw Bone Meal."
17. "Dissolved Bone and Potash."
18. "Pure Raw Ground Bone."

1. "Special Manure for Potatoes and Vegetables."
2. "Vegetable and Vine Fertilizer."
3. "Empire Phosphate."
4. "King Phosphate."
5. "Monarch Phosphate."
6. "Pure Ground Bone."
7. "Graves Potato and Tobacco Manure."
8. "Peerless Phosphate."
9. "Empire Lawn Fertilizer."
10. "Muriate of Potash."
No. 6. DEPARTMENT OF AGRICULTURE

1. "Truck and Corn."
2. "Potato Grade."
3. "General Use."

SLAGLE, E. A., Paxinos, Pa.
1. "Xtra Bone Phosphate."
2. "Crop Grower."

SMYSER, H. H., York, Pa.
1. "Chicago Soluble Bone."
2. "Chicago Crop Grower."
3. "Chicago Bone and Tankage."

SOUTHERN FERTILIZER COMPANY, York, Pa.
1. "Ox Brand Ammoniated Dissolved Bone."
2. "Ox Brand Special Potato Grower."
3. "Ox Brand General Crop Grower."
4. "Ox Brand Farmers' Choice Brand."
5. "Ox Brand Dissolved Bone Phosphate."
6. "Bone and Potash Mixture."
7. "Royal Wheat and Grass Grower."
8. "Farmer's Mixture."

STANDARD GUANO COMPANY, P. O. Station "G," Baltimore, Md.
2. "Standard Guano."

STERNER, E. H., Codorus, Pa.
1. "Sterner's Dissolved Bone Phosphate."

SWIFT & COMPANY, Union Stock Yards, Chicago, Ill.
1. "Swift's Super-Phosphate."
2. "Swift's Complete Fertilizer."
3. "Swift's Pure Raw Bone Meal."
4. "Swift's Bone Meal."
5. "Swift's Diamond (S) Phosphate."
6. "Swift's Onion and Potato and Tobacco Special."
7. "Swift's Special Bone Meal."
11. "Swift's Bone and Potash."

TAYLOR PROVISION COMPANY, THE, Trenton, N. J.
1. "Special Potato."
2. "High Grade Corn and Truck."
4. "Bone Tankage and Potash."

"K"
1. "No. 3. Farmers' Complete Fertilizer."
2. "No. 4. Atlas Brand."
3. "No. 5. High Grade Acid Phosphate."

THOMAS, D. A., Hagerstown, Md.
1. "Thomas' Bone Mixture."
2. "Thomas' Mixture."
3. "Dissolved Bone Phosphate."

THOMAS, JAMES, Williamsport, Pa.
1. "Thomas' High Grade Bone Super-Phosphate."
2. "Thomas' Klondike Brand."
3. "Thomas' Special Compound for Wheat, Oats, Corn and Grass."
5. "Thomas' Florida Bone Phosphate."
7. "Thomas' Fish, Bone and Potash Potato and Tobacco Manure."
8. "Thomas' Dissolved Soluble Bone Phosphate."

1. "S. C. Phosphate."
2. "Farmers' Choice Bone Phosphate."
3. "Normal Bone Phosphate."
4. "Improved Super-Phosphate."
5. "Special Corn Fertilizer."
6. "Alkaline Bone."
7. "Special Alkaline Bone."
8. "Dissolved Phosphate."
11. "Potato Fertilizer."
12. "Champion Bone Phosphate."
14. "Special Truckers' Fertilizer."
15. "Wheat and Corn Fertilizer."
16. "Raw and Acidulated Bone."

TRENTON BONE FERTILIZER CO., Trenton, N. J.
1. "Trenton Corn Mixture."
2. "Trenton $32.00 Potato Manure."
3. "Trenton Special Potato Manure."
4. "Trenton XX Brand Fertilizer."
5. "Trenton Potato Manure."

TRINLEY, JACOB, Linfield, Pa.
1. "Pure Raw Bone Meal."
2. "Pure Raw Bone Super-Phosphate."
3. "Grain and Grass Grower."
4. "Raven Bone Phosphate."
5. "Soluble Bone and Potash."
1. "Electrical Soluble Bone."
2. "Soluble Bone and Potash."
3. "Universal Grower."
4. "Excelsior Phosphate."
5. "I. X. L. Guano."
7. "H. G. Truck and Potato Guano."
8. "Raw and Acidulated Animal Bone."
11. "Re-sieved Phosphate."

TUSCARORA FERTILIZER CO., Lock Box No. 541, Baltimore, Md.
1. "Ammoniated Phosphate."
2. "Tuscarora Standard."
3. "Big (4) Brand."
5. "Bone and Potash."
6. "Tuscarora Bone Phosphate."
7. "Acid Phosphate."
8. "Tuscarora Potato."

TUSTIN, I. J., Phoenixville, Pa.
1. "Pickering Valley Special for Potatoes."
2. "Pickering Valley Special."
3. "Pickering Valley High Grade."

1. "Bone Phosphate."
2. "Pure Ground Bone."
3. "Soluble Bone and Potash."
4. "Potato Guano."
5. "Ammoniated Super-Phosphate."
6. "Popular Phosphate."
7. "Golden Harvest Phosphate."
8. "Acid Phosphate."
9. "Gold Edge Potato Guano."
10. "Early Truck Guano."

ULMER, JACOB, PACKING COMPANY, Pottsville, Pa.
1. "Ulmer's Blood, Meat and Bone Super-Phosphate."

UNIONTOWN FERTILIZER WORKS, Uniontown, Pa.
1. "Fell's Pure Ground Bone."
2. "Fell's Gold Premium Bone Phosphate."

1. “Four-Fold.”
2. “Grain King.”
3. “Big Bonanza.”
4. “Potato Special.”
5. “Meat, Blood and Bone with Potash.”
6. “Help-Mate.”
7. “Phosphoric Acid and Potash.”
8. “Bone and Meat.”
9. “Pure Raw Bone Meal.”
10. “Acid Phosphate.”
11. “Grain Manure.”
12. “Potash and Bone Phosphate.”

WALKER, J. C., & SON, Gap, Pa.
1. “Pride of Pequea.”
2. “Pride of Pequea, High Grade.”

WARNER, S. F., Indiana, Pa.
1. “Marl Fertilizer.”

1. “Special Potato and Truck Fertilizer.”
2. “Raw Bone Super-Phosphate.”
3. “Fish and Potash Fertilizer.”
4. “Ammoniated Super-Phosphate.”
5. “No. 2 Ammoniated Super-Phosphate.”
6. “Special Ammoniated Super-Phosphate.”
7. “Soluble Bone and Potash.”
8. “Available Ammoniated Super-Phosphate.”
9. “South Carolina Phosphate.”
10. “Sweet Potato and Celery Mixture.”
11. “Pure Ground Bone.”

WHANN, JOHN, & SON, No. 28 S. Delaware Avenue, Philadelphia, Pa.
1. “Our Brand Raw Bone Phosphate.”
2. “A. A. Acid Phosphate.”
4. “Reliable Ammoniated Super-Phosphate.”
5. “Whann’s Soluble Bone and Potash.”
6. “Whann’s No. 1 Ammoniated Bone Phosphate.”
7. “Pure Ground Bone.”
8. “Imperial Potato Manure.”

WILLS, CHAS. T., Parnassus, Pa.
1. “Special Compound for Vegetables, Grain and Grass.”

WOOLDRIDGE, THE R A., COMPANY, No. 33 S. Gay Street, Baltimore, Md.
1. “Florida Acid Phosphate.”
2. “German Potash Mixture.”
3. “Liberty Bell Potash Mixture.”
4. "Champion Giant Phosphate."
5. "Chieftain Bone Stock Phosphate."
7. "Tuckahoe Bone Meal."

YORK CHEMICAL WORKS, York, Pa.

1. "Plow Brand."
2. "Standard."
3. "Prosperity."
4. "Harvest Queen."
5. "Pure Dissolved Bone."
7. "York Special."
10. "Half and Half."
11. "Red Cross."
12. "Black Cross."
13. "Wheat Special."
14. "Dissolved Phosphate."
15. "Special Tobacco."
16. "Potato and Truck Special."
17. "Pure Ground Bone."


1. "Bone Phosphate."
2. "Zeigler's Potato Phosphate."
3. "Zeigler's Mixture."
4. "Zeigler's Crop Grower."

ZOOK, HENRY S., Elverson, Pa.

1. "No. 5. Pride of Chester Corn, Oats and Wheat Fertilizer."
2. "No. 6. Pride of Chester Dissolved Animal Bone Phosphate."
4. "No. 4. "Zook's Clear Acid Phosphate."
CROP REPORT FOR 1903.

Giving Prices of Farm Products and Live Stock, with Farm Wages and Board, in Pennsylvania, by Counties. Collected by A. L. Martin, Deputy Secretary of Agriculture.

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Average | $0.75 | $0.37 | $0.41 | $0.60 | $0.57 | $1.40 | $2.84 | $0.19
### CROP REPORTS FOR 1903—Continued.

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<th>Pears, per bushel</th>
<th>Plums, per quart</th>
<th>Cherries, per quart</th>
<th>Blackberries, per quart</th>
<th>Raspberries, per quart</th>
<th>Potatoes, per bushel</th>
<th>Butter, per lb., at store</th>
<th>Butter, per lb., at market</th>
<th>Milk, wholesale, per 100 lbs.</th>
<th>Milk, retail, per quart</th>
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**Average:** 55.5
COMMONWEALTH OF PENNSYLVANIA.

STATE LIVE STOCK SANITARY BOARD.

OFFICERS FOR 1904.

PRESIDENT.
Hon. Samuel W. Pennypacker, Governor

VICE PRESIDENT.
Dr. B. H. Warren, Dairy and Food Commissioner

TREASURER.
Hon. N. B. Critchfield, Secretary of Agriculture

SECRETARY.
Dr. Leonard Pearson, State Veterinarian
OFFICERS OF THE PENNSYLVANIA STATE GRANGE, 1904.

Master, W. F. Hill, Mont Alto, Franklin county.
Overseer, Hon. A. C. Barrett, New Milford, Susquehanna county.
Lecturer, A. M. Cornell, Altus, Bradford county.
Steward, H. M. Gooderham, Patton, Cambria county.
Assistant Steward, Harry H. Pratt, Goshenville, Chester county.
Chaplain, Rev. H. G. Teagarden, Punxsutawney, Jefferson county.
Treasurer, S. E. Nivin, Landenberg, Chester county.
Secretary, J. T. Allman, Thompsontown, Juniata county.
Gatekeeper, Wallace Chase, Fall Brook, Tioga county.
Ceres, Mrs. V. B. Holiday, Crooked Creek, Tioga county.
Pomona, Mrs. Mary Fisher, Lincoln University, Chester county.
Flora, Miss Florence Rhone, Centre Hall, Centre county.
L. A. S., Mrs. Della Hunsinger, Colley, Sullivan county.

EXECUTIVE COMMITTEE

I. Frank Chandler, Toughkenamon, Chester county.
Hon. Louis Piollet, Wysox, Bradford county.
G. W. Oster, Osterburg, Bedford county.

FINANCE COMMITTEE

D. B. McWilliams, Burnham, Mifflin county.
S. B. Brown, Sulphur Springs, Bedford county.
John T. Patton, Warriors Mark, Huntingdon county.

LEGISLATIVE COMMITTEE

W. F. Hill, Mont Alto, Franklin county.
Hon. W. T. Creasy, Catawissa, Columbia county.
Hon. S. R. Brunges, Tunkhannock, Wyoming county.
STATE FARMERS' ALLIANCE AND INDUSTRIAL UNION.

OFFICERS FOR 1904.

W. A. Gardner, President, Andrews Settlement, Pa.
Jacob J. Miller, Vice President, Waynesboro, Pa.
L. W. Smith, Secretary and Business Agent, East Benton, Pa.
Andrew Storry, Treasurer, R. F. D. No. 9, Meadville, Pa.

LECTURERS.


District No. 2, Northwest—Anna L. Teed, Black Ash; comprising the counties of Erie, Warren, Potter, Venango, Elk, Clinton, Butler, Jefferson, Crawford, McKean, Mercer, Forest, Cameron, Lawrence, Clarion and Centre.

District No. 3, Southwest—R. J. Nedamyer, St. Lawrence; comprising the counties of Beaver, Armstrong, Cambria, Huntingdon, Somerset, Washington, Fayette, Allegheny, Indiana, Blair, Mifflin, Westmoreland, Greene, Bedford and Clearfield.

District No. 4, Southeast—D. M. Omwake, Greencastle; comprising the counties of Snyder, Perry, Lebanon, Berks, Northampton, Franklin, York, Chester, Bucks, Juniata, Dauphin, Schuylkill, Adams, Lehigh, Lancaster, Delaware, Montgomery and Philadelphia.

EXECUTIVE BOARD.

G. W. Kilmer, Monroeton.
W. K. Salisbury, Upsonville.
G. M. Branthaver, Chambersburg.
Charles Brelsford, Williamsport.
PENNSYLVANIA HORTICULTURAL SOCIETY.

FOUNDED 1827.

OFFICERS FOR THE YEAR 1904.

PRESIDENT.
James W. Paul, Jr.

VICE PRESIDENTS.
James M. Rhodes, Edward Le Boutillier,
Henry F. Michell, Dr. George Goebel.

TREASURER.
S. W. Keith.

SECRETARY.
David Rust, Horticultural Hall, Broad Street, below Locust, Philadelphia.

PROFESSOR OF BOTANY.
Stewardson Brown.

PROFESSOR OF HORTICULTURAL CHEMISTRY.
Dr. Persifor Frazer.

PROFESSOR OF ENTOMOLOGY.
Dr. Henry Skinner.

PROFESSOR OF BIOLOGY.
Dr. Ida A. Keller.

EXECUTIVE COUNCIL.
Robert Craig, William K. Harris,
John McCleary, John W. Pepper,
Dr. J. Cheston Morris, John Westcott.

MEMBER OF THE STATE BOARD OF AGRICULTURE.
Edwin Lonsdale.

HOUSE COMMITTEE.
C. Hartman Kuhn, James M. Rhodes.

LIBRARIAN.
David Rust.
THE PENNSYLVANIA STATE AGRICULTURAL SOCIETY.

OFFICERS AND COMMITTEES FOR 1904.

PRESIDENT.
Hiram Young, York.

FIRST VICE PRESIDENT.
C. H. Bergner, Harrisburg.

VICE PRESIDENTS.

1. Theo. Voorhees, Philadelphia
2. William H. Wanamaker, Philadelphia
3. Benjamin S. Kunkle, Philadelphia
4. Israel W. Durham, Philadelphia
5. A. J. Cassatt, Philadelphia
6. Wm. T. Creasy, Catawissa
7. David Y. Wilson, Cochranville
8. Samuel W. Pynypacker, Harrisburg
9. Wm. H. Brosius, Drumore
10. Louis A. Watres, Scranton
11. A. P. Young, Millville
12. H. H. Colvin, Dalton
13. Geo. D. Stitzel, Reading
14. L. D. May, Granville Centre
15. A. D. Hay, Pottsville
16. Joel A. Herr, Cedar Springs
17. Samuel Berkinbine, Northumberland
18. C. H. Bergner, Harrisburg
19. N. B. Critchfield, Harrisburg
20. James A. Stahle, York
21. Wm. Patterson, State College
22. J. D. Kirkpatrick, North Liberty
23. J. C. Thornton, Fairview
24. A. L. Martin, Harrisburg
25. Wm. Powell, Springboro
26. James A. Beaver, Bellefonte
27. Jos. C. Sibley, Meadville
28. Chas. A. Stone, Warren
29. Jos. Speer, Pittsburg
30. Wm. A. Stone, Pittsburg
31. John Hamilton, State College
32. H. W. Oliver, Pittsburg
ADDITIONAL MEMBERS EXECUTIVE COMMITTEE.

E. J. Stackpole, ........................................ Harrisburg.
Thos. W. Rutherford, .................................... Harrisburg.
Samuel Kunkel, ........................................ Harrisburg.
S. F. Barber, ........................................... Harrisburg.
J. P. Nissley, ........................................... Hummelstown.

CORRESPONDING AND RECORDING SECRETARY.

J. P. Nissley, ........................................... Hummelstown.

TREASURER.

W. F. Rutherford, ..................................... Harrisburg.

CHEMIST AND GEOLOGIST.

Hugh Hamilton, ......................................... Harrisburg.

LIBRARIAN.

Wm. A. Kelker, ......................................... Harrisburg.

COMMITTEE ON ARRANGEMENTS.

Hiram Young, ........................................... York.
J. P. Nissley, ........................................... Hummelstown.
D. Y. Wilson, ............................................ Cochranville.
W. F. Rutherford, ..................................... Harrisburg.
C. H. Bergner, .......................................... Harrisburg.

COMMITTEE ON LEGISLATION.

S. F. Barber, ........................................... Harrisburg.
C. H. Bergner, .......................................... Harrisburg.
E. J. Stackpole, ...................................... Harrisburg.
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