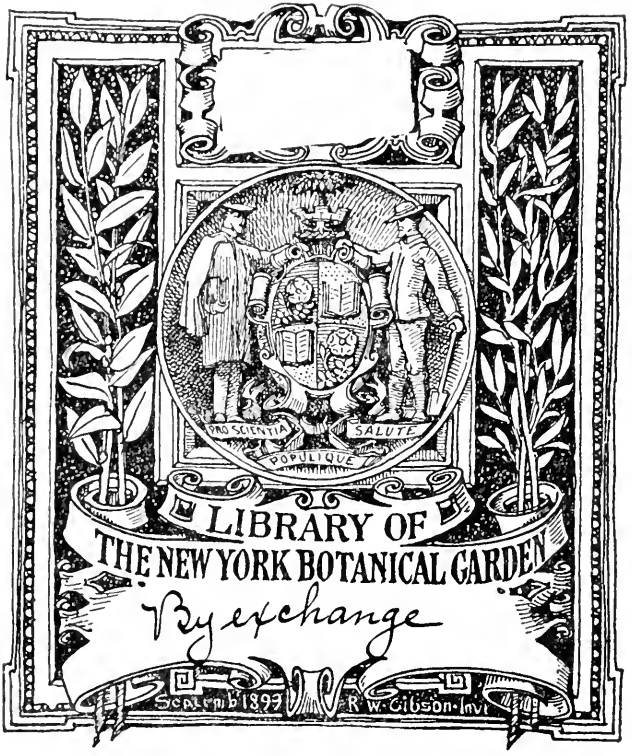
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SEVENTEENTH ANNUAL REPORT

OF THE

PENNSYLVANIA

Department of Agriculture

1911

HARRISBURG:
C. E. AUGHINBAUGH, PRINTER TO THE STATE OF PENNSYLVANIA
1912


VIRTUE
LIBERTY
AND

PENNSYLVANIA
DEPARTMENT OF AGRICULTURE

OFFICIAL LIST, 1911

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SEVENTEENTH ANNUAL REPORT OF THE SECRETARY OF AGRICULTURE

Hon. John K. Tener, Governor of Pennsylvania:

Sir: It is my duty as well as pleasant privilege to submit to you the report of the operations of the Department of Agriculture for the year 1911, together with climatic conditions and their effects on the farm crops of the State; also a report of the crop yields of the State, agricultural statistics from the Thirteenth Census not available for my report of 1910, and some suggestions for work along lines for which this Department should be equipped.

CLIMATIC CONDITIONS

The year opened with more than normally warm weather that continued throughout the month of January and nearly all of February, which has been exceeded only two or three times within twenty-five years. The average temperature ranged from four to eight degrees above normal during the month of January. The precipitation was below normal. Snowfall was comparatively light and winter crops had little protection, but on account of the mild weather they suffered little or no injury. Only during two short periods, did the temperature go below normal in February, and this was in sections where low temperatures generally prevail. Snow, varying from two to twelve inches, fell in various sections of the State, but did not remain on the ground for any extended time, and as already stated, winter crops did not suffer from cold as is usually the case when they do not have the snow covering. The average rainfall throughout the State was as much as an inch below normal, except in a small section in the northwestern part of the State.

MARCH

The weather conditions during March were, in general, throughout the district, typical of the month, except that the temperature was most of the time from two to five degrees below normal, and, therefore, the month was more wintry in character than the two previous months, with the exception of the warm wave which passed over the western part of the State the 10th to 12th, causing fruit buds to swell slightly. This was followed by a cold wave which culminated in temperatures below zero doing damage to peaches and other fruit in this section of the State. In the eastern part of the State the severe cold waves, destructive winds and heavy snows, have not been equalled in any March for a number of years. The average precipitation was below normal by more than one inch throughout

the State and reached its lowest at Lawrenceville, Tioga county, where the deficiency was nearly two inches. Climatic conditions were quite favorable for the maple sugar industry throughout the State, but the general cold weather caused the ground to be frozen, cold and unfit for early agricultural operations.

APRIL

The dominant characteristics of the weather throughout the State were the low temperatures in all sections, ranging from ten to twenty degrees below the normal in Western Pennsylvania, with zero temperatures in the east the 2nd, 3rd and 4th, and cold weather with freezing and frost in many places from the 5th to the 25th, retarding plant growth and preventing agricultural operations. With the 25th, warm weather set in, reaching temperatures as high as from eighty to ninety degrees in some sections of the State. The rainfall was again below normal. The snowfall for the month varied from one to eighteen inches, the latter at points in Somerset county. This is the month when winter crops such as wheat and grass begin growing, and when oats, early potatoes and legumes, such as the Canada Field Pea and clovers are seeded, but on account of the cold and freezing weather the winter crops made little or no growth and few if any of the spring crops were, or could be, planted or sown.

MAY

The month of May opened with seasonable weather. But after the 2nd there was a drop in the temperature and damaging frosts occurred in nearly all sections of the State. This cold period lasted until the 7th in the eastern section of the State, and until about the 6th in the western section, when the hot weather began, for which May, 1911, will be remembered for a long time. From the 10th to the end of the month, with regular persistency, there occurred nearly over the whole State, temperatures ranging from ninety to one hundred and one hundred and five degrees. Not only was the intense heat continual, but precipitation was as deficient as the heat was persistent and, while during the first week of hot weather vegetation grew rapidly, it soon showed the effects of the drought, which was especially manifest in the growth of winter wheat and grass that, by the end of the month, was little further advanced than they would have been at the end of April during a normal season. Early potatoes and early vegetables of all kinds were almost a failure throughout the State except where exceptionally good farming is done or where occasional summer showers occurred.

JUNE

The early days of June were similar to May, continuing so until the middle of the month, except in some few sections of the State where rain fell, and even here, because of the early drought, the rain was not sufficient to bring farm crops up to normal conditions, on account of the late start in Spring and the dry weather in May. There was a deficiency of rainfall at Emporium of nearly two inches, at Harrisburg of more than one inch, at Huntingdon of one inch, at Lawrenceville of one inch, at Wellsboro one inch, and at Williamsport, in the Susquehanna Valley, one inch. In the western section of the State the rainfall was, with few exceptions, among which are

Clarion, Greensboro and Saegerstown normal, and above normal, especially at Somerset where it exceeded four inches. As already stated, the hay crop on account of the cold weather of April and the dry weather of May and early June was very short, particularly in the eastern section of the State. The early potato crop was also very short. The wheat crop was retarded during the cold April and weakened by the dry and hot weather of May and early June, so that when it began to head, it was short and weak and afterward when attacked by the Hessian fly it had little resisting power and the crop was in many places nearly a total failure.

JULY

The most notable feature of the weather of the first twelve to thirteen days of July was the intense heat that prevailed throughout the entire State, which was not equalled in the eastern sections within the past thirty years, nor in the western section since 1901. The intensity of this heat was such that all cool weather crops, such as oats and potatoes, except in favored localities, were greatly damaged. The leaves of the potato plants were burned and in many places dried up, while the green stalks remained green for weeks. When, later on, more rain came, these stems had been weakened and did not again produce leaves and the tubers could not grow because there were no leaves to elaborate starch. From the middle to the end of the month more rain fell and the weather became cooler and crop conditions changed, except in some places where the weather was too cool for crops to do their best.

AUGUST

The first ten days of August were again very warm, and with the exception of parts of the western and southeastern sections, dry. The drought was especially injurious in the central part of the State until after the middle of the month when rain began to fall and, with few exceptions, as in Towanda and LeRoy, Bradford county, there was an excess of rain so that the precipitation varied from .04 of an inch at Indiana to 9.27 inches at Gettysburg. The temperature was about as variable as the rainfall. The rains that came in many sections of the State, the latter part of July and early in August, together with the warm weather already referred to, produced large corn crops in the sections where this rainfall occurred; whereas, where there was a deficiency of rain until the middle of August the corn crop was not up to the previous year.

SEPTEMBER

The month of September was pleasant, but the excessive rainfall of the latter part of August and the excessive and even normal rainfall of September caused the soils in many counties of the State to be so wet that, except where the very best farming is done, the seeding, which should be done during this month, had to be delayed, and in many places the delay was so long that a large acreage intended to be seeded with wheat was not seeded at all which will cause a reduction in the acreage of wheat the coming year. In many sections of the State the corn did not ripen as well as it should have done up to this time, because of the weather conditions already referred to.

OCTOBER

October continued warm and wet, a condition that prevailed nearly throughout the entire State, with a little frost here and there, so that corn ripened naturally during part of this month, but the weather did not afford favorable conditions for seeding wheat, that up to this time had not been sowed. Not only did the corn ripen, but the rains and the warm weather prevailing for so extended a period caused the growth of a second crop of grass, which was so luxuriant that, in some places in late September and early October, a second crop of hay was made, or such pasture was furnished that early Fall feeding was not necessary and in this way many farmers were able to supply the deficiency in the hay crop resulting from unfavorable conditions in June and July.

NOVEMBER.

The month of November remained mild from a week to ten days and more at a time in the southern and eastern sections of the State, so that pasturing could be continued and outdoor work was possible. The winter wheat was short on account of the late sowing, and had it not been for the mild weather of October, November and December, the prospects for a good wheat crop for 1912 would not have been as promising as they now are.

DECEMBER

The month of December was extremely mild, and for warmth exceeded all records since 1891. The rainfall for the district exceeded, by 10.18 inches, the normal, and amounted to 51.35 inches, and was exceeded only twice in forty years. This occurred regardless of the fact that there was a deficiency of rainfall during the first seven months of the year and all the excess fell after the middle of August except in a few of the western sections of the State.

This extended discussion of weather conditions of the year seemed necessary and is given in order that the following crop estimates from the United States Crop Reporter and those compiled from the census of 1910 may be fully understood.

PRINCIPAL FARM CROPS FOR 1911

BARLEY

Seven thousand acres were sown with barley in Pennsylvania in 1911, yielding, according to the Crop Reporter, 175,000 bushels, worth December 1, $114,000.00. The census of 1910 gives an acreage of 7,625 acres for 1909 with a yield of 136,239 bushels, worth $91,000. There has been little increase in the acreage of barley in this State for a number of years, for which there seems little or no reason except that possibly the value of the crop is not understood. This cereal should be raised in the thinner soils of the southwestern section of the State, especially when climatic conditions are such that oats cannot be sown

in March or early April, for with such conditions barley, being more able to endure hot and dry weather, will usually do better than oats.

BUCKWHEAT

Of the 17,549,000 bushels of buckwheat raised in the United States, Pennsylvania raised 6,373,000 bushels, or 36.31 per cent. The State had a larger acreage in 1911 than any state in the Union, and according to the census of 1910, with an acreage of 292,728 acres, which is about 6,000 acres greater than that of New York, her closest competitor, she had a yield of 4,797,350 bushels, worth $3,262,000. This is a crop that can be introduced into a rotation in the thinner soils when one of the winter crops fail, such as hay or wheat, as was the case with wheat and hay this year. Where there was hay or wheat worth cutting for forage, these could have been harvested early, the ground put in proper condition and sown with buckwheat, and the buckwheat harvested and the ground again sown with wheat or rye. Or, what might have been a still better plan, grass seed could have been sown with the buckwheat, and after the buckwheat was harvested the grass sod would have been there and in good condition for the following year.

CORN

Pennsylvania had a reported acreage of 1,435,000 acres of corn in 1911, and in the census of 1910 an acreage of 1,380,671 acres for the year 1909; giving a reported yield for 1911 of 63,858,000 bushels and for the year 1909, which was the crop taken by the census, a yield of 41,494,237 bushels. This represents an increase in two years of 22,363,763 bushels, which is no doubt correct, for, as I have already indicated in the report on weather conditions, there was a sufficient rainfall during the corn growing season, July and August, except in limited areas of the State, to make such an increase possible.

At the midwinter fair of the three agricultural organizations of the State, the State Livestock Breeders' Association, the State Dairy Union and the State Horticultural Society, held at Duquesne Garden, Pittsburg, January 15th to the 19th, 1912, the annual corn show, awarded prizes for the best ten exhibits of ten ears each of Yellow Dent Corn and the best ten exhibits of ten ears of White Cap Yellow Dent, six prizes for the best exhibits of ten ears of White Dent, eight prizes for the best eight exhibits of ninety day varieties, eight prizes for the best eight exhibits of ten ears of southeastern Pennsylvania varieties, and ten prizes for the best ten exhibits of ten ears of flint varieties. Awards were also given to Granges for Grange exhibits and to individuals for the best half-bushel of corn, for the champion ten ears, for the largest and longest ears, and for the champion ear. Several Congressmen awarded prizes of ten dollars for the best exhibits from their Congressional Districts. These corn exhibits and the awarding of prizes have created a wide spread interest in the State in corn growing and have stimulated the public educational agencies of a number of counties to organize boys' corn growing clubs to have an annual display where prizes are awarded for meritorious work. At a number of Farmers' Institutes, movements were started during the last season to organize corn growing

contests among farmers and farmers' boys' associations. A number of applications have come to this Department for information along these lines of work and these have been referred to experts who will give the necessary information and assistance. It has been demonstrated that southeastern Pennsylvania has a definite type of corn and that in this section of the State with this type developed, a larger quantity of corn can be raised to the acre than in any other section of the State, or the United States. For this reason as well as for many others, this type of corn should be developed by the farmers in this section, for it must be done within the limits of southeastern Pennsylvania, and the farmers are the persons to do it.

OATS

With dry weather, as already referred to, during March, April and May and the intense heat of June and early July, which embraces the entire season during which oats is grown, the average yield was four bushels above the average of the United States. In former reports as well as through other agencies of this Department, such as the Farmers' Institutes, this Department has urged that the growing of oats should be increased, especially in the central and northern sections of the State, where it is more difficult to grow corn. Oats grows within a short season, and after it the soil can be sown with wheat, rye or winter vetch and rye, a forage crop that will grow when few others will. According to the Crop Reporter for the year, the yield amounted to 31,720,000 bushels from an acreage of 1,121,000 acres, making an average of 28.5 bushels per acre, as against 28,172,686 bushels given by the census for the year 1909.

RYE

According to the Crop Reporter, 285,000 acres were sown with rye in Pennsylvania in 1911, yielding 4,304,000 bushels, while the acreage, according to the census reports for the year 1909, amounted to 272,560 acres, with a yield of 3,406,603 bushels.

WHEAT

One million two hundred and eighty-nine thousand acres were sown with wheat in 1911 yielding 17,402,000 bushels, a decrease from the yield of 1910 according to the Crop Reporter of nearly ten million bushels, and 4,162,479 bushels less than the census report for the year 1909. This means that Pennsylvania will have to import ten million bushels of wheat for the years 1911 and 1912 to feed her people. The reason for this decrease in yield is largely due to the depredations of the Hessian fly and to the dry weather of May and June and early July. If the farmers of the State would arrange their farming in such a way that there would be no volunteer wheat after harvest and would not sow until after the 25th of September, I feel that there would be little trouble with the Hessian fly, and in this way they could raise sufficient wheat to feed the people of our State and save ten million dollars for themselves and the State.

HAY AND OTHER FORAGE CROPS

Hay and other forage crops are, as usual, this year again the most valuable farm crops of the State. With an acreage, according to the Crop Reporter, of 3,148,000 acres, which is about 64,000 acres less than that of 1910, and with a decrease in yield on account of the dry weather during the growing season, the crop which amounts to 3,148,000 tons, or a ton per acre, is worth $62,960,000, or only $3,535,000 less than the crop of 1910 which was 1,285,000 tons larger than the crop of 1911.

The census of 1910 gives an acreage of all forage crops for the year 1909 of 3,088,105, with a yield of 3,677,307 tons valued at $35,623,573.00. It must be remembered here that the yield of hay in 1909 was less than that of any year from 1899 to 1909, so that the census report gives less than a normal crop for the State.

POTATOES

According to the Crop Reporter, 270,000 acres were planted with potatoes in 1911, yielding 15,120,000 bushels, valued at $14,062,000, or $1,478,000.00 more than the 24,200,000 bushel crop of 1910. This increase in value was due to the decrease in yield on account of the dry season of 1911. The census report of 1910 gives an acreage for 1909 of 262,013 acres and a yield of 21,740,611 bushels, valued at $14,131,000.00, or only $69,000.00 more than the crop of 1911.

The crop of 1911 of 15,120,000 bushels would furnish for the 7,665,111 people of the State 1.97 bushels per individual, about one-half the amount consumed, which does not take into consideration the seed potatoes needed for planting the crop of 1912 which will approximately mean 2,000,000 bushels more. From this it is evident that the State will expend from $8,000,000.00 to $10,000,000.00 for potatoes during the years 1911 and 1912.

This Department has issued a bulletin on potato raising, giving definite instruction for seed selection, cutting, planting, cultivating and spraying potatoes, which has been tried by many farmers of the State and found to be correct in methods recommended, which is available for all who desire copies as long as the issue lasts.

TOBACCO

The tobacco crop for 1911 amounted to 65,320,000 pounds from 46,000 acres, or at the rate of 1,420 pounds per acre, worth $6,205,400.00, or at the rate of $135.00 per acre: the most valuable, per acre crop, in the State. The census for 1910 gives an acreage for 1909 of 41,742, with a yield of 46,164,800 pounds, or an average yield of 1,106 pounds per acre as against 1,420 pounds per acre in 1911.

ANIMAL, DAIRY AND FRUIT EXHIBITS AT THE MIDWINTER FAIR HELD AT DUQUESNE GARDEN, PITTSBURG, PA.

The corn exhibits at this midwinter exposition have already been referred to and commented on, and for this reason it would only be right to commend the fruit and dairy displays, but a more gratifying reason both to this Department and the State is the magnificence

of the displays, especially the apple display which, according to the expressions of the judges and visitors from other states, has not been excelled, if equalled, by the apple display both for the number of varieties and excellence by any state in the Union. Prizes were awarded for excellence of fruit and exhibition, for single barrel exhibits, three barrel exhibits, single box, five box and twenty-five box exhibits: also for single plate and five plate exhibits. The following varieties in single box exhibits were awarded prizes both for excellence of fruit and exhibition: The Baldwin, the Ben Davis, Grimes Golden, Hubbartston, Jonathan, Northern Spy, Rambo, Smoke-house, Stayman, Summer Rambo, Tompkins King, Wagner, Winter Banana, York Imperial, York Stripe, American Blush and Wolf River. Five box collections of Grimes, Stayman, York Imperial and Ben Davis were also awarded prizes. Prizes were also awarded for from one to five plate exhibits for the following varieties: Arkansas, Baldwin, Ben Davis, Gano, Grimes Golden, Hubbardston, Rhode Island Greening, Jonathan, Northern Spy, Stayman, Rambo, Tompkins King, Twenty Ounce, Wagner, Wealthy, Yellow Bellflower, York Imperial, York Stripe and Smoke-house.

The following list gives an idea of the number of varieties of apples that can be successfully grown in Pennsylvania and of such a type as to merit prizes: Arkansas, Northern Spy, Rambo, Rhode Island Greening, Smoke-house, Stayman, Summer Rambo, Tompkins King, Twenty Ounce, Wagner, Wealthy, Winter Banana, Wolf River, Yellow Bellflower, Yellow Transparent, York Imperial and York Stripe.

Awards were also made for certified milk, market cream and market milk by the Pennsylvania Dairy Union.

STATISTICS FROM CENSUS OF 1910 THAT WERE NOT AVAILABLE FOR REPORT OF 1910

The land area of Pennsylvania is approximately 28,692,480 acres. Of this area, 18,586,832 acres, or 64.8 per cent., are included in farms. Of the farm acreage, 12,673,519 acres, or 68.2 per cent., are reported as improved land, representing 44.2 per cent. of the total land area of the State. The total acreage of farm land decreased 784,183 acres, or 4 per cent. during the last decade, and the acreage of improved land decreased 535,664 acres, or 4.1 per cent. As the acreage of improved land and the total acreage of farm land showed practically the same relative decreases between 1900 and 1910, the percentage of improved land has remained stationery during the decade.

PROGRESS DURING THE DECADE 1900 TO 1910

The following table summarizes for the State the more significant facts relating to population and land area, the number, value, and acreage of farms, and the value of all other farm property in 1910 and 1900:

Number, Area and Value of Farms.	1910 (April 15).	1900 (June 1).	Increase, amount.	Per cent.
Population,	7,665,111	6,302,115	1,362,996	21.6
Number of all farms,	219,295	224,248	—4,953	—2.2
Approximate land area of State,	28,692,480	28,692,480		
Land in farms,	18,586,832	19,371,015	—784,183	—4.0
Improved land in farms,	12,673,519	13,209,183	—535,664	—4.1
Average acres per farm,	84.8	86.4	—1.6	—1.9
Value of farm property:				
Total,	$1,253,274,862	$1,051,629,173	$201,645,689	19.2
Land,	630,430,610	575,392,940	55,037,070	9.6
Buildings,	410,638,745	322,879,810	87,758,935	27.2
Implements and machinery,	70,726,055	50,917,240	19,808,815	38.9
Domestic animals, poultry and bees,	141,480,052	102,439,183	39,040,869	38.1
Average value of all property per farm,	5,715	4,690	1,025	21.9
Average value of land per acre,	33 92	29 70	4 22	14.2

A minus sign (—) denotes decrease.

Notwithstanding the fact that the population of Pennsylvania increased 21.6 per cent. from 1900 to 1910, the number of farms decreased 2.2 per cent., the acreage of farm land 4 per cent. and the acreage of improved land 4.1 per cent., the decrease in farm acreage being greater in proportion than that in the number of farms. The average size of farms decreased 1.6 acres.

Farm property, which includes land, buildings, implements and machinery, and livestock (domestic animals, poultry and bees), has increased in value during the decade $201,646,000, or 19.2 per cent. This great increase was principally due to increases of $87,759,000 in the value of buildings, of over $55,000,000 in the value of land, and of $58,850,000 in the value of farm equipment, including implements and machinery and livestock. Of the increase last mentioned, about two-thirds represents that in the value of livestock. In considering the increase of values in agriculture, the general increase in the prices of all commodities in the last ten years should be borne in mind.

The average value in 1900 of a farm with its equipment was $4,690, while ten years later it was $5,715. The average value of land alone rose from $29.70 per acre in 1900 to $33.92 in 1910.

FARM TENURE

The number of all farms, and therefore of all farm operators, is 219,295. Of the operators, 164,229 are owners, 3,961 managers and 51,105 tenants. Of the owners, 154,088 operate exclusively land owned by them, while 10,141 operate land which they rent in addition to that which they own. The 51,105 tenants are further classified according to the character of their tenancy; thus, 27,951 are share tenants, 1,042 share-cash tenants, 18,940 cash tenants, and for 3,172 no report relative to character of tenure was secured.

The number of tenants constitutes 23.3 per cent. of the total number of farm operators. This percentage is but a little above that of 1880, when 21.2 per cent. of all farms were in the hands of tenants, and is exactly the same as that of 1890. The greatest absolute and relative number of tenants reported for any census year was for 1900, when 58,266, or 26 per cent. of all farmers, were in this class. During the last ten years the number has decreased 7,161, or 12.3 per cent. This decrease in the proportion of tenants in Pennsylvania corresponds with a similar movement in each of the North Atlantic states, but is in contrast to an increase, both absolute and relative, for the country as a whole.

VALUES OF ANIMALS, POULTRY AND BEES

The values of the various kinds of domestic animals and of poultry and bees, as reported by the censuses of 1910 and 1900, and the changes in such values, are shown in the following table:

Kind.	1910 (April 15).		1900 (June 1).		Increase.	
	Value.	Per cent. distribution.	Value.	Per cent. distribution.	Amount.	Per cent.
Total,	$141,480,052	100.0	$102,439,183	100.0	$39,040,869	38.1
Cattle,	47,229,894	33.4	43,063,191	42.0	4,166,703	9.7
Horses and colts,	68,055,489	48.1	40,948,827	40.0	27,106,662	66.2
Mules and mule colts,	6,424,039	4.5	2,907,690	2.8	3,516,349	120.9
Asses and burros,	43,438	(2)	22,559	(2)	20,879	92.6
Swine,	7,624,494	5.4	5,830,295	5.7	1,794,199	30.8
Sheep and lambs,	3,934,144	2.8	4,642,606	4.5	—708,462	—15.3
Goats and kids,	15,788	(2)	8,951	(2)	6,837	76.4
Other animals,*	200	(2)				
Poultry,	7,674,387	5.4	4,483,486	4.4	3,190,901	71.2
Bees,	478,179	0.3	531,578	0.5	—53,399	—10.0

A minus sign (—) denotes decrease.
(2) Less than one-tenth of one per cent.
*Deer.

During the decade, domestic animals, poultry and bees combined increased in value $39,041,000, or 38.1 per cent. While most classes increased in value, they changed in widely differing degrees. The greatest absolute increase is noted in the value of the horses and colts, being nearly seven-tenths of the net gain for domestic animals as a whole. The relative increase was 66.2 per cent. Horses are now the most important class of livestock in the State, as judged by total value, whereas, in 1900 cattle ranked first. The latter class shows an increase in value of only $4,167,000, or 9.7 per cent. The largest relative increase is found in the value of mules, 120.9 per cent. The total value of swine increased $1,794,000, or 30.8 per cent. and that of poultry $3,191,000, or 71.2 per cent. Sheep and lambs show the only noteworthy decrease, amounting to $708,000, or 15.3 per cent.

The value of horses and cattle represents about 82 per cent. of the value of all livestock. Swine and poultry are almost exactly the same in value, and together represent about 11 per cent. of the total. Mules represent 4.5 per cent. and sheep 2.8 per cent.

Of all the farms in the State, 88 per cent. report cattle, 87.2 per cent. reporting "dairy cows" and only 19.1 per cent. "other cows." The total number of cows increased somewhat during the decade, and the average value of dairy cows increased from $30.88 to $38.67, while that of other cows decreased from $25.02 to $23.03. The average number of dairy cows per farm reporting is nearly five. The census of 1900 was taken as of June 1st, after all the spring calves were dropped while that of 1910 was taken as of April 15th, before the close of the calving season and when the calves on hand were on the average younger that at the enumeration of 1900. As a result, the calves enumerated were fewer in number and of slightly lower average value in 1910 than in 1900, the number decreasing from 421,323 to 235,656 and the average value from $7.20 to $7.10.

Horses are reported by 84.1 per cent. of all the farmers in the State, but only 11.1 per cent. report colts born in 1909, and 2.8 per cent. report spring colts. The average value of mature horses, $128.22, is over one and three-fourths that reported in 1900. About one farmer in every twelve reports mules. The average values of mules are somewhat higher than those of horses of the corresponding age groups.

Sheep and lambs are reported from 25,436 farms, or 11.6 per cent. of all the farms in the State, whereas, in 1900, 19.6 per cent. of all farms reported sheep. Of the farms reporting sheep and lambs, 77.9 per cent. report spring lambs, the number of the latter being 51.9 per cent. of the number of ewes. This comparatively small proportion is doubtless due to the early date of enumeration. Ewes are reported on all but 754 of the farms reporting sheep, and for the farms reporting the average is over 19 per farm. Those reporting rams and wethers show an average of about 16 per farm. The average flock in the State, excluding spring lambs, is 25 sheep, while in 1900 it was 22.

Of all farms, 65.1 per cent. report swine and show an average of nearly 7 per farm reporting. On account of the early date of enumeration, only 23.9 per cent. report spring pigs. The average value of swine classed as "hogs and pigs farrowed before January 1, 1910," is $10.23.

POULTRY

The following table gives the numbers of the various kinds of poultry reported in 1910 and 1900, together with their value, and the number of farms reporting each kind in 1910:

Kind	1910 (April 15).				1900 (June 1).
	Farms reporting. Number.	Per cent. of all farms.	Number of fowls.	Value.	Number of fowls.
Total,	205,158	93.6	12,728,341	$7,674,387	11,044,981
Chickens,	205,026	93.5	11,895,903	7,020,303	10,553,106
Turkeys,	40,126	18.3	136,942	312,571	259,824
Ducks,	23,502	10.7	163,777	114,282	171,271
Geese,	13,400	6.1	46,318	66,509	60,780
Guinea fowls,	24,025	11.0	111,715	48,208	(1)
Pigeons,	16,161	7.4	373,304	111,365	(2)
All others,*	70	(4)	382	1,149	(2)

*Sixty-two farms report 158 peafowls, valued at $504; 6 farms report 221 pheasants, valued at $630; and 2 farms report 3 wild geese valued at $15.
(1) Included with chickens.
(2) Not reported.
(4) Less than one-tenth of one per cent.

The increase in the number of fowls on Pennsylvania farms during the last decade amounts to 15.2 per cent. while the value increased from $4,483,000 to $7,674,000, or 71.2 per cent. The number of farms reporting poultry decreased 2.2 per cent.; thus the average number of fowls per farm reporting increased from 53 to 62. The increase in the number of chickens, which are by far the most important class of fowls in the State, was sufficient to offset a decrease in the number of turkeys, ducks and geese. The value of poultry and number of farms reporting were obtained in 1900 for the total of all fowls only, and not for each kind, as in 1910.

BEES

The number of farms reporting bees decreased from 28,962 in 1900 to 22,297 in 1910, or 23 per cent. The number of colonies of bees decreased from 161,670 to 124,815, or 22.8 per cent., and their value decreased from $531,578 to $478,179, or 10 per cent. The average value of bees per farm reporting was $18.35 in 1900 and $21.45 in 1910. About ten farms in every one hundred report bees.

GRAINS AND OTHER CROPS

Potatoes were reported by 88 out of every 100 farms in 1909, hay and forage by 87, corn by 78, oats by 68, wheat by 53, buckwheat by 28, rye by 24 and tobacco by 5. Buckwheat and tobacco show larger percentages of farms reporting than in 1899, while for potatoes, hay and forage, corn, oats, wheat and rye the percentages

are smaller than ten years ago. These 8 crops now occupy about 61 per cent. of the improved land of the State, hay and forage alone representing 24.4 per cent. Corn, wheat, rye, and hay with other forage crops show decreases from 1899 to 1909 in the per cent. of improved land occupied. During the past decade there was a decrease of 414,137 acres, or 8.7 per cent. in the acreage of all cereals, and of 181,336 acres, or 5.5 per cent. in that of all hay and other forage. Potatoes increased in acreage 34,146 acres, or 15 per cent. and tobacco 13, 982 acres, or 50.4 per cent.

In the average value per acre, corn exceeds the other cereals, and wheat is a close second, while buckwheat and rye are less than one-half, and oats approximately two-thirds as great as corn in that respect. The average value per acre of hay and other forage is about three-fourths that of corn, and less than one-third that of potatoes. Tobacco shows the highest average value per acre, being more than five times as great as wheat and over twice that of potatoes. The average value per acre of all cereals combined is $16.27, which is slightly above the average of hay and other forage, and less than that for either corn or wheat.

The leading counties in the acreage of hay and other forage in the order of their importance are Bradford, Crawford, Lancaster, Susquehanna and Tioga. Bradford, Susquehanna and Tioga, together with Wayne county, forming a row of counties along the northern boundary, report nearly one-seventh of the total acreage for the State.

The decrease in the acreage of corn is confined to no particular section; there are, however, three groups of counties in which increases are shown—first, 10 mountainous counties in the east central part of the State; second, Somerset and Bedford counties; and third, Armstrong, Butler and Clarion counties. The acreage of wheat shows heavy decreases throughout the counties of the State with the exception of a group of five counties in the southeastern section, which show slight increases. The seven counties of Franklin, Cumberland, Adams, York, Lancaster, Berks and Chester report more than one-third of the wheat acreage of the entire State. Decreases in the acreage of oats are shown in the northeastern and western portions of the State, the group in the southeastern section reporting, as a whole, the largest decreases. The increase in the acreage of buckwheat is due to its increased cultivation throughout the western three-fourths of the State, this increase being sufficient to offset the general decrease throughout the eastern quarter. The three counties of Bradford, Indiana and Tioga report more than one-fifth of the total acreage of this crop. There are three general groups of counties which show an increase in the acreage of rye. The smallest of these groups comprises Franklin and Adams counties on the extreme southern line; the second in importance is a group in the central part of the State consisting of Center, Union, and Mifflin counties; the third and largest is made up of eight western and southwestern boundary counties. The remainder of the State, aside from a few scattered counties, shows marked decreases, especially in the northern and west central portions.

More than one-fifth of the potato acreage is reported from the five counties of Lehigh, Berks, Chester, Lancaster and York. Lancaster county alone harvests nearly 80 per cent. of the tobacco crop.

FARM EXPENSES

The following table shows the number of farms reporting expenditures for labor, feed and fertilizer by the census of 1910, as well as the sums expended in 1909 and 1899, with the amount and per cent. of increase:

Expense	1909.			1899.	Increase.	
	Farms reporting. Number.	Per cent. of all farms.	Amount.	Amount.	Amount.	Per cent.
Labor,	139,507	63.6	$25,611,838	$16,647,730	$8,964,108	53.8
Feed,	141,633	64.6	19,203,160	(1)	----------	------
Fertilizer,	129,769	59.2	6,801,605	4,685,920	2,115,685	45.1

(Note—(1) Not reported at census of 1900.)

Nearly two-thirds of the farmers of the State hire labor, the average amount expended in this way being $184. During the decade the total expenditure for labor increased $8,964,000, or 53.8 per cent., which is one of the greatest relative increases in Pennsylvania agriculture during the period. About one-fourth of the amount reported as expended for labor is in the form of house rent and board. Former censuses made no tabulation of the number of farmers reporting expenditures for labor.

Over six farmers out of every ten report some expenditures for feed, and about six out of every ten purchase fertilizer. The total amount reported as paid for fertilizer has increased $2,116,000, or 45.1 per cent. during the decade, the average per farm reporting being $52.41.

ANNUAL AND CENSUS AGRICULTURAL STATISTICS

It is to be regretted that the annual agricultural statistics and the census statistics do not harmonize more closely, but it is to be supposed that they are sufficiently accurate to permit some conclusions. Farm land has increased in value from $575,392,940 to $630,430,010 between 1900 and 1910, while the number of farms have decreased from 224,248 in 1900 to 219,295 in 1910, a decrease of 4,953 farms, or 4 per cent. This decrease is equal to the number of farms in any of the best farming counties of the State, and if the census statistics are correct, is not the kind of showing this State should make. It is reasonable to suppose, however, that the decrease is in some degree owing to the extension of the limits of growing cities and boroughs.

The value of farm buildings increased from $322,879,810 in 1900 to $410,638,745 in 1910. This would be very much more desirable if the number of farm buildings had increased sufficiently to make

possible this increase in value instead of the value of the materials of which these buildings are constructed, and therefore the value of the buildings themselves.

A DAIRY STATE

Pennsylvania's greatest claim in the line of animal husbandry, is that of being a dairy state. The number of dairy cows two years old and over in the State, according to census reports in 1900, was 943,773, and in 1910 was 933,055, a decrease of 10,718, while the cows not kept for dairy purposes in 1900 numbered 48,807 and in 1910, 99,165, an increase of 50,358. The total number of neat cattle in the State in 1900 was 1,896,847, while in 1910 there were reported 1,585,570, a decrease of 311,277; whereas, the total value of cattle in 1910 was $47,202,000, while in 1900 it was $43,063,000, an increase in value of $3,139,000. From the reports that are accessible, it seems the output of the dairies has decreased but little, if any, during the decade.

A good illustration of what is taking place with the animal industry in the State is furnished by the sheep industry. In 1840 there were 1,767,620 sheep reported in the State, yielding 3,048,564 pounds of wool, or 1.75 pounds per sheep. In 1850 there were reported 1,822,357 sheep, shearing 4,481,570 pounds of wool, or 2.43 pounds per sheep. From 1860 to 1880 the number of sheep remained practically stationary, but the yield of wool per sheep increased from 2.91 pounds to 4.77 pounds, or 61 per cent. Again, from 1890 to 1910 the number of sheep decreased from 954,002, yielding 4,800,610 pounds of wool, or 5.08 pounds per sheep, to 882,852 sheep shearing 5,296,112 pounds of wool, or 6 pounds per sheep, an increase of 487,102 pounds.

This shows that the emergency of the farmers has not been centered so much on increasing the number of animals as on increasing the efficiency of these animals, which is exactly what this Department has been teaching and which is showing results. If such results can be obtained in the increased efficiency of the animals, then certainly with the right equipment of this Department the efficiency of the acre can be increased, and with the increase of crop yields will come the increase in the number of the most efficient animals the State has ever had. But we must show the farmer that if he produces more he will receive more in proportion to the increase in quantity as well as quality.

INCREASING THE EFFICIENCY OF THE FARM

The farmer can buy better animals—cows, sheep, horses, hogs, chickens, etc., bred up to high standards by those who have made a study of this business, and by following the practice outlined by this Department and by those who are breeding animals, he can maintain this standard and sometimes excel in it, but when it comes to efficient farming and the application of better methods, he cannot buy these from his neighbors, but he must himself evolve methods adapted to his conditions, and this is one of the things few farmers undertake to do and the greatest agency in the State to-day for doing work of this kind is the Farmers' Institute, and it is obliged to do its work at a time of the year when practical demonstrations are impossible.

For this reason this Department should have sufficient funds to send out qualified experts who can study soils, climatic, market and labor conditions, and by actual field demonstration show how to increase the productivity and the latent fertility of the soil and raise crops, for which there is a well paying market, with the labor available on the farm. To fill positions of this kind requires men who know soils and climatic conditions and who can make labor efficient, who understand markets and who can put the farmer into a position to do the same things.

The census of 1910 shows clearly that the increased production of the acre in order to maintain her agricultural, manufacturing and mining prestige has become the watchword of the hour for Pennsylvania.

DEMONSTRATION WORK

This Department is the agency by which this demonstration work must be done because it is through the Department that the State Government keeps in touch with the agricultural interests, the most potent in the Commonwealth. The surrender of this educational work to any other agency would mean the alienation of the farming interests from the State Government, where all other public educational agencies are located and where this, one of the most essential, must certainly also be located. This is not an academic question, but a utilitarian one. Academics and utility up to this time have not mingled well, and for these and many more reasons I feel that the surrender of this work to an agency not directly under the control of the State, and upon which the State could not lay her restraining or encouraging hand whenever it may be deemed necessary would be as great a dilemma as to surrender her public educational work and hand it over to an agency not under her immediate control. Therefore, like the educational department, this Department should be equipped with funds to do this educational work in the most efficient manner, for before we can have education, before we can have scientific investigation, manufacturing, mining or transportation we must be fed, and the question of feeding the people of Pennsylvania is becoming more important every year and something must be done to improve this condition. An appropriation was asked for from the last Legislature by this Department for demonstration work along the lines indicated, but it failed during the last hours of the session. Requests come to us from many sources for information along all lines of agriculture, but for want of sufficient appropriation little help can be given.

BETTER PRICES FOR FARM PRODUCTS NECESSARY

It must be made interesting for the farmer to increase the products of his farm. As was said in a former report, if the farmer by keeping down production can realize as much out of ten dairy cows of equal capacity as he can out of twenty he is foolish for keeping and attending the twenty, but if by this demonstration work this Department can show the farmer that by keeping twenty of the better grade of cows already referred to, he will realize for the ten additional cows approximately as much per cow as he will for each of the ten cows, he will become interested, and it will not

be many years until Pennsylvania will stand where she should stand to-day in the animal industry, especially the dairying branch of the industry.

CO-OPERATION

In previous reports I have referred to the co-operative movement, and I am glad to report that this movement has taken definite shape in a number of counties in the State, especially in Lancaster and York counties. The farmers are beginning to see that they are the victims of a commercial system that is so organized as to buy from them all they have to sell and sell to them all they must buy, and collect tribute for a service that never adds any value to their own products, or to the commodities they buy. They recognize still more than this, that the manufacturer organizes his own sales agencies and makes the consumer pay for this service whether he uses it or not. The farmer who drives to the factory and loads up a machine pays as much for it as the farmer who buys the same machine from an agent five hundred miles away; the one enjoys the advantages of the agency, the other does not but pays as much as if he did. Another thing the farmer has learned is, that no matter what make of machine he buys, whether, if a harvesting machine, it be the Deering, Champion, McCormick, Johnston, or any other make of binder, the price is the same because all are made by the same combination. But while these machines are made by the same combination, there are still Deering Agents, Champion Agents, McCormick Agents, Johnston Agents, etc., each one making a regular propaganda in the same territory for his machine, for all of which the farmer pays, but when the time comes for the farmer to do as the harvester manufacturer does, add the extra price that it costs to sell his products to the price of his wheat, oats and corn, when he puts them into market another agent of this merchandising system appears, who makes the prices, regardless of what the products cost and regardless of what he paid the agent for selling him the harvesting machine.

The farmer is beginning to see that if it pays the manufacturer of harvesting machines to keep up a propaganda, such as I have described, to sell his machines directly to the consumer it would also pay the farmer, the producer of the necessities of life, to sell his products by means of his own sales agency to the consumers and charge them only what the agency costs him. This would encourage the formation of consumers co-operative purchasing agencies and would facilitate selling directly to the consumers through these inexpensive agencies kept up by the producer. This is the healthiest indication along agricultural lines to-day, because it will take out of the hands of men who have shown themselves the most unscrupulous, the handling of the necessities of life, and will hand it over to those who produce and consume them, thus preventing the destruction, by unscrupulous dealers, of these necessities of life, to keep up prices as well as create a market for produce that now frequently perishes in the hands of the farmers because there is no local demand for it, because the farmer under present conditions is not connected with the consumer who would be glad to purchase his products. If therefore it is the duty of this Department to instruct the farmer how to increase the yield of the acre it is also its duty, after the

larger crops have been produced, to get the producer in touch with the consumer, and for this work the Department is not, but should be equipped.

SAVE OUR RESOURCES

An enormous waste of both land, on account of gases thrown off by the coke ovens, and the nitrogen that passes into the air with these gases, occurs in the manufacture of coke. In the United States, in 1910, seventeen per cent. of the nitrogen contained in coking coal was recovered, while in Pennsylvania, the greatest coke manufacturing state in the Union, only two per cent. was saved. If all the coking coal mined annually in this State should be converted into smokeless fuel, or coke, and the nitrogen it contains were recovered by the use of possible appliances there would be nitrogen enough to furnish ten pounds of this most expensive element of fertility for every acre of improved farming land in Pennsylvania and all the rest of the North Atlantic States. If this were done the price of nitrogen would be cut in two and the expenses of the farmer vastly diminished. But not only is this valuable plant food thrown away, but the utter destruction of all plant life upon thousands of acres by sulphurous and other gases in the vicinity of these coke ovens follows. Surely our Agricultural Colleges should be able to devise and bring into use some process by which this nitrogen could be saved and the soil destruction ended.

Another great waste of fertility is that of the sewage of our cities by which our streams are contaminated. The Federal and State Departments of Agriculture, the Experiment Stations and Agricultural Colleges could do no greater service for the sanitation of the country and the maintenance of the fertility of the soil than by devising a process by which this sewage could be collected and the fertility it contains recovered and put into a condition to be easily applied to the soil. These institutions should be equipped by adequate appropriation for such work.

A number of serious bacterial diseases, such as the crown gall, root rot, fire blight, peach yellows, canker in its various phases, and many other fungicidal diseases now infesting our apple, pear and peach orchards, should, in order to save these orchards from perennial destruction, be investigated so that their character and methods of propagation may be thoroughly understood and effective remedial agencies discovered for their cure. Work of this character should be done by the well trained scientists connected with our Agricultural Colleges, and when thoroughly understood by them, the remedies for these diseases should be made so simple that they can be applied by the average farmer and fruit grower. Our General Assembly should not hesitate to make competent appropriations for such work.

THE AGRICULTURAL COLLEGE AND EXPERIMENT STATION

Within the past eight years the number of students in our State Agricultural College has increased from a little over on hundred to over six hundred, and there are but few more facilities for the six hundred than there were for the one or two hundred. Such a congestion exists that pupils are obliged to stand for hours during recitations. This is a condition to be deplored and is entirely due

to the fact that the appropriations have not been sufficient to put up buildings and furnish equipment for the proper housing and laboratory facilities for the instruction of the boys who come to be trained for efficiency in this most important of all vocations or arts. It is to be hoped that the next Legislature will make such appropriations as will equip both this Department and the college with all that is needed to do their work effectually.

REPORTS OF BUREAUS OF THE DEPARTMENT

The reports of the heads of the several bureaus of the Department, created by Act of Assembly, are herewith submitted for publication as part of the Department Report. These reports are all replete with information full of interest to the public and should be read with care. By way of calling attention to them, I give here a very brief epitome of their contents.

REPORT OF THE MANAGER OF FARMERS' INSTITUTES

This report shows that during the year 1911, 477 days of Farmers' Institutes and movable schools of agriculture were held in the State, with 1,162 sessions, having a total attendance of 189,383. Beside the regular institutes and movable schools, special institutes were held with an attendance of 10,379, and harvest home picnics attended by 20,000, making a grand total of 209,385 people, nearly all farmers.

The Farmers' Institute is gaining in deserved popularity, because it is the agency that brings to the average farmer the best scientific agricultural practice known. This is the agency of the Department to which I especially referred when speaking of the demonstration work for increasing the production of the acre. The Bureau of Farmers' Institutes is the leading educational division of the agricultural department of the Commonwealth and it should be equipped with funds sufficient to do its work most thoroughly and effectually.

It has been one of the agencies that have advertised the State College and Experiment Station, it has stimulated the raising of efficient dairy cows, so that with a less number of cows the State produces as much and more milk than was formerly produced with a larger number. The institute has assisted in the inauguration of the movement to raise thoroughbred stock of all kinds—horses, cattle, sheep, hogs and poultry, to such an extent that livestock values have greatly increased and the value of poultry especially, increased more than 71 per cent. in the last decade.

REPORT OF DAIRY AND FOOD COMMISSIONER

This report shows that the general character of the work of the Bureau has been very similar to that of the previous year, with the exception of the sausage act, approved April 6th, 1911, and the milk and cream act approved June 8th, 1911. The first of these laws defines sausage, prohibits the selling, offering or exposing for

sale, or having in possession with intent to sell, sausage that is adulterated according to the definition of the act.

First. The addition of water in excessive amounts beyond the limit specifically indicated by the law.

Second. The presence of any cereal or vegetable flour.

Third. The presence of coal tar dyes, containing chemical preservatives and other substances injurious to health.

Fourth. The presence of diseased, contaminated, filthy, or decomposed substance, products from a diseased animal, or one dying otherwise than by slaughter, or from substances so stored, transported, or handled as to render them unfit for use in foods.

Prior to the enactment of this law, serious abuses existed in the sausage trade in this State. But the enforcement of this law and the act by which the slaughtering of animals for use as food is placed under the supervision of the State Veterinarian have put the local butchering establishments into a sanitary condition, and the meats used for this important food, sausage, are now quite as free from contamination as that made by the large establishments under Federal supervision. The enforcement of the section prohibiting artificial coloring to enhance the appearance of the sausage and deceive the purchasers as to its quality has reduced this most pernicious practice very considerably. The same is true of the use of Boric acid and other preservatives. The new feature in this act, that prohibiting the addition of excessive water and cereal or vegetable flour to sausage, makes specific what was implied in a general way in the previous pure food laws, so that manufacturers know definitely what is meant by the adulteration and the courts can enforce strictly the intent of the act and the consumer knows that he can be protected, all of which is fully explained in the appended report of the Dairy and Food Commissioner.

The milk act, approved June 8th, 1911, requires a standard composition of milk for the State which is similar to the composition recommended by a board of experts who carefully studied the standards established by law in a number of states and municipalities and recommended their adoption throughout the United States, which the Secretary of Agriculture, by authority of Congress, later proclaimed as the standard for this country. The new law also raised the standard for the minimum limit of milk fat in cream, offered for sale in this State, from 15 per cent. of milk fat to 18 per cent., which brings the State into harmony with the standard of the National Department of Agriculture.

The policy of the Bureau of Pure Foods has been, whenever there was a change in the laws or a new law enacted, to inform the selling and manufacturing public and the consumer of the provisions of this legislation so that they might comply with the requirements of the law without resort to prosecutions by this Department. During the year 1911, 8,200 samples of the various kinds of food under legal restriction offered or exposed for sale throughout the State were analyzed by the chemists of the Pure Food Bureau, of which 1,029 were sold in violation of the law. This is a larger number of samples than were analyzed during any previous year in the existence of the Bureau.

The financial statement of the Dairy and Food Commissioner shows receipts from fines and all other sources for the year 1911 of $120,903.48, and an expenditure for the same period of $83,083.15, leaving a balance in the Bureau's favor of $37,820.33. This excess in the revenue of this Bureau over expenditures should not be construed as indicating that it does not need the financial support of the State, because there might be few violations or the expenses of enforcing the law might be such that the revenues of the Department might become exhausted and the violators would escape punishment, and in this way open the door for all kinds of food adulterators to come into the State.

REPORT OF THE STATE LIVESTOCK SANITARY BOARD AND STATE VETERINARIAN

This report shows that the demands made on this Bureau has caused it to be necessary to separate the work into divisions, with a responsible and capable person in charge of each, which are given in the report in the following order:

First. Meat Hygiene, Dr. T. E. Munce, Director.

Second. Horse Breeding and Practical Farm-work, Dr. Carl W. Gay, Director.

Third. Contagious and Infectious Diseases, Dr. R. M. Staley, Director.

Fourth. Laboratory and Research Work on State Farm, Dr. K. F. Meyer, Director.

Fifth. Milk Hygiene and Tuberculin Testing, Dr. W. S. Gimper, Director.

Sixth. Auditing, Miss Mary C. Butterworth, Clerk.

MEAT HYGIENE

For the purpose of a more thorough inspection of meats, this division was reorganized early in the year and the State divided into districts outlined by county boundaries, and an agent assigned to each district to which he largely confined his activities. Continuous inspection of a week at a time was kept up in several of the larger slaughtering centers with very good results, such as the placing of screens to protect meats from being handled by prospective purchasers and from contamination by flies. The agents of the State have been endeavoring to induce municipal and market house officials to have meats offered for sale protected from such contamination as above referred to. It seems that the time has come, when for the enforcement of hygienic conditions such as the State laws require, the slaughtering of animals and the preparation of meats and meat products and refrigeration should be conducted, controlled and owned by municipalities. Meat and meat products examined during the year amounted to 1,621,224 pounds, or 800½ tons; meat and meat products condemned during the year 17,531 pounds or 8½ tons. Regular inspections were not made in Philadelphia, Pittsburg, Reading and Harrisburg, because these cities have local inspection.

HORSE BREEDING

The law enacted by the last Legislature differs from the older law now repealed, especially in that it requires the licensing of each stallion for just what he is as to breed, soundness,

etc., no stallion shall enter the State without inspection, and in the provision it makes for the course to be pursued in prosecutions. Two thousand four hundred and thirty-one stallion licenses were issued in 1911, of which 941 were pure breds and 1,480 grades. Any breeder can see the license of all stallions and therefore know just what they are. The farm of the State Livestock Sanitary Board produced especially good crops of hay, wheat, corn, silage, carrots and turnips. The number of cattle on the farm have been reduced, while the hogs have been increased to furnish hog cholera serum to meet the general demand for this remedy.

CONTAGIOUS AND INFECTIOUS DISEASES

These are practically the same as in previous years, such as Actinomycosis, Anthrax, Blackleg, Glanders, Hog Cholera, Mange, Rabies, and Texas Fever.

Thirteen animals either died or were slaughtered during 1911 from Actinomycosis.

Anthrax: 1,005 cattle out of 77 herds reported from fourteen different counties were vaccinated in 1911 for Anthrax. Out of these herds 109 died previous to vaccination and one after vaccination.

Black-leg: This disease attacks only young cattle under three or four years old and can be entirely controlled by vaccination. The vaccine is furnished free of charge by the Livestock Sanitary Board. Twenty-one counties reported 149 herds containing 1,764 animals, of which 85 died before vaccination and none after.

Glanders: Eighteen counties reported glanders during the year and positive diagnoses were made in fourteen counties. One man in the State contracted the disease and died. From the eighteen counties, 57 supposed cases were reported, 57 stables were inspected, 265 animals were physically examined, 222 tested with mallein, 43 were condemned on physical examination, 5 on the mallein test, or a total of 48 condemned in the State during the year.

HOG CHOLERA

Forty-three counties reported hog cholera during 1911, with 411 herds infected consisting of 9,460 hogs and pigs, of which 4,933 were vaccinated. Over 3,000 hogs had died in these herds before vaccination and about the same number were found to be too sick to vaccinate. The serum for hog cholera is prepared on the State Livestock Sanitary Board's farm and is furnished free of charge. Good results have been obtained from the use of the serum in all parts of the State and wherever the treatment was applied early, the outbreak was checked and no further loss was sustained.

MANGE

Twelve counties with 43 cases reported mange during the year. 434 cases were examined in 1911, of which 85 were quarantined, of which all but three were cured.

RABIES

Fifty-two counties out of the 67 in the State reported rabies in 1911. 2,474 animals were quarantined for 100 days during 1911. 25 general quarantines of 100 days were maintained during the

year. 46 persons were reported bitten by rabid dogs during the year. In most cases the Pasteur treatment was taken, but one man in Johnstown refused to take the treatment, afterward developed rabies and died. 2,604 animals were destroyed. The number of cases of rabies has increased year after year for a number of years.

TEXAS FEVER

Twelve counties were involved, with two outbreaks of Texas Fever, exposing 1,105 cattle to infection; of these 41 were affected and 18 died. The outbreaks occurred in native cattle that were shipped in cars in which southern cattle had been carried, showing that there was not thorough disinfection. This disease is easily controlled in Pennsylvania if the precautions of the Board are observed.

CONTAGIOUS ABORTION

It has been quite well established through the investigation of Prof. Bang of Denmark, and confirmed by the studies of the Royal Commission appointed by King Edward of England, to examine and confirm the evidence, that abortion is due to a bacterium. This bacterium has been isolated from an aborted foetus by this Bureau.

LABORATORY AND RESEARCH WORK

During the year the laboratory on the farm has been thoroughly equipped and manned with ample and efficient help so that first-class work can be done. The work as outlined and begun is Research Experiments, Routine Work, and Milk Hygiene. Research work is being conducted on glanders to confirm certain methods of diagnosis, on Epizootic Lympangitis, on Tuberculosis in which the work started by Dr. Pearson and continued by Dr. Gilliland, was completed and some of the newer methods of Tuberculin Testing are studied; on contagious abortion for the purpose of diagnosing the disease, and on hog cholera, Texas Fever, forage poisoning and plant and feed poisoning.

LABORATORY ROUTINE WORK

During the year over 900 different specimens representing the various diseases referred to were received for diagnosis; 427 heads were received during 1911 representing horses, cattle, sheep, hogs, mules, goats, cats, dogs, and one human brain from one of the city hospitals for diagnosis for rabies.

One hundred and twenty-four specimens were received for diagnosis for glanders, 60 specimens for diagnosis for hog cholera, 34 specimens exclusive of milk samples for diagnosis for tuberculosis, 31 specimens for examination for antharx, 8 specimens for diagnosis for epizootic lympangitis, 6 specimens for chronic bacterial dysentery, one specimen for symptomatic anthrax or blackleg.

One hundred and ninety-eight thousand seven hundred and twenty cubic centimeters of tuberculin solution were distributed, 2,768 c. c. mallein solution were prepared, 1,671 doses of anthrax vaccine Nos. 1 and 2 for cattle, and 51 doses of anthrax vaccine Nos. 1 and 2 for horses were prepared and distributed; 217,085 c. c. hog cholera serum were prepared and distributed during the year.

MILK HYGIENE

Under the act approved March 30th, 1905, and by request of the properly authorized officials of the city, this Board undertook the work of inspecting the farms from which the milk supply of Philadelphia was derived. The main objects of the inspection were to determine what proportion of the supply was coming from bad dairies and to what extent the supply would be reduced by eliminating these, and whether such inspection could be made sufficiently educative to induce the careless dairyman to produce a higher grade article, which latter proved to be the case. The results of this inspection are tabulated in the report and they show according to the requirements of the score card, also included in the report, that about 9 per cent. of these dairies produce milk that is prejudicial to public health.

On October 1, the entire work of dairy farm inspection was transferred to the State Livestock Sanitary Board. With our previous experience of the inspections conducted in the vicinity of Philadelphia, we were capable to formulate plans to make a systematic inspection of the entire State and make it an educational campaign, and likely in the near future safeguard the general milk supply of the State as well as foster and encourage the dairy industry.

It is impossible to estimate the value of this service to the State, and the possibilities for its future usefulness are still greater and an appropriation for its maintenance should be as liberal as its service is valuable.

REPORT OF THE ECONOMIC ZOOLOGIST

The report is divided into ten sections:

First. Correspondence, examining specimens, and answering questions.
Second. Investigations and experiments.
Third. Publications.
Fourth. Lectures.
Fifth. Inspection of nurseries and private premises.
Sixth. Inspection of imported plants, seeds and fruits.
Seventh. Making collections.
Eighth. Inspection of orchards.
Ninth. Demonstrations.
Tenth. Exhibits.

CORRESPONDENCE

During the year 8,530 letters were written from this office, made up of general correspondence, 6,215 letters, model orchard correspondence, 1,347 and inspectors letters, 963. By far the largest number of the letters of general correspondence are in answer to questions in regard to insect pest suppression, the spray materials to use for this suppression, the kind of apparatus, and orchard management.

INVESTIGATIONS AND EXPERIMENTS

The concentrated home-made lime and sulphur is advanced as the best material for San Jose scale, made according to the formula of one pound of lime, two pounds sulphur and one gallon water, boiled one hour and diluted with approximately seven gallons of water. This

same solution with one ounce of Lead Arsenate to the gallon is advocated for flat headed apple tree borers. The highly dilute, or about one gallon of concentrated solution to forty gallons water, is advocated to take the place of Bordeaux mixture for all fungicidal sprays except potato blight and for grapes.

PUBLICATIONS

The regular monthly bulletin of the Bureau was changed to a bi-monthly at the beginning of the year and six issues were sent out during the year. Beside this bi-monthly bulletin, circulars treating on a number of phases of the work of this Department were sent out during the year, and also weekly press letters appropriate to the season of the year when published, were sent to the newspapers of the State.

LECTURES

Besides the addresses given by the orchard demonstrators and inspectors, the Economic Zoologist delivered 45 lectures throughout the State during the past year, many of them illustrated with lantern slides from photos of this Department.

INSPECTION OF NURSERIES

Two hundred nurseries were inspected in the State in the last year, covering 3,130 acres. This inspection is made twice a year, during mid-summer and again in the latter part of the winter. The reports state that the attitude of the nurserymen is favorable to this inspection and that they regard it as a benefit to themselves as well as the tree buying public.

INSPECTION OF IMPORTED PLANTS

In order to prevent the importation of all obnoxious and injurious pests, all plants and seeds in so far as possible are inspected before being planted after unpacking. Dr. L. O. Howard, United States Entomologist, and the United States Custom House officers regularly inform this Bureau of all nursery stock, cuttings, bulbs, seedlings, etc., coming into any port of entry destined for Pennsylvania. In this way we keep in touch with what is being done.

MAKING COLLECTIONS

During 1911 there were added 1,000 specimens to our zoological collection, 1,026 insect specimens, 75 invertebrates other than insects, 15 fishes and reptiles, 8 birds, 3 mammals, and equally as much material not pertaining to any of these classes.

INSPECTION OF ORCHARDS

During the year 1911 twenty-five regular orchard inspectors were kept in the field and they inspected 3,037 premises and 9,416 orchards. Among these were 245 demonstration orchards in which 930 demonstrations were given, attended by 14,092 people, and there were beside these 1,064 supervision orchards which were visited 1,972 times by the inspectors.

EXHIBITIONS

At the request of a number of County Fair Associations to make exhibits of the work and methods of this Bureau, four such exhibitions were made consisting of charts of many species of insects greatly enlarged showing their life history, photographs of orchards properly pruned, cultivated and sprayed trees, fruit of many kinds, spraying apparatus, chemicals for spraying, specimens of beneficial and injurious insects, mounted birds and mammals. The work of this Bureau has been very helpful and should be supplied with appropriations to maintain its efficiency.

DIVISION OF CHEMISTRY

The Division of Chemistry was under the direction of Mr. Jas. W. Kellogg, Chief Chemist, from whose report I take the following statements:

The work of this Bureau, as in former years, has been that of collecting and analyzing samples of feeding stuffs and linseed oil, and sending out reports, copies of bulletins, and answering requests for information.

One thousand samples of feeding stuffs were collected and analyzed during the year; 327 towns in 56 counties were visited to make these collections. Forty prosecutions for violation of the feeding stuffs law were ordered; $300.00 were secured for fines and costs from cases ordered to be prosecuted in 1910, and $957.98 for prosecutions in 1911, making a total of $1,237.98 for the year.

The quality of feeding stuffs has improved, as is evident from the fact that no adulterations with rice hulls, corn cobs, and peanut shucks were detected during the year. 189 special samples sent in by dealers were analyzed, for which $187.00 was received. As provided by the law, and in compliance with requests from the Bureau 450 manufacturers of feeding stuffs registered with the department during 1911.

Reports showing results of analyses for 1910 to the number of 6,000 were sent to manufacturers and dealers in feeding stuffs. 150 samples of linseed oil were analyzed during the year, of which 14 were found to be adulterated and for which prosecutions were ordered, and for which $258.72 were received in fines and costs. $200 were turned into the Treasury from fines and costs from prosecutions for adulteration of linseed oil brought in 1910. The adulteration of linseed oil has increased during the year, which is due to the fact that the last Legislature did not allow an appropriation for the examination work, which is now working and will still more in the future, work a hardship upon the honest manufacturers of paint, and on those who are using it, which should include all citizens and all owners of buildings.

No work was done in the enforcement of the Paris Green law because the last Legislature did not make an appropriation to continue this work.

It is certainly to be deplored that when this Department is endeavoring to induce farmers to improve and beautify their premises and take more pride in their homes, make these homes look inviting, and improve and increase their crops, that on account of the Legislature failing to appropriate a few thousand dollars, these people

who want to improve their surroundings and kill the insect pests that infest and destroy their crops can have imposed on them paints that will fade and wash away with the first winter's and spring rains, and poisons that will neither kill nor destroy.

FERTILIZER CONTROL WORK

This work was under the special supervision of Mr. Harry E. Klugh from whose report the following extracts are made:

Fifteen agents of the Department canvassed the entire State during the months of April and May and collected samples for analysis, from the fertilizers exposed for sale for the Spring trade, and again during August and September, collecting samples from fertilizers for the Fall trade. 3,257 samples of mixed fertilizers and fertilizing materials were collected during the year, of which 1,229 were subjected to separate analysis. Where two or more samples of the same brand were reported, equal parts of each sample were united and the composite sample was analyzed, full information of which appears in Bulletins Nos. 212 and 218. Where more than three samples of the same brands were sent in it was necessary to discard the same on account of the reduced appropriation made for this work. In making up the composite sample we have followed the practice of former seasons in the selection of individual samples, so as to have, as nearly as possible, three different sections of the State represented.

Where deficiencies occur in these composited samples, a separate analysis is made of the remaining parts of the individual samples entering into the composite sample, and the deficiency is traced to the particular single sample that was below guarantee.

The legislation of 1909 has made needful some additional tests. Section 4, of the act of May 1st, 1909, prohibits the sale of pulverized leather, hair, ground hoofs, horns, or wool waste, raw, steamed, roasted, or in any form, as a fertilizer, or as an ingredient of a fertilizer or manure, without an explicit statement of the fact. All nitrogenous fertilizers were therefore submitted to a careful microscopic examination, at the time of preparing the sample for analysis, to detect the presence of the tissues characteristic of the several materials above named. The act of April 23, 1909, makes it unlawful to use the word "bone" in connection with, or as part of the name of any fertilizer, or any brand of the same, unless the phosphoric acid contained in such fertilizer shall be the product of pure animal bone. All fertilizers in whose name the word "bone" appears, were therefore examined by microscopic and chemical methods to determine, so far as possible with present knowledge, the nature of the ingredient or ingredients supplying the phosphoric acid. It is a fact, however, well known to fertilizer manufacturers and which should be equally understood by the consumer, that it is, in certain cases, practically impossible to determine the source of the phosporic acid by an examination of a fertilizer when it is ready for the market. The microscope shows clearly the structure of raw bone, but does not make it possible to discriminate between thoroughly acidulated bone and acidulated rock. The ratio of nitrogen to phosphoric acid in a raw bone—and only such bone as has not been deprived of any considerable proportion of its nitrogenous material by some manufacturing process can properly be called "pure animal bone"—is about 1:8;

in cases where the ratio of nitrogen to phosphoric acid exceeds 8, it is clear that part, at least, of the phosphoric acid has been supplied by something else than pure animal bone; but, inasmuch as nitrogen may have been introduced in some material other than bone and no longer detectible by the microscope, the presence of nitrogen and phosphoric acid in the proportions corresponding to those of bone is not proof positive that they have been supplied by bone. Finally the differences in the iron and silica content of bone and rock respectively afford means of distinction useful in some cases. The usefulness of this distinction is limited, however, by the facts that kitchen bone frequently contains earthy impurities rich in iron and silicia, and that earthy fillers can legally be used in fertilizers and are in fact considerably used therein both as "make-weights" and as "conditioners," or materials introduced to improve the drilling qualities of the goods. The fact that the phosphoric acid in bone and rock are identical in character is probably so well known as to require no detailed consideration in this connection.

The cases of departure of goods from guaranty, where the deficiency was two-tenths per cent., amounted to 38 per cent. which in my judgment is due to improper mixing or a separation of the mixed materials in transit.

Many of the fertilizers were found short in one element but over in the other guaranteed elements, yet these fertilizers are not exempt from being classified with the more deficient samples, which materially increases the percentage of deficient samples.

Where it was believed that fraud was attempted or gross carelessness was permitted among manufacturers, from the samples showing a marked deficiency, the manufacturers or the venders were prosecuted.

During the year the Department instituted 16 proceedings for the violation of the Fertilizer Law, and recovered $389.33 in fines and costs which were paid into the State Treasury, as required by law.

For a clear understanding of the above, I submit herewith for comparison a table of average composition and average guaranty for the year 1911:

	Average composition. Per cent.	Average guaranty. Per cent.
Phosphoric Acid:		
Total,	9.72	9.01
Available,	8.25	7.86
Potash,	4.30	4.02
Nitrogen,	1.32	1.36

The following statement made by Dr. Wm. Frear, Chief Chemist of the Pennsylvania Agricultural Experiment Station, who had charge of the analytical work, in a report to this Department, is self explanatory:

"The microscopic examination of the nitrogenous fertilizers for leather, hair, and other materials the use of which without notice is prohibited by the act of May 1, 1909, revealed in no case such quantity of any of these substances as might not fairly be regarded as an accidental trace. No instance has been reported by the sampling agents in which a declaration of the presence of such material has been made. It is, however, a matter of quite general knowledge that substances of this kind are being largely used in fertilizer mixtures; but, in most cases at least, only after such treatment as results in the destruction of the characteristic tissues and, at the same time, wholly or partly in that of organic compounds originally present. The Pennsylvania Agricultural Experiment Station is now conducting, under the writer's supervision, an investigation to determine the degree to which the acid treatment usually employed improves the availability of the nitrogen in these substances.

"In conformity with the requirements of the act of April 23, 1909, many firms dropped from the brand names of goods manufactured by them the word 'bone' hitherto forming part of said names. Where such change in name appears, it may be taken as evidence that the phosphoric acid is derived, at least in part, from something else than bone."

During the year just ending there were 1,575 brands of mixed fertilizers and fertilizing materials registered with the Department. License fees amounting to $27,960.00 were received from the above registration and paid into the State Treasury, as provided by law.

At the present writing (April, 1912), one hundred and seventy-four reports have been received from manufacturers and importers, containing statements of their sales in this State during the year 1911, amounting to 281,782 tons, covering all materials used for fertilizing purposes.

After comparing these reports with reports showing the tonnage of 1910, I find there appears a decrease in the amount of mixed fertilizers consumed during the year, and a marked increase in the amount of the raw materials used. This condition, in a measure, is brought about by the extensive education that is being published concerning the economy of "home mixed" fertilizers, and also by the zealous efforts of manufacturers' agents to execute contracts when they are unable to sell their regular brands.

For your better information I have prepared the following table showing the reported tonnage, for both the years 1910 and 1911, of the several classes of fertilizers:

	1910.	1911.
Complete,	178,770	178,070
Rock and potash,	70,596	68,112
Acid phosphate,	19,876	18,578
Bone,	8,455	8,202
Muriate of potash,	1,042	2,561
Sulphate of potash,	293	357
Nitrate of soda,	1,146	1,872
Kainit,	995	1,854
Blood,	14	26
Tankage,	180	112
Basic slag,	1,316	1,460
Miscellaneous,	46	578
Total,	282,729	281,782

It is especially gratifying that many manufacturers have withdrawn the maximum figures of their guarantees from their bag statements and others are eliminating the "equivalents," both of which have proved confusing to consumers.

BUREAU OF PUBLICATIONS

During the year 1911, the Department issued 14 bulletins, Nos. 205 to 218, both inclusive. The demand for Department reports and bulletins is very great, each year showing an increased interest in agricultural knowledge over the preceding year. Requests come from the schools of the State for literature along agricultural lines, and many High Schools use the bulletins of the Department in class study.

Since 1899, 12 annual reports, aggregating 12,400 pages and 177 bulletins aggregating 15,500 pages have been published. During the same period there has been distributed to the people of the Commonwealth, various states of the Union and foreign countries, about 400,000 copies of the Department publications. This number does not include the annual reports distributed by the members of the Senate and House of Representatives, aggregating in 12 years about 150,000, making a total of 550,000 copies of reports and bulletins sent out for the information of the people in agriculture and allied subjects.

Neither does the above number include the monthly bulletins issued by the Dairy and Food Bureau and the Bureau of Economic Zoology, from which has gone out during the past 10 years at least 500,000 copies making a grand total of more than one million of copies of literature for the benefit of the general farmer, trucker, fruit grower and producer of livestock, etc., distributed during 12 years. There are on hand at the present time for distribution more than 250,000 publications.

These publications are, for the most part, prepared by specialists along the many lines to which they relate, the editing of the same being done by the Chief Clerk of the Department, Mr. M. D. Lichliter, who also has supervision of their distribution.

STATE FAIR

For a number of years the State Livestock Breeders' Association, the Dairy Union, the Horticultural Society and the State Board of Agriculture have held what would be in many states regarded a very creditable exhibition of agricultural, horticultural and dairy products, as well as animal displays, for which premiums secured by voluntary contributions and by some advertising were offered that have been of such amounts and character as to create keen competition to obtain them.

It seems that after these agricultural organizations have created such an interest in State exhibits by voluntary action that the time has come for the Legislature to make an appropriation for the purchase of grounds and the erection of buildings for a State Fair, and for the payment of such premiums as are compatible with the agricultural interest of the State.

I wish, in conclusion, to express to your Excellency personally my appreciation of your readiness on all occasions to give to me every assistance possible in carrying forward the work of the Department.

I desire to express my appreciation of the faithfulness to duty of the heads of the several Bureaus of the Department without which the success that has crowned our efforts would have been impossible.

I also feel under renewed obligations to the press of this city and to the agricultural and public press generally for the important aid they have continued to give to the work for which this Department stands.

Respectfully submitted,

Secretary of Agriculture.

Harrisburg, Pa., April 4, 1912.

3—6—1911

SEVENTEENTH ANNUAL REPORT OF THE BUREAU OF FARMERS' INSTITUTES FOR THE SEASON OF 1910-1911

Harrisburg, Pa., *January 1, 1912.*

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

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

INSTITUTES HELD AND ATTENDANCE

There were held in the season ending June 1, 1911, in the different counties 477 days of institute and schools, divided into 1,162 sessions, a total attendance at which was 189,383. Attendance at Regular Institutes 162,809, Special Institutes 10,376, Movable Institute Schools 16,198, Harvest Home Picnics 20,000, making a grand total in attendance of 209,383. Our Annual Normal Institute was held in the city of Lancaster, May 23-26, 1911. This meeting was attended not only by Managers of Institutes in the various counties and practically all State Lecturers, but representatives of County Agricultural Societies, local granges and farmers' clubs. The State Grange was represented by Master Creasy. More than ordinary interest was manifested on part of the delegates on the question of Co-operation amongst the Farmers for the Marketing of their Crops and purchasing Farm Supplies. A committee was appointed, consisting of Messrs. R. P. Kester, E. B. Dorsett and Archie Billings to investigate the matter and make recommendations for action at our next annual meeting.

MOVABLE SCHOOLS AND INSTITUTES

Movable Schools, continuing four days each, were held in 12 counties of the State, consisting of Potter, Warren, York, Lebanon, Lackawanna, Columbia, Venango, Erie, Crawford, Westmoreland, Chester and Lehigh. As previously reported, these schools continue to teach and demonstrate lessons in Dairying, Horticulture, Poultry and Domestic Science, and Home Sanitation, as a result of which a marked improvement may be noted in the matter of dairy improvement by use of the Babcock Test, the unprofitable dairy cow is being rapidly elimiated from the herd, barn ventilation and conveniences is taking the place of old and unsanitary methods. Horticulture, as developed by our experts, is being practiced by thousands of farmers of the State with very satisfactory results. I may name one instance in Tioga county where 15 orchards within a radius of two miles were supplied with a spraying outfit directly as a result of such teaching. This is only an example of what is occurring in hundreds of other places. Our fruit industry is scarcely second to that of dairying. A careful and somewhat hurried estimate of the fruit growing interests of the State shows that we have over 23,225,000 apple trees planted, 1,000,000 pear, 3,000,000 peach, making a total of 27,225,000

in all. These figures show somewhat the importance of Horticulture in Pennsylvania. As a result of introducing poultry as a line of special teaching at our schools and institutes, the farm poultry of the State is being rapidly improved. The old mongrel hen is supplanted by thoroughbred stock, fed and housed in such manner as to bring profitable results in both egg production and poultry for the market. We feel safe in saying that no other branch of livestock industry offers more promising results for the money invested than a well cared for flock of hens. The value of this industry in birds and their products amounts to upwards of $23,000,000 for the year 1911. No Institute or School is held in Pennsylvania at which is not taken up the subject of Horticulture or Poultry in one or the other of their branches.

PENNSYLVANIA FARMERS' INSTITUTES 1910-1911

The following is a complete list, by counties, of dates and places where institutes, movable schools and special institutes were held throughout the State for the institute year, ending June 1, 1911:

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1910-1911.

County.	Place.	Date.	Days of institute.	Number of sessions.	Attendance by Sessions.	Speakers Present.		Attendance.		
						State.	Local.	Average.	Total.	By counties.
Adams,	New Oxford,	Dec. 26-27,	2	5	120, 110, 56, 140, 180,	3	1	121	606	
	York Springs,	Dec. 28-29,	2	5	80, 300, 90, 260, 400,	4	2	226	1,130	
	Arendtsville,	Dec. 30-31,	2	4	60, 50, 290, 70,	3		118	470	2,206
Allegheny,	New Texas,	Jan. 9-10,	2	5	48, 170, 50, 150, 200,	4		123	618	
	Montour Church,	Jan. 11-12,	2	5	50, 150, 50, 150, 250,	4	2	130	650	
	Bakerstown,	Jan. 13-14,	2	4	65, 250, 75, 145,	4	2	132	530	1,798
Armstrong,	Dayton,	Feb. 15-16,	2	5	50, 240, 100, 200, 250,	4	4	168	840	
	Worthington,	Feb. 20-21,	2	5	25, 27, 47, 50, 20,	4		34	169	
	Kittanning,	Feb. 17-18,	2	5	42, 60, 40, 100, 110,	4		70	352	1,361
Beaver,	Mt. Pleasant,	Dec. 26-27,	2	5	30, 225, 40, 150, 225,	3		134	670	
	Hookstown,	Dec. 28-29,	2	5	60, 200, 21, 45, 80,	3	2	81	406	
	Grange Hall,	Dec. 30-31,	2	5	75, 150, 75, 100, 200,	3	3	120	600	1,676
Bedford,	Friends Cove,	Nov. 30-Dec. 1,	2	5	20, 205, 65, 120, 130,	3	1	108	540	
	Loysburg,	Dec. 2-3,	2	5	43, 65, 62, 90, 210,	3	1	94	470	
	Graceville,	Dec. 5-6,	2	4	10, 13, 34, 14,	3		18	71	1,081
Berks,	Geigertown,	Jan. 30,	1	3	150, 200, 150,	4		167	500	
	Beckersville,	Jan. 30-31,	2	5	50, 100, 40, 78, 175,	4		89	443	
	Mt. Etna,	Feb. 1-2,	2	5	150, 225, 200, 80, 190,	4		169	845	
	Kutztown,	Feb. 3-4,	2	5	80, 350, 50, 150, 400,	4		206	1,030	
	Amityville,	Feb. 6-7,	2	5	125, 200, 60, 200, 250,	4		163	815	
(Special),	Geigertown,	Oct. 15,	1	3	100, 150, 200,	2	2	150	450	4,083
Blair,	Bellwood,	Jan. 11-12,	2	5	30, 120, 42, 92, 100,	4	4	89	444	
	Newry,	Jan. 13-14,	2	5	87, 250, 92, 125, 302,	4	3	171	856	
	Williamsburg,	Jan. 16-17,	2	5	42, 286, 42, 112, 520,	4	3	196	982	
(Special),	Henrietta,	Aug. 11,	1	1	150,	1	3	500	500	2,782
Bradford,	Leroy,	Dec. 30-31,	2	5	130, 190, 85, 35, 200,	3	2	128	640	
	Wilmont,	Jan. 2-3,	2	5	100, 100, 190, 175, 250,	4	2	163	815	
	Spring Hill,	Jan. 4-5,	2	5	95, 125, 150, 175, 225,	4	3	153	765	
	Wysox,	Jan. 6-7,	2	5	90, 180, 120, 170, 250,	4		162	810	

(Special),	North Orwell,	Jan. 5-6,	2	5	185, 310, 100, 250, 350,	3	4	238	1,195	4 225
Bucks,	Pineville,	Feb. 8-9,	2	5	80, 200, 100, 180, 250,	4		162	810	
	Plumsteadville,	Feb. 10-11,	2	5	220, 300, 200, 250, 450,	4		284	1,420	
	Doylestown,	Feb. 13-14,	2	5	200, 700, 150, 600, 300,	4		390	1,950	
	Richboro,	Feb. 16-16,	2	5	125, 225, 160, 200, 300,	4		202	1,010	
	Richlandtown,	Feb. 17-18,	2		150, 225, 130, 225, 300,	4		206	1,030	
(Special),	Menlo Park,	Sept. 15,	1	1	200,	1		200	200	6,420
Butler,	Jacksville,	Jan. 2-3,	2	5	80, 200, 100, 150, 250,	4	5	156	780	
	Muddy Creek,	Jan. 4-5,	2	5	35, 125, 22, 42, 156,	4	7	78	380	
	Hooker,	Jan. 6-7,	2	5	40, 135, 38, 35, 150,	4	1	79	398	1,558
Cambria,	Patton,	Dec. 7-8,	2	6	17, 52, 76, 52, 205, 150,	4	1	80	547	
	Loretto,	Dec. 9-10,	2	4	56, 146, 26, 125,	4	1	87	347	
	Wilmore,	Dec. 12-13,	2	6	34, 52, 270, 68, 134, 300,	4	3	143	858	
(Special),	Scalp Level,	Nov. 29-30,	2	2	305, 340,	1	10	315	645	2,397
Cameron,	Sinnamahoning,	Jan. 30,	1	2	8, 25,	2		17	33	
	Sterling Run,	Dec. 1,	1		10, 25, 100,	3		45	135	
	Rich Valley,	Dec. 2,	1	3	3, 20, 50,	3		93	70	
	Sizerville, Truman,	Dec. 3,	1	2	25, 75,	2		50	100	338
Carbon,	New Mahoning,	Feb. 6-7,	2	5	45, 150, 75, 150, 225,	3	2	129	645	
	Stemlerville,	Feb. 8,	1	2	25, 40,	3		53	105	
	Big Creek,	Feb. 9,	1	3	45, 75, 150,	3		90	270	
	Weatherly,	Feb. 10-11,	2	4	20, 75, 45, 65,	3		51	205	1,235
Centre,	Pleasant Gap,	Feb. 20-21,	2	5	53, 200, 60, 120, 280,	3	2	146	730	
	Unionville,	Feb. 22-23,	2	5	138, 298, 144, 298, 303,	3	1	236	1,178	
	Eagleville,	Feb. 24-25,	2	5	221, 375, 108, 273, 380,	3	1	271	1,357	3,263
Chester,	Avalon,	Feb. 17-18,	2	5	30, 60, 35, 75, 150,	4		70	350	
	Oxford,	March 1-2,	2	4	220, 350, 240, 560,	4	8	393	1,570	
	Doe Run,	March 3-4,	2	5	50, 140, 110, 160, 160,	4	3	112	560	
	Kimberton,	March 6-7,	2	4	120, 240, 190, 230,	4	4	197	790	
	Cedarville,	March 8-9,	2	5	160, 280, 180, 240, 350,	5	3	220	1,110	
(Movable Institute School.)	Unionville,	Jan. 30-Feb. 2,	4	9	75, 80, 45, 75, 110, 70, 90, 160, 180.	3		98	885	5,265
Clarion,	Greenville,	Feb. 14-15,	2	5	50, 110, 75, 125, 200,	3	2	113	590	
	Rimersburg,	Feb. 16-17,	2	5	300, 400, 165, 250, 400,	3	2	323	1,615	
	Pickingville,	Feb. 18-19,	2	5	50, 150, 50, 100, 250,	4	3	120	600	2,805
Clearfield,	Curwensville,	Feb. 27-28,	2	5	125, 220, 90, 175, 200,	4	1	162	810	
	Burnside,	March 1-2,	2	5	65, 270, 85, 245, 300,	5	2	193	965	
	DuBois,	March 3-4,	2	4	72, 78, 88, 165,	4	2	60	243	2,118
(Special),	Utahville,	March 6-7,	2	4	90, 120, 80, 110,	4	1	108	430	
(Special),	Luthersburg,	March 8-9,	2	4	100, 140, 100, 140,	4	1	120	480	
(Special),	Fandy,	March 10,	1	2	100, 150,	4	1	125	250	
(Special),	Kylertown,	March 13-14,	2	2	112, 100, 124, 100,	4	1	109	436	1,796
Clinton,	Woolrich,	Feb. 6-7,	2	5	20, 100, 40, 150, 325,	4	1	127	635	
	Lamar,	Feb. 8-9,	2	5	50, 300, 75, 250, 325,	4	1	200	1,000	
	Loganton,	Feb. 10-11,	2	5	150, 300, 225, 275, 300,	3	2	250	1,250	2,885
(Movable Institute School.)										
Columbia,	Berwick,	Jan. 4-7,	4	10	35, 40, 40, 85, 75, 52, 115, 90, 75, 105.	4	1	71	710	

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1910-1911—Continued.

County.	Place.	Date.	Days of Institute.	Number of sessions.	Attendance by Sessions.	Speakers Present.		Attendance.		
						State.	Local.	Average.	Total.	By counties.
(Movable Institute School.)	Catawissa,	Jan. 6-10,	4	10	100, 250, 120, 225, 300, 100, 225, 130, 280, 320.	4		206	2,060	2,770
(Movable Institute School.)	Hartstown,	Jan. 13-17,	4	11	25, 50, 115, 40, 75, 125, 125, 115.	4		80	870	
Crawford,	Brown Hill,	Jan. 30-31,	2	5	75 125, 165, 175, 225,	4	1	142	710	
	Blooming Valley,	Feb. 1-2,	2	5	105, 200, 200, 180, 120,	4	1	163	815	
	Black Ash,	Feb. 3-4,	2	5	150, 250, 222, 330, 335,	4	1	249	1,247	2,772
Cumberland,	Middle Springs,	Jan. 15-16,	2	5	60, 100, 110, 140, 280,	2		150	750	
	Centreville,	Jan. 17-18,	2	5	70, 220, 25, 190, 450,	3		171	855	
	New Kingston,	Jan. 19-20,	2	5	85, 180, 110, 280, 300,	3		191	955	
	Hogestown,	Jan. 30,	1	3	60, 240, 320,	2		207	620	
	Churchtown,	Jan. 31,	1	3	18, 160, 225,	3		134	403	3,583
Dauphin,	Bachmansville,	Dec. 5,	1	2	30, 40,	4		35	70	
	Hummelstown,	Dec. 6,	1	3	28, 37, 120,	4		62	185	
	Linglestown,	Dec. 7-8,	2	5	60, 400, 50, 70, 500,	4		216	1,080	
	Gratz,	Dec. 9-10,	2	5	550, 700, 150, 500, 800,	3	3	525	2,625	
(Special),	Berrysburg,	March 13,	1	1	750,	1		750	750	1,790
Delaware,	Newtown Square,	Feb. 22-23,	2	5	40, 90, 35, 140, 110,	4		83	415	
	Media,	Feb. 24-25,	2	5	60, 170, 35, 180, 190,	5	2	127	635	
	Concordville,	Feb. 27-28,	2	5	60, 220, 40, 210, 290,	4	1	164	820	1,870
Elk,	Ridgeway,	Nov. 25-26,	2	5	45, 30, 20, 50, 30,	3	1	35	175	
	St. Marys,	Nov. 28-29,	2	5	35, 50, 30, 50, 100,	2	1	53	265	440
(Movable Institute School.)										
Erie,	Edinboro,	Jan. 11-14,	4	10	80, 90, 110, 150, 150, 150, 200, 165, 98, 175.	4		137	1,367	
	Greenfield,	Feb. 27-28,	2	5	75, 200, 225, 105, 215,	4		161	820	
	Girard,	March 1-2,	2	5	100, 200, 100, 175, 225,	4	2	160	800	2,987

Fayette,	Flatwoods,	Dec. 2-3,	2	5	30, 70, 125, 150, 125,	4		100	500		
	Farmington,	Dec. 5-6,	2	5	60, 35, 95, 75, 90,	4		71	355		
	Morris X Roads,	Dec. 7-8,	2	5	68, 190, 86, 150, 300,	4	4	155	774	1,629	
Forest,	Tionesta,	Feb. 22-23,	2	5	60, 200, 90, 200, 350,	4	1	180	900		
	East Hickory,	Feb. 24-25,	2	5	50, 150, 50, 75, 250,	4	1	115	575	1,475	
Franklin,	Marion,	Jan. 2-3,	2	5	18, 50, 20, 35, 140,	4	1	53	263		
	Lemasters,	Jan. 4-5,	2	6	35, 130, 200, 60, 90, 300,	4	1	151	905		
	Dry Run,	Jan. 6-7,	2	5	120, 450, 130, 410, 550,	4	1	330	1,660	2,868	
Fulton,	Warfordsburg,	Nov. 25-26,	2	5	29, 200, 36, 68, 210,	4		108	543		
	Needmore,	Nov. 28-29,	2	5	68, 64, 69, 101, 160,	4		92	462	1,005	
Greene,	Graysville,	Nov. 21-22,	2	5	50, 250, 80, 200, 300,	5		176	880		
	Holbrook,	Nov. 23-24,	2	5	100, 150, 120, 200, 250,	5		164	820	1,700	
Huntingdon,	Warriors Mark,	Jan. 18-19,	2	5	51, 225, 85, 128, 260,	4	3	149	749		
	Petersburg,	Jan. 20-21,	2	4	41, 140, 68, 190,	4		109	439		
	McAlevys Fort,	March 6-7,	2	4	130, 70, 85, 125,	3		103	410		
	Orbisonia,	March 8-9,	2	5	10, 396, 72, 180, 400,	4	3	226	1,128	2,726	
Indiana,	Cookport,	Feb. 27-28,	2	5	160, 300, 200, 250, 300,	4	3	242	1,210		
	Homer City,	March 1-2,	2	5	80, 325, 75, 150, 450,	4		211	1,055		
	Clarksville,	March 3-4,	2	5	50, 225, 100, 150, 200,	4		145	725		
	Plumville,	March 6-7,	2	5	110, 450, 200, 825, 100,	4		297	1,485	4,485	
Jefferson,	Oliveburg,	Nov. 21-22,	2	5	35, 90, 40, 100, 125,	3		78	390		
	Roseville,	Nov. 23-24,	2	5	125, 90, 175, 225, 175,	3		158	790	1,180	
Juniata,	Vandyke,	Dec. 26-27,	2	5	39, 158, 66, 110, 310,	4	1	137	683		
	McCoysville,	Dec. 28-29,	2	5	40, 212, 80, 135, 475,	4	1	188	942	1,625	
Lackawanna,	Madisonville,	Nov. 22-23,	2	5	21, 39, 24, 33, 52,	4		34	169		
	Daleville,	Nov. 25-26,	2	5	19, 110, 20, 80, 115,	4		69	344		
	Tompkinsville,	Nov. 28-29,	2	5	35, 96, 35, 65, 110,	4		70	351		
	Bald Mount,	Nov. 30-Dec. 1,	2	5	30, 90, 40, 85, 150,	3		79	395		
(Movable Institute School.)	Clarks Greene,	Jan. 2-5,	4	10	30, 9, 25, 45, 80, 62, 200, 130, 194, 81, 185.	4		80	852	2,111	
Lancaster,	Quarryville,	Nov. 21-22,	2	5	40, 190, 50, 180, 450,	4	1	182	910		
	Lampeter,	Nov. 23-24,	2	5	80, 400, 95, 375, 550,	4	1	300	1,500		
	Paradise,	Nov. 25-26,	2	5	85, 550, 75, 270, 600,	4	1	313	1,580		
	Mechaniesville,	Nov. 28-29,	2	5	75, 100, 40, 180, 550,	4	2	189	945		
	Ephrata,	Nov. 30-Dec. 1,	2	5	220, 700, 180, 330, 650,	4	2	428	2,140		
	Maytown,	Dec. 2-3,	2	5	220, 540, 330, 460, 580,	4	2	436	2,130		
(Summer Institutes)											
	Fairmount,	Aug. 24-25,	2	5	80, 210, 650, 1,600	4	1	635	2,540		
	Terre Hill,	Aug. 26-27,	2	5	90, 150, 300, 1,100, 250,	4	1	578	2,890	14,685	
Lawrence,	Mt. Jackson,	Jan. 16-17,	2	5	42, 225, 60, 100, 250,	4		135	677		
	Princeton,	Jan. 18-19,	2	5	58, 190, 40, 100, 225,	4		123	613		
	East Brook,	Jan. 20-21,	2	5	80, 225, 70, 165, 200,	4		148	742		
	New Wilmington,	Feb. 13-14,	2	5	150, 200, 100, 110, 200,	5		153	765	2,797	
(Movable Institute (School.)											
Lebanon,	Annville,	Dec. 28-31,	4	10	40, 35, 25, 45, 60, 40, 46, 105, 26, 55.	3	1	47	477		
	Jonestown,	Feb. 13-14,	2	5	50, 120, 40, 85, 145,	4		88	440		
	Schaefferstown,	Feb. 15-16,	2	5	54, 225, 70, 87, 350,	4		157	786		

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1910-1911—Continued.

County.	Place.	Date.	Days of institute.	Number of sessions.	Attendance by Sessions.	Speakers Present.		Attendance.		
						State.	Local.	Average.	Total.	By counties.
(Special), ... (Movable Institute (School.)	Heilmansdale, ...	Aug. 6, ...	1	2	300, 1,000	1	1	650	1,300	3,003
Lehigh, ...	Allentown, ...	Feb. 1-4, ...	4	10	95, 55, 80, 140, 110, 165, 250, 65, 75, 400.	4	.....	180	194	
	Germansville, ...	Feb. 20-21, ...	2	5	125, 200, 60, 250, 300,	4	.....	188	938	
	Macungie, ...	Feb. 22-23, ...	2	5	65, 300, 35, 80, 350,	3	.....	166	830	3,769
Luzerne, ...	Orange, ...	Jan. 9-10, ...	2	5	150, 250, 190, 315, 410,	4	1	259	1,295	
	Sweet Valley, ...	Jan. 11-12, ...	2	5	80, 175, 115, 250, 150,	3	.....	171	855	
	Hobbie, ...	Jan. 13-14, ...	2	5	170, 235, 150, 210, 250,	3	1	223	1,115	3,265
Lycoming, ...	Hughesville, ...	Jan. 26-31, ...	2	5	125, 250, 150, 300, 350,	4	.....	235	1,175	
	Pine Run, ...	Feb. 1, ...	1	3	90, 125, 135,	4	.....	116	350	
	Limestone, ...	Feb. 4, ...	1	3	120, 250, 125, 200, 250,	4	.....	169	845	
	Waterville, ...	Feb. 2-3, ...	2	6	35, 125, 100,	4	.....	90	260	2,639
McKean, ...	Bell Run, ...	Dec. 5-6, ...	2	5	40, 85, 45, 75, 90,	4	.....	67	335	
	Turtle Point, ...	Dec. 7-8, ...	2	5	40, 100, 45, 65, 90,	4	.....	68	340	
	Smethport, ...	Dec. 9-10, ...	2	4	40, 30, 25, 45,	4	.....	37	140	815
Mercer, ...	Greenville, ...	Feb. 6-7, ...	2	5	40, 100, 100, 100, 100,	3	2	88	440	
	Clarks Mills, ...	Feb. 8-9, ...	2	5	50, 175, 75, 125, 300,	3	1	145	725	
	Jackson Centre, ...	Feb. 10-11, ...	2	5	130, 300, 125, 230, 600,	4	.....	277	1,385	2,550
Mifflin, ...	Belleville, ...	Dec. 30-31, ...	2	6	44, 81, 110, 250, 350, 400,	4	2	247	1,235	
	Lewistown, ...	Jan. 2-3, ...	2	6	25, 76, 75, 94, 170, 164,	4	1	120	604	1,839
Monroe, ...	Kresgeville, ...	Jan. 16-17, ...	2	5	30, 95, 30, 65, 130,	4	3	74	370	
	Brodheadsville, ...	Jan. 18, ...	1	3	70, 150, 300,	4	1	104	520	
	Marshalls Creek, ...	Jan. 19-20, ...	2	5	35, 15, 50, 25, 55,	4	1	36	180	1,070
Montgomery, ...	Sanatoga, ...	Feb. 22-23, ...	2	5	110, 220, 90, 220, 200,	3	2	188	940	
	King of Prussia, ...	Feb. 24-25, ...	2	6	60, 150, 190, 75, 100, 250,	4	1	149	885	
	Center Point, ...	Feb. 27-28, ...	2	5	200, 375, 325, 250, 150,	5	1	300	1,500	
	Harleysville, ...	March 1-2, ...	2	5	180, 275, 80, 175, 300,	5	1	202	1,010	
	East Greenville, ...	March 3-4, ...	2	6	140, 320, 100, 275, 400,	4	1	245	1,225	5,560

Montour,	James Church,	Feb. 10-11,	2	4	62, 225, 45, 170,	4	2	134	537		
	White Hall,	Feb. 13-14,	2	6	50, 96, 95, 156, 210, 120,	3	1	104	627	1,164	
Northampton,	Ackermanville,	Jan. 30-31,	2	5	60, 195, 60, 110, 300,	4	1	185	725		
	Tatamy,	Feb. 1-2,	2	5	95, 300, 75, 175, 275,	4	1	183	915		
	Cherryville,	Feb. 3-4,	2	5	65, 115, 70, 155, 225,	4	2	126	630	2,270	
Northumberland,	Pottsgrove,	Feb. 3-4,	2	5	140, 375, 80, 275, 375,	4	1	249	1,245		
	Snydertown,	Feb. 6-7,	2	5	81, 195, 145, 260, 305,	3		197	986		
	Urban,	Feb. 8-9,	2	5	60, 110, 105, 165, 375,	3	1	163	815	3,046	
Philadelphia,	Bustleton,	Feb. 20-21,	2	4	70, 310, 50, 350,	5	3	170	680	680	
Perry,	Blain,	Jan. 9-10,	2	5	140, 340, 110, 345, 550,	4		297	1,485		
	Ickesburg,	Jan. 11-12,	2	5	100, 240, 120, 200, 250,	4		182	910		
	Millerstown,	Jan. 13-14,	2	5	80, 380, 35, 110, 370,	4		201	1,005	3,400	
Pike,	Greentown,	Jan. 4-5,	2	6	48, 100, 200, 80, 290, 325,	4		173	1,037		
	Paupack,	Jan. 6-7,	2	5	35, 40, 85, 45, 80,	4		59	295	1,332	
(Movable Institute Schools.)											
Potter,	Odin,	Nov. 30-Dec. 3,	4	6	55, 32, 20, 36, 23, 28,	4		36	194		
	Ellisburg,	Dec. 2-6,	4	7	29, 20, 105, 50, 70, 85, 90,	4		74	449	643	
Schuylkill,	Barnesville,	Feb. 13-14,	2	5	95, 240, 100, 155, 300,	4	1	178	890		
	McKeansburg,	Feb. 15-16,	2	6	45, 95, 200, 50, 130, 225,	4	1	124	745		
	Pitman,	Feb. 17-18,	2	4	215, 350, 200, 350,	3		244	975		
	Pinegrove,	Feb. 20-21,	2	5	35, 325, 45, 60, 400,	3	1	175	875		
(Special),	Sacramento,	Dec. 1,	1	2	500, 800,	1		650	1,300	4,785	
Snyder,	Beavertown,	Jan. 30-31,	2	6	45, 82, 240, 110, 120, 300,	3		149	897		
	Mt. Pleasant,	Feb. 1-2,	2	5	125, 375, 120, 200, 350,	3	3	234	1,170	2,067	
Somerset,	Salisbury,	Jan. 4-5,	2	5	120, 220, 115, 324, 300,	4	1	195	979		
	Somerset,	Jan. 6-7,	2	5	84, 198, 111, 190, 240,	4	1	165	823		
	Stoyestown,	Jan. 9-10,	2	6	40, 80, 138, 139, 230, 250,	4	3	144	877	2,679	
Sullivan,	Muney Valley,	Dec. 26-27,	2	5	25, 85, 25, 100, 200,	3	1	87	435		
	Estella,	Dec. 28-29,	2	5	25, 100, 35, 175, 125,	3	4	92	460	895	
Susquehanna,	Rush,	Dec. 2-3,	2	4	115, 125, 80, 125,	3		111	445		
	Montrose,	Dec. 5,	1	3	35, 90, 175,	3		100	300		
	Lawsville,	Dec. 6-7,	2	5	35, 75, 129, 45, 95,	3		74	370		
	Welsh Hill,	Dec. 8-9,	2	4	66, 225, 85, 150,	3		156	526	1,641	
Tioga,	Tioga,	Jan. 13-14,	2	5	150, 300, 125, 250, 300,	4	2	225	1,125		
	Mitchells Mills,	Jan. 16-17,	2	5	100, 200, 225, 200, 275,	4	1	200	1,000		
	Mansfield,	Jan. 17-18,	2	5	200, 275, 250, 300, 500,	4	1	305	1,525		
	Wellsboro,	Jan. 18-20,	2	5	300, 200, 325, 600, 125,	4	1	310	1,550		
	Osceola,	Jan. 20-21,	2	4	150, 175, 225, 300,	4	1	170	850		
	Westfield,	Jan. 23-24,	2	5	130, 250, 200, 250, 300,	4		226	1,130	7,180	
Union,	Vicksburg,	Feb. 15-16,	2	5	112, 275, 155, 178, 350,	3	1	215	1,070		
	Laurelton,	Feb. 17-18,	2	5	54, 290, 61, 172, 300,	4	1	175	877	1,947	
(Movable Institute School.)											
Venango,	Franklin,	Jan. 9-12,	4	12	15, 25, 45, 50, 75, 90, 75, 100, 100, 100, 106, 120.	4		75	901	901	

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1910-1911—Continued.

County.	Place.	Date.	Days of institute.	Number of sessions.	Attendance by Sessions.	Speakers Present.		Attendance.		
						State.	Local.	Average.	Total.	By counties.
(Movable Institute Schools.)										
Warren,	Youngsville,	Dec. 7-9,	3	8	25, 22, 25, 40, 16, 21, 45, 40,	4		30	236	
	Sugargrove,	Dec. 5-8,	3	7	40, 25, 35, 65, 65, 103, 73,	3		58	406	642
Washington,	Amity,	Nov. 25-26,	2	5	40, 100, 120, 50, 350,	4		104	520	
	Midway,	Nov. 28-29,	2	5	40, 170, 250, 200, 400,	4	6	212	1,000	
	Bentleyville,	Nov. 30-Dec. 1,	2	5	30, 260, 115, 60, 350,	4	5	151	755	
(Special),	Centerville,	Jan. 27-28,	2	5	75, 200, 50, 150, 200,	2	3	138	690	3,025
Wayne,	Waymart,	Dec. 27-28,	2	5	40, 70, 25, 60, 50,	3		49	245	
	Honesdale,	Dec. 29,	1	3	160, 100, 25,	3		62	185	
	Ariel,	Dec. 30-31,	2	5	60, 70, 55, 100, 130,	3		83	415	
	Sterling,	Jan. 2-3,	2	5	100, 150, 100, 200, 250,	3		160	800	1,645
Westmoreland,	Adamsburg,	Dec. 8-9,	2	5	30, 54, 21, 39, 66,	3	3	44	220	
	New Kensington,	Feb. 22-23,	2	5	68, 60, 65, 57, 40,	4	3	58	290	
	West Fairfield,	Feb. 24,	1	3	54, 120, 176,	4		117	350	
(Movable Institute School.)	Scottdale,	Jan. 16-19,	4	12	45, 75, 250, 120, 200, 240, 250, 300, 325, 125, 295, 375.	4		220	2,600	3,460
Wyoming,	Tunkhannock,	Jan. 9-10,	2	5	85, 200, 300, 170, 350,	4	5	220	1,110	
	West Nicolson,	Jan. 11-12,	2	5	35, 85, 150, 100, 175,	4	4	385	1,925	3,035
York,	Lewisberry,	Feb. 1-2,	2	5	225, 400, 180, 380, 400,	3	2	317	1,585	
	Dover,	Feb. 3-4,	2	5	230, 550, 100, 540, 600,	3	1	404	2,020	
	Dallastown,	Feb. 6-7,	2	5	140, 310, 170, 260, 580,	4	2	292	1,460	
	New Freedom,	Feb. 8-9,	2	5	210, 450, 110, 380, 550,	4	1	340	1,700	
	Springgrove,	Feb. 10-11,	2	5	90, 260, 110, 190, 300,	5	1	190	950	
(Special),	York,	May 19,	1	1	150,	1		150	150	
(Special),	Goldsboro,	July 30,	1	2	500, 500,	1	1	500	1,000	

(Movable Institute School.)	Fawn Grove,	Dec. 26-29,	2	10	65, 80, 75, 140, 250, 300, 365, 370, 280, 325.	5		225	2,250	
(Special),	Stewartstown,	Sept. 9,	1	2	600,	2		600	600	11,715
			477	1,162		839	252			189,383

Attendance at special institutes,	10,376
Attendance at movable schools,	16,198
Attendance at regular institutes,	162,809
Attendance at harvest home picnics, etc.,	20,000
Total attendance,	209,383
Days of regular institute,	395
Days of special institute,	24
Days of movable school,	58
Total,	477

MEETING OF THE FARMERS' ANNUAL NORMAL INSTITUTES, LANCASTER, PA.

PROGRAM

First Session Convenes Tuesday Afternoon, May 23, 1911.

MR. J. ALDUS HERR, Lancaster, Pa., Chairman.

Call to order 1.30.

Address of Welcome, by Mayor Frank B. McClain, Lancaster, Pa.

Response, by Dr. W. T. Phillipy, Carlisle, Pa.

1. "THE PRODUCTION OF SANITARY MILK."

Prof. D. H. Bergey, University of Pennsylvania, Philadelphia, Pa.

2. "ESSENTIALS OF BUTTER MAKING."

Mrs. Jean Kane Foulke, West Chester, Pa.

Note: Governor Tener will be present and address one or more sessions of the Institute.

Tuesday Evening, May 23, 1911.

DR. M. E. CONARD, Westgrove, Pa., Chairman.

Call to order, 7.30.

1. "WHAT IS THE MATTER WITH PENNSYLVANIA FARMERS."

T. D. Harmon, National Stockman and Farmer, Pittsburg, Pa.

2 "THE COUNTRY LIFE SITUATION."

Dr. L. H. Bailey, Director, Experiment Station, Cornell University, Ithaca, N. Y.

3. "ADDRESS."

Dr. Thomas F. Hunt, Dean, Experiment Station, State College, Pa.

Wednesday Morning, May 24, 1911.

MR. J. W. STEWART, Jefferson, Pa., Chairman.

Call to order 9.30.

1. "HANDLING OF THE APPLE CROP."
Chester A. Tyson, Floradale, Pa.

2. "A FORTUNE IN 15 YEARS, AND FRUIT THE FACTOR."
Dr. J. H. Funk, Boyertown, Pa.

3. "HORTICULTURE: PAST, PRESENT AND FUTURE."
W. W. Farnsworth, Waterville, Ohio.

Wednesday Afternoon, May 24, 1911

MR. G. F. BARNES, Rossville, Pa., Chairman.

Call to order 1.30.

"THIS SESSION WILL BE DEVOTED TO GENERAL DISCUSSION FOR THE DEVELOPMENT OF QUESTIONS RELATING TO THE INSTITUTE WORK THROUGHOUT THE STATE."

Opened by Hon. A. L. Martin, Director of Institutes, Harrisburg, Pa.

Note: It is expected that County Chairmen of Institutes and Lecturers will prepare written questions relating to the improvement of the work.

Wednesday Evening, May 24, 1911.

DR. T. J. FERGUSON, Mechanicsburg, Pa., Chairman.

Call to order 7.30.

1. "THE POULTRY INDUSTRY."
Prof. James E. Rice, in Charge Poultry Husbandry, Cornell University, Ithaca, N. Y.

(Illustrated with lantern slides.)

2. "FARM MANAGEMENT."
Prof. D. A. Brodie, Acting Agriculturist, Bureau of Plant Industry, Dept. of Agriculture, Washington, D. C.

(Illustrated with lantern slides.)

Thursday Morning, May 25, 1911.

B. F. KILLAM, Paupack, Pa., Chairman.

Call to order 9.30.

1. "NEEDS OF RURAL SCHOOLS."
Miss Sara C. Lovejoy, State College, Pa.

2. "SOME LESSONS WE SHOULD TEACH."
R. P. Kester, Grampian, Pa.

3. "THE PRESENT TREND OF AGRICULTURAL EDUCATION."
Prof. L. A. Clinton, Director, Experiment Station, Storrs, Conn.

4. "COUNTRY SCHOOLS FOR FARM LIFE."
Prof. Thos. I. Mairs, State College, Pa.

Thursday Afternoon, May 25, 1911.

J. MILES DERR, Milton, Pa., Chairman.

Call to order 1.30.

1 "COMMON DISEASES OF LIVESTOCK."
Dr. C. J. Marshall, State Veterinarian, Harrisburg, Pa.

2 "CULTIVATION AND HARVESTING OF TOBACCO."
(Illustrated.)
E. K. Hibshman, Ephrata, Pa.

3. "MARKET GARDENING."
M. H. McCallum, Wernersville, Pa.

Thursday Evening, May 25, 1911.

MRS. SARAH B. F. ZEIGLER, Duncannon, Pa., President.

Call to order 7.30.

1 "GLEANINGS FROM OTHER COUNTRIES.",
Miss Sara Phillips Thomas, No. 3413 Race St., Philadelphia, Pa.

2 "FARM SANITATION."
Mrs. Geo. E. Monroe, Dryden, N. Y.

3. " A THREE-COURSE DINNER." (Demonstrated with actual cooking.)
Mrs. Anna B. Scott, Domestic Science Bureau, Philadelphia, Pa.

Friday Morning, May 26, 1911.

HON. H. G. McGOWAN, Geiger's Mills, Pa., Chairman.

Call to order 9.30.

1. "REPORT OF RESOLUTION COMMITTEE."
2. "VISITING POINTS OF INTEREST IN CITY AND COUNTY."
Closing Remarks and Adjournment.

LIST OF COUNTY INSTITUTE MANAGERS FOR THE SEASON OF 1910-11

County	Name and Address of Chairman
Adams,	A. I. Weidner, Arendtsville.
Allegheny,	A. J. Purdy, Imperial, R. F. D.
Armstrong,	S. S. Blyholder, Kelly Station.
Beaver,	A. L. McKibben, New Sheffield.
Bedford,	D. W. Lee, Bedford.
Berks,	H. G. McGowan, Geiger's Mills.
Blair,	H. F. Cox, Bellwood.
Bradford,	F. D. Kerrick, Towanda.
Bucks,	Watson T. Davis, Ivyland.
Butler,	N. F. Bartley, Euclid.
Cambria,	James Westrick, Patton, Pa., R. F. D. No. 2.
Cameron,	W. H. Howard, Emporium.
Carbon,	Edw. Leinhard, Mauch Chunk, R. F. D. No. 1.
Centre,	John A. Woodward, Howard.
Chester,	M. E. Conard, Westgrove.
Clarion,	J. H. Wilson, Clarion.
Clearfield,	Peter Gearhart, Clearfield.
Clinton,	Joel A. Herr, Millhall.
Columbia,	A. P. Young, Millville.
Crawford,	J. F. Seavy, Saegerstown.
Cumberland,	T. J. Ferguson, Mechanicsburg.
Dauphin,	Edward S. Keiper, Middletown.
Delaware,	E. J. Durnall, Swarthmore.
Elk,	J. B. Werner, St. Marys.
Erie,	Archie Billings, Edinboro.
Fayette,	T. H. Smith, Dunbar, R. F. D. No. 32.
Forest,	C. A. Randall, Tionesta.
Franklin,	J. P. Young, Marion.
Fulton,	J. L. Patterson, McConnellsburg.
Greene,	J. W. Stewart, Jefferson.
Huntingdon,	G. G. Hutchison, Warrior's Mark.
Indiana,	S. C. George, West Lebanon.
Jefferson,	Peter B. Cowan, Brookville, R. F. D. No. 4.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Horace Seamans, Factoryville.
Lancaster,	J. Aldus Herr, Lancaster, R. F. D. Edward K. Hibshman, Ephrata.
Lawrence,	Sylvester Shaffer, New Castle, R. F. D.
Lebanon,	Edward Shuey, Lickdale.
Lehigh,	P. S. Fenstermaker, Allentown.
Luzerne	J. E. Hildebrant, Dallas, R. F. D. No. 2.

Lycoming, ...A. J. Kahler, Hughesville.
McKean, ...O. W. Abbey, Turtle Point.
Mercer, ...Wm. C. Black, Mercer.
Mifflin, ...M. M. Naginey, Milroy.
Monroe, ...F. S. Brong, Saylorsburg
Montgomery, ...H. H. Fetterolf, Collegeville.
Montour, ...J. Miles Derr, Milton, Pa., R. F. D. No. 1.
Northampton, ...C. S. Messinger, Tatamy.
Northumberland .....I. A. Eschbach, Milton, Pa., R. F. D.
Philadelphia, ...J. B. Kirkbride, Bustleton.
Perry, ...A. T. Holman, Millerstown.
Pike, ...B. F. Killam, Paupack.
Potter .....Horace H. Hall, Ellisburg.
Schuylkill, ...John Shoener, New Ringgold, R. F. D. No. 1.
Snyder .....John S. Kauffman, Middleburg, R. F. D. No. 1.
Somerset, ...J. C. Weller, Rockwood, R. F. D. No. 2.
Susquehanna, ...F. A. Davies, Montrose.
Tioga, ...E. B. Dorsett, Mansfield.
Union, ...J. Newton Glover, Vicksburg.
Venango, ...W. A. Crawford, Cooperstown.
Warren, ...Geo. A. Woodside, Sugargrove.
Washington, ...D. S. Taylor, Burgettstown.
Wayne, ...W. E. Perham, Pleasant Mt.
Westmoreland, ...M. P. Shoemaker, Greensburg.
Wyoming, ...D. A. Knuppenburg, Lake Carey.
York, ...G. F. Barnes, Rossville.

LIST OF INSTITUTE LECTURERS FOR SEASON OF 1910-11.

Anderson, H. M., New Park, Pa.
Barnitz, Chas. M., Riverside, Pa.
Bond, M. S., Danville, Pa.
Bonsteel, F. E., Bear Lake, Pa.
Boreland, Andrew S., State College, Pa.
Bruckart, J. W., Lititz, Pa.
Callahan, E. E., Ferenbaugh, N. Y.
Campbell, J. T., Hartstown, Pa.
Card, Fred W., Sylvania, Pa.
Carter, Miss Arabella, No. 1305 Arch St., Philadelphia, Pa.
Clark, M. N., Claridge, Pa.
Cochel, Prof. W. A., State College, Pa.
Conard, Dr. M. E., Westgrove, Pa.
Cooke, Prof. Wells W., Department of Agriculture, Washington, D. C.
Cornman, Chas. T., Carlisle, Pa.
Cox, John W., New Wilmington, Pa.
Detrich, Dr. J. D., No. 438 Adams Ave., Scranton, Pa.
Dorsett, E. B., Mansfield, Pa.
Drake, W. M. C., Volant, Pa.
Eschbach, I. A., Milton, Pa., R. F. D. No. 1.
Evans, H. M., Dillsburg, Pa.
Fassett, F. H., Meshoppen, Pa.
Foulke, Mrs. Jean Kane, West Chester, Pa.
Fulton, H. R., State College, Pa.
Frear, Dr. Wm., State College, Pa.

Funk, Dr. J. H., Boyertown, Pa.
Fox, Cyrus T., Division of Zoology, Harrisburg, Pa.
Funk, Sheldon W., Boyertown, Pa.
Goodling, C. L., State College, Pa.
Gardner, Prof. Frank D., State College, Pa.
Gregg, J. W., State College, Pa.
Hibshman, Edw. K., Ephrata, Pa.
Herr, Joel A., Millhall, Pa.
Hill, W. F., Huntingdon, Pa.
Hull, Geo. E., Transfer, Pa., R. F. D.
Jackson, Prof. Homer T., State College, Pa.
Kahler, A. J., Hughesville, Pa.
Kester, R. P., Grampian, Pa.
Kline, Frank, Spring City, Pa.
Ledy, J. H., Marion, Pa.
Lighty, L. W., East Berlin, Pa.
Lovejoy, Miss Sara C., State College, Pa.
Mairs, Prof. T. I., State College, Pa.
McCallum, M. H., Wernersville, Pa.
McCurdy, C. C., Hartstown, Pa.
McDowell, M. S., State College, Pa.
Mackintire, W. H., State College, Pa.
Menges, Prof. Franklin, York, Pa.
Monroe, Mrs. Geo. E., Dryden, N. Y.
Murray, D. K., Liverpool, Pa.
Northup, Henry W., Dalton, Pa., R. F. D.
Owens, Prof. Wm. G., Lewisburg, Pa.
Peachey, J. H., Belleville, Pa.
Philips, T. J., Atglen, Pa.
Phillips, E. L., New Bethlehem, Pa.
Phillipy, Dr. W. T., Carlisle, Pa.
Rich, Chas. H., Woolrich, Pa.
Pillsbury, Prof. J. P., State College, Pa.
Ross, Warren G., State College, Pa.
Seeds, Robt. S., Birmingham, Pa.
Shaw, Prof. Chas. F., State College, Pa.
Stephens, A. Woodward, Mooresburg, Pa.
Stout, W. H., Pinegrove, Pa.
Thomas, Miss Sara Phillips, No. 3413 Race St., Philadelphia, Pa
Van Noy, Leon Otice, Troy, Pa., R. F. D., No. 66.
Wagner, F. J., Harrison City, Pa.
Watts, D. H., Kerrmoor, Pa.
Weld, R. J., Sugargrove, Pa.
Watts, Prof. R. L., State College, Pa.
Wittman, W. Theo., Allentown, Pa.
Woodman, S. Paul, Rushland, Pa.
Zeigler, Mrs. Sara B. F., Duncannon, Pa.

4—6—1911

THE FOLLOWING IS A LIST OF SPEAKERS AND THEIR ASSIGNMENTS SEASON OF 1910-1911

H. M. ANDERSON, New Park, York County, Pa.

Town.	County.	Date.
Hughesville,	Lycoming,	Jan. 30-31.
Pinerun,	Lycoming,	Feb. 1.
Limestone Twp.,	Lycoming,	Feb. 2-3.
Waterville,	Lycoming,	Feb. 4.
Woolrich,	Clinton,	Feb. 6-7.
Lamar,	Clinton,	Feb. 8-9.
Loganton,	Clinton,	Feb. 10-11.

MISS ADALINE C. BAKER, Kennett Square, Chester County, Pa.

Dallastown,	York,	Feb. 7.
New Freedom,	York,	Feb. 8.
Sanatoga,	Montgomey,	Feb. 22-23.
King of Prussia,	Montgomey,	Feb. 24-25.
Burnside,	Clearfield,	March 2.
DuBois,	Clearfield,	March 3.

CHAS. M. BARNITZ, Riverside, Northumberland County, Pa.

Estella,	Sullivan,	Dec. 26-27.
Muncy Valley,	Sullivan,	Dec. 28-29.
Tunkhannock,	Wyoming,	Jan. 9-10.
West Nicholson,	Wyoming,	Jan. 11-12.
Tioga,	Tioga,	Jan. 13-14.
Mitchell's Mills,	Tioga,	Jan. 16.
Mansfield,	Tioga,	Jan. 17-18.
Wellsboro,	Tioga,	Jan. 19-20.
Osceola,	Tioga,	Jan. 21.
Westfield,	Tioga,	Jan. 23-24.

M. S. BOND, Danville, Montour County, Pa.

Pineville,	Bucks,	Feb. 8-9.
Doylestown,	Bucks,	Feb. 10-11.
Plumsteadville,	Bucks,	Feb. 13-14.
Richlandtown,	Bucks,	Feb. 15-16.
Richboro,	Bucks,	Feb. 17-18.

Town.	County.	Date.

F. E. BONSTEEL, Bear Lake, Warren County, Pa.

Lewistown,	Mifflin,	Jan. 2-3.
Salisbury,	Somerset,	Jan. 4-5.
Somerset,	Somerset,	Jan. 6-7.
Stoyestown,	Somerset,	Jan. 9-10.
Bellwood,	Blair,	Jan. 11-12.
Newry,	Blair,	Jan. 13-14.
Williamsburg,	Blair,	Jan. 16-17.
Warriors Mark,	Huntingdon,	Jan. 18-19.
Petersburg,	Huntingdon,	Jan. 20-21.

ANDREW S. BORLAND, State College, Centre County, Pa.

Hughesville,	Lycoming,	Jan. 30-31.
Pinerun,	Lycoming,	Feb. 1.
Limestone Twp.,	Lycoming,	Feb. 2-3.
Waterville,	Lycoming,	Feb. 4.

J. W. BRUCKHART, Lititz, Lancaster County, Pa.

Orange,	Luzerne,	Jan. 9-10.
Sweet Valley,	Luzerne,	Jan. 11-12.
Hobbie,	Luzerne,	Jan. 13-14.
Ackermanville,	Northampton,	Jan. 30-31.
Tatamy,	Northampton,	Feb. 1-2.
Cherryville,	Northampton,	Feb. 3-4.
New Mahoning,	Carbon,	Feb. 6-7.
Stemlersville,	Carbon,	Feb. 8-9.
Weatherly,	Carbon,	Feb. 10-11.

E. E. CALLAHAN, Ferenbaugh, N. Y.

Beavertown,	Snyder,	Jan. 30-31.
Mt. Pleasant Mills,	Snyder,	Feb. 1-2.
Rebucks,	Northumberland,	Feb. 3-4.

J. T. CAMPBELL, Hartstown, Crawford County, Pa.

Will attend all meetings in the Fifth Section.

FRED. W. CARD, Sylvania, Bradford County, Pa.

Will attend all meetings in the Fifth Section from November 22 to December 9; First Section from December 26 to January 21, and February 6 to March 7.

MISS ARABELLA CARTER, No. 1305 Arch Street, Philadelphia, Pa.

Town.	County.	Date.
Ackermanville,	Northampton,	Jan. 30-31.
Tatamy,	Northampton,	Feb. 1-2.
Cherryville,	Northampton,	Feb. 3-4.
Dallastown,	York,	Feb. 7.
New Freedom,	York,	Feb. 8.
Centre Point,	Montgomery,	Feb. 28.
Harleysville,	Montgomery,	March 1.
Burnside,	Clearfield,	March 2.
DuBois,	Clearfield,	March 3.

M. N. CLARK, Claridge, Westmoreland County, Pa.

Graysville,	Greene,	Nov. 21-22.
Holbrook,	Greene,	Nov. 23-24.
Amity,	Washington,	Nov. 25-26.
Farmington,	Fayette,	Dec. 5-6.
Morris Cross Roads,	Fayette,	Dec. 7-8.
Adamsburg,	Westmoreland,	Dec. 9-10.

PROF. W. A. COCHEL, State College, Centre County, Pa.

Millerstown,	Perry,	Jan. 13-14.
Harleysville,	Montgomery,	March 1-2.
East Greenville,	Montgomery,	March 3-4.

DR. M. E. CONARD, Westgrove, Chester County, Pa.

Will attend the Movable Institute Schools from November 30 to January 31, and Farmers' Institutes in the Fourth Section from February 6 to March 2.

PROF. WELLS W. COOKE, Department of Agriculture, Washington, D. C.

Will attend the Movable Institute Schools from November 30 to February 2, and Farmers' Institutes, First Section, December 9 and 10.

CHAS. T. CORNMAN, Carlisle, Cumberland County, Pa.

Will attend all meetings in the First Section from November 21 to December 3; Fourth Section December 30 to January 7; Movable Institute Schools January 9-10, Feb. 3-4, and the Fifth Section February 13 to 21.

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

Town.	County.	Date.
Muncy Valley,	Sullivan,	Dec. 26-27.
Estella,	Sullivan,	Dec. 28-29.
Le Roy,	Bradford,	Dec. 30-31.
Wilmont,	Bradford,	Jan. 2-3.
Spring Hill,	Bradford,	Jan. 4-5.
Wysox,	Bradford,	Jan. 6-7.
Tunkhannock,	Wyoming,	Jan. 9-10.
West Nicholson,	Wyoming,	Jan. 11-12.

DR. J. D. DETRICH, No. 438 Adams Avenue, Scranton, Pa.

Salisbury,	Somerset,	Jan. 4-5.
Somerset,	Somerset,	Jan. 6-7.
Stoyestown,	Somerset,	Jan. 9-10.
Tioga,	Tioga,	Jan. 13-14.
Mitchell's Mills,	Tioga,	Jan. 16.
Mansfield,	Tioga,	Jan. 17-18.
Wellsboro,	Tioga,	Jan. 19-20.
Osceola,	Tioga,	Jan. 21.
Westfield,	Tioga,	Jan. 23-24.
Allentown,	Lehigh,	Feb. 1-2.
Worthington,	Armstrong,	Feb. 20-21.
New Kensington,	Westmoreland,	Feb. 22-23.
Fairfield,	Westmoreland,	Feb. 24.
Cookport,	Indiana,	Feb. 27-28.
Homer City,	Indiana,	March 3-4.
Clarksburg,	Indiana,	March 6-7.
Plumville,	Indiana,	March 1-2.

ELMER E. DOCKEY, Elizabethville, R. F. D., Dauphin County, Pa.

Oliveburg,	Jefferson,	Nov. 21-22.
Roseville,	Jefferson,	Nov. 23-24.
Ridgway,	Elk,	Nov. 25-26.
St. Mary's,	Elk,	Nov. 28-29.
Sinnamahoning,	Cameron,	Nov. 30.

E. B. DORSETT, Mansfield, Tioga County, Pa.

Will attend all meetings in the First Section from November 21 to December 10 and the Fourth Section from January 30 to February 11.

W. M. C. DRAKE, Volant, Lawrence County, Pa.

Will attend all meetings in the Fourth Section from November 21-26 and the Third Section from November 28 to December 10 and February 17 to February 23.

I. A. ESCHBACH, Milton, R. F. D. No. 1, Northumberland County, Pa.

Town.	County.	Date.
Bachmanville,	Dauphin,	Dec. 5.
Hummelstown,	Dauphin,	Dec. 6.
Linglestown,	Dauphin,	Dec. 7-8.
Gratz,	Dauphin,	Dec. 9-10.

H. M. EVANS, Dillsburg, York County, Pa.

New Oxford,	Adams,	Dec. 27.
York Springs,	Adams,	Dec. 28.

F. H. FASSETT, Meshoppen, Wyoming County, Pa.

Will attend all meetings in the First Section from December 5 to January 7; Fourth Section from January 13 to January 24 and the Second Section from February 6 to 10 and February 27 to March 9.

MISS JEAN KANE FOULKE, West Chester, Chester County, Pa.

Fawn Grove,	York,	Dec. 27-28.
Annville,	Lebanon,	Dec. 29-30.
Allentown,	Lehigh,	Feb. 3.
Media,	Delaware,	Feb. 24-25.
Concordville,	Delaware,	Feb. 27.
Cedarville,	Chester,	March 7.

H. R. FULTON, State College, Centre County, Pa.

Jacksville,	Butler,	Jan. 2-3.
Muddy Creek,	Butler,	Jan. 4-5.
West Sunbury,	Butler,	Jan. 6-7.

DR. WM. FREAR, State College, Centre County, Pa.

Mt. Pleasant Church,	Beaver,	Dec. 26-27.
Hookstown,	Beaver,	Dec. 28-29.
Grange Hall,	Beaver,	Dec. 30-31.
Sanatoga,	Montgomery,	Feb. 22-23.
King of Prussia,	Montgomery,	Feb. 24-25.
Centre Point,	Montgomery,	Feb. 27-28.

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

Will attend Movable Institute Schools from December 2 to February 2 and Farmers' Institutes in the Fifth Section from February 6 to March 4.

CYRUS T. FOX, Division of Zoology, Department of Agriculture, Harrisburg, Pa.

North East,	Erie,	Feb. 27-28.
Girard,	Erie,	March 1-2.

SHELDON W. FUNK, Boyertown, Berks County, Pa.

Town.	County.	Date.
Quarryville,	Lancaster,	Nov. 21-22.
Lampeter,	Lancaster,	Nov. 23-24.
Paradise,	Lancaster,	Nov. 25-26.
Mechanicsville,	Lancaster,	Nov. 28-29.
Ephrata,	Lancaster,	Nov. 30-Dec. 1.
Maytown,	Lancaster,	Dec. 2-3.

C. L. GOODLING, State College, Centre County, Pa.

Orange,	Luzerne,	Jan. 9-10.
Sweet Valley,	Luzerne,	Jan. 11-12.
Hobbie,	Luzerne,	Jan. 13-14.
Mausdale,	Montour,	Feb. 13-14.
Vicksburg,	Union,	Feb. 15-16.
Laurelton,	Union,	Feb. 17-18.

PROF. FRANK D. GARDNER, State College, Centre County, Pa.

Hickory,	Forest,	Feb. 24-25.
North East,	Erie,	Feb. 27-28.
Girard,	Erie,	March 1-2.

J. W. GREGG, State College, Centre County, Pa.

Germansville,	Lehigh,	Jan. 20-21.
Macungie,	Lehigh,	Jan. 22-23.

EDW. K. HIBSHMAN, Ephrata, Lancaster County, Pa.

Geigertown,	Berks,	Jan. 30.
Beckersville,	Berks,	Jan. 31.
Mt. Aetna,	Berks,	Feb. 1-2.
Kutztown,	Berks,	Feb. 3-4.
Amityville,	Berks,	Feb. 6-7.

JOEL A. HERR, Millhall, Clinton County, Pa.

Kresgeville,	Monroe,	Jan. 16-17.
Brodheadsville,	Monroe,	Jan. 18.
Marshalls Creek,	Monroe,	Jan. 19-20.
Ackermanville,	Northampton,	Jan. 30-31.
Tatamy,	Northampton,	Feb. 1-2.
Cherryville,	Northampton,	Feb. 3-4.

W. F. HILL, Huntingdon, Huntingdon County, Pa.

Midway,	Washington,	Nov. 28-29.
Bentleyville,	Washington,	Nov. 30-Dec. 1.
Flatwoods,	Fayette,	Dec. 2-3.

GEO. E. HULL, Transfer, R. F. D., Mercer County, Pa.

Mt. Jackson,	Lawrence,	Jan. 16-17.
Princeton,	Lawrence,	Jan. 18-19.
Eastbrook,	Lawrence,	Jan. 20-21.
Brown Hill,	Crawford,	Jan. 30-31.
Blooming Valley,	Crawford,	Feb. 1-2.
Black Ash,	Crawford,	Feb. 3-4.

HOMER T. JACKSON, State College, Centre County, Pa.

Graysville,	Greene,	Nov. 21-22.
Holbrook,	Greene,	Nov. 23-24.
Amity,	Washington,	Nov. 25-26.
Spring Grove,	York,	Feb. 10-11.
Jonestown,	Lebanon,	Feb. 13-14.
Schaefferstown,	Lebanon,	Feb. 15-16.

A. J. KAHLER, Hughesville, Lycoming County, Pa.

Limestone,	Clarion,	Feb. 14-15.
Reimersburg,	Clarion,	Feb. 16-17.
Lickingville,	Clarion,	Feb. 20-21.
Tionesta,	Forest.	Feb. 22-23.

R. P. KESTER, Grampian, Clearfield County, Pa.

Will attend all meetings in the Third Section.

FRANK KLINE, Spring City, Chester County, Pa.

Blain,	Perry,	Jan. 9-10.
Ickesburg,	Perry,	Jan. 11-12.
Millerstown,	Perry,	Jan. 13.
Geigertown,	Berks,	Jan. 30.
Beckersville,	Berks,	Jan. 31.
Mt. Aetna,	Berks,	Feb. 1-2.
Kutztown,	Berks,	Feb. 3.
Germanstown,	Lehigh,	Feb. 20-21.
Macungie.	Lehigh,	Feb. 22-23.

J. H. LEDY, Marion, Franklin County, Pa.

Marion,	Franklin,	Jan. 2-3.
Lemasters,	Franklin,	Jan. 4-5.
Dry Run,	Franklin,	Jan. 6-7.
Orange,	Luzerne,	Jan. 9-10.
Sweet Valley,	Luzerne,	Jan. 11-12.
Hobbie,	Luzerne,	Jan. 13-14.
Kresgeville,	Monroe,	Jan. 16-17.
Brodheadsville,	Monroe,	Jan. 18.
Marshalls Creek,	Monroe,	Jan. 19-20.

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

Will attend all meetings in the First Section.

MISS SARA C. LOVEJOY, State College, Centre County, Pa.

Town	County.	Date.
Quarryville,	Lancaster,	Nov. 22.
Lampeter,	Lancaster,	Nov. 23.
Youngsville,	Warren,	Dec. 8.
Sugargrove,	Warren,	Dec. 9.
Unionville,	Chester,	Feb. 2.
Jackson Centre,	Mercer,	Feb. 11.
New Wilmington,	Lawrence,	Feb. 13.
Unionville,	Centre,	Feb. 23.
Eagleville,	Centre,	Feb. 24.

PROF. T. I. MAIRS, State College, Centre County, Pa.

Farmington,	Fayette,	Dec. 5-6.
Morris Cross Roads,	Fayette,	Dec. 7-8.
Adamsburg,	Westmoreland,	Dec. 9-10.
Atglen,	Chester,	Feb. 17-18.
Bustleton,	Philadelphia,	Feb. 20-21.
Newtown Square,	Delaware,	Feb. 22-23.

M. H. McCALLUM, Wernersville, Berks County, Pa.

Will attend all meetings in the Fifth Section from December 27 to January 7; Third Section from January 9 to January 21 and the First Section from January 30 to February 4.

C. C. McCURDY, Hartstown, Crawford County, Pa.

Graysville,	Greene,	Nov. 21-22.
Holbrook,	Greene,	Nov. 23-24.
Amity,	Washington,	Nov. 25-26.
Jacksville,	Butler,	Jan. 2-3.
Muddy Creek,	Butler,	Jan. 4-5.
West Sunbury,	Butler,	Jan. 6-7.

M. S. McDOWELL, State College, Centre County, Pa.

Will attend all meetings in the First Section from January 16 to February 9.

W. H. McINTIRE, State College, Centre County, Pa.

New Texas,	Allegheny,	Jan. 9-10.
Montour Church,	Allegheny,	Jan. 11-12.
Bakerstown,	Allegheny,	Jan. 13-14.

PROF. FRANKLIN MENGES, York, York County, Pa.

Will attend all meetings in the Second Section.

MRS. GEO. E. MONROE, Dryden, N. Y.

Town.	County.	Date.
Madisonville,	Lackawanna,	Nov. 22-23.
Daleville,	Lackawanna,	Nov. 25-26.
Tompkinsville,	Lackawanna,	Nov. 28-29.

D. K. MURRAY, Liverpool, Perry County, Pa.

Warfordsburg,	Fulton,	Nov. 25-26.
Needmore,	Fulton,	Nov. 28-29.
Charlesville,	Bedford,	Nov. 30-Dec. 1.
New Enterprise,	Bedford,	Dec. 2-3.
Woodbury,	Bedford,	Dec. 5-6.
Patton,	Cambria,	Dec. 7-8.
Loretto,	Cambria,	Dec. 9-10.
Wilmore,	Cambria,	Dec. 12-13.

HENRY W. NORTHUP, Dalton, R. F. D., Lackawanna County, Pa.

Will attend all meetings in the Second Section from November 25 to December 13 and the First Section from February 13 to Feb. 18.

PROF. WM. G. OWENS, Lewisburg, Mifflin County, Pa.

Vandyke,	Juniata,	Dec. 26-27.
McCoysville,	Juniata,	Dec. 28-29.
Belleville,	Mifflin,	Dec. 30-31.

J. H. PEACHEY, Belleville, Mifflin County, Pa.

Will attend all meetings in the Fourth Section.

T. J. PHILIPS, Atglen, Chester County, Pa.

Will attend all meetings in Part Two of the Fifth Section from January 30 to February 23.

E. L. PHILLIPS, New Bethlehem, Clarion County, Pa.

Worthington,	Armstrong,	Feb. 20-21.
New Kensington,	Westmoreland,	Feb. 22-23.
Fairfield,	Westmoreland,	Feb. 24.
Cookport,	Indiana,	Feb. 27-28.
Homer City,	Indiana,	March 1-2.
Clarksburg,	Indiana,	March 3-4.
Plumville,	Indiana,	March 6-7.

DR. W. T. PHILLIPY, Carlisle, Cumberland County, Pa.

Will attend all meetings in the Fourth Section from November 21 to December 10 and Part Two of the Fifth Section from January 30 to February 23.

CHAS. H. RICH, Woolrich, Clinton County, Pa.

Will attend all meetings in the Fourth Section from December 1 to December 10.

PROF. J. P. PILLSBURY, State College, Centre County, Pa.

Town.	County.	Date.
Midway,	Washington,	Nov. 28-29.
Bentleyville,	Washington,	Nov. 30-Dec. 1.
Flatwoods,	Fayette,	Dec. 2-3.

WARREN G. ROSS, State College, Centre County, Pa.

Hogestown,	Cumberland,	Jan. 30.
Churchtown,	Cumberland,	Jan. 31.
Lewisberry,	York,	Feb. 1-2.
Dover,	York,	Feb. 3-4.

ROBT. S. SEEDS, Birmingham, Huntingdon County, Pa.

Will attend all meetings in the Fourth Section from December 30 to January 7 and in the First Section from January 9 to January 14.

PROF. CHAS. F. SHAW, State College, Centre County, Pa.

New Wilmington,	Lawrence,	Feb. 13-14.
Dayton,	Armstrong,	Feb. 15-16.

A. W. STEPHENS, Hebron, Ohio.

Will attend all meetings in the Third Section from January 30 to February 18.

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

Bellwood,	Blair,	Jan. 11-12.
Newry,	Blair,	Jan. 13-14.
Williamsburg,	Blair,	Jan. 16-17.
Warriors Mark,	Huntingdon,	Jan. 18-19.
Petersburg,	Huntingdon,	Jan. 20-21.

MISS SARA PHILLIPS THOMAS, Wayne, R. F. D., Delaware County, Pa.

Belleville,	Mifflin,	Dec. 30-31.
Lewistown,	Mifflin,	Jan. 2-3.
Clarks Green,	Lackawanna,	Jan. 4.
Berwick,	Columbia,	Jan. 5.
Catawissa,	Columbia,	Jan. 6.
Franklin,	Venango,	Jan. 10-11.
Edinboro,	Erie,	Jan. 12-13.
Hartstown,	Crawford,	Jan. 16.
Scottdale,	Westmoreland,	Jan. 17.
Allentown,	Lehigh,	Feb. 3.

LEON OTICE VAN NOY, Troy, R. F. D. No. 66, Bradford County, Pa.

Will attend all meetings in the Third Section from January 9 to February 18 and the Second Section from February 20 to March 9.

C. B. WADE, Orangeville, Ohio.

Town.	County.	Date.
Mt. Pleasant Church,	Beaver,	Dec. 26-27.
Hookstown,	Beaver,	Dec. 28-29.
Grange Hall,	Beaver,	Dec. 30-31.
Jacksville,	Butler,	Jan. 2-3.
Muddy Creek,	Butler,	Jan. 4-5.
West Sunbury,	Butler,	Jan. 6-7.

F. J. WAGNER, Harrison City, Westmoreland County, Pa.

Fairfield,	Westmoreland,	Feb. 24.
Cookport,	Indiana,	Feb. 27-28.
Homer City,	Indiana,	March 1-2.
Clarksburg,	Indiana,	March 3-4.
Plumville,	Indiana,	March 6-7.

D. H. WATTS, Kerrmoor, Clearfield County, Pa.

Will attend all meetings in the Fifth Section from November 22 to December 9 and the Second Section from December 26 to February 25.

R. J. WELD, Sugargrove, Warren County, Pa.

Sterling Run,	Cameron,	Dec. 1.
Rich Valley,	Cameron,	Dec. 2.
Sizerville,	Cameron,	Dec. 3.
Newery,	McKean,	Dec. 5-6.
Turtle Point,	McKean,	Dec. 7-8.
Bell Run,	McKean,	Dec. 9-10.

PROF. R. L. WATTS, State College, Centre County, Pa.

Catawissa,	Columbia,	Jan. 9-10.
Allentown,	Lehigh,	Feb. 3-4.

W. THEO. WITTMAN, Allentown, Lehigh County, Pa.

Will attend Movable Institute Schools from December 2 to February 2; Farmers' Institutes in Second Section, November 25 to November 30; February 27 to March 9; Part Two of the Fifth Section from February 8 to February 18 and the First Section from February 20 to February 25.

S. PAUL WOODMAN, Rushland, Bucks County, Pa.

Will attend all meetings in the Fifth Section from December 27 to January 7 and First Section from February 24 to March 7.

MRS. SARA B. F. ZEIGLER, Duncannon, Perry County, Pa.

Patton,	Cambria,	Dec. 7-8.
Loretto,	Cambria,	Dec. 9-10.
Wilmore,	Cambria,	Dec. 12-13.
Clarks Green,	Lackawanna,	Jan. 4.
Berwick,	Columbia,	Jan. 5.
Catawissa,	Columbia,	Jan. 6.
Franklin,	Venango,	Jan. 10-11.
Edinboro,	Erie,	Jan. 12-13.
Hartstown,	Crawford,	Jan. 16.
Scottdale,	Westmoreland,	Jan. 17.

DEPARTMENT LECTURERS

In so far as time and circumstances will permit, the officers of the Department of Agriculture are desirous of engaging in Institute work.

In order to prevent disappointment in the arrangement of programs, it is recommended that Institute Managers first consult the individual whose services they may wish to secure, before placing his name on the program.

Department lecturers come to these Institutes free of charge, except that they are to be taken from and to the railroad station at the expense of local manager. The topics which they will discuss can be procured by addressing the following officers of the Department of Agriculture:

HON. N. B. CRITCHFIELD, Secretary of Agriculture.
HON. A. L. MARTIN, Deputy Secretary and Director of Institutes.
JAMES FOUST, Dairy and Food Commissioner.
PROF. H. A. SURFACE, Economic Zoologist.
DR. C. J. MARSHALL, State Veterinarian.

AGRICULTURAL SOCIETIES

From reports received, we can not but commend the Agricultural Societies throughout the State for the effort they are making to promote agriculture at the County Fairs, which is receiving the encouragement of this Bureau by sending instructors to lecture along agricultural lines.

The attendance for 1910 was 1,543,473, as compared with previous year, 1,449,000, shows an increase of 94,473; total membership, 13,942; amount received from State Fund, $28,351.94; amount paid in premiums, 1910, $121,225.80; amount offered in premiums. 1911. $128,075.00, an increase of $6,849.20.

List of County and Local Agricultural Societies, with Names and Addresses of Presidents and Secretaries and Dates for Holding Fall Exihibitions of 1911, Etc.

County.	Corporate Name of Society.	Name and Address of President.	Name and Address of Secretary.
	State Horticultural Association of Pennsylvania,	Gabriel Heister, Harrisburg,	Chester J. Tyson, Floradale.
	Grangers' Interstate Picnic Association,	R. H. Thomas, Mechanicsburg,	H. S. Mohler, Mechanicsburg.
	Encampment and Fair of Patrons of Husbandry,	Leonard Rhone, Centre Hall,	Leonard Rhone, Centre Hall.
Adams,	Fruit Growers' Association of Adams County,	R. M. Eldon, Aspers,	Edwin C. Tyson, Floradale.
Allegheny,	Allegheny County Agricultural Association,	J. M. Shoup, Carnegie, R. F. D.,	H. W. DeLong, Imperial.
Armstrong,	Dayton Agricultural and Mechanical Association,	Wm. Gallagher, Dayton,	C. C. Cochran, Dayton.
Bedford,	Bedford County Agricultural Society,	Dr. S. F. Statler, Bedford,	J. Roy Cessna, Bedford.
Bedford,	Osterburg Grange Picnic Association,	S. S. Kauffman, Osterburg,	Geo. W. Oster, Osterburg.
Berks,	Kutztown Fair Association,	Chas. D. Herman, Kutztown,	C. J. Rhode, Kutztown.
Berks,	Agricultural and Horticultural Asso. of Berks County,	James McGowan, Geigers Mills,	H. Seidel Throm, Reading.
Blair,	Grange Fair Association of Blair County,	Dr. W. Frank Beck, Altoona,	H. S. Wertz, Duncansville.
Bradford,	Bradford County Agricultural Society,	John W. Conklin, Towanda, R. F. D. No. 5.	O. L. Smiley, Towanda.
Bradford,	Troy Agricultural Society,	Liston Bliss, Troy,	D. F. Pomeroy, Troy.
Bradford,	Wyalusing Fair Association,	S. M. Wells, Wyalusing,	G. M. Lyon, Wyalusing.
Bucks,	Bucks County Agricultural Society,	Frank W. DeLancey, Sellersville,	I. Y. Baringer, Perkasie.
Bucks,	Farmers' Picnic and Exhibition,	Jacob M. Landis, Richland Centre,	Miss Carrie Landis, Richland Centre.
Butler,	Butler Driving Park and Fair Association,	Geo. A. Schaffner, Butler,	W. B. Purvis, Butler.
Cambria,	Cambria County Agricultural Association,	W. F. Cunningham, Patton, R. F. D.	J. V. Maucher, M. D., Carrolltown.
Cameron,	Cameron County Agricultural Association,	F. X. Blumle, Emporium,	F. G. Judd, Emporium.
Carbon,	Carbon County Industrial Society,	O. F. Aeker, Lehighton,	J. Albert Durling, Lehighton.
Centre,	Centre County Agricultural Exhibiting Company,		De Laun Stewart, Bellefeute.
Chester,	The Oxford Agricultural Association,	Henry Cope, Lincoln University,	Thos. F. Grier, Oxford.
Chester,	Chester County Agricultural Association,	John H. Darlington, West Chester,	Fred Durose Reid, West Chester.
Clarion,	Clarion County Fair Association,	B. W. Thompson, Clarion,	S. S. Laughlin, Clarion.
Clearfield,	DuBois Driving Association,	B. B. McCreight, DuBois,	P. O. Griesemer, DuBois.
Columbia,	Columbia County Agricultural, Horticultural and Mechanical Association.	Wm. J. Hidley, Light Street,	A. N. Yost, Bloomsburg.
Crawford,	Conneaut Lake Agricultural Association,	H. O. Holcomb, Conneaut Lake,	Chas. T. Byers, Conneaut Lake.
Cumberland,	Agricultural Association of Cumberland County,	J. Kirk Bosler, Carlisle,	W. H. McCrea, Carlisle.

Cumberland,	Hogestown Horse and Cattle Show,	Vance C. McCormick, Harrisburg,	Frank Martin, Box 547, Harrisburg.
Dauphin,	Middletown Fair Association,	Colin S. Few, Middletown,	E. Hollis Croll, Middletown.
Dauphin,	Gratz Agricultural and Horticultural Association,	Harry Smith, Gratz,	F. S. Klinger, Gratz.
Erie,	Erie County Horticultural Society,	Geo. W. Blank, North East,	A. L. Loop, North East.
Erie,	Corry Fair and Driving Park Association,	J. J. Desmond, Corry,	W. W. Morgaridge, Corry.
Greene,	Greene County Agricultural and Manufacturing Society,	G. M. Bailey, Khedive,	W. A. Ruth, Carmichaels.
Indiana,	Indiana County Agricultural Society,	M. F. Jamison, Indiana,	David Blair, Indiana.
Jefferson,	Jefferson County Agri. and Driving Park Association,	Samuel Arthurs, Brookville,	Richard E. Reitz, Brookville.
Juniata,	Juniata County Agricultural Society,	Chas. D. Frankhouse, Port Royal,	James N. Groninger, Port Royal.
Lackawanna,	Lackawanna County Fair and Grange Poultry Association,	John F. Lacoe, Ransom, R. F. D.,	F. L. Thompson, Schultzville.
Lancaster,	Lancaster County Agricultural Society,	P. T. Watt, Lancaster,	I. C. Arnold, Lancaster.
Lawrence,	Pulaski Fair Association,	Geo. Watson, West Middlesex,	H. H. Knox, Pulaski.
Lebanon,	Lebanon Valley Fair Association,	W. H. Bollman, Lebanon,	J. A. Bollman, Lebanon.
Lebanon,	Lebanon County Agricultural and Horticultural Asso.,	John H. Bennetch, Newmanstown, R. D. No. 1.	S. P. Heilman, M. D., Heilmandale.
Lehigh,	Lehigh County Agricultural Society,	John W. Eckert, Allentown,	Harry B. Schall, Allentown.
Lycoming,	Muncy Valley Farmers' Club,	Wm. A. Ball, Hughesville,	Edward E. Frontz, Hughesville.
McKean,	McKean County Fair Association,	R. W. Hilton, Smethport,	Guy McCoy, Smethport.
Mercer,	Mercer Central Agricultural Society,	A. J. McKean, Mercer,	John O. Orr, Mercer.
Mercer,	Mercer County Agricultural Society,	J. M. Bentley, Mercer, R. D.,	Geo. H. Fowler, Stoneboro, R. F. D.
Monroe,	Monroe County Agricultural Society,	W. C. Hood, Stroudsburg,	H. F. Coolbaugh, Stroudsburg.
Northampton,	Northampton County Agricultural Society,	C. S. Messinger, Tatamy,	J. R. Reinheimer, Nazareth.
Northampton,	Pennsylvania State Fair Association,	J. Walter Lovatt, Bethlehem,	H. A. Gorman, Bethlehem.
Northumberland,	Milton Fair and Northumberland Co. Agricultural Asso.,	Geo. W. Klinger, Milton,	Wm. G. Murdock, Milton.
Perry,	Perry County Agricultural Society,	T. H. Butturf, Newport,	J. C. F. Stephens, Newport.
Philadelphia,	Pennsylvania Horticultural Society,	C. B. Newbold, 511 Chestnut St., Philadelphia.	David Rust, Hort. Hall, Philadelphia.
Sullivan,	Sullivan County Agricultural Society,	M. E. Wilcox, Forksville,	O. N. Molyneaux, Dushore.
Susquehanna,	Susquehanna County Agricultural Society,	F. A. Davis, Montrose,	W. H. Turrell, Montrose.
Susquehanna,	Harford Agricultural Society,	F. A. Osborne, New Milford, R. F. D.	O. F. Maynard, Harford.
Tioga,	Cowanesque Valley Agricultural Society,	George Rumsey, Westfield,	J. W. Smith, Westfield.
Tioga,	Smythe Park Association,	John F. Pitts, Wellsboro,	R. C. Longbothum, Mansfield.
Tioga,	Tioga County Pomona Grange,	James E. Spencer, Wellsboro,	W. H. Whiting, Wellsboro, R. D. No. 4.
Union,	Union County Agricultural Society,	F. W. Getz, Lewisburg,	C. Dale Wolfe, Lewisburg.
Washington,	Union Agricultural Association,	J. E. Perrin, Independence,	D. S. Taylor, Burgettstown, R. D. No. 3.
Washington,	Sandy Plains Fair Association,	Andrew Allen, Millsboro,	B. Frank Emery, Millsboro.
Warren,	Warren County Farmers' and Breeders' Association,	J. J. Mahon, Sugargrove,	R. J. Weld, Sugargrove.
Wayne,	Wayne County Agricultural Society,	W. L. Ferguson, Seelyville,	Emerson W. Gammell, Honesdale.
Westmoreland,	Westmoreland Agricultural Society,	M. P. Shoemaker, Greensburg,	W. F. Holtzer, Greensburg.
Wyoming,	Wyoming County Fair Association,	S. R. Brungess, Tunkhannock,	F. S. Harding, Rosengrant.
York,	York County Agricultural Society,	John H. Wogan, York,	Edward Chapin, York.
York,	Hanover Agricultural Society,	C. J. Delone, Hanover,	J. B. Miller, Hanover.
York,	New Freedom Farmers' Improvement Association,	G. F. Miller, New Freedom,	W. H. Freed, New Freedom.

List of County and Local Agricultural Societies, with Names and Addresses of Presidents and Secretaries and Dates for Holding Fall Exhibitions of 1911, Etc.—Continued.

County.	Corporate Name of Society.	Attendance, 1910.	Race track.	Membership.		Premiums.		Held 1911.	
				Number.	Amount received from State fund.	Paid, 1910.	Offered, 1911.	Place.	Date.
	State Horticultural Association of Penna.								No fair.
	Grangers' Interstate Picnic Association,	60,000		6				Williams Grove,	Aug. 28-Sept. 2.
	Encampment and Fair of Patrons of Husbandry.	15,000		1,500	$52 00	152 00	$175 00	Grange Park, Centre Hall.	Sept. 9-15.
Adams,	Fruit Growers' Asso., of Adams County,			250				Bendersville,	Dec. 13-15.
Allegheny,	Allegheny County Agricultural Asso.,		½ mile,	103	350 00			Imperial,	Not decided.
Armstrong,	Dayton Agricultural and Mech. Asso.,	22,000	½ mile,	280	400 00	1,164 45	2,550 00	Dayton,	Sept. 26-29.
Bedford,	Bedford County Agricultural Society,		½ mile,		894 95	894 95		Bedford,	Not decided.
Bedford,	Osterburg Grange Picnic Association,	15,000		75				Osterburg,	Aug. 14-19.
Berks,	Kutztown Fair Association,	18,000	½ mile,	500	323 44	1,927 65	2,200 00	Kutztown,	Sept. 26-29.
Berks,	Agricultural and Hort. Asso. of Berks County.	60,000	½ mile,	260	676 56	3,750 00	5,000 00	Reading,	Sept. 12-15.
Blair,	Grange Fair Association of Blair County,	45,000	½ mile,	15	100 00	1,221 75	1,500 00	Hollidaysburg,	Sept. 26-29.
Bradford,	Bradford County Agricultural Society,	15,000	½ mile,	350	495 79	1,700 00	1,700 00	Towanda,	Sept. 26-29.
Bradford,	Troy Agricultural Society,	15,000	½ mile,	10	200 00	800 00	2,000 00	Alperon Park, Troy.	Sept. 12-15.
Bradford,	Wyalusing Fair Association,	5,000		117	104 84	500 00	2,000 00	Wyalusing,	Sept. 12-15.
Bucks,	Bucks County Agricultural Society,	10,973		16	207 93	208 00		Menlo Park, Perkasie.	Sept. 13-16.
Bucks,	Farmers' Picnic and Exhibition,		½ mile,	83				Lulu Park, Quakertown.	Sept. 1-2.
Butler,	Butler Driving Park and Fair Association.	50,000	½ mile.	350		4,240 25	8,000 00	Butler,	Aug. 22-25.

Cambria,	Cambria County Agrl. Association,	10,000	½ mile,	371	685 25	2,406 50		Carrolltown,	Sept. 5-8.
Cameron,	Cameron County Agricultural Association.	5,000		15	500 00	580 00	1,000 00	Emporium,	Sept. 12-15.
Carbon,	Carbon County Industrial Society,	15,000	½ mile,	28	773 63	773 63	1,000 00	Lehighton,	Sept. 26-29.
Centre,	Centre County Agrl. Exhibiting Company.	2,000	½ mile,	7	562 30	2,000 00	2,000 00	Bellefonte,	October.
Chester,	The Oxford Agricultural Association,	15,000	½ mile,		500 00	2,000 00	2,000 00	Oxford,	Sept. 19-22.
Chester,	Chester County Agricultural Association,	20,000	½ mile,	175	500 00	2,000 00	2,000 00	West Chester,	Sept. 5-8.
Clarion,	Clarion County Fair Association,	12,000	½ mile,	270	820 00	2,500 00	4,000 00	Clarion,	Sept. 19-22.
Clearfield,	DuBois Driving Association,	14,000	½ mile,	85	700 00	740 00		DuBois,	Sept. 5-8.
Columbia,	Columbia County Agrl., Hort. and Mech. Asso.	30,000	½ mile,	400	1,000 00	8,421 80	8,000 00	Bloomsburg,	Oct. 3-6.
Crawford,	Conneaut Lake Agricultural Association,	47,000	½ mile,		1,000 00	5,000 00	7,000 00	Exposition Park,	Aug. 28-Sept. 1.
Cumberland,	Agricultural Association of Cumberland County.	15,000	½ mile,					Carlisle,	Not decided.
Cumberland,	Hogestown Horse and Cattle Show,	3,000		18				Hogestown,	June 7-8.
Dauphin,	Middletown Fair Association,	20,000	½ mile,	100	595 10	695 50		Middletown,	September.
Dauphin,	Gratz Agricultural and Hort. Asso.,	4,500	½ mile,	65	50 00	486 95		Gratz,	Not decided.
Erie,	Erie County Horticultural Society,								
Erie,	Corry Fair and Driving Park Asso.,	20,000	½ mile,	98	659 90			Corry,	Sept. 12-15.
Greene,	Greene County Agrl. and Manufacturing Society.	8,000	½ mile,	114	671 00			Carmichaels,	Sept. 19-22.
Indiana,	Indiana County Agricultural Society,	10,000	½ mile,		400 00	3,000 00	3,000 00	Indiana,	Aug. 29-Sept. 1.
Jefferson,	Jefferson County Agrl. and Driving Park Association.	15,000	½ mile,		847 40	847 40		Brookville,	Sept. 12-15.
Juniata,	Juniata County Agricultural Society,	40,000	½ mile,	113	359 00	958 00	1,000 00	Port Royal,	Sept. 12-15.
Lackawanna,	Lackawanna County Fair and Grange Poultry Association.	10,000		50		561 00	1,000 00	Clarks Summit,	Sept. 12-14.
Lancaster,	Lancaster County Agrl. Society,	75,000	½ mile,	333	1,000 00	1,647 00	2,500 00	Lancaster,	Sept. 26-29.
Lawrence,	Pulaski Fair Association,	12,000	½ mile,	100	1,000 00	1,409 00	1,500 00	Pulaski,	Sept. 11-14.
Lebanon,	Lebanon Valley Fair Association,	45,000	½ mile,	600	900 40	5,823 40	6,000 00	Lebanon,	Aug. 22-25.
Lebanon,	Lebanon County Agrl. and Hort. Asso.,			165					No fair.
Lehigh,	Lehigh County Agricultural Society,	200,000	½ mile,	897	375 00	25,000 00	25,000 00	Allentown,	Sept. 19-22.
Lycoming,	Muncy Valley Farmers' Club,	10,000	½ mile,	115	1,000 00	1,063 02	1,000 00	Hughesville,	Oct. 10-13.
McKean,	McKean County Fair Association,	20,000	½ mile,	65	1,000 00	1,002 70	1,500 00	Smethport,	Sept. 5-8.
Mercer,	Mercer Central Agricultural Society,	20,000	½ mile,						Not decided.
Mercer,	Mercer County Agricultural Society,	25,000	½ mile,	300	500 00	2,820 35	3,500 00	Stoneboro,	Sept. 18-21.
Monroe,	Monroe County Agricultural Society,	10,000	½ mile,	55	791 50	691 50	1,000 00	Stroudsburg,	Sept. 4-8.
Northampton,	Northampton County Agrl. Society,	75,000	½ mile,	325	208 10	1,583 70	4,000 00	Nazareth,	Sept. 12-15.
Northampton,	Pennsylvania State Fair Association,								No fair.
Northumberland,	Milton Fair and Northumberland County Agricultural Association.	20,000	½ mile,	98	686 50	823 95	2,400 00	Milton,	Sept. 19-22.
Perry,	Perry County Agricultural Society,	10,000	½ mile,	325	771 50	772 00	1,500 00	Newport,	Oct. 10-13.
Philadelphia,	Pennsylvania Horticultural Society,			870		2,300 00	2,580 00	Hort. Hall, Phila.	Nov. 7-10.
Sullivan,	Sullivan County Agricultural Society,	5,000		68	416 15	416 15		Forksville,	Oct. 3-6.
Susquehanna,	Susquehanna County Agrl. Society,	5,000		30	171 63	516 50		Montrose,	Sept. 12-15.
Susquehanna,	Harford Agricultural Society,	10,000	½ mile,			561 80	825 00	Harford,	Sept. 20-21.

List of County and Local Agricultural Societies, with Names and Addresses of Presidents and Secretaries and Dates for Holding Fall Exhibitions of 1911, Etc.—Continued.

County.	Corporate Name of Society.	Attendance, 1910.	Race track.	Membership.		Premiums.		Held 1911.	
				Number.	Amount received from State fund.	Paid, 1910.	Offered, 1911.	Place.	Date.
Tioga,	Cowanesque Valley Agricultural Society,	10,000	½ mile,	50	410 55	1,367 50	4,000 00	Westfield,	Sept. 12-15.
Tioga,	Smythe Park Association,	40,000	½ mile,		500 00	2,100 00	3,000 00	Mansfield,	Sept. 19-22.
Tioga,	Tioga County Pomona Grange,		½ mile,	300				Lewisburg,	No fair.
Union,	Union County Agricultural Society,	15,000	½ mile,	202	371 25	1,374 75	1,500 00		Sept. 26-29.
Washington,	Union Agricultural Association,	35,000	1-3 mile,	2,000	1,000 00	2,414 45	2,500 00	Burgettstown,	Oct. 2-5.
Washington,	Sandy Plains Fair Association,	3,000	½ mile,			2,000 00	2,500 00	Sandy Plains, Millsboro,	Aug. 28-30.
Warren,	Warren Co. Farmers' and Breeders' Asso.,			50	50 00				No fair.
Wayne,	Wayne County Agricultural Society,	15,000	½ mile,					Honesdale,	Not decided.
Westmoreland,	Westmoreland Agricultural Society,	15,000	½ mile,	100	1,000 00	2,651 35	3,000 00	Youngwood,	Sept. 5-8.
Wyoming,	Wyoming County Fair Association,	12,000	½ mile,	195	898 00	898 00	1,500 00	Tunkhannock,	Sept. 19-22.
York,	York County Agricultural Society,	135,000	½ mile,	215	1,100 00	5,067 25	9,000 00	York,	Oct. 2-6.
York,	Hanover Agricultural Society,	50,000	½ mile,	120		5,354 75	6,200 00	Hanover,	Sept. 19-22.
York,	New Freedom Farmers' Improvement Association.	12,000		100		150 00		New Freedom,	Sept. 28-30.
	Total,	1,543,473		13,942	$28,351 94	$121,225 80	$128,075 00		

CROP REPORT.

The following is a tabulated report of prices received throughout the State:

CROP REPORT FOR 1911

Giving Prices of Farm Products and Livestock, with Farm Wages and Board, in Pennsylvania, by Counties. Collected by A. L. Martin, Deputy Secretary of Agriculture.

Counties.	Cereals.										Hay.			
	Wheat, per bushel.	Wheat, estimate yield per acre.	Corn, per bushel.	Corn, estimate yield per acre.	Oats, per bushel.	Oats, estimate yield per acre.	Rye, per bushel.	Rye, estimate yield per acre.	Buckwheat, per bushel.	Buckwheat, estimate yield per acre.	Hay, clover, per ton.	Hay, clover, estimate yield per acre.	Hay, timothy, per ton.	Hay, timothy, estimate yield per acre.
Adams,	$0 95	16	00 65	30	$0 45	45	$ 70	20	$0 75	15	$12 00	2	$16 00	2
Allegheny,	1 00	20	00	30	45	35	80	20	75	15	14 00	1	16 00	1
Armstrong,	95	15	70	25	45	25	70	18	65	15	12 00	1½	14 00	1
Beaver,	1 00	15	65	30	45	30	90	15			12 00	1	15 00	1
Bedford,	1 00	15	70	30	40	35	75	12	60	15	8 00	1	14 00	1
Berks,	90	15	55	40	40	35	80	18			12 00	2	15 00	2
Blair,	90	15	65	30	50	25	70	12	75		12 00	1½	14 00	1½
Bradford,	1 00	18	60	35	45	40	70	20	55	20	12 00	1½	15 00	1½
Bucks,	95	25	70	40	50	50	75	20	60	20	12 00	1½	16 00	1½
Butler,	90	20	75	30	45	25	70	20	60	15	12 00	2	15 00	1½
Cambria,	1 00	20	75	30	45	30	80	18	65	25	15 00	2	18 00	2
Cameron,	95	25	70	35	50	30	85	20	80	25	14 00	1	18 00	1
Carbon,	1 00	20	75	25	35	35	80	18	70	20	12 00	1	16 00	1½
Centre,	95	15	60	40	40	35	65	20	70	20	12 00	1½	15 00	2
Chester,	95	25	60	50	45	50	70	22			12 00	1½	16 00	1½

Counties.	Cereals.										Hay.			
	Wheat, per bushel.	Wheat, estimate yield per acre.	Corn, per bushel.	Corn, estimate yield per acre.	Oats, per bushel.	Oats, estimate yield per acre.	Rye, per bushel.	Rye, estimate yield per acre.	Buckwheat, per bushel.	Buckwheat, estimate yield per acre.	Hay, clover, per ton.	Hay, clover, estimate yield per acre.	Hay, timothy, per ton.	Hay, timothy, estimate yield per acre.
Clarion,	95	18	60	30	45	30	70	15	55	18	13 00	1	15 00	1
Clearfield,	1 00	18	60	30	45	35	85	18	70	25	15 00	1	18 00	1
Clinton,	95	20	65	35	45	35	80	20	65	20	12 00	1	14 00	1
Columbia,	90	18	60	35	40	35	70	18	50	20	12 00	1	14 00	1
Crawford,	1 00	20	70	35	46	35	80	18	50	25	10 00	1	12 00	1
Cumberland,	90	20	60	30	35	25	70	15			10 00	1	14 00	1
Dauphin,	1 00	20	75	40	50	35	85	20	85	20	12 00	1	16 00	1
Delaware,	90	25	70	45	45	40	80	20			12 00	1	16 00	1
Elk,	1 00	25	75	35	55	40	80	20	75	25	12 00	1	16 00	1
Erie,	1 00	20	55	30	45	35	75	24	75	20	10 00	1	12 00	1
Fayette,	1 00	18	65	25	40	30	80	16	80	18	14 00	1	16 00	2
Forest,	1 00	20	75	25	50	30	85	20	60	18	12 00	1	14 00	1
Franklin,	1 00	18	60	35	50	30	75	20	65	20	15 00	1	18 00	1
Fulton,	1 00	15	70	25	45	35	80	18	70	18	15 00	1	18 00	1
Greene,	1 00	15	70	35	40	25	90	12			12 00	2	15 00	2
Huntingdon,	1 00	15	80	35	45	30	70	15	70	20	14 00	1	16 00	1
Indiana,	90	15	70	35	45	30	70	15	50	25	12 00	1	15 00	1
Jefferson,	1 00	18	70	30	45	25	90	20	55	20	14 00	1	17 00	1
Juniata,	95	15	60	40	40	30	70	15	60	15	12 00	1	15 00	1
Lackawanna,			60	40	40	25	75	20	55	18	12 00	1	16 00	1
Lancaster,	95	25	60	40	50	40	75	16			13 00	1½	17 00	2

Lawrence,	95	18	60	30	50	30	75	20	55	15	12 00	1	15 00	1
Lebanon,	90	20	60	40	40	40	75	20			14 00	1½	18 00	2
Lehigh,	95	25	55	35	35	40	75	20	70	25	14 00	1½	18 00	1½
Luzerne,	1 00	25	60	35	45	40	75	20	60	25	12 00	1	15 00	1
Lycoming,	1 00	15	60	30	40	30	75	60	60	30	12 00	2	16 00	2
McKean,	1 15	20	70		40	25	90	20	70	30	14 00	2	18 00	1
Mercer,	95	15	20	35	45	30	80	15	60	12	12 00	1	13 00	1
Mifflin,	1 00	17	50	40	35	25	70	15			12 00	1	15 00	1
Monroe,	95	20	70	30	40	25	75	15	60	30	15 00	1	18 00	1
Montgomery,	90	20	50	45	45	40	75	20	75	30	13 00	2	17 00	2
Montour,	1 00	20	65	30	50	45	70	20	60	20	12 00	1	16 00	1
Northampton,	90	25	50	30	40	35	85	20	70	25	12 00	1	17 00	2
Northumberland,	95	15	60	25	40	30	75	15	60	20	17 00	1	16 00	1
Perry,	90	15	55	40	40	25	75	15	60	18	12 00	1	14 00	1
Philadelphia,	1 00	20	70	50	45	30					14 00	1	18 00	1
Pike,	1 10	18	65	35	45	30	70	20	70	25	15 00	1	18 00	1
Potter,	90	20	55	35	45	30	75	20	60	20	13 00	1	15 00	1
Schuylkill,	90	18	70	30	40	35	75	20	60	20	14 00	2	18 00	2
Snyder,	95	20	60	35	40	35	65	20	55	15	10 00	1	14 00	1
Somerset,	1 00	16	60	30	40	30	70	14	35	15	13 00	1	15 00	1
Sullivan,	1 00	20	65	40	40	30	70	20	55	25	10 00	1	12 00	1
Susquehanna,	1 00	25	65	40	40	30	70	20	60	25	12 00	2	16 00	1
Tioga,	1 00	20	70	35	40	35	80	20	60	20	12 00	1	14 00	1
Union,	90	15	65	45	40	40	70	20	60	16	12 00	1	16 00	1
Venango,	95	15	70	30	40	25	70	15	55	18	12 00	1	14 00	1
Warren,	1 00	20	65	40	45	35	75	20	55	20	16 00	2	12 00	2
Washington,	95	20	70	45	40	30					12 00	2	16 00	2
Wayne,	1 10		60	30	45	35	75	20	65	30	12 00	2	16 00	2
Westmoreland,	1 05	20	75	40	45	40	80	18			16 00	1	18 00	1
Wyoming,	1 00	18	75	40	40	30	70	15	15	20	12 00	1	15 00	1
York,	90	20	60	40	40	30	70	20			12 00	2	14 00	1
Average,	$0 95	20	$0 65	35	$0 43	32	$0 75	18	$0 62	20	$12 00	1½	$15 00	1½

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Counties.	Livestock.										
	Horses, average per head.	Mules, average per head.	Cows, average per head.	Lambs, average per head.	Ewes, average per head.	Steers, fat, per pound.	Steers, for feeding, per pound.	Swine, shoats, per pound.	Fat hogs, per pound.	Chickens, dressed, per pound.	Chickens, live, per pound.
Adams,	$150 00	$175 00	$50 00	$3 75	$3 75	$0 06	$0 05	$0 09	$0 10	$0 16	$0 12
Allegheny,	150 00	175 00	50 00	4 00	4 50	07	05	09	10	20	14
Armstrong,	150 00	150 00	40 00	4 50	4 50	06	05	09	10	20	12
Beaver,	150 00	175 00	40 00	3 00	4 00	07	05	08	09	18	12
Bedford,	125 00	----------	40 00	3 00	3 50	05	05	06	08	15	12
Berks,	150 00	100 00	50 00	4 00	5 00	06	05	09	10	20	12
Blair,	175 00	200 00	50 00	4 50	4 00	06	04	07	06	16	12
Bradford,	150 00	150 00	45 00	4 50	4 50	05	04	08	07	16	13
Bucks,	200 00	200 00	55 00	5 00	5 00	07	05	09	09	18	14
Butler,	150 00	----------	40 00	4 00	5 00	----------	----------	08	09	18	12
Cambria,	150 00	150 00	40 00	4 50	5 00	07	05	09	10	18	12
Cameron,	175 00	----------	35 00	3 50	4 50	08	06	08	09	18	12
Carbon,	175 00	200 00	50 00	4 00	----------	07	05	08	09	20	13
Centre,	175 00	175 00	45 00	4 50	5 00	05	04	07	09	16	12
Chester,	150 00	175 00	50 00	5 50	5 00	06	05	08	09	18	15
Clarion,	150 00	175 00	40 00	4 50	4 00	05	04	08	08	15	10
Clearfield,	150 00	150 00	35 00	4 00	4 00	07	05	08	09	20	12
Clinton,	150 00	150 00	35 00	4 00	4 00	05	04	08	09	16	11
Columbia,	125 00	150 00	40 00	4 50	4 00	06	05	08	09	18	12
Crawford,	150 00	150 00	40 00	4 50	4 50	06	05	08	09	18	12
Cumberland,	150 00	150 00	40 00	4 00	5 00	06	05	08	09	18	12
Dauphin,	200 00	200 00	50 00	6 00	6 00	06	05	08	08	18	12
Delaware,	175 00	175 00	40 00	4 50	6 00	06	05	08	09	18	14

Elk,	175 00	200 00	35 00	4 00	5 00	07	06	08	09	18	14
Erie,	140 00	----------	40 00	4 00	4 00	05	04	07	08	18	12
Fayette,	150 00	175 00	40 00	4 00	4 50	06	05	07	09	18	14
Forest,	150 00	175 00	35 00	4 00	5 00	05	04	07	08	18	12
Franklin,	150 00	150 00	50 00	5 00	5 50	07	05	08	09	16	12
Fulton,	125 00	150 00	35 00	4 00	4 00	05	04	06	07	14	09
Greene,	150 00	150 00	40 00	4 00	5 00	06	05	07	08	14	10
Huntingdon,	150 00	175 00	35 00	4 00	4 00	06	05	07	08	20	12
Indiana,	150 00	200 00	40 00	4 00	5 00	05	04	07	08	18	10
Jefferson,	150 00	160 00	35 00	4 00	4 00	05	04	07	08	17	10
Juniata,	140 00	150 00	40 00	4 50	4 50	06	04	08	09	15	10
Lackawanna,	150 00	150 00	40 00	4 00	4 00	07	05	10	11	18	14
Lancaster,	150 00	175 00	40 00	4 50	5 50	06	05	08	09	18	12
Lawrence,	150 00	200 00	40 00	3 00	4 00	05	04	06	07	16	11
Lebanon,	150 00	175 00	50 00	----------	----------	06	05	08	09	17	12
Lehigh,	175 00	200 00	50 00	4 00	3 50	06	05	09	10	18	12
Luzerne,	175 00	200 00	50 00	4 00	4 50	----------	----------	08	10	20	16
Lycoming,	200 00	----------	45 00	4 00	4 00	06	05	----------	----------	20	15
McKean,	175 00	----------	40 00	4 50	4 00	06	05	----------	09	18	12
Mercer,	150 00	175 00	40 00	4 50	4 50	05	04	07	08	15	10
Mifflin,	150 00	175 00	40 00	4 50	5 00	05	04	09	10	15	16
Monroe,	150 00	175 00	40 00	4 00	4 00	05	04	09	10	16	12
Montgomery,	150 00	150 00	50 00	5 00	4 00	06	05	10	11	20	15
Montour,	200 00	200 00	40 00	4 50	5 00	07	06	10	10	15	12
Northampton,	200 00	200 00	40 00	----------	----------	05	04	09	10	16	12
Northumberland,	150 00	200 00	45 00	5 00	4 00	06	05	10	11	20	12
Perry,	150 00	175 00	40 00	4 00	5 00	05	04	10	11	15	12
Philadelphia,	150 00	175 00	50 00	----------	----------	07	06	10	11	20	14
Pike,	150 00	175 00	35 00	4 00	4 00	05	04	08	09	18	15
Potter,	125 00	----------	35 00	4 00	5 00	06	04	08	09	16	11
Schuylkill,	150 00	200 00	40 00	----------	----------	06	04	09	10	20	14
Snyder,	125 00	150 00	40 00	4 00	5 00	05	04	07	06	16	12
Somerset,	150 00	175 00	45 00	4 50	4 00	06	05	08	09	15	10
Sullivan,	125 00	150 00	35 00	4 50	4 00	05	04	06	08	14	10
Susquehanna,	150 00	175 00	40 00	3 50	4 00	05	04	07	08	18	14
Tioga,	150 00	125 00	40 00	1 00	5 00	05	04	08	09	16	12
Union,	150 00	175 00	40 00	5 00	5 00	05	04	10	11	18	12
Venango,	150 00	----------	35 00	4 00	4 00	05	04	06	08	14	10
Warren,	150 00	150 00	40 00	5 00	4 50	05	04	08	08	15	16
Washington,	150 00	150 00	40 00	4 00	4 00	05	04	07	08	14	10
Wayne,	150 00	----------	50 00	4 00	5 00	06	05	07	08	16	10
Westmoreland,	200 00	----------	45 00	4 00	5 50	06	05	08	08	18	14
Wyoming,	150 00	150 00	50 00	4 00	4 25	05	04	09	09	17	14
York,	150 00	150 00	60 00	5 00	4 00	05	04	08	09	15	10
Average,	$150 00	$175 00	$42 00	$4 00	$4 00	$0 06	$0 05	$0 08	$0 09	$0 17	$0 12

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Counties.	Vegetables, Fruit, Etc.													
	Apples, per bushel.	Peaches, per basket.	Pears, per bushel.	Plums, per quart.	Cherries, per quart.	Blackberries, per quart.	Raspberries, per quart.	Potatoes, per bushel.	Butter, per pound, average at store.	Butter, per pound, average at market.	Milk, wholesale, per 100 pounds.	Milk, retail, per quart.	Eggs, per dozen.	Tobacco, leaf, per pound.	Honey, per pound.
Adams,	$0 65	$1 00	$0 50	$0 07	$0 06	$0 06	$0 08	$0 50	$0 30	$0 35	$1 30	$0 05	$0 30	.....	$0 20
Allegheny,	1 00	1 50	75	10	09	09	09	70	35	40	2 50	08	35	.....	20
Armstrong,	75	1 00	75	07	08	08	08	65	28	30	1 80	07	28	.....	20
Beaver,	1 00	1 25	1 00	09	08	09	09	75	30	35	1 60	07	28	.....	.....
Bedford,	60	1 00	50	06	06	06	07	55	25	28	1 50	06	25	.....	.....
Berks,	75	1 00	1 00	06	06	08	08	55	30	35	1 50	06	25	.....	.....
Blair,	60	1 00	70	06	06	06	08	55	28	32	1 75	06	25	.....	20
Bradford,	75	1 00	75	08	08	08	10	45	28	30	1 60	06	28	.....	13
Bucks,	90	90	75	08	07	07	10	70	30	32	1 25	06	30	.....	.....
Butler,	70	1 00	1 00	08	08	08	08	50	30	32	1 40	07	30	.....	18
Cambria,	80	1 50	1 00	09	08	06	08	65	30	35	2 10	08	30	.....	18
Cameron,	1 00	2 00	1 50	09	09	08	09	50	30	32	1 60	06	32	.....	18
Carbon,	80	2 00	1 50	08	07	06	07	60	30	35	2 00	18	30	.....	.....
Centre,	45	1 25	1 00	06	07	05	07	45	25	30	.....	06	25	.....	16
Chester,	75	1 00	90	08	08	09	10	50	32	35	1 80	07	30	.....	20
Clarion,	75	1 50	1 50	07	07	06	06	60	27	30	1 50	06	25	.....	18
Clearfield,	75	1 00	1 00	08	08	09	09	55	30	35	2 00	07	30	.....	15
Clinton,	60	1 25	1 00	08	06	06	06	55	25	30	2 10	06	28	.....	16
Columbia,	70	1 00	90	07	07	07	09	50	28	32	2 00	06	30	.....	16
Crawford,	75	1 50	1 00	10	10	10	10	40	28	30	1 50	07	25	.....	16
Cumberland,	70	1 00	80	10	10	08	07	55	28	30	1 50	06	30	.....	20
Dauphin,	55	1 00	50	06	06	07	09	60	25	30	1 30	06	25	.....	15

Delaware,	50	1 00	70	06	06	07	07	60	30	35	1 60	07	30	-------	20
Elk,	70	1 00	80	06	08	09	09	55	30	35	1 40	06	30	-------	15
Erie,	80	90	1 00	08	07	08	08	50	30	35	1 40	07	25	-------	20
Fayette,	1 00	1 40	1 50	10	10	10	09	75	30	30	-------	08	30	-------	20
Forest,	1 00	1 50	1 00	08	10	07	09	55	25	28	-------	06	28	-------	16
Franklin,	75	1 00	80	06	06	08	08	60	30	32	1 45	06	28	-------	15
Fulton,	50	1 00	60	05	05	05	06	45	25	28	-------	05	25	-------	12
Greene,	75	1 00	1 00	05	05	05	06	60	24	28	-------	07	25	-------	20
Huntingdon,	55	1 00	1 00	05	06	07	09	60	25	30	1 40	06	25	-------	16
Indiana,	1 00	1 00	1 00	05	07	08	08	55	28	30	1 60	07	25	-------	15
Jefferson,	90	1 00	1 00	08	08	07	07	45	30	32	-------	07	28	-------	15
Juniata,	50	75	75	06	06	06	06	55	28	30	1 50	05	28	-------	15
Lackawanna,	90	1 00	1 00	07	08	09	10	65	28	30	1 60	07	30	-------	15
Lancaster,	80	75	1 00	07	08	08	09	60	26	30	1 60	06	30	$0 12	18
Lawrence,	90	1 00	1 00	09	09	09	10	60	25	30	1 25	06	28	-------	20
Lebanon,	1 00	1 00	70	08	07	07	10	50	28	30	1 40	06	24	10	20
Lehigh,	90	1 00	70	09	06	08	08	40	30	35	1 50	06	28	-------	15
Luzerne,	90	1 00	1 00	06	09	10	10	55	30	35	2 00	08	30	-------	15
Lycoming,	60	1 00	80	06	08	08	08	45	30	34	1 60	07	30	-------	14
McKean,	1 00	-------	-------	06	07	07	06	45	28	30	1 35	07	28	-------	15
Mercer,	50	1 00	90	06	07	07	08	50	24	28	1 40	07	26	-------	18
Mifflin,	60	75	90	06	07	06	08	60	26	30	1 60	06	26	-------	18
Monroe,	60	1 00	1 00	06	08	06	09	50	26	28	2 00	06	30	-------	18
Montgomery,	90	1 00	75	10	10	06	10	65	30	35	1 70	06	30	-------	16
Montour,	75	1 00	85	10	10	10	10	65	24	28	1 80	06	30	-------	15
Northampton,	90	1 00	1 00	08	-------	-------	-------	50	28	30	-------	06	25	-------	16
Northumberland,	60	1 00	1 00	08	08	10	10	60	28	30	2 00	07	28	-------	15
Perry,	65	60	50	06	05	04	07	50	24	26	1 50	06	22	-------	15
Philadelphia,	90	1 00	1 25	09	12	-------	-------	70	32	36	-------	08	35	-------	-------
Pike,	80	1 00	1 00	08	10	08	10	60	30	32	1 50	06	30	12	15
Potter,	55	1 00	1 00	-------	-------	-------	-------	50	28	30	1 80	06	28	-------	14
Schuylkill,	75	90	1 00	08	08	10	10	60	28	32	1 60	06	30	-------	20
Snyder,	65	75	1 00	08	08	10	10	60	28	30	1 40	06	28	12	16
Somerset,	65	1 00	1 00	08	08	08	08	60	28	30	2 20	07	30	-------	18
Sullivan,	70	1 00	1 00	06	06	07	07	60	28	30	-------	06	28	-------	15
Susquehanna,	80	1 00	1 00	07	09	08	09	50	28	30	1 40	06	28	-------	15
Tioga,	75	1 00	75	07	09	08	09	35	28	30	1 25	06	25	14	15
Union,	55	1 00	1 00	08	09	07	09	60	28	30	1 40	06	25	-------	18
Venango,	70	-------	1 00	07	08	-------	-------	55	30	32	2 00	07	30	-------	15
Warren,	1 00	1 00	1 00	10	10	10	10	50	28	30	1 25	05	30	-------	18
Washington,	80	1 25	1 25	06	06	08	08	60	25	30	-------	06	22	-------	-------
Wayne,	90	1 00	1 00	10	09	10	12	50	30	35	2 00	07	30	-------	15
Westmoreland,	90	1 50	1 30	10	10	10	10	70	30	35	-------	08	30	-------	-------
Wyoming,	75	1 00	1 00	06	08	10	10	60	30	33	1 20	06	30	-------	15
York,	1 00	1 00	90	05	06	07	07	55	28	30	1 20	06	25	10	20
Average,	$0 75	$ 50	$0 95	$0 07	$0 08	$0 08	$0 08	$0 55	$0 28	$0 31	$1 60	$0 07	$0 28	$0 12	$0 17

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Counties.	Wool.						Farm Land, Value per Acre.		Farm Wages.						
	Wool, short, unwashed.	Wool, short, washed.	Wool, medium, unwashed.	Wool, medium, washed.	Wool, long, unwashed.	Wool, long, washed.	Farm land, improved, value per acre.	Farm land, average, value per acre.	Farm wages, by year, with board.	Farm wages, for summer months only.	Farm wages, by day, with board.	Farm wages, by day, without board.	Farm wages, whole year, without board.	Farm wages, harvest, by day.	Household help, female, with board, per week.
Adams,	$0 24						$55 00	$40 00	$180 00	$18 00	$1 00	$1 25	$320 00	$1 25	$2 50
Allegheny,			$0 23	$0 28	$0 26	$0 30	100 00	70 00	180 00	20 00	1 00	1 50	380 00	2 00	3 50
Armstrong,							60 00	40 00	200 00	30 00	1 25	1 50	350 00	2 00	3 00
Beaver,	25	30					50 50	30 00	200 00	20 00	1 00	1 25	350 00	1 50	2 50
Bedford,							50 00	35 00	150 00	18 00	1 00	1 25	300 00	1 75	3 00
Berks,	22						75 00	50 00	240 00	22 00	1 00	1 25	380 00	1 75	3 00
Blair,	20	28	22	30			80 00	50 00	240 00	22 00	1 00	1 25	360 00	2 00	2 50
Bradford,	20	23	21	26	24	30	40 00	30 00	240 00	25 00	1 00	1 25	325 00	2 00	3 00
Bucks,							75 00	50 00	240 00	25 00	1 00	1 50	420 00	1 75	3 00
Butler,	24						65 00	40 00	200 00	25 00	1 00	1 50	380 00	1 50	3 00
Cambria,	25	30	27	35	30	37	50 00	30 00	300 00	30 00	1 25	1 60	500 00	2 00	3 50
Cameron,							40 00	25 00	300 00	30 00	1 25	1 50	480 00	2 00	3 50
Carbon,							80 00	40 00	200 00	20 00	1 25	1 50	360 00	1 75	2 50
Centre,							70 00	40 00	180 00	18 00	1 00	1 25	380 00	1 80	2 00
Chester,							65 00	40 00	200 00	20 00	1 00	1 25	300 00	1 75	3 00
Clarion,	20	25	22	28	28	32	50 00	25 00	200 00	20 00	1 25	1 50	325 00	2 00	3 00
Clearfield,	23		25				40 00	25 00	240 00	25 00	1 00	1 25	400 00	1 50	2 50
Clinton,	20	25	21	25	24	25	60 00	40 00	200 00	20 00	1 00	1 25	280 00	1 50	2 50
Columbia,	20	25					70 00	50 00	200 00	20 00	1 00	1 25	300 00	1 50	2 50
Crawford,	25	28	27	30	30	35	45 00	30 00	200 00	20 00	1 00	1 50	250 00	2 00	3 00
Cumberland,							70 00	50 00	200 00	20 00	1 25	1 50	300 00	1 75	3 00
Dauphin,	20						80 00	60 00	200 00	20 00	1 25	1 50	300 00	1 75	3 00

Delaware,	------	------	------	------	------	------	90 00	55 00	250 00	25 00	1 25	1 50	400 00	2 00	3 50
Elk,	------	------	------	------	------	------	50 00	25 00	250 00	25 00	1 25	1 50	400 00	1 75	3 00
Erie,	20	------	20	------	------	------	100 00	65 00	300 00	30 00	1 25	1 50	400 00	2 00	3 50
Fayette,	20	25	25	28	28	30	75 00	40 00	240 00	25 00	1 00	1 50	360 00	2 00	3 00
Forest,	20	24	22	20	28	30	30 00	15 00	250 00	25 00	1 00	1 50	380 00	2 00	3 00
Franklin,	20	------	23	28	25	30	100 00	70 00	180 00	20 00	1 00	1 25	275 00	1 50	2 50
Fulton,	20	24	22	26	------	------	40 00	20 00	180 00	20 00	1 00	1 25	275 00	1 50	2 50
Greene,	20	26	24	30	25	30	75 00	60 00	200 00	20 00	1 00	1 25	300 00	1 50	3 00
Huntingdon,	------	------	------	25	------	------	40 00	25 00	200 00	20 00	1 00	1 25	300 00	1 50	2 00
Indiana,	23	28	25	35	28	32	50 00	35 00	180 00	18 00	1 00	1 25	300 00	1 50	3 00
Jefferson,	28	30	30	32	------	------	60 00	40 00	190 00	18 00	1 00	1 50	400 00	1 50	3 00
Juniata,	25	------	------	------	------	------	55 00	40 00	200 00	20 00	1 00	1 50	300 00	1 50	2 50
Lackawanna,	------	------	------	------	------	------	75 00	30 00	240 00	20 00	1 25	1 50	300 00	2 00	3 00
Lancaster,	------	------	------	------	------	------	150 00	100 00	200 00	20 00	1 00	1 25	300 00	1 75	2 50
Lawrence,	24	28	23	31	23	31	60 00	40 00	200 00	25 00	1 25	1 50	300 00	2 00	3 00
Lebanon,	------	------	------	------	------	------	70 00	50 00	225 00	25 00	1 25	1 50	360 00	2 00	2 50
Lehigh,	------	------	------	------	------	------	80 00	50 00	240 00	25 00	1 25	1 50	325 00	1 50	3 00
Luzerne,	20	------	------	------	------	------	40 00	30 00	200 00	25 00	1 00	1 25	375 00	1 75	3 00
Lycoming,	------	------	------	------	------	------	50 00	30 00	240 00	20 00	1 00	1 25	300 00	1 75	2 50
McKean,	18	------	19	------	------	------	50 00	30 00	250 00	20 00	1 25	1 75	375 00	2 25	4 00
Mercer,	26	25	22	27	25	30	45 00	30 00	200 00	20 00	1 25	1 50	350 00	2 00	3 50
Mifflin,	20	------	------	------	------	------	75 00	45 00	200 00	20 00	1 25	1 50	300 00	1 75	3 00
Monroe,	25	------	------	------	------	------	50 00	35 00	240 00	20 00	1 00	1 50	300 00	1 75	3 00
Montgomery,	------	------	------	------	------	------	85 00	60 00	200 00	20 00	1 25	1 50	340 00	2 00	3 00
Montour,	------	------	------	------	------	------	50 00	35 00	200 00	20 00	1 00	1 25	300 00	1 50	2 50
Northampton,	------	------	------	------	------	------	55 00	40 00	180 00	18 00	1 00	1 25	300 00	1 50	2 50
Northumberland,	20	28	------	------	------	------	65 00	50 00	200 00	20 00	1 00	1 25	300 00	1 50	2 50
Perry,	18	20	20	22	22	24	60 00	40 00	180 00	18 00	1 00	1 25	300 00	1 50	2 00
Philadelphia,	------	------	------	------	------	------	200 00	100 00	240 00	25 00	1 25	1 50	400 00	2 00	3 50
Pike,	18	20	20	22	22	25	50 00	35 00	200 00	20 00	1 00	1 25	360 00	2 00	3 50
Potter,	20	22	------	------	------	------	55 00	20 00	200 00	20 00	1 00	1 25	300 00	2 00	3 00
Schuylkill,	------	------	------	------	------	------	75 00	50 00	250 00	25 00	1 25	1 50	400 00	2 00	3 00
Snyder,	------	------	------	------	------	------	85 00	60 00	175 00	18 00	75	1 00	280 00	1 50	2 00
Somerset,	21	24	22	28	------	------	50 00	35 00	200 00	20 00	1 00	1 25	320 00	1 50	3 00
Sullivan,	20	23	21	24	24	26	50 00	30 00	200 00	25 00	1 25	1 50	300 00	2 00	2 50
Susquehanna,	23	26	25	28	27	30	40 00	25 00	200 00	20 00	1 25	1 50	300 00	2 00	3 00
Tioga,	22	25	24	28	30	34	45 00	30 00	300 00	30 00	1 25	1 50	400 00	2 00	3 50
Union,	22	26	23	27	30	34	70 00	45 00	200 00	20 00	1 00	1 25	400 00	2 00	2 50
Venango,	22	28	23	30	------	------	35 00	20 00	200 00	20 00	1 00	1 25	400 00	2 00	3 50
Warren,	20	28	------	------	------	------	40 00	20 00	240 00	24 00	1 25	1 50	400 00	2 00	4 00
Washington,	24	28	25	30	------	------	60 00	35 00	275 00	25 00	1 25	1 50	400 00	2 00	3 00
Wayne,	25	------	25	------	------	------	50 00	20 00	200 00	20 00	1 25	1 50	400 00	2 00	3 00
Westmoreland,	------	------	------	------	------	------	100 00	50 00	280 00	30 00	1 50	2 00	450 00	2 00	4 00
Wyoming,	20	24	------	------	------	------	60 00	40 00	200 00	22 00	1 25	1 50	300 00	2 00	3 00
York,	------	------	22	25	------	------	80 00	50 00	240 00	20 00	1 25	1 50	300 00	1 75	3 50
Average,	$0 21	$0 26	$0 23	$0 28	$0 26	$0 30	$60 00	$40 00	$200 00	$20 00	$1 10	$1 40	$340 00	$1 80	$3 00

The following comparison of tables for the past nine years shows the prices of the various products of Pennsylvania:

TABLE OF COMPARISON

	1902	1903	1904	1905	1906	1907	1908	1909	1910
Wheat,	$0.73	$0.75	$1.08	$0.83	$0.78	$0.95	$0.96	$1.10	$0.95
Corn,	.45	.57	.62	.57	.55	.65	.71	.75	.65
Oats,	.37	.41	.44	.37	.40	.53	.55	.50	.43
Rye,	.53	.60	.70	.63	.61	.73	.76	.77	.75
Buckwheat,	.43	.57	.58	.56	.58	.68	.73	.70	.62
Hay, clover,	9.43	11.10	10.50	10.00	11.00	11.00	10.50	12.00	12.00
Hay, timothy,	10.47	14.00	12.00	12.00	13.50	16.50	13.00	15.00	15.00
Horses, average,	84.00	115.00	120.00	131.00	145.00	148.00	150.00	150.00	150.00
Mules, average,	77.00	120.00	125.00	139.00	155.00	155.00	160.00	160.00	175.00
Cows, average,	28.00	33.00	35.00	35.00	38.00	37.00	36.00	38.00	42.00
Lambs, average,	2.76	3.50	3.50	3.95	4.15	4.25	4.00	4.00	4.00
Ewes, average,	2.81	3.45	3.50	4.10	4.50	4.75	4.50	4.25	4.00
Steers, fat, per pound,	.05	.04	.04½	.04	.05	.05	.05	.06	.06
Steers, for feeding, per pound,	.03	.03	.03½	.03	.04	.04	.04	.05	.05
Swine, shoats, per pound,	.06	.06	.06	.05	.06	.06	.06	.07	.08
Hogs, fat, per pound,	.06	.06	.06½	.06	.07	.08	.07	.08	.09
Chickens, dressed, per pound,	.11	.14	.13	.15	.15	.15	.14	.16	.17
Chickens, live, per pound,	.08	.10	.10	.10	.11	.10	.10	.12	.12
Apples, per bushel,	.35	.50	.44	.70	.55	.70	.70	.85	.75
Peaches, per basket,	.75	1.15	.82	.90	1.10	1.50	1.20	1.25	1.50
Pears, per bushel,	.81	.98	.94	.90	.90	1.10	.85	1.10	.95
Plums, per quart,	.06	.07	.08	.07	.07	.08	.07	.07	.07
Cherries, per quart,	.06	.08	.08	.08	.07	.09	.07	.08	.08
Blackberries, per quart,	.07	.07	.08	.07	.07	.08	.07	.09	.08
Raspberries, per quart,	.08	.08	.09	.08	.08	.09	.09	.07	.08
Potatoes, per bushel,	.50	.58	.52	.59	.60	.70	.80	.70	.55
Butter, per pound, at store,	.18	.24	.22	.22	.23	.27	.27	.28	.28
Butter, per pound, at market,	.22	.24	.24	.25	.27	.30	.30	.32	.31
Milk, wholesale, per 100 pounds,	1.16	1.41	1.50	1.30	1.50	1.50	1.30	1.40	1.60
Milk, retail, per quart,	.05	.05	.05	.05	.06	.06	.06	.07	.07
Eggs, per dozen,	.18	.22	.24	.24	.25	.27	.27	.28	.28
Wool, short, unwashed,	.16	.18	.21	.25	.25	.26	.20	.26	.21
Wool, short, washed,	.17	.24	.28	.31	.30	.31	.25	.30	.26
Wool, medium, unwashed,	.17	.18	.22	.26	.26	.27	.22	.28	.23
Wool, medium, washed,	.20	.25	.30	.32	.32	.32	.26	.32	.28
Wool, long, unwashed,	.15	.19	.23	.29	.30	.28	.24	.30	.26
Wool, washed,	.24	.25	.31	.34	.34	.33	.30	.34	.30
Farm land, improved, value per acre,	49.00	56.50	57.00	55.00	60.00	60.00	60.00	60.00	60.00
Farm land, value per acre, average,	33.00	39.00	37.00	35.00	40.00	38.00	38.00	40.00	40.00
Farm wages by year, with board,	153.00	187.00	185.00	190.00	210.00	225.00	200.00	200.00	200.00
Farm wages, summer months only,	17.00	20.00	20.00	19.00	20.00	22.50	20.00	20.00	20.00
Farm wages, by day, with board,	.86	1.00	1.00	1.00	1.10	1.45	1.05	1.10	1.10
Farm wages, by day, without board,	1.15	1.40	1.35	1.35	1.40	1.45	1.35	1.40	1.40
Farm wages, whole year, without board,	196.00	280.00	300.00	295.00	300.00	315.00	310.00	325.00	340.00
Farm wages, harvest by day,	1.23	1.55	1.60	1.60	1.65	1.75	1.75	1.75	1.50
Farm wages, household help, female,	2.05	2.35	2.50	2.50	2.50	2.75	2.75	2.75	3.00

The following gives the acreage, amount produced and value of Cereals, Potatoes and Hay grown in Pennsylvania; also the number and value of the different Farm Animals and Pennsylvania's rank among the different states of the Union for the various products enumerated in the year 1910.

CEREALS, HAY AND FARM PRODUCTS

	Acreage.	Production.	Average yield per acre.	Value.	Standing.
Rye,	360,000	5,508,000 bu.	18 bu.	$4,406,000	1
Potatoes,	305,000	23,790,000 by.	----------	15,464,000	2
Oats,	998,000	25,948,000 bu.	32 bu.	12,740,000	12
Wheat,	1,545,000	26,060,000 bu.	20 bu.	28,021,000	10
Corn,	1,525,000	48,800,000 bu.	35 bu.	34,160,000	18
Buckwheat,	290,000	5,655,000 bu.	20 bu.	3,845,000	2
Hay,	3,118,000	3,742,000 tons.	----------	54,633,000	2
Total,	----------	----------	----------	$153,877,000	------

FARM ANIMALS

	Number.	Value.	Standing.
Horses,	619,000	$81,708,000	11
Mules,	43,000	6,235,000	18
Milch cows,	1,140,000	44,460,000	5
Other cattle,	917,000	17,606,000	17
Sheep,	1,112,000	5,338,000	14
Swine,	931,000	8,444,000	15
Eggs, doz.,	75,000,000	15,160,000	------
Total,	----------	$178,951,000	------

CONCLUSION

This report shows an attendance at the Institutes proper greater than any previous year. A deep seated desire on the part of the farmers of Pennsylvania to arrive at a true conclusion as to the best and most approved methods to follow in their various lines of farm operations is freely manifested. The call is for more thorough instruction as the years go by. We have endeavored, to the extent of our ability and resources, to meet the requirements in this respect. In the Movable Institute School work, at which scientific research is demanded as well as practical knowledge, we find that this higher order of instruction is measureably meeting the demands of such localities where the farmers have concentrated their efforts in two or three special lines of farm operations, or have become specialists in dairying, horticulture or poultry. The schools in such places

become a moving power in the development of a high degree of intelligence and more earnest effort in the application and practice of real business methods in agriculture. The outgrowth of the Institutes and Movable Schools of Agriculture is a demand, first, for an additional appropriation for the Schools and Institutes of not less than $10,000; and, further in order to enforce the work, an appropriation should be made for the employment of a limited number of practical and scientific counsellors whose business it would be to visit farms of the State and there advise and counsel with the farmers along their respective lines of work, thereby explaining, in a personal manner, many things that would vastly help in the upbuilding of the great work throughout the State.

With full assurance that when these requests are made to the coming Legislature, this greatest of occupations will receive such recognition as their needs demand, I am,

Very respectfully,

A. L. MARTIN,
Director of Institutes.

REPORT OF THE DAIRY AND FOOD COMMISSIONER

Harrisburg, Pa., *December 31, 1911.*

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

Dear Sir: I have the honor to submit herewith a report of the Dairy and Food Bureau of the Department of Agriculture, for the year ending December 31, 1911. It covers the operations for the year and contains some details that may be useful for public information.

INTRODUCTORY REMARKS

The work of this Bureau of the Department of Agriculture is very precisely determined by the language of the several State food acts. The general body of food statutes remained, with two exceptions presently to be mentioned, the same as in preceding years; hence, the general character of the work in the past year has been like that of the years immediately preceding. Since the general nature of this work has been quite fully discussed in preceding reports, it probably requires no discussion of its principles at this time.

There have, however, been added to the statutes, the enforcement of which the Legislature has committed to the care of the Dairy and Food Bureau, two new and important laws, which call for especial consideration in this connection.

THE SAUSAGE ACT

The first of these two acts is what is generally known as the sausage act, approved on the 6th day of April, A. D. 1911. This act defines sausage, prohibits the selling, the offering and exposing for sale and the possessing with intent to sell, of sausage that is adulterated, under the definitions of the act, and then in a third section declares that the following conditions shall be regarded as adulterations:

First. The addition of water in excessive amounts, beyond the limit specifically indicated by the law.

Second. The presence of any cereal or vegetable flour.

Third. The presence of coal tar dyes, certain chemical preservatives and other substances injurious or deleterious to health.

Fourth. The presence of diseased, contaminated, filthy or decomposed substance, products from a diseased animal, or one dying otherwise than by slaughter, or from substances so stored, transported, or handled as to render them unfit for use in foods.

Prior to the passage of this act, it had been known for some time that serious abuses existed, widespread, in the sausage trade. It is

true, that owing to the National Meat Inspection Act, the raw materials used for the production of this very generally used food product were, in all large establishments, brought under the careful examination of government experts, and that, as a result of the National inspection, the sanitary character of the meats used had been quite fully insured, as respects the sausage produced in establishments of such extent as to come within the scope of the National Act. Furthermore, the enactment and enforcement of the Pennsylvania law, by which the slaughter of animals for use as food is placed under the supervision of the State Veterinarian, have materially increased the safety of the public with respect to the products coming from the smaller local butchering establishments. It is believed, therefore, that the sanitary risks had been quite materially reduced, if not wholly removed, as the result of the operation of the national and state laws just mentioned.

With respect to the use of artificial coloring, by whose employment to dye the casing of sausage, its appearance is so changed as to deceive the purchaser concerning its quality, and to lead him to accept as a prime article sausage made from inferior meats, prosecutions brought under the general food law of the State had very largely diminished this undesirable practice. The same statement applies also to the use of boric acid and other preservatives, formerly much used by some sausage manufacturers.

The incorporation into the present sausage act, of these sanitary provisions, and also of those relative to the use of coal tar dyes and of chemical preservatives in sausage, was made necessary, however, because of the legal principle of giving to recently enacted laws priority of application over laws earlier enacted upon the same subject. The purpose of the reenactment of the special provisions here under consideration, was to make sure that the general principle adopted by the Legislature in enacting the Pure Food Law of May 13, 1909, should also apply in the case of sausage.

The most important new features appearing in the present sausage act, are those prohibiting the addition of excessive amounts of water, and of cereal or vegetable flour. For the information of the consumer, I desire to state, in this connection, the reasons for urging the inclusion of these prohibitions in the present sausage act, which, in this respect, differs not at all in principle from the general food act, but only in making specific a prohibition already implied in the general food law, to the end that the manufacturers, the consumers and the courts might more clearly understand and more efficiently enforce these principles, as they affect sausage.

The general definition of sausage, incorporated in the act, is essentially that adopted by the Association of Official Agricultural Chemists and the Association of National and State Food and Dairy Departments, upon the recommendation of their joint committee on food standards, who had devoted several years to the study of the subject, and had not only familiarized themselves with the literature pertaining to it, but had visited packing establishments and conducted extensive correspondence with, and granted hearings to, the sausage manufacturing trade. It is recognized that under the name "sausage," and more particularly under its German equivalent "Wurst," a great

variety of materials has been included, and that in certain comparatively rare products, such, for example, as bread sausage (brodwurst), bread crumbs were essential ingredients. It was clear, however, that the addition of such materials to the general body of products recognized under the name "sausage," was abnormal, and generally regarded, even in Germany, the home of sausage, as an abuse. The objection to the introduction of starchy substances, such as cereals and vegetable flour, is not, of course, owing to objections to them as unfit for food, or as absolutely lacking in food value, but because they replace and, especially with the water they hold, make possible the omission of very considerable quantities of the normal sausage substance, meat. The result is that the consumer, who buys the sausage, is deceived. He supposes that he is securing for his use, a purely meat product, except for the seasoning used in the sausage mixture, when, as a matter of fact, he is made to pay meat price for starchy substances, costing at wholesale not more than three cents per pound, and for much larger quantities of water, costing the manufacturer practically nothing. This condition is manifestly undesirable.

In fairness to the manufacturer, his arguments for the use of these materials ought here to be stated. He claims, in the first place, that, during the operation of chopping the meat and seasoning it, to fit it for making high quality sausage, it is necessarily exposed, in a finely divided condition, to the air, and thereby loses a considerable portion of its normal water content, and that, consequently, it becomes too dry to reduce to a mass of such consistence that it can not readily be stuffed, by the customary processes, into the delicate casings and that it is necessary, therefore, to add water sufficient to bring the sausage mass to a consistence fitting it for stuffing. The Legislature, in passing the sausage act, recognized that there was a measure of fairness in this claim of the manufacturer, and, therefore, prohibited the addition of water only in excess of those quantities needed to bring the meats back to the moisture conditions normal to fresh meats of the kind used, believing that no further tolerance of added water is necessary to the manufacturer who prepares a sausage meat of the usual tissues, used in common proportions, one to the other.

It may be stated at this point that, in fixing this limit of tolerance for added water, the Legislature was not making a provision that is incapable of reasonable enforcement, since it is possible to determine, by chemical means, the fact that water is or is not present in excess of the amount normal to fresh meats. Such meats vary very much in moisture, it is true, according as they are derived from fat or lean animals, but the moisture supply in the meat tissue bears a quite constant relation to the nitrogenous substances of the meat, so that by determining both the amount of moisture present in the sausage, and also the quantity of nitrogen, it is practicable to discover wide departures from the normal relation between these two substances.

The manufacturer has urged that the use of starchy ingredients in sausage has been quite general in this country, and that the length of time during which it has been thus used, as well as the large proportion of sausage makers who have followed this practice, should be regarded as having established for the sausage manufacturer a right to such practice. There is, however, no evidence to show that the consumer has been, at all generally, aware that under the name

"sausage" he has been buying cereals, or vegetable flour, together with the very considerable proportions of water they will hold, when in the cooked state, instead of the meat they replace, and at the prices of such meat. For this reason, the right to use such materials, at least without a declaration of their presence, is not to be admitted.

The manufacturer further claims that the use of such starchy material in sausage is necessary as a "binder," that is, as a substance loosely cementing the meat particles into a common mass and holding them together, not only during the stuffing process, but also during the later storage, transportation, and even the cooking. It is true that certain sausage ingredients, especially lean meats, used without the presence of other usually included meat parts, do not unite to form a coherent mass, particularly when the meats are not properly seasoned, and that, therefore, sausages prepared from these materials alone lack certain of the desirable qualities of the best made sausages, and that, in such cases, the presence of cooked starch, holding large amounts of water, does add somewhat to the appearance, and other physical characters, of the sausage, but it is also true that cereals are not used at all generally, where more expensive, good quality pork is included as part of the sausage mass, and that starch serves to give to the inferior sausage, similiarity in appearance, and something of similarity during the cooking, to the more expensive, high quality product.

Under the provisions of the National Meat Inspection Act, all sausages to which cereal, potato flour, or other vegetable flour, has been added, are required to declare such addition upon the labels under which they are sold. These labeling requirements are quite readily carried out, so long as the product is held in the original, wholesale package, but are less satisfactorily applicable to the conditions of the retail trade, in the course of which the product is very commonly removed from the container, so that the buyer is not informed, as it was intended he should be, concerning the real nature of the product he is buying. There was a second reason for the course taken by the Pennsylvania Legislature, in framing the present sausage act: Dry starch, when cooked in the presence of water, takes up and holds in the thick paste thereby formed, a number of times its own weight of water. The declaration, therefore, of the presence of the starch alone, fails to inform the buyer of the much more important added water.

The statement of the results of the examination of sausages retailed in Pennsylvania during 1911, which will be made in a later paragraph, must, I believe, convince the public of the need for this legislation.

THE MILK AND CREAM ACT

On June 8, 1911, the Governor approved a new act relating to milk and cream, repealing all earlier acts, or parts of acts, inconsistent with the provisions of the new law, but specifically retaining in force the act of June 10, 1897, prohibiting the adulteration or coloring of milk and cream by the addition of so-called preservatives or coloring matter, and the act of April 19, 1897, amending the first section of the act just mentioned. The general milk acts thus repealed, especially the act of 1909, were similar, in their general intent, to the new act, especially as they related to milk, for both acts prohibited the watering and skimming of milk, although not prohibiting the

sale, as such of skimmed milk. The older act, however, omitted the expression of a fixed standard for this important food product, in this respect at least, that it did not include any statement of the least quantities of milk solids and of milk fat that would be regarded as necessary to make milk legally salable for general consumption.

In this respect, the former Pennsylvania milk act differed from that of most states in the Union, and was far more difficult of enforcement.

In fixing limits of composition for milk, the Legislature has, in reality, recognized a principle not recognized in the preceding State milk acts, namely, the principle that milk sold without qualification, under the name "milk," must not only be free from adulteration by skimming or watering, but must, also, not be abnormally inferior in its composition, from causes other than direct manipulation by dairymen or milk vendors. It is true that milk produced by different cows differs very much in composition, and also that there are marked variations in the composition of milk produced by the same cow, under different conditions of feeding and management, and at different times during the period of lactation. Where, however, good management, including proper feeding, is maintained, these variations are less than where poorer methods of management prevail. There are, it is true, certain rather constant differences in the character of milk produced by cows of different breeds, or, at least, by certain strains, or classes of animals in the different breeds; and among these strains, certain families of the Holstein and other Lowland breeds of cattle quite frequently produce milk low in both solids and fat. It is also true that animals of these breeds are heavy milkers, as a class, and that in many regions of the United States these breeds have been preferred by dairymen supplying milk for direct consumption, because of certain advantages they give them for milk production, and in spite of the inferior richness of the milk they produce.

Certain other facts, however, need to be considered, in determining public policy with respect to the standardization of this highly important human food. In the first place, the milk sold at the present day for direct consumption, is very rarely the unmixed product from a single cow, but is usually the mixed product from a herd of cows. The variations in herds' milk are, therefore, those which need, chiefly, to be considered in determining the minimum limits of composition in normal milk, and the variations in herds' milk are very much narrower than those observed in the case of milk from single cows. It is true that some act of mismanagement of the herd, may affect all the animals in it at the same time, but the consequences of such mismanagement show themselves much more in the alteration of the yield of milk, than they do in its composition. Again, in herds maintained for the purpose of supplying milk for direct consumption, the cows do not usually become fresh at the same time, but, rather, are so managed in this particular that the milk supply shall be maintained as uniform as possible throughout the year. Consequently, those differences in composition appearing in the milk of a single cow, as its period of lactation progresses, are, by no means, so marked in the case of milk from dairy herds kept for the purpose just mentioned. It must, however, be frankly ad-

mitted, that there are herds of Lowland breeds which, with no lack of good management, produce milk that will not uniformly, nor even in the average case, come up to the requirements of the standards commonly fixed for market milk. The owner of such a herd is, however, not driven to the dire necessity of destroying the herd; all he has to do is to introduce the necessary proportion of animals, the quality of whose milk is such as to bring the mixed herd's milk up to the normal limit; and to accomplish this change, it is not necessary for him even to reject the breed he prefers, because there have been developed in large numbers, strains of the same breed that are producing milk considerably above the minimum limits in composition, commonly adopted.

It is, possibly, deserving of mention in this connection, that there is one cause of variation in milk quality whereby the solids-not-fat of milk are abnormally reduced in quantity, over which the dairyman has no control, and against which he cannot guard, where the method of pasturage enters largely into his system of management. It is generally known, that in prolonged dry seasons, where the pasture becomes very short and scanty, the tendency is for the solids-not-fats to fall from one-fourth to one-half per cent. below the quantity normal to the animal, and sometimes the diminution of these constituents is even greater. It may be urged that the dairyman can, by the introduction of food from other sources, keep up both the milk flow and the milk composition; but it is fair to recognize that farm management is necessarily complex, and that the control of the food supply, in the manner just indicated, is one involved with great difficulty, and not always practicable. On the other hand, the conditions of prolonged drought, sufficient to produce the effects just described, are quite rare, and the conditions of milk production during these rare periods could be accepted as the general basis of limitation of milk composition, only at a disadvantage to the consumer that must extend through periods of time manifold longer than those during which these abnormal climatic conditions prevail. It seems, therefore, to be a wiser policy to trust to the judgment of experts examining the milk supply, and of executive officers charged with the enforcement of the law, to recognize the presence of these conditions, to modify their recommendations, and to avoid the carrying of the law beyond its true intent, rather than to inflict upon the consuming public a continuous disadvantage, because of the rare occurrence of such climatic conditions.

The standards of composition for milk, incorporated in the present act, are those proclaimed by the Secretary of Agriculture, under authority of Congress, and upon the recommendation of a board of experts who carefully studied the limits established by law in the several states and municipalities of the Union, and also the composition of market milk throughout the United States. From our knowledge of milk produced in Pennsylvania, a knowledge secured by the milk examinations made by this Bureau through past years, together with those made by other public agencies, it is established that the limits adopted are safely applicable to Pennsylvania market milk.

The new act differs from the act of 1909, also, in fixing 18 per cent. of milk fat as the minimum limit for cream, whereas the earlier act set 15 per cent. as the minimum limit. This change brings the State

standard into conformity with that recognized by the national authorities, in dealing with cream that enters into interstate commerce between Pennsylvania and the neighboring states. The analyses of market creams made by the chemists of this Bureau, in course of enforcement of the act of 1909, indicated that an 18 per cent. minimum for cream would not be unjust in its application to the cream trade of Pennsylvania.

PUBLICITY POLICY

The foregoing discussion of the new food acts of 1911, illustrates the fact that the pure food laws of this State, as well as other states, are, from time to time, undergoing modification in matters of detail and, in rarer cases, by the recognition of more advanced principles of public policy. It is nevertheless true, that the main principles expressed in the general food law lie at the basis, also, of these new laws, and are not set aside with the modifications of detailed legislation.

It is an assumption of the courts, long recognized as necessary to the enforcement of laws, that every citizen know the law. It is not my purpose to discuss, in this connection, the extent to which the facts support this thory. It is mentioned only as introductory to the statement, that it is the policy of this Bureau to make every endeavor to secure a general knowledge on the part of the selling public, as well as on the part of the consumer, relative to the provisions of the food laws and of regulations issued thereunder, in order that the practices of the manufacturer and dealer may be, so far as practicable, brought into compliance with the law without resort to the method of legal prosecutions.

The agencies employed for the spread of information concerning new acts and regulations have been various. The work has, in part, been accomplished by the efficient services of the agents of the Bureau, in the course of the exercise of their regular duties as purchasers of samples; in part by articles of information prepared by this office, and distributed throughout the State by the courteous assistance of the public press; and in part by addresses made by the Commissioner, or his representatives, to various trade organizations concerned.

In pursuance of the policy here outlined, manufacturers of sausage and dealers in milk were promptly informed of the new legislative acts affecting their business, with the result, it is believed, that very few of those engaged in these lines of production failed to have knowledge of the recently adopted legal requirements, before the work of the Bureau in the enforcement of these laws by the examination of samples and the institution of prosecutions, was begun.

In like manner, widespread notice was given when it became evident that it was the duty of the Food Commissioner to bring before the courts, for judicial determination as to its legality, the practice by confectioners of coating certain classes of their wares with resinous glazes, such as shellac or the grass gums. One further illustration of the same policy may be mentioned at this time. Earlier experience had shown that stocks of breakfast foods and other cereals, held through the summer months, often became the subjects of insect attack during the warm period, and were thereby rendered unfit for

use as human food. When it was determined, for this reason, that instructions should be given to sampling agents to give especial attention during the early fall to commodities of this class, a corresponding notice was issued through the press, urging that retailers examine their own stocks at once, and remove therefrom any packages that had been attacked and rendered unfit for use, to the end that the consumers might thereby have the needed protection, without recourse to prosecutions, so far as such warning might serve this purpose.

Speaking generally, it is the policy of the Bureau to use, so far as practicable, publicity measures of the kind above described as the first means of enforcing the law, with the hope that they will prove sufficient, in case of most dealers, so that the more severe measure of resort to court procedure may be kept down so far as the safety of the public may permit.

THE MONTHLY BULLETIN

The Monthly Bulletin of the Bureau has served during the past year, as during the preceding years, as the means of giving to the public current information concerning the work of the Bureau, and the policy originally adopted by which it was made a medium not only of statements concerning the statistical work of the Bureau, but also of general information on the subject of food production and food control, has been continued.

The demand for these Bulletins and the general interest with which the public has received them, have continued in such degree as to prove their value for the purpose stated.

SUMMARY OF WORK FOR THE YEAR 1911

In the Appendix to this report are presented summaries showing the list of articles purchased by the agents and analyzed by the chemists of the Bureau during the year, and also a table giving a list of those classes of articles found adulterated and misbranded, and made the basis of prosecutions that have been terminated during the year. The recapitulation of samples analyzed during 1911 shows a total of 8,200, a number far in excess of the report for any single preceding year during the existence of the Bureau. The number of cases terminated also exceeds the previous record, the number being 1,029. The increase in these numbers is due, very largely, to the greater number of samples of dairy products examined since the passage of the new milk act of June 8, 1911, the total number of these samples analyzed since that enactment being 4,957, as compared with 3,296 samples of these products analyzed in 1909.

In the following portion of this report the several classes of food products analyzed will be considered separately in detail:

DAIRY PRODUCTS

The number of milk samples examined during 1911 was 3,512, a portion of the work falling under the act of 1909, but the larger part under the act of 1911. As the result of these analyses, there were

prosecuted and terminated for violation of the act of 1911, 418 cases. That is to say, the chemists' findings showed, on the average, out of nine samples examined one illegal in quality. The general character of the analytical results indicates that adulteration by the addition of water was of as frequent occurrence as that by the removal of milk fat. It ought further to be mentioned that a very considerable fraction of the cases instituted were based upon the analyses of milk sold at hotels and restaurants, which were visited somewhat more generally than usual. It is clear from these findings that the public greatly needed the protection which this new milk act affords.

There were terminated during the year 7 cases brought for the reason that formaldehyde had been added to milk, no instance appearing in which boric acid had been so used. The number of cases found this year, as compared with the 5 reported for 1910, is not out of proportion to the latter number when the difference in the number of samples in the two years is taken into account. The condition of the milk supply as respects its freedom from chemical preservatives, remains highly favorable, especially when the widespread use of these objectionable preservatives in the milk supply on the markets a few years ago is recalled. There were also terminated during this year, 38 cases brought for milk adulteration, under the act of 1909, and two brought under the food act of 1907.

CREAM

During 1911, 1,038 samples of cream were analyzed, and during the year there were 150 prosecutions terminated for the sale of cream containing less than the standard quantity of butter fat. Supplementary sampling of the cream stocks of a number of communities showed a very wholesome improvement in the quality of the cream supplied, following the first series of prosecutions brought for violations of the law.

When it is recalled that within a very few years customers asking for cream were frequently supplied with a product containing but 6 to 8 per cent. of butter fat, although the cream secured by the old-fashioned method of skimming commonly contained over 30 per cent. of fat, it will be realized how much better assurance the householder can have, under the present act, of getting a fairly uniform, good cream.

CONDENSED MILK

Duing 1911 there were examined 11 samples of products sold as condensed milk and evaporated milk, but the present year has witnessed the termination of no case instituted for the violation of the laws, as they apply to these materials.

SKIMMED MILK AND BUTTERMILK

There were examined during the past year 116 samples of skimmed milk and 3 samples of buttermilk, the sale of which, under these specific names, is allowed by the present laws. Three cases of additions of water to skimmed milk were terminated during the year, showing that, as respects adulterations by such additions, the skimmed milk supply is not in a serious condition.

ICE CREAM

The chemists of the Bureau analyzed, during 1911, 208 samples of ice cream and similar products. There were terminated during the same period, 30 cases, for violation of this Act, 28 of these cases being brought for deficiency in fat below the very mild requirement of the law, that products sold as ice cream shall contain not less than 8 per cent. of milk fat.

CHEESE

Seventeen samples of cheese were examined during the year, but no cases have been terminated for violations of the cheese law. In general, the findings show the composition of domestic cheeses, at least, to be up to the normal as respects their fat content.

RENOVATED BUTTER AND OLEOMARGARINE

It was noted in the preliminary report for 1910, that in recent years the sale of renovated butter has been very limited. This is further illustrated by the fact that during 1911 no sample of this product was found on the market by the agents.

Oleomargarine samples to the number of 113 were examined by the Bureau's chemists, and there were instituted and terminated during the year 63 cases, for violation of the oleomargarine act of 1901. Of these cases, 13 were instituted for sales of oleomargarine as and for butter; 10 for sales with meals, without the license legally required, and 19 for sales by vendors, without licenses; 1 for sale from a bread wagon on the streets, in violation of the legal requirement that the place of sale be restricted to the store room specified in the application for the license; and 24 for the reason, solely or in part, that the product was colored so as to cause it to resemble, or be in imitation of yellow butter.

It should be stated that the licenses issued upon application, and in accordance with the requirements of the law, represent nearly every town and populous village in the Commonwealth, and that the number of applications for licenses appears to be steadily on the increase. In these times of high price of dairy products, including butter, oleomargarine is often called "the poor man's butter." The legalization of the sale of oleomargarine for use as a food, recognizes its fitness for such use, and gives no warrant for any official hostility to the oleomargarine trade when the production and sale of oleomargarine are conducted in entire compliance with the letter and the spirit of the law. The chief difficulty we have found in the enforcement of the oleomargarine Act has been to secure a faithful compliance with its requirement that the oleomargarine "shall be made and kept free from all coloration or ingredients causing it to look like yellow butter." The reason for the legal requirement just quoted was not that the coloration would necessarily lead to the development or introduction of poisonous or deleterious compounds or ingredients, but in order that the deception of the consumer, so difficult to prevent where the oleomargarine is made to resemble butter of the usual appearance, might be avoided so far as practicable without placing upon the oleomargarine trade an unnecessary hardship. The consumer who studies closely the market prices of the white or light colored oleomargarines, and those which are brought

most nearly into resemblance with high grade yellow butter, will appreciate the commercial advantage which the oleomargarine manufacturer and dealer find in bringing their product into close resemblance, in point of color, with yellow butter. It will be found, further, by a careful examination of the facts, that oleomargarine so colored does not usually owe its higher price to the payment by the dealer of the ten cent tax fixed by the National oleomargarine act for colored oleomargarine: because, by official contruction, the term "coloration" used in the National act is limited in its application to the color change secured by the addition of materials used exclusively for the purpose of causing the color change, whereas, nearly all of the yellow oleomargarine now offered for sale owes its color to yellow fats, not introduced exclusively for coloring purposes, but also as valuable ingredients, contributing, like other fats, to the nutritive value of the oleomargarine. The study of the production costs for these yellow oleomargarines, made in the manner just stated, shows that the margin of profit for oleomargarine of this kind is very much greater than for oleomargarine not made in resemblance of yellow butter.

For the several reasons above suggested, the Bureau is convinced of the essential correctness of the policy laid down in the oleomargarine act of 1901, and that the maintenance of the intended color line of separation between these two products is important, not only to the producer and dealer in butter, but also to the "poor man," to whom the oleomargarine trade so frequently and endearingly refers.

The difficulties of securing convictions of offenders under the oleomargarine law for violations of the coloration provision, continue as great as in the recent past. Every effort to secure conviction brings to the support of the defense, the organized oleomargarine trade and its expert witnesses, who use their best endeavor to convince court and jury that when the Legislature, in the act of 1901, used the words "yellow butter," not all yellow butter was intended, but only certain butters of a very deep yellow tint, and often comparisons so complex are instituted as to confuse the minds of the hearers of the evidence, so that the verdicts sought by the Commonwealth fail to be secured despite the best efforts on its part to obtain a full and effective enforcement of the act.

MEAT PRODUCTS

There were examined during the past year 77 samples of meats, canned and fresh, and 339 samples of sausages of various makes; also 169 samples of fish and shellfish. There were terminated during the same period cases for adulteration of products of this class, as follows: 5 cases concerning meats, of which 2 cases were for the sale of meats in unsanitary or decomposed condition, and 3 for the sale of Hamburger steaks containing added sulphites; 28 cases relating to sausages of various classes, the chief adulteration appearing in these cases being the presence of cereal or vegetable flour, together with excessive quantities of added water. It should be noted that the number of cases terminated corresponds to 9 per cent. of the number of sausages examined, a fact clearly establishing the wide extent of the abuse which the law seeks to correct. There were 23

cases relating to fish, of which all but 4 were based upon the unfitness of the fish, at the time of sale, for human consumption, the remaining 4 being based upon the addition of red coloring matter, for the purpose of deceiving the purchaser as to the nature of the fish. The examinations included those of 16 samples of canned oysters and 80 samples of fresh oysters. The cases terminated related to 15 samples of oysters adulterated, usually, by the inclusion of excessive quantities of water, introduced either as ice packed directly in contact with the oysters, or by the "floating" of the oyster before its removal from the shell. The limits of composition adopted by the chemists of the Bureau as the basis of their judgment as to the presence or absence of excessive water, are those adopted by the United States government for the same purpose, and were based upon extensive examinations of oysters under the various customary conditions of production.

The intention of the Bureau to adopt this basis of judgment was duly announced to the oyster trade, in the form of a regulation, in ample time to enable the shippers and dealers to arrange their practice so as to meet the requirements of the law, as it was interpreted by the Bureau, and later by the courts. The cases of adulteration of the character above described correspond to nearly 20 per cent. of the samples of fresh oysters examined. These figures make it evident that this protective measure was greatly needed for the safety of the consumer.

LARD

There were analyzed during the past year 98 samples of lard, compound lard and lard substitutes, and during the same period 13 cases were terminated for violation of the lard act of 1909. The findings upon which the charges in these cases were based were quite various, the greater number being due to the presence of added beef stearin. In one case it was found that the material was composed largely of cotton seed oil, or a product thereof, and in 2 cases relating to compound lard, it was found that one sample contained less than 50 per cent. of lard, while the other contained no swine fat at all. These figures indicate that the usual forms of adulteration of this product are continuing in about the same volume as during recent years, although in very much smaller proportion than when the work of the Bureau upon this product was begun.

EGGS

The chemists of the Bureau examined in 1911 95 samples of eggs, dried, fluid and in the shell, and during the year there were 31 cases terminated for the sale, or having in possession with intent to sell, or the use for food manufacturing purposes of eggs, in one or other of the forms above mentioned, unfit for food. As in the preceding years since the passage of the egg act of 1909, due care has been taken to institute cases only where the facts could not be accounted for by the percentage of spoilage frequently found where proper methods of handling and prompt sale are maintained. It may be remarked that the major portion of these cases developed in the more thickly settled communities of the State, and that while the very large percentage of condemnations in proportion to the number of

samples examined very clearly shows the need for the egg act and for its continued vigorous enforcement, nevertheless the general condition of the egg trade in the State as a whole is not fairly represented by the proportions exhibited in the foregoing figures. As a matter of fact, the systematic trade in eggs rejected by commission men after the process of candling, is confined almost exclusively to the two cities of the first class, more especially Philadelphia.

MINCE MEAT

There were examined during the year 48 samples of products sold under this name. The number of cases instituted were 9, of which more than half were due to the presence of benzoic acid, or a compound thereof, used for preserving purposes. In one case, no meat at all was found.

FRUIT AND VEGETABLE PRODUCTS

CANNED FRUITS AND VEGETABLES

There were examined during the year 94 samples of canned fruits and vegetables, pickles, etc. During the same period 14 cases were terminated relating to this class of products. The major portion of these cases refer to so-called Maraschino cherries, and in all instances because of the use of a chemical preservative, with or without the use of a deceptive dye. The number of cases relating to this product corresponds to 20 per cent. of the total number. One case of mushrooms, out of 14, contained sulphur dioxide, and one case of French peas contained compounds of copper. The general condition of the remaining materials belonging to the class of canned fruits and vegetables was excellent.

CATSUPS, ETC.

Two hundred and eighty-nine samples of catsups, salad oils, salad dressings, sauces, etc., were analyzed during the year. There were 46 cases terminated during the same period, relating to materials of this class. Of the samples examined, 257 were sold as catsup or tomato catsup, and one containing as a very important part of its solids, apple pulp, was sold under the curious name of Pomona Catsup. Of the cases terminated, 43 were related to catsups. In 15 of these cases, the charge was that they contained an amount of benzoic acid in excess of the legal limit of toleration, in other words, corresponding to more than one-tenth of one per cent. of benzoate of soda, while in 4 cases the preparations were found to have been manufactured, in whole or in part, from filthy or decomposed vegetable products unfit for human consumption. When it is considered that a very notable proportion of the larger catsup manufacturers of the country are now placing upon the market catsup made without the use of a chemical preservative, the condition of affairs revealed by the examinations just made, together with those of recent years,

shows that there is need for a very great improvement in the manufacture of this commodity on the part of some of its producers, and also that there is little ground at the present time for the contention formerly made by practically all catsup manufacturers, that it was impossible to make a commercial catsup that would keep satisfactorily until delivered into the hands of the consumer, without the use of some such preservative as benzoate of soda.

DRIED FRUITS AND VEGETABLES

Samples of dried apricots, peaches, raisins, corn and peas were examined to the number of 16, but only one case was terminated, relating to dried apricotts preserved with sulphur dioxide, whose presence was not declared upon the package containing the product, as the law requires.

FRUIT BUTTERS, JAMS, JELLIES AND PRESERVES

There were examined during the period covered by this report 73 samples belonging to this class, but there was only a single case terminated during the period, relating to these products. In other words, the findings for these materials correspond closely to those reported for the year 1910, in which the examination of 74 samples led to the discovery of no violations of the food act.

In the same connection it may be stated that 5 samples of fruit syrups were examined, and one case terminated for adulteration. The condition of this class of products has been very much improved in recent years, in fact, since the time when the fruit syrup act of 1905 went into effect and was followed by a vigorous enforcement.

VINEGAR

Of products belonging to this class, 206 were examined during 1911, while the same period witnessed the termination of 38 cases instituted for adulteration. In most of these cases the offense consisted either in the watering of cider vinegar, or in the sale, under the name of cider vinegar, of imitation products made by the addition of either apple solids, or artificial color, or both. The difficulty in the precise determination of the nature of spurious vinegars by analytical methods is very great, and consequently, the number of determinations required upon each sample is unusually large. There has been less difficulty, however, than in earlier years in securing convictions where the facts of the analysis are fully brought forth in the trial proceedings. The important fraction of spurious cider vinegar still appearing upon the markets, renders necessary the highest vigilance of the Bureau's agents and experts.

BAKERY MATERIALS

There were examined during 1911, 41 samples of flours, corn starch, etc. During the same period there were terminated 3 cases for the adulteration of buckwheat flour and 4 cases for the adulteration of wheat flour by the bleaching process, as well as 11 cases in which the charge was the adulteration of baking powder, the cases last named having originated in 1910. The public still needs to be on its guard against the purchase of bleached flour, although the number of cases found at the present time is much less than occurred in earlier years.

FLAVORING EXTRACTS

Twenty-three samples of flavoring extracts and essences were examined, but no cases relating to these products were terminated during the year. The presence on the market of numerous brands of compound and modified products of this class is still very manifest, but the labeling of these inferior products has been brought more largely into conformity with the requirements of the law, so that the consumer who reads the label carefully should not be deceived as to the nature of the package contents.

BAKERY PRODUCTS

Seventy-five samples of bread, cakes, pies and puddings were examined by the Bureau chemists during the last year. The chief points in the examination related to the presence or absence in these products of eggs, egg substitutes, preservatives and artificial coloring. During the same period there were terminated 9 cases, brought because of the presence in cakes of artificial coloring matter, so used as to indicate the presence of eggs in large quantity when, as a matter of fact, they were either entirely absent or were in abnormally low proportion.

BREAKFAST FOODS

Owing to the discovery in earlier years of too frequent cases in which the stocks of these products appearing in the fall on the shelves of the retailer exhibited evidences of the attack of insects during the warmer months, a careful examination of these products was made during the fall months of 1911, after the warning notice, mentioned in the preliminary part of this report, had been given to the trade. Twenty-five samples of these foods were purchased, the agents limiting themselves to the purchase of packages whose appearance led to the supposition that there might be something wrong with the contents, and where there was no evidence that the retailer had, himself, thoroughly examined his stock of these goods, so as to eliminate from them undesirable materials. Only a single case, however, was terminated during the year, because of the sale of a breakfast food which had been invaded by insects. This indicates a very fair condition of the retail stocks after they had been sorted by the retailers, with the rejection of suspicious packages.

CANDY

During the past year a very large amount of work has been done upon the candy sold in the State, the total number of samples examined having been 612, representing a very great variety of materials, more especially of those cheaper grades, the so-called "penny goods," such as are sold to school children. Prof. Charles A. LaWall has prepared a bulletin (No. 216) setting forth the facts obtained in this examination. Examinations made a few years ago showed that many such candies contained, at that time, sulphur dioxide, introduced in part with the glucose used as an ingredient, and also in commercial preparations sold as stiffeners or hardeners, made largely from sulphites. The present examination of these products shows a greatly improved condition with respect to this adulterant. There were terminated during the year 6 cases in which the charge was

the presence of sulphites in candied fruits, largely imported products which had been treated, like many of our western dried fruits, with sulphur gas for bleaching purposes. It is very doubtful whether, at the present time, there is any sulphurous acid introduced into candies by the glucose used in their manufacture, because of the improvement made in the manufacture of this confectionery ingredient, whereby the use of sulphites has been practically cut out.

It ought, possibly, to be added in this connection, that the conditions under which candies are kept for sale to children by small retailers have often been found to be very far from cleanly. Under the present forms of legislation it is, however, very difficult to draw clean cut lines, such as will appear to the court and jury as fairly drawn. Under present conditions, much of the burden of protecting their children from the purchase of candies kept under such conditions, must continue to be borne by the parents.

It is also worth mention that in a number of cases where goods purported to be made from, or to contain, licorice, no evidence of the presence of this ingredient could be discovered, but that a somewhat similar flavor was introduced by the use of oil of anise, while the color effect of licorice was imitated by the addition of lamp black, or some other finely divided form of carbon. The formerly quite common practice of using iron oxide as a substitute for chocolate, to impart a brown color to cheap chocolate fudge, seems to have disappeared entirely.

One undesirable practice, however, remains quite prominent, namely, the use of shellac and other resinous glazes as coating for certain classes of fudges, caramels, burnt almonds, burnt peanuts and candy easter eggs. Cases brought under the general food law against the vendors of such candies are now in process of judicial determination.

HONEY AND SYRUPS

There were examined during the year 188 samples of honey, syrups, molasses, etc. Of these, maple syrups formed quite a large fraction. Their examination revealed very few cases of pronounced adulteration. The major portion of the syrups appearing on the market with the name "maple" upon their labels, are branded and sold as "maple and cane," or "cane and maple syrups." The findings of the chemist who examined the most of these samples, Dr. William Frear, of State College, has appeared in the form of a bulletin (No. 224), so that further details concerning the character of the goods examined will be omitted.

NON-ALCOHOLIC DRINKS

Of goods belonging to this class, 288 samples were examined during the past year. The same period witnessed the termination of 83 cases brought for adulteration of these preparations. A portion of these cases terminated were begun in 1910, and in 63, that is in about three-fourths of these cases, the adulteration consisted in the substitution of saccharin for sugar, although there occurred a number of cases of misbranding, and 5 cases in which the addition of capsicum to ginger ale, without declaration of its presence on the label, was involved. In fairness to the bottling trade, it ought

to be said that the major portion of the cases of violation discovered during 1911, were found in portions of the State not fully covered by the agents during the sampling period of 1910. The general attitude of the trade has been highly favorable to the rejection of the undesirable ingredient, saccharin, and the trade as a whole should have due credit for its attitude of obedience to the law.

NUTS

Twenty-two samples of nuts were examined in 1911, and during the same period a like number of cases was terminated for the sale of nuts unfit for food. Most of the cases terminated were begun in 1910.

MISCELLANEOUS PRODUCTS

In addition to the materials named under the foregoing classifications, 137 samples, representing a great variety of products, were analyzed by the Bureau's chemists during the past year, especially including such materials as chocolate, cocoa, shredded cocoanut, coffee and tea, and spices. Very few of these materials were found to be adulterated. A number of cases were terminated during the year affecting goods classified as miscellaneous. One case involved egg noodles colored with saffron in place of eggs; 3 cases involved the sale of rotten fruit and vegetables. The general condition, however, of goods belonging to this class was found to be such as not to call for the institution of prosecutions, and mention should be made in particular of the freedom of spices from the forms of adulteration which so conspicuously marked this class of products a few years ago.

FINANCIAL STATEMENT

The financial statement appended hereto shows receipts during the year 1911 amounting to $120,903.48, and expenditures for the corresponding period of $83,083.15. The very large excess of receipts over expenditures needs little comment. It shows, however, that there is no compelling reason for failing to give to the work of this Bureau the full measure of financial support which its efficiency requires.

CONCLUSION

In the performance of the large volume of work described in the foregoing paragraphs, the Commissioner has been greatly indebted for encouragement and advice given by the Governor of the Commonwealth, Hon. John K. Tener, and the Secretary of Agriculture, Hon. N. B. Critchfield. He desires to acknowledge also the hearty cooperation given to him by the Attorney General's Department, and to express his appreciation of the efficient and loyal assistance of the special agents, the chemists, special counsel and office force of the Bureau.

JAMES FOUST,

Dairy and Food Commissioner.

APPENDIX

SUMMARY

The following gives a list of articles analyzed by Chemists of this Bureau during the year 1911:

Article	Number Analyzed
DAIRY PRODUCTS:	
Butter,	260
Cheese,	17
Cream,	1,038
Milk, butter,	3
Milk, condensed,	4
Milk, evaporated,	7
Milk, skimmed,	116
Milk,	3,512
	4,957
OLEOMARGARINE,	113
EGGS (dried, fluid and in shell),	95
BAKING POWDER, BAKING SODA, CORNSTARCH, CORNMEAL AND FLOUR:	
Baking powder,	1
Baking soda,	1
Cornmeal,	1
Cornstarch,	3
Flour, buckwheat,	14
Flour, wheat,	20
Flour (buckwheat and wheat flour compound),	1
	41
BREAD, CAKES, PIES AND PUDDINGS:	
Bread,	3
Cakes, Drop,	1
Cake, Fig,	1
Cake, Frosted,	1
Cake, Fruit,	1
Cake, Golden,	1
Cake, Icing,	1
Cake, Jelly Roll,	4
Cake (no name given),	12
Cake, Nut,	1
Cake, Pound,	3
Cakes, Small,	1
Cake, Sponge,	24
Cake, Strawberry Roll,	1
Cake, Wine,	1
Champagne Wafers,	1
Charlotte Russe,	1
Chocolate Eclairs,	1
Cream Puffs,	1
Pie, Apricot,	1
Pie, Custard,	1
Pie, Egg Custard,	2
Pie, Lemon,	2
Pudding, Chocolate Fruit,	1
Pudding, Plum,	2
Pudding, Quick,	1
Fruit Puddine,	2
Gelatin,	2
Tapioca,	1
	75

SUMMARY—Continued

Article	Number Analyzed
BREAKFAST FOODS:	
Cornflakes,	3
Cream of Wheat,	1
Jersey Cornflakes,	1
Mother's Oats,	2
Mother's Crushed Oats,	2
Post Toasties,	1
Quaker Oats,	4
Ralston's Breakfast Food,	5
Rolled Oats,	2
Shredded Wheat,	1
Toasted Cornflakes,	3
	25
CANNED FRUITS AND VEGETABLES:	
Apricots,	1
Blackberries,	1
Cherries,	4
Cherries, Creme de Menthe,	1
Cherries, Maraschino,	25
Corn,	7
Currants,	2
Mince meat,	48
Mixed fruits,	1
Mushrooms,	14
Olives,	4
Peaches,	1
Pears,	1
Peas,	15
Peas, French,	2
Pickles, cucumber,	2
Pickles, sweet,	2
Pineapples,	1
Pineapple juice,	1
Pumpkin,	1
Tomatoes,	8
	142
CATSUPS, OILS, SALAD DRESSING, SAUCES, ETC.:	
Casup (no name given),	82
Catsup, Pomona,	1
Catsup, Tomato,	175
Horseradish, Ground,	2
Horseradish and Beets,	2
Oil, Olive,	11
Oil, Salad,	1
Oil, Snowdrift,	1
Salad dressing,	1
Sauce, Celery,	1
Sauce, Challenge,	1
Sauce, Chili,	6
Sauce, Longfield's,	1
Sauce, Mint,	1
Sauce, Tomato,	2
Sauce, Worcestershire,	1
	289
CONFECTIONERY:	
Assorted Candy Drops,	1
Burnt Almonds,	9
Burnt Peanuts,	8
Butterscotch,	2
Candied Apricots,	5
Candied Cherries,	6
Candied Figs,	1
Candied Fruit (no name given),	7
Candied Ginger,	1

SUMMARY—Continued

Article	Number Analyzed
CONFECTIONERY—Continued.	
Candied Pears,	1
Candied Pineapples,	2
Candy Almonds,	6
Candy Babies,	1
Candy Bags,	1
Candy Balls,	2
Candy Bananas,	8
Candy Bars,	1
Candy Beads,	1
Candy Beans,	2
Candy Berries,	2
Candy Bonbons,	1
Candy Boston Baked Beans,	1
Candy Butter Corn,	1
Candy Cakes,	1
Candy Carrots,	1
Candy Cherries,	2
Candy Cigarettes,	1
Candy Cones,	1
Candy Dogs,	1
Candy Eggs,	11
Candy Fish,	1
Candy Fudge,	77
Candy Kisses,	12
Candy Loaf,	2
Candy Marbles,	2
Candy (no name given),	6
Candy Oranges,	1
Candy Pans,	2
Candy Peaches,	1
Candy Pears,	1
Candy Peaches and Pears,	1
Candy Pies,	1
Candy Plates,	1
Candy Potatoes,	1
Candy Rabbits,	1
Candy Sandwiches,	1
Candy Shortcake,	2
Candy Strawberries,	1
Candy Whistles,	1
Chewing Candy,	2
Chocolate Babies,	2
Chocolate Balls,	1
Chocolate Bars,	3
Chocolate Bonbons,	2
Chocolate Brownies,	1
Chocolate Candy,	4
Chocolate Caramels,	3
Chocolate Chickens,	1
Chocolate Chips,	1
Chocolate Cigars,	2
Chocolate Cigarettes,	2
Chocolate Caramel Rolls,	1
Chocolate Creams,	4
Chocolate Creams with nuts,	1
Chocolate Cream Eggs,	7
Chocolate Coated Cherries,	6
Chocolate Coated Maraschino Cherries,	15
Chocolate Coated Eggs,	2
Chocolate Discs,	1
Chocolate Dogs,	1
Chocolate Drops,	5
Chocolate Fish,	1
Chocolate Fudge,	21
Chocolate Marshmallows,	2
Chocolate Mints,	2
Chocolate Neptunes,	1
Chocolate Pipes,	1
Chocolate Rabbits,	4
Chocolate Slabs,	3
Chocolate Sticks,	1
Chocolate Taffy,	2
Chocolate Wafers,	1
Cinnamon Drops,	1

SUMMARY—Continued

Article	Number Analyzed
CONFECTIONERY—Continued.	
Clear Gum Drops,	1
Clear Toys,	1
Cocoa Bonbons,	1
Cocoa Cuts,	1
Cocoanut Balls,	1
Cocoanut Bars,	2
Cocoanut Bars, roasted,	1
Cocoanut Blocks,	1
Cocoanut Candy,	5
Cocoanut Caramels,	6
Cocoanut Cubes,	1
Cocoanut Kisses,	1
Cocoanut Marshmallows,	1
Cocoanut Peaches,	1
Cocoanut Sticks,	1
Coffee Chocolates,	1
Colonial Drops,	1
Creams,	1
Cream Balls,	1
Cream Caramels,	2
Cream Eggs,	1
Cream Fudge,	1
Cream Taffy,	1
Custard Fudge,	1
Date Balls,	1
Glace Apricots,	6
Glace Fruits, assorted,	14
Glace Ginger and Apricots,	1
Glace Limes and Plums,	1
Glace Pears,	1
Gum Drops,	3
Ice Paste Candy,	1
Ice Cream Cocoanut Bonbons,	1
Jelly Beans,	7
Jelly Eggs,	47
Licorice Babies,	1
Licorice Beans,	1
Licorice Cigarettes,	1
Licorice Drops,	2
Licorice Gum,	1
Licorice Sticks,	6
Licorice Strips,	3
Licorice, Sugar coated,	1
Licorice Tubes,	1
Lime Drops,	4
Lemon Cocoanut,	1
Lulu Bars with chocolate,	1
Maple Kisses,	1
Marshmallows,	26
Marshmallow Babies,	2
Marshmallow Bananas,	6
Marshmallow Bars,	1
Marshmallow Biscuits,	1
Marshmallow Blocks,	1
Marshmallow Blocks, Chocolate coated,	1
Marshmallow Chicks,	1
Marshmallow Cones,	1
Marshmallow Eggs, colored,	1
Marshmallow Fish,	2
Marshmallow Fruit,	2
Marshmallow Pears,	1
Marshmallow Rabbits,	1
Marshmallow Rolls,	2
Marshmallow Revolvers,	1
Marshmallow Sandwiches,	1
Marshmallow Shortcake,	1
Marshmallow Slabs,	3
Marshmallow Squares with nuts, Chocolate coated,	1
Marshmallow Strawberries,	1
Marshmallow, Toasted,	1
Mint Drops,	1
Mint Lozenges,	1
Mint Sticks,	1
Mixed Candy,	18
Molasses Blocks,	1

SUMMARY—Continued

Article	Number Analyzed
CONFECTIONERY—Continued:	
Molasses Candy, Chocolate coated,	1
Molasses Candy Popcorn,	1
Nougats,	2
Nut Fudge,	3
Orange Bars,	1
Orange Blocks,	1
Orange Candy,	4
Paraffin Chewing Gum,	1
Peanut Bars,	1
Peanut Bars, Chocolate coated,	2
Peanut Blocks,	1
Peanut Candy,	2
Peanut Candy, Chocolate coated,	1
Pecan Fudge,	1
Prize Bag,	1
Prize Box,	2
Prize Candy,	2
Prize Package,	2
Raspberry Candy,	1
Raspberry Drops,	2
Red Candy,	1
Red Candy Beans,	1
Red Candy Blocks,	1
Ribbin Candy,	1
Roasted Almonds,	1
Salt Water Taffy,	1
Sour Balls,	2
Stick Candy,	2
Strawberry Candy,	5
Strawberry Rolls,	1
Suckers,	13
Sugar Cakes,	1
Sugar Peanuts,	1
Taffy,	1
Taffy on Stick,	1
Taffy and Licorice,	1
"Tri-Sum,"	1
Toasted Cherries,	1
Vanilla Fudge,	10
Walnut Creams,	1
Zebra Fudge,	1
	612
DRIED FRUITS AND VEGETABLES:	
Apricots,	3
Corn,	1
Peaches,	3
Peas,	5
Raisins,	4
	16
FLAVORING ESSENCES AND EXTRACTS:	
Essence, Lemon,	1
Extract, Almond,	3
Extract, Lemon,	4
Extract, Orange,	3
Extract, Vanilla,	12
	23
FRUIT BUTTERS, JAMS, JELLIES AND PRESERVES:	
Butter, Apple,	10
Butter, Corn syrup, Apple and Sugar,	1
Butter, Peach,	2
Butter, Peanut,	9
Butter, Sugar,	2
Jam, Cherry,	1
Jam, Compound,	1
Jam (no name given),	5
Jam, Peach,	1

SUMMARY—Continued

Article	Number Analyzed
JAMS, ETC.—Continued:	
Jam, Raspberry,	1
Jam, Strawberry,	1
Jelly, Apple,	18
Jelly, Apple and Elderberry,	1
Jelly, Apple and Lemon,	1
Jelly, Apple and Red Raspberry,	1
Jelly, Chocolate and Sugar,	1
Jelly, Currant,	1
Jelly, Grape,	1
Jelly, imitation fruit,	2
Jelly (no name given),	4
Jelly, Raspberry,	1
Jelly, Strawberry,	1
Marmalade,	2
Preserves, Compound,	2
Preserves, Peach,	1
Preserves, Pineapple,	1
Preserves, Plum,	1
	73
FRUIT SYRUPS:	
Blackberry,	1
Orange,	1
Raspberry,	2
Strawberry,	1
	5
HONEY AND SYRUPS:	
Honey (in comb and extracted),	10
Honey and Glucose,	1
Molasses,	3
Syrup, cane and maple,	12
Syrup, Corn,	3
Syrup, Golden,	1
Syrup, Maple,	25
Syrup (no name given),	124
Syrup, Rock Candy and Maple,	2
Syrup, table,	4
Syrup, White Flake,	1
Syrup, White Sugar,	2
	188
ICE CREAMS:	
Ice Cream, Caramel,	2
Ice Cream, Cherry,	1
Ice Cream, Chocolate,	24
Ice Cream, Lemon,	1
Ice Cream, Maple,	2
Ice Cream (no flavor given),	45
Ice Cream, Peach,	3
Ice Cream, Strawberry,	23
Ice Cream, Vanilla,	105
Frozen Cherries,	1
Ice Balls,	1
	208
LARD:	
Lard,	72
Lard, compound,	25
Lard, substitute,	1
	98
FISH—CANNED AND FRESH:	
Bloaters,	1
Clams, soft shelled,	1
Codfish,	9

SUMMARY—Continued

Article	Number Analyzed
FISH—Continued:	
Codfish, boneless,	1
Codfish Cakes,	1
Codfish, shredded,	1
Fish (no name given),	25
Fish Flakes,	2
German Carp,	2
Herring,	5
Herring, kippered,	2
Oysters, canned,	16
Oysters, fresh,	80
Perch,	1
Salmon, canned,	4
Sardines,	7
Smoked Fish (no name given),	1
White Fish, smoked,	11
	169
MEATS—CANNED AND FRESH:	
Bacon, fresh,	1
Bacon, sliced, canned,	1
Beef Steak, Fresh,	1
Chicken, fresh,	1
Corned Beef,	3
Cottage Beef, canned,	1
Dried Chipped Beef, canned,	2
Fat Meat, fresh,	1
Hamburger Steak, fresh,	36
Minced Ham, canned,	10
Pork and Beans, canned,	2
Potted Ham,	1
Potted Meat, ham flavor,	12
Potted Meat (no flavor given),	4
Tripe,	1
	77
SAUSAGE:	
Sausage, Beef,	1
Sausage, Bologna,	60
Sausage, Frankfurters,	35
Sausage, Fresh Pork,	96
Sausage, Fresh Pork and Beef,	26
Sausage, Fresh Pork and Veal,	1
Sausage, German Style,	2
Sausage, Ham,	1
Sausage, Holstein,	1
"Knacht-Wurst,"	1
"Liver Pudding,"	2
"Liverwurst,"	2
Sausage, Luncheon,	6
Sausage, "Morinella,"	2
Sausage, Fresh (no name given),	52
Sausage, Polish,	5
Sausage, Potted,	1
Sausage, Smoked,	5
Sausage, Vienna style,	33
Sausage, Wiener,	7
	339
NON-ALCOHOLIC DRINKS:	
Birch Beer,	26
Cherry Cheer,	2
Cherrysip,	1
Cherry Smash,	3
Cider, Crabapple,	1
Cider, Grape,	1
Cider, Orange,	4
Cider, Sweet,	7
Coco Cola,	3

SUMMARY—Continued

Article	Number Analyzed
NON-ALCOHOLIC DRINKS—Continued:	
Cream Sour,	1
Eaglo,	1
Ginger Ale,	29
Ginger Beer,	1
Lekvar,	1
Lemon Sour,	5
Lime Juice,	2
Liquid Force,	1
Malthop,	2
Nectar,	1
Orangeade,	3
Orcherade,	1
Peach Blow,	1
Phosphate, Cherry,	1
Phosphate, Orange,	1
Plezol Drink,	1
Pop, Black,	7
Pop, Brown,	3
Pop, Lemon,	1
Pop (no flavor given),	2
Pop, Orange,	1
Pop, Pineapple,	1
Pop, Raspberry,	3
Pop, Red,	1
Pop, Strawberry,	25
Pop, Teaberry,	1
Pop, White,	10
Root Beer,	24
"San Clara,"	1
Sarsaparilla,	5
Soda, Cherry,	2
Soda, Cream,	8
Soda, Lemon,	10
Soda (no flavor given),	35
Soda, Orange,	3
Soda, Raspberry,	5
Soda, Strawberry,	31
Soda, Vanilla,	5
Strawberry Ade,	1
Summer Drink (Orange Flavor),	1
Swankey,	1
Temperance Brew,	1
	288
NUTS:	
Brazil Nuts,	1
Chestnuts,	4
Cream Nuts,	2
English Walnuts,	10
Mixed Nuts,	5
	22
SOUPS:	
Soup, Chicken,	1
Soup, Tomato,	1
	2
VINEGAR:	
Vinegar, Amber,	1
Vinegar, Apple,	12
Vinegar, Cider,	155
Vinegar, Distilled,	2
Vinegar, Distilled White,	12
Vinegar, Malt,	1
Vinegar (no name given),	12
Vinegar, Syrup,	1
Vinegar, White,	9
Vinegar, White Wine,	1
	206

SUMMARY—Continued

Articles	Number Analyzed
MISCELLANEOUS PRODUCTS:	
Ambrew,	1
Apples,	1
Bromangelon,	1
Butter Color,	1
Celery,	1
Chocolate,	5
Chocolate Compound,	1
Cinnamon, ground,	1
Citron,	1
Cloves, ground,	2
Cocoa,	4
Cocoanut in shell,	2
Cocoanut, shredded,	6
Coffee,	5
Coffee, ground,	1
Coffee, prepared,	1
Coffee and Cereal Filler,	1
Coffee, Essence of,	1
Cornflavor,	1
Egg Noodles,	4
Egg Powder,	1
Egg Substitute,	1
Fig Newton,	1
Formaldehyde,	1
Frou Frou,	1
Ginger,	2
Hominy,	1
Hominy, granulated,	3
Hominy Grits,	2
Ice Cream Powder,	1
Ice Cream Cones,	3
Italian Cream,	4
Jellyeon,	1
Jersey Creme Syrup,	1
"Kar-Eal" for Coffee,	1
"Kitchen Bouquet,"	1
Macaroni,	1
Maple Sugar,	4
Maroons in Syrup,	1
Mincemeat Cider,	1
Mustard, ground,	1
Mustard, prepared,	12
Nutmegs, ground,	1
Nutmegs, whole,	5
Onions,	1
Oranges,	2
Paprika,	1
Paraffin,	1
Pepper, Black, ground,	13
Pepper, Red, ground,	2
Pepper, White, ground,	1
Pickled Pigs Feet,	1
Pickled Tripe,	3
Pie Preparation,	1
Pigs Feet Jelly,	1
Pot Pie Crust,	1
Raspberry Cuplets,	1
Rice, Coated,	1
Rice, not coated,	2
Roasted Almonds,	1
Sauer-Kraut,	1
"Seasonine,"	1
Spaghetti,	1
Strawberry Flavor, arificial,	1
Sugar Color,	1
Tea,	1
Tea, Green,	3
Tumeric,	3
	137

SUMMARY—Continued

Article	Number Analyzed
RECAPITULATION:	
Butter,	260
Cheese,	17
Cream,	1,038
Milk,	3,642
Oleomargarine,	113
Eggs,	95
Fruit Syrup,	5
Ice Cream,	208
Lard,	98
Non-Alcoholic Drinks,	288
Sausage,	339
Vinegar,	206
Food,	1,891
Total,	8,200

CASES TERMINATED

THE FOLLOWING TABLE GIVES A LIST OF ARTICLES ANALYZED BY CHEMISTS AND FOUND TO BE IN VIOLATION OF THE FOOD LAWS, AND THE NUMBER OF SAMPLES OF EACH PRODUCT ON WHICH PROSECUTIONS WERE BASED AND TERMINATED

EGG ACT, 1909. IN VIOLATION OF

Eggs unfit for food, having in possession,	1
Eggs unfit for food, in possession of establishment where food products are manufactured,	1
Eggs, bad, preparing to use in bakery,	1
Eggs, bad, selling,	1
Eggs, rotten, selling,	1
Eggs, rotten, selling as fresh,	1
Eggs unfit for food, selling,	25

FOOD ACT, 1907. IN VIOLATION OF

Beef, extract of, misbranded,	4
Milk, skimmed and watered, selling,	1
Milk, adulterated, selling,	1

FOOD ACT, 1909. IN VIOLATION OF

Apple Jelly, misbranded,	1
Apricots, candied, adulterated,	1
Apricots, candied, containing sulphites,	1
Apricots, dried, preserved with sulphur dioxide. Not declared on package,	1
Baking Powder, adulterated,	11
Bologna, adulterated,	7
Breakfast Food, unfit for food; contains weevil,	7
Buckwheat Flour, misbranded,	1
Buckwheat Flour, containing wheat flour,	2

Burnt Almonds, varnished with resinous coating, ... 1
Butter, containing an excessive amount of moisture, ... 1
Cake, colored, ... 2
Cake, dirty, and containing artificial color, ... 1
Candy Eggs, containing talc, ... 1
Candied Figs, containing sulphites, ... 1
Candy Suckers, containing sulphur dioxide, ... 1
Canned Corn, unwholesome, ... 1
Catsup, adulterated, ... 6
Catsup, consisting of a highly decomposed and putrid vegetable matter, ... 1
Catsup, containing an excessive amount of benzoic acid, ... 4
Catsup, containing an excessive amount of benzoate of soda, 8
Catsup, made from decomposed vegetable substance, ... 1
Catsup, made from filthy and decomposed substance, ... 1
Catsup, made from filthy and decomposed substance and containing an excessive amount of benzoate of soda, ... 1
Chestnuts, filthy and decomposed, ... 2
Chestnuts, unfit for food, ... 2
Chicken, unwholesome, ... 1
Chili Sauce, adulterated, ... 1
Chili Sauce, containing an excessive amount of benzoate of soda, ... 1
Cream Nuts, filthy, decayed and unwholesome, ... 2
Cream Nuts, unfit for human consumption, ... 1
Egg Noodles, colored with saffron, ... 1
English Walnuts, unfit for food, ... 5
English Walnuts, decayed and filthy, ... 1
English Walnuts, unfit for food, ... 1
Fish, containing coal tar color, ... 4
Fish, decomposed, ... 1
Fish, unfit for food, ... 1
Fish, unfit for food, keeping and selling, ... 11
Fish, unwholesome, ... 6
Flour, bleached, containing nitrites, ... 2
Flour, bleached with nitrous oxide, ... 2
Frankfurters, adulterated, ... 1
Fudge, coated with a resinous glaze, ... 1
Glace Fruit, containing sulphites, ... 2
Jelly Beans, coated with mineral substance, ... 1
Jelly Eggs, coated with talc, ... 8
Jelly Foaming, deleterious food product, ... 1
Jelly Roll Cake, containing coal tar dye, ... 1
Ketchup, adulterated, ... 1
Maraschino Cherries, containing coal tar dye, benzoic acid, sulphurous acid, ... 1
Maraschino Cherries, containing coal tar dye and sulphur dioxide, ... 1
Maraschino Cherries, containing sulphurous acid, ... 1
Maraschino Cherries, containing sulphur dioxide or compound thereof, ... 1
Maraschino Cherries, preserved and colored, ... 1
Meat, diseased, ... 1

Mince Meat, adulterated, ... 2
Mince Meat, containing benzoates; not declared on label, .. 2
Mince Meat, containing benzoic acid, or compound thereof, and not declared on label, ... 3
Mince Meat, misbranded, ... 1
Mince Meat, selling under the distinctive name of another article. Contained no meat, ... 1
Mushrooms, adulterated, ... 1
Mushrooms, containing sulphur dioxide, ... 1
Nuts, unfit for food, ... 7
Olive Oil, adulterated, ... 1
Onions, decomposed, ... 1
Oranges, decomposed, ... 1
Oranges and Apples, decomposed, ... 1
Oysters, adulterated, ... 7
Oysters, containing added water, ... 8
Peas, containing compounds of copper, ... 1
Pickles, adulterated, ... 5
Pickles, decomposed, ... 1
Pork Sausage, adulterated, ... 1
Saur Kraut, decomposed, ... 1
Sausage, adulterated, ... 8
Sausage, fresh, adulterated, ... 4
Sausage, containing added starch, ... 1
Sausage, containing starch and water, ... 1
Sausage, fresh, containing added starch, ... 1
Sponge Cake, containing artificial color, ... 4
Strawberry Roll Cake, containing coal tar color, ... 1
Tea Buns, containing coal tar color, ... 1
Tomato Catsup, adulterated, ... 8
Tomato Catsup, containing an excessive amount of benzoic acid or compound thereof, ... 8
Tomato Catsup, containing an excessive amount of sodium benzoate, ... 4
Walnuts, unfit for human food, ... 2

FRUIT SYRUP ACT, 1905. IN VIOLATION OF

Strawberry syrup, adulterated, ... 1

ICE CREAM ACT, 1909. IN VIOLATION OF

Ice Cream, below standard for butter fat, ... 16
Ice Cream, adulterated, ... 1
Ice Cream, Chocolate, low in fat, ... 4
Ice Cream, Lemon, low in fat, ... 1
Ice Cream, Strawberry, artificially colored and flavored, ... 1
Ice Cream, Strawberry, low in fat, ... 2
Ice Cream, Vanilla, low in fat, ... 5

LARD ACT, 1909. IN VIOLATION OF

Lard, containing beef stearin, ... 4
Lard, adulterated, ... 2
Lard, adulterated and not branded, ... 3
Lard, composed largely of cottonseed oil and, ... 1

Lard, compound, not branded and containing less than 50 per cent. lard, ... 1
Lard, adulterated and decomposed, ... 1
Lard compound; containing no swine fat, ... 1

FRESH MEAT ACT, 1905. IN VIOLATION OF

Hamburger Steak, containing sulphites, ... 3

MILK ACT, 1901. IN VIOLATION OF

Milk, containing formaldehyde, ... 7
Cream, containing formaldehyde, ... 1

MILK ACT, 1909. IN VIOLATION OF

Cream, below standard for butter fat, ... 20
Milk, containing added water, ... 17
Milk, below standard for butter fat, ... 14
Milk, below standard for butter fat; skimmed, ... 3
Milk, skimmed, ... 4
Skimmed Milk, for milk, ... 1

MILK ACT, 1911. IN VIOLATION OF

Cream, below standard for butter fat, ... 130
Milk, containing added water, ... 3
Milk, below standard for butter fat, ... 108
Milk, below standard for butter fat; skimmed, ... 5
Milk, below standard for butter fat; watered, ... 14
Milk, below standard for butter fat; skimmed and watered, .. 1
Milk, below standard for butter fat and solids, ... 134
Milk below standard for butter fat and solids; skimmed, ... 42
Milk, below standard for butter fat and solids; watered, ... 12
Milk, below standard for solids; watered, ... 1
Milk, skimmed and watered, ... 1
Skimmed Milk, containing added water, ... 3

NON-ALCOHOLIC DRINK ACT, 1909. IN VIOLATION OF

Birch Beer, containing saccharin, ... 4
Cream Soda, containing saccharin, ... 1
Ginger Ale, containing capsicum, ... 4
Ginger Ale, containing saccharin, ... 2
Ginger Ale, containing saccharin and capsicum, ... 1
Iron Brew, misbranded, ... 1
Lemon Sour Pop, adulterated, ... 2
Orange Cider, containing saccharin, ... 1
Orange Cider, misbranded, ... 1
Orange Soda, containing saccharin, ... 1
Peach Blow Pop, adulterated, ... 1
Root Beer, adulterated, ... 1
Root Beer, containing saccharin, ... 7
Sarsaparilla Pop, adulterated, ... 1
Soda Water, artificially flavored, ... 1
Soda Water, containing saccharin, ... 44
Strawberry Ade, misbranded, ... 1

Strawberry Pop, adulterated,	2
Strawberry Pop, artificially colored and flavored,	5
Strawberry Pop, containing saccharin,	1
Strawberry Soda, adulterated,	1

OLEOMARGARINE ACT, 1901. IN VIOLATION OF

Oleomargarine, at wholesale without a license,	3
Oleomargarine, colored,	14
Oleomargarine, colored; with meal,	3
Oleomargarine, colored and no license,	4
Oleomargarine, colored and not stamped,	1
Oleomargarine, as and for butter and without a license,	3
Oleomargarine, as and for butter,	10
Oleomargarine, without a license,	12
Oleomargarine, with meal; no license,	10
Oleomargarine, in imitation of yellow butter,	2
Oleomargarine, from bread wagon on streets,	1

SAUSAGE ACT, 1911. IN VIOLATION OF

Bologna Sausage, adulterated,	1
Bologna Sausage, containing vegetable flour,	5
Frankfurter Sausage, containing coal tar dye and added water,	2
Frankfurter Sausage, containing vegetable flour,	1
Fresh Pork Sausage, containing vegetable flour,	1
Luncheon Sausage, containing vegetable flour and added water,	1
Sausage, containing vegetable flour,	1
Sausage, containing vegetable flour and added water,	5
Vienna Style Sausage, containing added cereal and water,	1
Vienna Style Sausage, containing vegetable flour and added water,	7
Vienna Style Sausage, containing vegetable flour,	2

VINEGAR ACT, 1901. IN VIOLATION OF

Cider Vinegar, adulterated,	12
Vinegar, colored,	1
Vinegar, distilled, deficient in acid,	2
Vinegar, distilled, for cider vinegar,	4
Vinegar, distilled, colored, for cider vinegar,	5
Vinegar, imitation cider,	4
Vinegar, watered,	4
Vinegar, containing caramel and distilled liquor, as cider vinegar,	1
Vinegar, imitation, low in solids and ash, for cider vinegar,	1
Vinegar, white distilled, adulterated,	1
Vinegar, white wine, adulterated,	1
Total cases terminated,	1,029

FINANCIAL STATEMENT

RECEIPTS AND EXPENDITURES OF THE DAIRY AND FOOD BUREAU FOR THE YEAR 1911

RECEIPTS

Covering oleomargarine license fees, renovated butter license fees, pure food, milk, vinegar, oleomargarine, egg, meat, non-alcoholic drink, sausage, ice cream and lard fines, $120,993.48.

EXPENDITURES

Covering special agents' salaries and expenses, chemists and laboratory salaries and expenses, attorneys, detectives and assistants salaries, fees and expenses, and clerical and stenographers' salaries, $83,083.15.

REPORT OF THE STATE VETERINARIAN

Harrisburg, Pa., *March 25, 1912.*

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

Dear Sir: As Secretary of the State Livestock Sanitary Board and State Veterinarian, I have the honor to submit this, my first annual report, for the year 1911.

Dr. S. H. Gilliland, my predecessor, was compelled by pressure of other duties to sever his connection with the Board in December, 1910. His resignation was accepted by Governor Edwin S. Stuart. My appointment as State Veterinarian was received from Governor John K. Tener, February 1, 1911. Dr. T. E. Munce was re-appointed Deputy State Veterinarian, and subsequently elected as Assistant Secretary of the Board.

Practically no changes were made in the personnel of the office force. The plans and policies of the Board, which were so well planned and followed by my predecessors have been changed as little as possible. The routine work is increasing each year and new responsibilities have been assumed until it has become necessary to divide the work into Divisions with a capable, responsible person in charge of each one. The Divisions and those in charge are as follows:

1. Meat Hygiene: Dr. T. E. Munce, Acting Director.
2. Horse Breeding and Practical Farm Work: Dr. Carl W. Gay, Director.
3. Contagious and Infectious Diseases: Dr. R. M. Staley, Director.
4. Laboratory and Research Work on State Farm: Dr. K. F. Meyer, Director.
5. Milk Hygiene and Tuberculin Testing: Dr. W. S. Gimper, Director.
6. Auditing: Miss Mary C. Butterworth, Clerk.

There were two appointments made during the year to fill vacancies on the Meat Hygiene force. Dr. T. E. Munce, one of the ten original agents, was subsequently appointed by Governor Edwin S. Stuart as Deputy State Veterinarian. Dr. Charles S. Gelbert, of Scranton, and Dr. M. P. Hendrick, of Meadville, were appointed to fill the positions formerly held by Doctors T. E. Munce and C. C. McLean. Dr. P. K. Jones resigned from this Service and was put in charge of a sub-office of the Board at Pittsburg. His duties there are principally to supervise tuberculin test on interstate cattle and to look after contagious and infectious diseases in animals at that point.

Dr. Joseph Johnson, who formerly had charge of the State Farm, was transferred to Lancaster to look after the interests of the Board at that point. Pittsburg and Lancaster are the two principal places to which cattle are shipped from other states. It has been found advisable to keep an agent in each of these cities.

The following reports were received from the Director of each Division:

MEAT HYGIENE

Sir: I have the honor to transmit the report of the Meat Hygiene Service. This Division was reorganized early in the year. The State was redistricted and each agent given a definite territory which was outlined by counties, and the agent largely confined his activities to the district assigned him. In a few instances it was found advisable to have one agent go into another district for a time to assist in maintaining continuous inspection in the larger centers of slaughter. Continuous inspection was maintained usually for a week at a time at the following places: Erie, Butler, Punxsutawney, Johnstown, Altoona, Williamsport, and York. Such inspection brought good results. It proved to be popular with the public and should hereafter be more extensively carried on throughout the State.

A placard, which reads as follows, was mailed to each butcher in the State:

Please Post in Conspicuous Place

NOTICE!

The Handling of Meats and Meat Products by prospective purchasers is not permitted under the Rules and Regulations of the Meat Hygiene Service.

State Livestock Sanitary Board

These notices were well received for the reason that they called the attention of the public to the filthy practice of handling meats before making a purchase. A number of butchers wrote for additional notices so that they could post them in their market wagons also.

At Williamsport the butchers were the first in the State to provide screens which would prevent prospective purchasers from handling meats. They are also a protection against flies and other objectional insects. The agent in that district, who was responsible for bringing about this improvement, and the butchers who willingly complied with the request are most highly commended. It is to be hoped that the butchers in many other localities will soon provide similar facilities for safeguarding the public's meat supply from contamination. The public can do much in the way of assisting the Board in getting butchers to provide satisfactory screens. Meats exposed for sale in front of shops or in market houses in such a manner that they can be handled by the public, and contaminated by flies, cannot be regarded as clean and wholesome for human consumption. It is recommended that municipal, also market house officials, give this matter the careful consideration it deserves, especially at places where new market houses are likely to be provided or old ones remodeled.

The time has come when municipal owned or controlled slaughter houses must be regarded as the most sanitary as well as the most

convenient and economic method of slaughtering animals and preparing meats and meat products, also proper refrigeration of same.

During the year two local meat hygiene ordinances were adopted, one at Ellwood City, Lawrence county, the other at Bristol, Bucks county, and in each case an agent was appointed to enforce it. Much was done by the agents of the Board in each of these districts towards bringing about the adoption of these ordinances. Several other municipalities are considering seriously the question of providing local inspection and in each case the agent in that district is doing much in the way of demonstrating the necessity for such work.

The activities of the agents were confined largely to examining slaughter houses and meat markets, and where faulty construction was observed and unsanitary methods in vogue, instruction was given for making the necessary corrections. A great deal of time is consumed in carrying on this work in the rural districts because the establishments are widely scattered, and the roads are bad about half of the year, making travel slow and laborious. While at slaughter houses, the agents examine all the animals on foot as well as post-mortem.

AMOUNT EXAMINED DURING THE YEAR

Cattle,	2,254
Sheep,	389
Swine,	1,382
Cattle quarantined,	268
Swine quarantined,	95
Carcasses:	
Cattle,	20,052¾
Sheep,	5,920¼
Swine,	12,630¼
Carcasses condemned:	
Cattle,	969
Sheep,	38¼
Swine,	147¾
Organs examined,	7,173
Organs condemned,	2,593

Meats and products examined, ...1,621,224 lbs. (810½ tons)
Meats and meat products condemned, ...17,531 lbs. (8½ tons)

A variety of diseased conditions were found, such as tuberculosis, hog cholera, pneumonia, pleurisy, actinomycosis (lump jaw), septicemia, pyemia, echinococcus cysts, and the usual variety of parasitic diseases. In addition to the above diseases, a number of condemnations were made on account of emaciation, immaturity and various other unwholesome conditions.

The immature (bob) veal trade, which at the beginning of the State Meat Hygiene Service, flourished to such an extent that it was almost impossible to cope with it, is now fairly under control. There were three prosecutions made during the year for handling bob veal, all of which terminated successfully for the Board.

(Note).—Regular inspections were not made at Philadelphia, Pittsburg, Reading and Harrisburg because these places have local inspection.

In addition to the immature veal cases, three other successful prosecutions were completed, two for the sale of unwholesome beef, and one for the slaughter of a diseased cow and sale of the meat. Several cases of trichonosis were reported by physicians, and in each case it was found on investigation that the person afflicted had been eating fresh pork which had not been sufficiently cooked.

The Meat Hygiene agents appraised nearly all of the cattle reacting to the tuberculin test, and arranged for and supervised the slaughter, which included conducting post-mortem examination and seeing that the condemned meat was properly disposed of. They also investigated a large number of complaints and much valuable advice was given by them to butchers and livestock owners in reference to improving their sanitary conditions.

MEAT MARKETS

Counties.	Number of meat markets examined.	Number defective on first examination.	Number defective on second examination.	Number defective on third examination.	Number defective on fourth examination.
Adams,	30	4			
Allegheny,*	16				
Armstrong,	53	1	1		
Beaver,	1				
Bedford,	11				
Berks,	122	2			
Blair,	152	2			
Bradford,	67	1			
Bucks,	42	1			
Butler,	2				
Cambria,	275	2			
Cameron,	23				
Carbon,	21	5			
Centre,	59	5			
Chester,	128	2			
Clarion,	28	3			
Clearfield,	58				
Clinton,	55				
Columbia,	128	2			
Crawford,	61	2			
Cumberland,	52	2	2		
Dauphin,	195	2			
Delaware,	90	1			
Elk,	31				
Erie,	23	2			
Fayette,					
Forest,	7				
Franklin,	29	1			
Fulton,	1				
Greene,					
Huntingdon,	41	3			
Indiana,	49	1			
Jefferson,	31				
Juniata,	12	2	1		
Lackawanna,	422	5			
Lancaster,	216	1			
Lawrence,	58	3			
Lebanon,	57	2	2		
Lehigh,	141	4	2		
Luzerne,	224	7			
Lycoming,	208				

*Meat markets in Allegheny county outside of Pittsburg. No general examination was made of meat markets in Philadelphia, Reading or Harrisburg.

Counties.	Number of meat markets examined.	Number defective on first examination.	Number defective on second examination.	Number defective on third examination.	Number defective on fourth examination.
McKean,	66				
Mercer,	50	3			
Mifflin,	64				
Monroe,	13	1			
Montgomery,	140	9			
Montour,	48				
Northampton,	117	5			
Northumberland,	138	5			
Perry,	21				
Philadelphia,	4				
Pike,					
Potter,	41				
Schuylkill,	153	8	5		
Snyder,	29				
Somerset,	57	7			
Sullivan,	7				
Susquehanna,	25				
Tioga,	86	1			
Union,	56				
Venango,	126				
Warren,	36				
Washington,	12				
Wayne,	26				
Westmoreland,	12				
Wyoming,	15				
York,	56	2			
Total,	4,601	109	13		

SLAUGHTER HOUSES

Counties.	Number slaughter houses examined.	Number defective on first examination.	Number defective on second examination.	Number defective on third examination.	Number defective on fourth examination.
Adams,	30	4			
Allegheny,*	20				
Armstrong,	26	9	1		
Beaver,	1				
Bedford,	8	5			
Berks,	150	8	5	1	
Blair,	36	4			
Bradford,	21	2	1		
Bucks,	10	2	2		
Butler,	1				
Cambria,	42	8			
Cameron,					
Carbon,	6	1			

*Slaughter houses in Allegheny county outside of Pittsburg. No examinations were made of slaughter houses in Philadelphia, Reading or Harrisburg.

Counties.	Number slaughter houses examined.	Number defective on first examination.	Number defective on second examination.	Number defective on third examination.	Number defective on fourth examination.
Centre,	39	5			
Chester,	24	7	1	1	
Clarion,	17	12			
Clearfield,	21	3			
Clinton,	12				
Columbia,	15	1			
Crawford,	11	4			
Cumberland,	40	24			
Dauphin,	75	2			
Delaware,	10	3			
Elk,	8	3			
Erie,	14	3			
Fayette,					
Forest,					
Franklin,	25	1	1		
Fulton,	1				
Greene,					
Huntingdon,	10	4	1		
Indiana,	17	12			
Jefferson,	4				
Juniata,	15				
Lackawanna,	27	6	1		
Lancaster,	74	5			
Lawrence,	5	3			
Lebanon,	64	9			
Lehigh,	42	9	7		
Luzerne,	21	7	1	1	1
Lycoming,	12				
McKean,	8				
Mercer,	13	5			
Mifflin,	16	3			
Monroe,	4	1	1		
Montgomery,	20	2			
Montour,	18				
Northampton,	44	11			
Northumberland,	69	2			
Perry,	12	1	1		
Philadelphia,					
Pike,	3				
Potter,	12	2			
Schuylkill,	55	3	3		
Snyder,	30	3			
Somerset,	23	8			
Sullivan,	7	1			
Susquehanna,	11	1			
Tioga,	32	4			
Union,	45				
Venango,	5	2			
Warren,	5				
Washington,	4	3			
Wayne,	10	4			
Westmoreland,	1	1			
Wyoming,	8	3	1		
York,	48	5			
Total,	1,468	231	27	3	1

Respectfully submitted,

T. E. MUNCE,

Acting Director.

To C. J. Marshall, State Veterinarian.

HORSE BREEDING

Sir: I have the honor to submit the following report:

The Legislature at the last session passed a law concerning stallion licensing which differs in many respects from the older law, the act of April 25, 1907, which was thereby repealed. This new law contains many features deemed beneficial to the horse industry of the State, among which may be mentioned the licensing of each stallion for just what he is as to breed, soundness, etc., not simply as pure bred, grade or cross bred. Another feature is the prevention of stallions entering the State for breeding purposes without inspection. The law also contains a clause making the prosecution of violators a much more simple matter, as the former law made no provisions concerning the course to be pursued in making prosecutions. The following clause was contained in the original draft of the law, but was stricken out as unconstitutional by the Committee in whose hands it was placed:

> "If the provisions of this act are complied with the owner or part owner of a stallion or jack may file a lien upon any colt gotten by such stallion for the sum stipulated to be paid for the services of the stallion at any time before the colt is one year old in case the price agreed upon for such service remains unpaid, and may sell the same at public places in the township where the colt is kept or where the owner of the colt resides, and apply the proceeds of such sale to the payment of the amount due for such service and the expenses of such seizure and sale returning the residue to the owner of the colt."

A total of 2,016 stallions, of which 666 were pure breds and 1,350 grades, were licensed during 1908. In 1909 there were 2,254 licenses issued, of these 823 were pure breds and 1,427 grades. During 1910 the total number was 2,385, composed of 908 pure breds and 1,477 grades. For the year 1911 there were 2,431 licenses issued, 941 pure breds and 1,480 grades. Thus it will be seen that the pure bred stallions have constantly increased; in fact during the four years in which the law has been operative the number of pure bred stallions has increased more than 42 per cent., while the grades have increased but 10 per cent.

The comparative number of pure bred stallions licensed each year and their breeds follows:

NUMBER OF STALLIONS LICENSED

Breed	1908	1909	1910	1911
Percheron,	256	290	315	354
Standardbred,	211	253	289	293
Belgian,	37	48	66	70
Shire,	33	43	43	44
German Coach,	23	36	46	40
French Draft,	29	33	29	30
Hackney,	23	29	26	29
Clydesdale,	19	30	33	26
French Coach,	15	24	25	25
Morgan,	11	11	9	13
Thoroughbred,	5	10	10	12
Saddle,	5	6	7	5
Cleveland Bay,	3	5	3	2
Shetland,	3	2	3	2
Suffolk,	0	1	1	2
Yorkshire,	1	1	1	1
Orloff,	0	1	1	1
Welsh Pony,	0	0	1	1
Arabian,	0	0	0	1
Jack,	0	0	0	1

Respectfully submitted,

CARL W. GAY,

Director.

To C. J. Marshall, State Veterinarian.

PRACTICAL FARM WORK

Sir: I have the honor to submit the following report:

The past season at the Farm of the State Livestock Sanitary Board has been a generally successful one, especially good crops of hay, wheat, corn, silage, carrots and turnips being harvested.

During the past year the number of cattle on the Farm has been materially reduced, while the stock of hogs has been increased to enable the Laboratory to meet the greater demands for hog cholera serum.

The management of the Farm has assumed control of the boarding-house for the farm hands, the house having been thoroughly renovated and refurnished throughout, and placed in the hands of a competent housekeeper.

The farm help has been organized with a working foreman in direct charge of all field and stock work, with a herdsman and helper, a hog man, and three teamsters under him.

The policy of placing out young bred dairy bulls, of which there are a limited number, in the hands of farmers, has been adopted,

and has already been taken advantage of in several instances. Care is taken to place these bulls in communities where they will be of most service in grading up the stock of these localities, without in any way interfering with the legitimate business of state breeders. In fact it is believed this practice will result in promoting a greater appreciation of pure bred sires, ultimately promoting the breeders sales.

Respectfully submitted,

CARL W. GAY,
Director.

To C. J. Marshall, State Veterinarian.

CONTAGIOUS AND INFECTIOUS DISEASES

Sir: I have the honor to submit the following report:

The principal contagious and infectious diseases that have occurred during the year are practically the same as met in previous years. They are actinomycosis, anthrax, blackleg, glanders, hog cholera, mange, rabies and Texas fever. (Tuberculosis is handled by another Division.)

ACTINOMYCOSIS

Animals afflicted with generalized actinomycosis are destroyed as worthless. Those that are afflicted with a mild form may be slaughtered under inspection, the diseased parts destroyed and the balance of the carcass used for food. The animal may be kept in quarantine and treated if the owner and agent deem it advisable to do so.

ACTINOMYCOSIS

County.	Number of cases reported.	Action taken.
Berks,	1	Bull slaughtered for food purposes.
Blair,	1	Bull slaughtered for food purposes.
Clarion,	1	(1) Animal died.
Fayette,	1	Cow slaughtered for food purposes.
Franklin,	1	(1) Animal quarantined.
Lehigh,	2	(1) Given treatment. Kept alone. (2) Slaughtered for food purposes.
McKean,	1	(3) Animals killed and buried.
Schuylkill,	1	(1) Slaughtered for food purposes.
Sullivan,	1	(1) Died.
Tioga,	2	(1) Quarantined and treated. (2) Treatment given.
Union,	1	Animal quarantined.

ANTHRAX

Anthrax is not widely distributed in Pennsylvania. An occasional case only has been reported from fourteen counties. The disease is most common in sections of country surrounding tanneries. For the past few years the Board has recommended vaccination and done it at State expense on all bovine animals kept in localities where the disease has occurred in previous years. Very little trouble has resulted from the vaccination, and in no case has the disease occurred in herds after they have been vaccinated.

The vaccination should be done early in the spring before animals are turned on infected fields. They should not be turned out or exposed to this infection for at least two weeks after the vaccination is finished.

Owners are warned not to skin animals that have died suddenly or mysteriously in places where anthrax is known to exist. The carcass should be burned to ashes, if possible on the spot where the animal died. If this is not possible it should be buried under eight feet of earth. The body, the grave and territory around it should be well covered with quick lime and fenced off so no other animals can get to it.

ANTHRAX—1911

County.	Herds.	Number of vaccinated animals.	Number of animals dead.	
			Previous to vaccination.	Following vaccination.
Berks,	8	73	16	----------
Bradford,	5	110	----------	----------
Bucks,	1	28	----------	----------
Chester,	8	222	5	----------
Erie,	6	106	2	1
Forest,	12	22	4	----------
Lancaster,	2	9	----------	----------
McKean,	15	240	18	----------
Montgomery,	3	31	----------	----------
Potter,	5	32	13	----------
Susquehanna,	5	64	12	----------
Tioga,	4	34	15	----------
Warren,	1	19	20	----------
Westmoreland,	2	15	4	----------

BLACKLEG

Blackleg, or symptomatic anthrax, was reported and vaccinations performed in twenty-one counties. The disease is only met in young cattle or those under three to four years old. It can be entirely controlled by vaccination. Most stock owners can recognize the disease when it occurs on account of the rapid course, sure death and the black, tarry, frothy appearance of the flesh in certain portions of the body when the skin has been cut into or removed.

In order to bring the attention of stock owners to the importance of vaccination against blackleg, notices are placed in the newspapers in sections of the State from which the disease has been reported in previous years.

Local veterinarians can make the diagnosis and apply the vaccine, which is furnished, free of charge, by the Board.

BLACKLEG—1911

County.	Herds.	No. of vaccinated animals.	No. of Animals Dead.	
			Previous to vaccination.	Following vaccination.
Armstrong,	1	14	1	
Beaver,	1	2	1	
Bedford,	11	98	16	
Bradford,	6	55	1	
Butler,	1	3	1	
Cambria,	1	3	1	
Clarion,	2	10	1	
Crawford,	1	13	6	
Erie,	19	182	2	
Fulton,	1	6		
Huntingdon,	1	5	3	
Lycoming,	1	5	5	
McKean,	3	37	4	
Potter,	6	117	5	
Sullivan,	1	18		
Susquehanna,	51	622	15	
Somerset,	1	4		
Tioga,	4	31	11	
Venango,	1	21	1	
Warren,	1	23	1	
Wayne,	35	495	10	

GLANDERS

Suspected cases of glanders were reported from eighteen counties during the year. A positive diagnosis was made in fourteen counties. One man in the State contracted the disease and died. Each positive case of the disease in horses has been disposed of in accordance with the rules and regulations of the Board. Veterinarians seldom make a mistake in diagnosing advanced cases of glanders, yet in nearly every instance it has been confirmed by the laboratory examination and all horses known to have been exposed to this infection were tested with mallein. In many cases the compliment fixation test, agglutination test and Strauss method, one or all have been applied to suspicious cases. Well marked physical cases and animals that react to the Strauss method are destroyed. Those that have been exposed and react to the other tests, but show no physical symptoms may be appraised and destroyed or kept under provisional quarantine and retested. This plan has been followed for years in Pennsylvania, and so far no trouble has arisen from reacting horses that show no physical symptoms of glanders.

GLANDERS—1911

County.	Number of supposed cases reported.	Number of stables inspected.	Animals examined physically.	Animals tested with mallein.	Animals condemned on physical examination.	Animals condemned on mallein test.	Total number of animals condemned.
Allegheny,	3	3	48	11	4	1	5
Armstrong,	2	2	2		2		2
Blair,	1	1	3	2	1		
Clearfield,	2	2	3	3			
Crawford,	1	1	1	1			
Delaware,	1	1	5	4	1	1	2
Franklin,	3	3	24	32	5		5
Jefferson,	1	1	1	1			
Luzerne,	7	7	22	17	1		1
Montgomery,	2	2	44	48	1		1
Northumberland,	2	2	8	7	1		1
Northampton,	1	1	3	2	1	2	3
Philadelphia,	16	16	67	64	17	1	18
Potter,	7	7	12	11	3		3
Schuylkill,	1	1	4	4	4		4
Susquehanna,	4	4	14	12	1		1
Tioga,	2	2	3	2	1		1
Wayne,	1	1	1	1			

HOG CHOLERA

Hog cholera was reported from forty-three counties. Four hundred and eleven droves, consisting of nine thousand, four hundred and sixty hogs and pigs were examined and four thousand, nine hundred and thirty-three were vaccinated. Over three thousand hogs had died in these herds before vaccination was applied and about the same number were found to be too sick to vaccinate. The State has given the serum treatment only in herds where the disease had broken out. Many requests were received to get it done before the disease was observed. This plan was followed because the period of immunity is short, lasts only about two to four months, and serum could not be made fast enough to treat herds already afflicted. The plant at the farm, where the vaccine is made, has been enlarged and perfected to such an extent that it is hoped that the supply in the future will be adequate to keep up with the demand and administer the serum promptly when the disease is first recognized.

In most cases the diagnosis can be made and the serum applied by the local veterinarian. Agents of the Board were sent to sections of the State in which there was no veterinarian, or where he had had no experience with the disease or this form of treatment. The agent, in addition to diagnosing and treating the case, instructed the local man where necessary in the use of the serum. Unusually good results have been obtained in all parts of the State from the use of hog cholera serum. In nearly every case the outbreak has been checked and no further losses sustained after the treatment was applied.

HOG CHOLERA—1911

County.	Number of pigs examined.	Number of hogs examined.	Number showing symptoms of hog cholera.	Number dead.	Number vaccinated.	Number droves.
Adams,	65	142	62	40	132	4
Allegheny,	80	15	0	19	69	2
Armstrong,	13	4	12	5	12	1
Bucks,	393	338	282	327	514	19
Bedford,	0	20	19	10	18	6
Berks,	163	122	117	64	217	34
Blair,	0	3	0	1	0	1
Chester,	71	104	32	49	148	6
Columbia,	9	36	16	4	41	3
Cumberland,	64	78	47	127	67	6
Clinton,	4	0	2	2	0	1
Centre,	16	35	28	6	36	12
Cambria,	17	2	19	19	15	5
Clearfield,	2	8	0	14	4	2
Crawford,	1	5	4	3	6	1
Carbon,	10	10	10	2	10	1
Dauphin,	74	90	65	32	163	6
Delaware,	372	295	179	150	676	15
Franklin,	88	146	95	110	146	27
Fayette,	9	4	13	1	13	1
Greene,	30	14	24	18	16	1
Indiana,	52	55	28	17	88	9
Jefferson,	0	23	5	25	0	1
Lebanon,	208	315	237	347	392	48
Lawrence,	3	0	542	544	3	3
Luzerne,	90	73	91	49	134	10
Lancaster,	298	153	193	63	395	16
Lackawanna,	13	38	50	0	50	1
Lycoming,	15	2	3	8	17	1
Montour,	3	6	0	3	9	1
Monroe,	57	44	28	30	51	5
Montgomery,	623	475	318	156	719	76
McKean,	113	47	67	27	6	6
Northampton,	6	11	12	90	17	3
Philadelphia,	16	4	6	1	20	3
Potter,	104	74	65	108	48	14
Somerset,	0	20	0	0	7	1
Schuylkill,	67	118	51	53	162	17
Venango,	9	30	20	62	39	1
Westmoreland,	63	132	47	59	156	14
Washington,	54	49	87	42	82	8
Wyoming,	16	20	19	3	36	1
York,	64	194	132	181	199	18

MANGE

Sheep are not kept extensively in Pennsylvania, and mange is seldom seen in our native flocks. In chickens the disease is known as chalky legs but is seldom reported. Mange in horses was reported from twelve counties. Chronic cases are practically incurable, yet in acute cases it responds readily to treatment. Horses known to be afflicted with mange are quarantined until they are no longer a source of infection. The owner is required to pay for the treatment and properly disinfect the premises occupied by a mangy horse. The disease has not been reported in other animals, yet mange in dogs and cats is common, especially in cities.

MANGE—1911

County.	Number of cases reported.	Number of animals examined.	Number of animals quarantined and affected.	Number of animals cured and released.
Bucks,	5	25	9	9
Clearfield,	1	5	5	5
Erie,	1	1	1	1
Forest,	4	16	9	9
Indiana,	1	8	8	8
Lackawanna,	1	2	2	1
Lebanon,	1	3	3	3
Montgomery,	4	7	4	4
Philadelphia,	21	357	35	32
Susquehanna,	1	1	1	1
Warren,	1	2	1	1
York,	1	7	7	7

RABIES

Rabies has been more prevalent than in former years. It was reported from fifty-two counties. A correct diagnosis is seldom made by laymen, yet a veterinarian usually recognizes it. There is no known disease with more characteristic symptoms, runs a more uniform course or results in death more surely than is seen in rabies, yet a positive diagnosis can be made only by a laboratory examination. Too much time should not be lost, however, in waiting for the laboratory examination in cases where a human being has been bitten and the animal that inflicted the bite was seen by an experienced person and rabies diagnosed or suspected by him.

As in all other contagious or infectious diseases the law requires that rabies should be reported to the Board. When rabies are reported an investigation is made promptly. Animals that have been bitten by a rabid dog are placed in quarantine usually for one hundred days. This is known as an Individual Quarantine. Two thousand four hundred and seventy-four such quarantines were enforced during the year. If a large number of animals have been bitten by a rabid dog, or where several cases have been observed in the same locality a General Quarantine may be placed on the territory for one hundred days and renewed if necessary. Such quarantines are placed usually only upon request from local Boards of Health, or on petitions signed by the leading citizens of the community. Twenty-five general quarantines were maintained during the year. In case of a general quarantine no dogs within its boundary are allowed to run loose without a muzzle, which must be sufficiently large, strong and applied in such a way that the animal wearing it cannot inflict a bite to man or other animals. Dogs that are found running at large with no muzzle may be confiscated, shot or killed by any citizen. The local Board of Health, Humane Society, or anybody may enforce the quarantine. The Board in most cases has taken full charge of all such quarantines. Its agents destroyed two thousand six hundred and four dogs during the year. Forty-six persons were reported as having been

bitten by rabid dogs. In most cases the Pasteur treatment has been taken. A rabid dog in Johnstown bit two persons, one of them took the Pasteur treatment and experienced no further trouble. The other refused to take it, but subsequently developed rabies and died.

The number of cases of rabies that are reported has increased each year for a number of years, not only in Pennsylvania, but in all parts of this country. Much of the infection is spread by ownerless, worthless, renegade dogs. Persons who are fond of dogs should use their influence to destroy homeless ones, and persuade those who own dogs to give them good care and see that they are not allowed to roam at large and thus become a nuisance and source of danger to people and animals.

RABIES—1911

Counties.	Number of cases reported.	Animals quarantined.	Localities quarantined.	Animals destroyed.	Persons bitten.
Adams,	3	0	0	0	1
Allegheny,	8	10	0	0	0
Armstrong,	6	23	0	0	1
Berks,	5	75	0	0	5
Beaver,	1	1	0	0	0
Blair,	1	0	0	0	0
Bucks,	14	100	2	0	0
Butler,	5	10	0	0	0
Cambria,	14	56	3	500	3
Carbon,	3	42	0	0	0
Centre,	5	0	1	39	1
Chester,	11	75	0	0	1
Clearfield,	7	4	1	0	0
Clarion,	1	36	0	0	0
Columbia,	5	8	1	43	1
Crawford,	5	32	1	292	2
Cumberland,	1	14	1	56	0
Dauphin,	9	20	0	0	0
Delaware,	13	209	1	164	0
Fayette,	10	40	1	0	3
Forest,	1	2	0	0	0
Franklin,	2	54	0	0	0
Greene,	2	22	0	0	0
Huntingdon,	2	10	0	0	0
Indiana,	11	467	0	0	0
Jefferson,	7	75	2	306	2
Lackawanna,	6	39	0	0	0
Lancaster,	7	35	2	23	2
Lawrence,	4	0	0	0	0
Lehigh,	2	12	0	0	0
Luzerne,	46	157	2	186	12
Lycoming,	2	0	0	0	1
Mercer,	6	62	3	199	0
Mifflin,	2	10	0	0	0
McKean,	2	16	0	0	1
Montgomery,	17	72	0	0	0
Montour,	2	23	1	0	0
Monroe,	1	0	0	0	0
Northumberland,	2	4	0	0	0
Northampton,	9	67	0	0	0
Philadelphia,	38	14	0	0	2
Schuylkill,	2	52	0	0	0
Snyder,	2	13	0	0	0
Somerset,	5	91	1	310	0
Susquehanna,	1	6	0	0	0
Union,	1	25	0	0	0
Venango,	1	75	0	0	0
Washington,	4	108	1	242	2
Wayne,	2	13	0	0	0
Westmoreland,	22	66	0	56	5
Wyoming,	2	0	0	0	1
York,	8	129	1	188	1

TEXAS FEVER

There were two small outbreaks of Texas fever in the State during the year. In both cases it was recognized at once by the local veterinarians and the diagnosis was confirmed by the laboratory examination. The outbreak occurred in each instance in native cattle that were shipped in cars that had carried Southern cattle. Evidently the cars had not been sufficiently disinfected.

Permits are given to certain slaughter houses in the State to handle Southern cattle. No trouble has ever arisen from this custom. The Federal, as well as State agents maintain a careful supervision over the handling of Southern cattle. Before the cause and characteristics of Texas fever were known, extensive losses were sustained each year from this disease. It is easily controlled in Pennsylvania at the present time.

Counties Involved.	Number of cattle exposed.	Number of cattle affected.	Number of cattle died.	Number of outbreaks.
Twelve,	1,105	41	18	4

CONTAGIOUS ABORTION

Considerable work has been done during the year on this important disease. The Director of the laboratory succeeded in isolating the bacillus of Bang from an aborted foetus thus confirming the prevailing suspicion that our dairy herds were afflicted with the same form of contagious abortion that was studied and so minutely described by Prof. Bang of Denmark, and whose work was confirmed by the Royal Commission appointed by King Edward to study the disease. Much more may be expected in reference to this disease in the future.

A large number of other diseases were reported during the year but on investigation were found to be harmless or insignificant so far as being a source of danger to other animals were concerned and are, therefore, not reported.

Respectfully submitted,

R. M. STALEY,
Director.

To C. J. Marshall, State Veterinarian.

LABORATORY AND RESEARCH WORK

Sir: I have the honor to submit the following report:

I took charge of this work on the first of February in 1911. The report is divided into three sections: A. Research Experiments; B. Routine Work; C. Milk Hygiene.

There are so many problems of importance to be investigated that it was, at the beginning, difficult to select for an understaffed, poorly equipped laboratory the most urgent of them, and avoid splitting the routine work into unpractical sub-groups. During the year the laboratory has been thoroughly equipped and ample and efficient help provided in the laboratory and at the farm so that first-class work is now possible in every respect.

A. RESEARCH EXPERIMENTS

1. GLANDERS

Experience gathered in other laboratories concerning the diagnois of glanders has been applied to research work in the laboratory. It was first emphasized by German investigators that the complement fixation test is most valuable for the diagnosis of glanders. The necessary sera were at once prepared, and the test which has been used for over eight months has proved to be a great success. The veterinarians were asked to forward to the laboratory blood samples which were examined according to this method usually in combination with the Agglutination test. An early glander's infection can be more readily diagnosed by means of this test than with the Complement Fixation test. In one instance the results demonstrated the unreliability of the mallein test. The Complement Deviation and the Agglutination tests are very delicate and undoubtedly the varying results which have been obtained by investigators may be ascribed to faulty technique. The results of our work will soon be ready for publication.

In many instances glanders cultures were isolated from the specimens forwarded to the laboratory. The biological reactions were tested by modern methods but many contradictory results obtained, and were, therefore, held for a more complete study. As soon as results are available they will be published.

2. "EPIZOOTIC LYMPHANGITIS"

Page, Frothingham, and Paige published in the year 1910 an article under the title of "Sporothrix and Epizootic Lymphangitis in Pennsylvania. Through connection with an institute for tropical diseases, in which many cases of true Epizootic Lymphangitis were observed, I was familiar with this form of skin disease in equines and knew its real cause to be a sporothrix. An opportunity was offered during the year to study a case in a horse which suffered a relapse of "Epizootic Lymphangitis." From this animal two small subcutaneous abscesses were aseptically extirpated. The pus was smeared on malose agar

and potatoes, and showed in five days the characteristic growth of a Sporothrix. In two other instances the same micro-organism was isolated from the same horse. After being tested on many different culture media and thoroughly identified, animal inoculations were made and confirmed the views expressed by Page, Frothingham and Paige. In two instances the agglutination according to Widal was positive 1:800. Another sample of pus and serum from a horse quarantined in Pennsylvania gave the same result. The complement fixation was negative with glanders antigen and positive with sporothrix extract. The histological structure was identical with those described for this disease in human beings, and there is no doubt but that the disease which resembled "Epizootic Lymphangitis" is Sporothrilcosis. The investigation in connection with true Epizootic Lymphangitis was contained. Cultures of the real Saccharomyces farcinomosus were promised to the laboratory from Africa and Italy. They will be the basis for a complete comparative study. It may be mentioned here that Sporothrix cultures were undoubtedly obtained from many other cases at the laboratory previous to this investigation, because several culture tubes found in the laboratory proved on replantation on the necessary media to be identical with those of Sporothrix. The facts will be published in two or three months in connection with work done in other laboratories on a blastomycotic skin disease of dogs.

3. TUBERCULOSIS

The research work outlined and started by Dr. Leonard Pearson and continued by Dr. Gilliland was completed; the animals were tested, destroyed and autopsied. The results, at present in a stage of compilation, will be included in the report on "The Tuberculosis Vaccination according to the method of Dr. Pearson."

Many interesting features were observed during these autopsies. Animal inoculations were made and the tubercle bacillus isolated to determine its biological characteristics and its virulency to cattle. To verify the views advanced by Prof. Eber many different tests must necessarily be carried out before an opinion can be expressed. This work proved that we are still in an experimental stage in the question of immunizing cattle against tuberculosis. This and other reasons collected from various investigators caused us to abandon the vaccination of cattle against tuberculosis for the present.

Ophthalmic Test. Recently German publications have called attention to the good results obtained with several newer methods of tuberculin testing. Such tests were applied under the different conditions in Pennsylvania to determine whether or not they are of value to the general routine of tuberculin testing. The ophthalmic test has been applied on many animals and the results were controlled by the subcutaneous test and autopsy. The value of the ocular test was confirmed, and we hope to be able soon to apply it more universally in conjunction with the subcutaneous tuberculin injection. The special tuberculin required for the ocular test has been prepared and can be supplied at any time when wanted. The results of some work done on this subject have been published in the proceedings of the United States Livestock Sanitary Associations under the title of "Newer Methods of Tuberculin Testing" in December, 1911.

4. CHRONIC BACTERIAL DYSENTERY

Having had an opportunity to study this disease in Europe and extra effort has been made to continue the investigation in this country. Efforts were made to reproduce the disease in cattle. Tests were carried out to determine the diagnostical value of Avian Tuberculin. Several animals kept under isolation supplied the necessary material for this work. A cow purchased in Northampton county gave only a slight positive ophthalmo-reaction to Avian tuberculin, but proved to be affected with bacterial dysentery when autopsied. In several cases post mortem and microscopical examinations confirmed the reaction obtained with Avian tuberculin. The lesions found were different than those described by Prof. Bang and previously observed by the writer. Chronic intoxication and anemia were more pronounced and the lesions in the intestinal tract are less prominent than are usually seen in European cases. In three instances we succeeded, by means of intra-venous inoculations of emulsions of tissues containing the specific acid fast bacillus in large quantities, in reproducing the disease in such a form that the animal would react to avian tuberculin. Attempts to cultivate bacillus on at least thirty different culture media failed entirely. Inoculations on guinea pigs showed lesions similar to those produced by the inoculation of material from pigeons which contained an acid fast bacillus very much like those found in Bacterial Dysentery.

5. CONTAGIOUS ABORTION

The prevalency of this disease demanded thorough and urgent investigation. In different instances pure culture of the Bang bacillus was obtained from the intestinal tract of a foetus. The morphological and biological characteristic of this bacillus will be published later. Proof can be given to show that "Granular Vaginitis" of cows is not responsible for contagious abortion. Preparations have been made to install the complement fixation and agglutination test for diagnosing this disease.

6. HOG CHOLERA

The preparation of serum for the immunization of hogs against hog cholera involved a considerable amount of work. Under the condition serum was prepared the year before the amount was not sufficient to answer the requirements. Climatic conditions did not permit an extensive serum production during the winter months, and it was the idea of Dr. Leonard Pearson to construct a special building for this particular work at the farm. The plans, based more or less on his idea, were submitted by Mr. Hileman at the beginning of the year to the Board and accepted. In the beginning of May the erection of the building was started, but was not completed until the middle of November. The entire building is of stone and concrete construction, with perfect drainage into a well in which the refuse and drainage of the hog cholera building as well as of the post mortem laboratory can be thoroughly disinfected.

At first we had difficulties in obtaining the necessary amount of virulent blood to be used for hyper-immunization purposes. Previous to October, 1911, such blood was collected from sick hogs in outbreaks in the neighborhood of Philadelphia and inoculated into im-

mune hogs. Many times the blood proved to be contaminated or changed so that it caused the death of several animals used for hyper-immunization. The hog bred on the farm could be used for hyper-immunization because they had a certain amount of immunity, and would easily resist too mild hog cholera infection. Immunity produced with blood from hog cholera outbreaks in the eastern part of the State did not have the same protective properties against a severe infection as when the serum was produced with virulent blood from the western part of the State. There appears to be a variation of virulency which is confined to certain localities, and the serum produced from such places will only protect against this particular hog cholera infection. It is, therefore, the policy at present to use a polyvalent virus (a virus which contains at least 10 to 12 hog cholera virus) from different localities. To increase the potency of this virus several strains were added through the courtesy of Dr. Van Es, of North Dakota.

We are now preparing virus by inoculation or by the exposure of susceptible hogs in naturally infected pens. Hogs for this purpose were purchased from parts of Pennsylvania where hog cholera was never observed. They were at first inoculated but it was soon learned that the pens were sufficiently infected to cause a natural infection. Daily records of temperatures would indicate an infection, and the animals were killed in agonal stage shortly before death. Their blood is used at once for hyper-immunization. A careful autopsy of the animal will demonstrate the severeness of the disease, and one familiar with this work can readily ascertain the fitness of the virus for hyper-immunization by the morbid lesions. Hyper-immunized hogs are usually bled four times at intervals of ten days, the blood is defibrinated, filtered and preserved with 0.5 per cent. carbolic acid. From September to January over 111,485 c. c. of serum were produced. The mixture of different bleedings has usually been tested in the way described by Dorset and DeSchweinitz. The results obtained in the field with this serum are very encouraging. As a prophylactic the serum proved to be of great value. The therapeutic effect was not satisfactory. It must be kept in mind that hogs may succumb after they have been immunized against hog cholera but not to a secondary invasion which is caused by lesions in the lungs or other organs. A statistical report would show better the value of serum treatment if results were more faithfully submitted. It is hoped that during the coming year more interest will be shown in this phase of the work.

The simultaneous method of treating hogs with a small dose of virulent blood and serum together has been entirely dropped. Prof. Hutyra claims that hog cholera is disseminated by the sero-simultaneous method, and that areas of the disease are thus established. His views have been confirmed by our experience. If the serum treatment is given early in the disease and particularly when only one or two animals have succumbed the results are perfect. Outbreaks of hog cholera should be reported as early as possible, and treatment begun at once if the fullest benefit is to be expected. The serum treatment should not be given unless there are cases of cholera on the premises.

An investigation concerning the importance of the bacillus suipestifer and other micro-organisms found in hog cholera has been started, but sufficient data is not at hand to permit a conclusive statement.

Conditions similar to those described by Uhlenhuth and his collaborators are undoubtedly met with. These experiments are being continued and will be published as soon as they are finished.

A comparative study of the value of several modern serological methods for the standardization of hog cholera serum was undertaken. Extracts of the different organs, particularly those of bone marrow of hogs dead from cholera, were made and highly potent sera were tested by the complement deviation test. The results were negative. Further investigation will be conducted to find a method to determine the potency of this serum.

Investigations concerning the biological character of the virus have been undertaken, but this work is still in the preliminary stage.

7. TEXAS FEVER

An opportunity was offered to collect blood from an animal suffering from Texas fever near Doylestown. It was inoculated into two animals and in due time they developed Texas fever. After an incubation time of twenty-eight days there was a relapse, and in the blood the changes which have been described by Theobald Smith and Kilborne in 1894 as coccus like peripheral bodies on the blood cells were noted. A careful study was made of these bodies to see if we could verify the statement made by Theiler and Sieber that these bodies are of parasitic origin. We were unable to confirm the statement, and therefore consider the disease as "Pernicious Anemia of Cattle" and not "Anaplasmosis" as was proposed by them.

A report on this investigation was presented at the meeting of the United States Livestock Sanitary Association in Chicago, December, 1911, and will be printed in their proceedings. The results will be published also in the "Hand-buchder Pathogenen Mikroorganismen," by Kolle and Wassermann.

8. FORAGE POISONING

Autopsies of several cases of Forage Poisoning have been made during the year, and in several instances a careful histological examination of the brain was carried out to determine whether we have the same lesions as have been described by Professor Joest. In studying enzootic cerebro-spinal meningitis Joest found disseminated infiltrations of a lymphocytic character, and cell inclusions in the large ganglion cells of the hippocampus and olfactoric regions of the brain similar to those seen in Rabies. In the specimens submitted for these purposes the reactions or alterations just described could not be verified. Investigations are being continued, which may permit in a few months to express a better opinion on the nature of this disease.

9. PLANT AND FEED POISONING

During the year several investigations were made on animals which had died of this disease, and in which the lesions are somewhat similar to those described in hemorrhagic septicemia. We were unable to isolate the characteristic bacillus. Interest was therefore directed to the possibility that a poisoning, possibly of plant origin may cause the similarity of post mortem lesions. Necessary preparations have been made to study this disease in the field during the next season. The following interesting observations were made on two cases:

1. In September several cattle died suddenly on three different farms which were located in the mountains at an altitude of 1900 to 2,000 feet. These animals were grazing in the woods near the farm. The clinical symptoms were severe anemia, sub-normal temperature, emaciation, and well marked hemoglobinemia. The autopsy demonstrated the characteristic lesions of hematolysis, hemoglobinuria, icterus, anemia, gastro-intestinal catarrh, and degeneration of the parenchymatous organs. The bacteriological examination and the animal inoculation proved that no blood parasites could have caused the severe anemia. Several of the rabbits died after a distinct incubation time, but a bacteriological examination proved that no organized bodies could have caused the death. The conditions of this outbreak led to the conclusion that we are dealing with the effect of a blood poison, and that possibly mushrooms of the type of "amanita phalloides" with its toxic alkaloids had caused the deaths. Several requests were made to get these fungi but none were received. This observation is therefore incomplete, and only circumstantial evidence gives us the right to conclude that death may have been caused by mushrooms.

2. In the neighborhood of Norristown and North Wales several animals died during the month of November with the symptoms of salivation, sub-normal temperature, tonic and tetanic spasms, severe nervous depression, constipation, etc. In several instances a post mortem was performed, but with the exception of a gastro-intestinal inflammation no alterations of a distinct character could be found. The examination for rabies was negative. An inquiry showed that in all the stables in which the disease occurred the bran fed has been purchased from the same source. It was also found that this feed had been purchased in each case between the 28th and 30th of October. The first cases of death were reported the 14th of November. It appeared that animals in the same stable were susceptible in varying degrees. Out of twenty-one animals in one stable only six became sick, in another stable of nine, six became sick and succumbed to the intoxication. A diagnosis of feed poisoning was made, and a feeding experiment was started at the laboratory. The same bran which had been purchased by one of the farmers was fed experimentally to three animals for over four weeks, and one died after five days with same symptoms and post mortem lesions as was found in the original cases.

B. ROUTINE WORK

SPECIMENS RECEIVED FOR EXAMINATION

During the year seven hundred and sixteen shipments containing a total of over nine hundred different specimens were received for diagnosis. A small number of the specimens received were so decomposed that an examination was impossible. In most cases they reached the laboratory in good condition.

RABIES

Four hundred and twenty-seven heads were received during the year. These were from horses, cattle, sheep, hogs, mules, goats, cats and dogs. One human brain was brought from one of the city hospitals to the laboratory for diagnosis. A large percentage of these cases were positive for rabies.

GLANDERS

One hundred and twenty-four specimens were received for examination, one hundred and three being samples of serum and twenty-one of pus. The examination of these specimens was determined as follows:

Diagnosis of serum:
1. Complement deviation test.
2. Agglutination test.

Diagnosis of pus:
1. Microscopical examination.
2. Strauss method.

These tests were carefully carried out in each instance, and checked with the record of the mallein test, if such had been made. Whenever circumstances would permit an autopsy was made and record kept of each examination.

The complement deviation test, heretofore not carried out at the laboratory, has proven invaluable in the diagnosis of this disease. In each instance, however, an agglutination test was also made, and results checked up. As before proven, it was found that the agglutination test alone is of very little value. The Strauss reaction was made from samples of pus, and when necessary the bacillus maillei was isolated to confirm the diagnosis.

During the year a diagnosis of fifteen cases of glanders was made. Several fine pathological specimens from glandered horses were brought to the laboratory by veterinarians and added to the exhibit in the museum. They consisted of sections of lungs, spleen and nasal septum.

HOG CHOLERA

A total of sixty specimens representing twenty-five different hogs, and including three whole carcasses were received and examined. A positive diagnosis was made in twenty-two cases, two were reported as negative.

TUBERCULOSIS

Thirty-four specimens exclusive of milk samples were received and examined. These specimens including different tissues, pus and feces and the diagnosis depended upon were:

1. (a) The demonstration of tubercle bacilli in the smears.
   (b) Examination of smear preparations after the antiformin method.
2. The microscopical examination of tissue.
3. The animal inoculation test.

Twenty-three specimens were diagnosed positive and fourteen negative. Several gross specimens were received from the School of Veterinary Medicine and the different abattoirs. They were properly mounted, and added to the museum collection.

ANTHRAX

Of thirty-one specimens received for examination all except one were from cattle. The diagnosis depended upon:

1. The demonstration of anthrax bacilli in smears of blood.
2. The examination of twenty-four hour cultures made from the blood or tissues.
3. The inoculation of mice with suspected material.
4. Precipitin test after Ascoli.

These specimens included sections of muscle, liver, spleen, and in the majority of cases whole ears. Of the number received ten were diagnosed positive. To avoid any errors in diagnosis the demonstration of bacilli resembling anthrax was followed by inoculation with tissues. By this means we were enabled to isolate several new strains which were kept in stock and used in the preparation of the different anthrax vaccines.

"EPIZOOTIC LYMPHANGITIS"

Of the total number of eight specimens received it was possible to demonstrate the double membraned spores of Sporothrix (saccharomyces farciminosus) in but two instances. Unstained preparations fixed in Ernst solution show these bodies particularly fine.

CHRONIC BACTERIAL DYSENTERY

Six specimens of tissue, rectal scrapings, and feces were received and examined. Of these five were negative and one positive.

SYMPTOMATIC ANTHRAX OR BLACKLEG

One specimen suspected of this disease was a portion of muscle from a calf, and with it we were able to reproduce the disease. The bacillus of symptomatic anthrax was also successfully demonstrated in smears from the tissue received, and from cultures.

POULTRY

Forty-eight fowls were received during the year, including twenty-three living and twelve dead hens, five living and three dead ducks, four dead guinea hens and one living squab, together with five different specimens of tissue. Some of the animals received showed typical lesions of roup and were diagnosed as such. Some recovered completely, and were either destroyed, returned, or kept for observation. During the summer many chickens were received which showed the following symptoms:—loss of appetite and coordination, drooping of wings, anemia of the mucous membranes, coma, and diarrhoea, and the autopsies revealed nothing but a catarrhal hastro-enteritis.

MISCELLANEOUS

The remaining specimens received, fifty in number, were diagnosed as follows:—Forage poisoning, Borna's disease, Texas fever, cow pox, navel ill, croupous and broncho-pneumonia, invaginations, rupture, traumatic pericarditis, osteomalacia, streptococcic or straphlococcis infections, tumors, including lymphoma, fibromyxoma, hard fibroms and round cell sarcoma, parasitic infections including oesophogostomum columianum, trichophytom tonsurans, cystocercus-pisiformis, rhipicephalus sanguineus, boophilus annulatus, demondex folliculurum, larvae of the hypoderma bovis, strongylus filiria, etc.

Tuberculin: One hundred and ninety-eight thousand seven hundred and twenty cubic centimeters of tuberculin solution were prepared and distributed. Over six hundred cubic centimeters of concentrated tuberculin were used in the preparation of dry precipitated tuberculin for the ophthalmic test.

Mallein: Two thousand seven hundred and sixty-eight c. c. of mallein solution were prepared during the year.

Anthrax Vaccine: One thousand six hundred and seventy-one doses of anthrax vaccine Nos. 1 and 2 for cattle, and fifty-one doses of anthrax vaccine Nos. 1 and 2 for horses were prepared and distributed. The reports following these vaccinations were very favorable. The cultures of the different anthrax strains, from which the vaccines are made, are transplanted upon new culture media regularly. New standardized vaccines are freshly prepared early each Spring for the annual vaccinations.

Hog Cholera Serum: Two hundred and seventeen thousand and eighty-five c. c. were manufactured and distributed during the year.

Computing the Hog Cholera serum at 5 cents per c. c., the tuberculin and mallein at 15 cents per dose, and the anthrax vaccine at 10 cents per dose, the saving to the Commonwealth for these products alone is $19,138.00. It is not possible to estimate in dollars and cents the livestock saved by their application.

Milk Hygiene: In addition to the regular work for the State an experiment was conducted for the United States Department of Agriculture, entitled "Comparative Studies of Biochemic Reactions of Milk to the Bacterial Count and Their Practical Application." One hundred samples were collected from various stores throughout the city of Philadelphia to compare the biochemic reactions with the bacterial count. Several experiments were conducted to observe the conditions which influences the several biochemic reactions used.

Weekly bacteriological examinations were made of samples of certified milk and cream from different dealers around Philadelphia. All samples of milk that contained more than ten thousand bacteria per cubic centimeter, and all samples of cream that contained more than twenty-five thousand bacteria per cubic centimeter were reported to the Secretary of the Philadelphia Pediatric Society. The maximum bacterial count of this Society for milk is ten thousand per cubic centimeter, and for cream twenty-five thousand per cubic centimeter. When the count exceeds these figures the Society may withdraw its certification.

A microscopic examination is also made of different types of bacteria to determine whether any are pathogenic. If the colonies are found to be of a pathogenic type, the Secretary is notified, and an inspection made of the herd.

One hundred and fifty-four samples of milk were sent to the laboratory by veterinarians and farmers and examined during the year. The examinations consisted of a determination of the number and kind of bacteria present, the specific gravity, per cent. fat, per cent. of acid, per cent. of total solids, preservatives, etc., or for a diagnosis of pathological conditions.

Respectfully submitted,

K. F. MEYER,
Director.

To C. J. Marshall, State Veterinarian.

MILK HYGIENE

Sir: I have the honor to submit the following report:

Pursuant to a request from the properly authorized officials of the city of Philadelphia, under the act approved May 21, 1895, this Board undertook the work of inspecting the farms from which the milk supply of Philadelphia was derived.

The main objects of this inspection were to determine what proportion of the supply was coming from bad dairies, and to what extent the supply would be diminished if such places were eliminated.

It was intended that it should be a campaign of education. To accomplish this purpose only registered veterinarians having an intimate knowledge of animal diseases and principles of hygiene were employed in the work.

The following form of score card was used:

FORM D. I. 3.

Commonwealth of Pennsylvania.

STATE LIVESTOCK SANITARY BOARD

Milk Hygiene

Date .....Time .....
Owner .....Dairyman .....
P. O. Address .....P. O. Address .....
Location of Farm, ...
(State distance from train or trolley)
Milk delivered to what railroad station .....
Shipping station, Creamery, Condensary } .....
Distance from Farm .....
To whom is milk shipped .....
Address .....
Number of cows in herd .....Number milking .....
Number of quarts delivered .....
Is ice provided for cooling milk .....
If water is used for cooling milk, give temperature .....
Temperature of milk stored at farm .....
Has herd been tuberculin tested .....
When .....
Does owner want a tuberculin test made .....
When .....

To the best of my judgment and belief the conditions for producing, handling and furnishing to the public clean, wholesome milk for this dairy are .....Probability of improvement .....

Name of Inspector .....
Address .....

MILK HYGIENE

(1) The producer should agree to permit the inspector to examine his herd and premises as often as it may be considered necessary, and give said inspector such information as may be desired as to the herd, the food, and the method of handling the milk, etc.

(2) The room in which cows are kept and milked must be reserved for the exclusive use of the cows. Straw, hay, and other foods, wagons, stable tools and the like, should not be stored therein.

All livestock other than cows, such as dogs, cats, poultry, etc., must be excluded from the stable in which the milch cows are kept, and an effort should be made to eliminate rats and other vermin. (Calves and bulls may be allowed in the same room, if kept clean and sanitary.)

(3) The cow stable shall be provided with adequate ventilation, either through the medium of air chutes extending from the room in which the cows are kept to the outside air, or by the substitution of muslin for glass in the window openings. At least 600 cubic feet of air space must be provided for each cow.

(4) Enough windows must be installed for the satisfactory lighting of the stable (2 square feet of window light to each 600 cubic feet of air space to represent the minimum) and the glass in such windows must be kept free from dust and dirt.

(5) Stable floors must be water tight; they must be properly graded and well drained; and must be made of some non-absorbent material, such as cement, since such floors can be more easily kept clean than floors made of wood or earth.

(6) Manure gutters should be provided, and they should be from 6 to 8 inches deep, and constructed of non-absorbent material.

(7) The platform on which the cows stand must be made of some non-absorbent material, and so constructed that manure and urine will drop into the gutter, and it must be well lighted and kept clean at all times.

(8) The ceilings and walls must be so constructed as to be easily cleaned. If the space above the cows is used for storage, the ceiling must be made tight so as to prevent chaff and dust from falling through. The ceilings, walls and ledges must be thoroughly swept down and kept free from dust, dirt, manure or cobwebs. They must be whitewashed at least twice each year unless the walls are painted or made of smooth cement.

(9) If individual drinking basins are used, they should be drained and cleaned at least twice each week.

(10) Feed boxes, mangers and feeding floors shall be kept in a clean and sanitary condition.

(11) There should be no direct opening from the silo or grain pit into the room in which the cows are milked.

(12) In order to protect the atmosphere from dust, dry fodder should not be fed to the cows during or just before milking.

(13) Horse manure must not be used as bedding. Only bedding which is clean, dry and absorbent may be used. Preferably it should be shavings, straw, fodder or dried leaves.

NOTE: Each paragraph relates to an individual detail of milk production. The degree of satisfaction with which the requirement that it contains is complied with is to be indicated in the left hand margin by a system of crosses; one cross indicating that it is excellent (certified dairy); two crosses that is good; three crosses that is fair; and four crosses that it is bad. A naught signifies no effort or provision.

(14) Manure must be removed from the stable at least once each day, and the floors must be swept and kept free from dirt, rubbish and decaying animal or vegetable matter. Such cleaning must not be done during the milking hour nor within one hour prior to the milking time. Manure when removed from the stable should be drawn to the field. If this is not possible, it must be stored at a safe distance from the stable and milk house, and in a place not accessible to the dairy herd.

(15) All liquid matter should be absorbed and removed daily, and at no time should it be allowed to overflow or saturate the ground under or around the cow barn or milk house.

(16) It is recommended that the floors and gutters be sprinkled daily with land plaster or phosphate rock.

(17) All doors and windows should be well screened during fly time.

CARE OF THE COWS

(18) Each cow in the herd must be groomed daily, and no manure, mud or filth allowed to remain upon the tail, the flanks, udder or belly during milking.

(19) Long hairs must be clipped from the udder and flanks of the cow. The hair on the tails must be cut so that the brush may be well above the ground.

(20) The udders and teats of the cow must be cleaned before milking, by being brushed, after which they must be wiped with a cloth and warm water.

(21) To prevent the cows from lying down and becoming dirty between the time of cleaning and the time of milking, a throat latch of rope or chain must be fastened under the cow's neck.

(22) Only food which is of good quality and free from dirt and mould may be fed. Any food in a state of decomposition or putrefaction must not be given.

(23) All dairy cows should be turned out for exercise at least two hours in each twenty-four in suitable weather. Exercise yards must be free from manure and other filth.

CONTROL OF DISEASE IN THE HERD

(24) Cows having rheumatism, leucorrhoea, inflammation of the uterus, severe diarrhoea, or disease of the udder, or, cows that from any other cause may be a menace to the herd, shall be removed from the herd, placed in a building separate from that which may be used for the isolation of cows with tuberculosis, unless such building has been properly disinfected since it was last used for this purpose.

The milk from such cows shall not be used, nor shall the cows be restored to the herd until permission has been given by the inspector after a careful physical examination.

(25) In the event of the occurrence of any of the diseases just described between the visits of the inspector, or if at any time a number of cows become sick at one time in such a way as to suggest the outbreak of a contagious disease or poisoning, it shall be the duty of the dairyman to withdraw such sickened cattle from the herd, to destroy their milk, and to notify the Dairy Herd Inspector by telegraph or telephone immediately.

(26) Cows that are emaciated from chronic diseases or any cause that in the opinion of the inspector may endanger the quality of the milk must be removed from the herd.

TUBERCULIN TEST

(27) The herd should be free from tuberculosis, as shown by the proper application of the tuberculin test. The test should be applied in accordance with the rules and regulations of the State Livestock Sanitary Board of Pennsylvania.

(28) No new animals shall be admitted to the herd without first having passed a satisfactory tuberculin test, made in accordance with the rules and regulations of the State Livestock Sanitary Board of Pennsylvania.

(29) Immediately following the application of the tuberculin test to a herd for the purpose of eliminating tuberculous cattle, should the disease be found, the cow stable must be disinfected under the inspector's supervision according to a method approved by the State Livestock Sanitary Board. Barnyards must be cleaned and disinfected after the tuberculin test in a manner directed by the inspector.

(30) When tuberculosis is found on the original test a second tuberculin test should follow each primary test in six (6) months, and should again be applied in accordance with the rules and regulations of the State Livestock Sanitary Board. Thereafter the tuberculin tests should be applied annually.

MILKERS

(31) The hands of the milkers must be thoroughly washed with soap, water and brush, and carefully dried on a clean towel immediately before milking. The practice of moistening the hands with milk is forbidden.

(32) Clean overalls, jumper and cap must be worn during milking. They should be kept clean and used for no other purpose, and when not in use they must be kept in a clean place, protected from dust and dirt.

(33) No milker shall permit his hands, fingers, lips or tongue to come in contact with milk intended for sale.

(34) Milkers must see that the milking stools are kept clean.

(35) Milkers are forbidden to spit upon the walls or floors or into the gutters of stables, or upon the walls or floors of milk houses, or into the water used for cooling the milk or washing the utensils.

MILKING

(36) The first streams from each teat should be rejected, as this fore milk contains large numbers of bacteria. Such milk should be collected in a separate vessel and not milked onto the floor or into the gutter. The milking should be done rapidly and quietly, and the cows should be treated kindly.

(37) Milk from all cows should be excluded for a period of fifteen days before and five days after calving.

(38) If milk from any cow is bloody and stringy or of unnatural appearance, the milk from that cow must be rejected and the cow isolated from the herd until the cause of such abnormal appearance has been determined and removed.

HANDLING THE MILK

(39) Milk, when emptied from the milk pail to the can, must be strained through strainers made of a double layer of finely meshed cheese cloth or gauze. The strainers must be cleaned immediately after being used, by thorough washing, after which they must be boiled. They must be scalded a second time immediately before using. In large herds several strainers must be provided for each milking, in order that they may be frequently changed during the straining of the milk.

(40) Properly constructed cooler of sufficient capacity to reduce the temperature to 50 degrees F. must be used, and it must be so situated that it can be protected from flies, dust and odors, and on no account shall it be used in the stable or out of doors. Milk shall be passed over the cooler immediately after being milked.

(41) Milk, after being cooled and placed in cans, should be tightly covered and securely wired and sealed.

MILK HOUSES

(42) A milk house must be provided which shall be separated from the stable and dwelling and located a safe distance from the hog pen, privy, or manure pile and at a higher level.

(43) It must be kept clean and must not be used for purposes other than the handling and storing of milk and milk utensils. It must be provided with light and ventilation, and the floors must be graded and water tight.

(44) It must be provided with ample facilities for cooling milk to the required standard of 50 degrees F., and be supplied with an adequate amount of clean hot and cold water.

(45) The milk house must be properly screened to exclude flies.

UTENSILS

(46) After each milking, the milk pails, cans and other utensils shall be thoroughly rinsed in cold water, then washed in hot water, then rinsed in boiling water and inverted in a place free from dust, flies and obnoxious odors; preferably all utensils should be subjected to the action of live steam after washing.

(47) All utensils must be so constructed as to be easily cleaned. The milk pail should have an elliptical opening 5x7 inches in diameter (the modified Loy type). The cover of this pail should be so convex as to make the entire interior of the pail visible and accessible for cleaning. It should be made flush with the very top of the pail, so as to avoid a groove which would conduct milk that might fall upon the top around to the opening of the pail. A suitable cover soldered to an ordinary milk pail by a local tinsmith will answer if the work is well done and all of the seams are carefully filled with solder. The pail should be made of heavy seamless tin, or with seams which are flushed and made smooth by solder. Wooden pails, galvanized iron pails, or pails made of rough, porous materials, are forbidden.

(48) No producer of milk shall be permitted to have in his possession any bottle, milk can or other container bearing the name of any other producer or any dealer, unless such bottle, can or container is

so marked as to indicate that it has just come into his possession through the purchase of milk from the person whose name appears upon said bottle, milk can or other container.

(49) All utensils used in milking must be kept in good repair. Rusty, leaking or broken cans, old, broken, or perforated, or badly fitting lids, and all other utensils which, in the judgment of the inspector, are dangerous receptacles for milk, may be condemned after due notice has been given, and after such utensils have been branded by him.

WATER SUPPLY

(50) The entire water supply shall be absolutely free from contamination, and shall be sufficient for all dairy purposes. It shall be protected against flood or surface drainage, and shall be conveniently situated in relation to the milk house.

(51) Privies, pig-pens, manure piles, and all other possible sources of contamination shall be so situated on the farm as to render impossible the contamination of the water supply.

TOILET ROOMS

(52) Toilet facilities for the milkers, outside of the stable or milk house, must be supplied. These shall be kept clean and shall be provided with wash basins, water, soap and towels, and the milkers shall be required to wash and dry their hands before leaving the toilet room.

(53) The milk gathered at the morning and evening milkings should be shipped on the evening of the same day.

(54) Vehicles used for carrying milk from the dairy farm to the railroad stations, receiving stations, creameries or condensaries, and all vehicles used for carry milk from receiving stations to the railroad shipping station, should be covered.

All such wagons must be kept sweet and clean at all times, and suitable provisions must be made to keep milk cooled to the required temperature of 50 degrees F.

This work was continued over a period of about six weeks from April 17th to May 31st. The results obtained are expressed in the following table:

County.	X	XX	XXX	XXXX	Total.
Berks,	3	153	83	10	249
Bucks,	8	590	744	122	1,464
Chester,	3	206	560	226	1,095
Delaware,	1	86	179	19	285
Lancaster,	4	302	812	25	1,143
Montgomery,	11	360	492	55	927
Totals,	30	1,697	2,990	465	5,163

X—Number of excellent dairies.
XX—Number of good dairies.
XXX—Number of fair dairies.
XXXX—Number of bad dairies.

It will be seen that about nine per cent. of the farms inspected were producing milk, the use of which, in the opinion of these judges, would be prejudicial to public health.

In the fair class were placed those farms which ordinarily produced good milk, but owing to insanitary arrangements or carelessness in handling, the product might at times become contaminated to such an extent as to render it unwholesome. This class constitutes about fifty-eight per cent. of the total number.

It appears that the major portion of the supply comes from dairies where a little education properly applied would result in a marked improvement in the general supply of the city.

In the food class were placed those dairies which were being operated by competent and intelligent dairymen. About thirty-two per cent. of the farms inspected were placed in this class. On these places milk was being produced as a business and not as a side issue to general farming. It was a noteworthy fact that this class of dairymen did not complain of a lack of profit in the business. In most instances they were receiving a bonus over the regular market price for their better product which retailed at a higher price in the city. It was only from the "Fair and Bad" dairymen that the complaint was heard "That the more cows a man owns the poorer he becomes."

The excellent class was reserved for certified dairies operating under the regulations of the Pediatric Society of Philadelphia. The milk from these places retails in the city for sixteen to twenty cents per quart and is intended for infant feeding, invalids, and discriminating consumers.

During the preceding winter Typhoid Fever was prevalent among the inmates of a large institution in Philadelphia. The cause of the epidemic was attributed to the use of ten thousand pounds of butter which had been purchased in the spring of 1910 and placed in cold storage for winter use. During the investigation which followed it was necessary to trace the origin and handling of eight hundred and forty thousand pounds of milk which was concerned in the churnings. After a most searching inquiry, it was definitely determined that the milk had not been contaminated with Typhoid germs and the butter was removed from suspicion.

On the first of October the entire work of Dairy Farm Inspections was transferred to the State Livestock Sanitary Board. Our experiences with the previous inspection were of much value in formulating plans to extend the same system of inspection throughout the entire State. It was definitely decided to make it a general campaign of education for the purpose of fostering and encouraging the dairy industry as well as safeguarding the general milk supply of the State. The greatest impediment to the success of this plan is to obtain a sufficient number of inspectors who possess the necessary qualifications to act in an advisory capacity to the dairymen. There are approximately one hundred and ninety-one thousand dairy herds in this State, the work of inspection and instruction has scarcely begun, but thus far, reinspections have shown that improvements have been made in more than fifty per cent. of the places which had scored Bad and Fair on first inspection.

NUMBER OF DAIRIES INSPECTED FROM OCTOBER 15TH TO DECEMBER 31ST, 1911

County.	X	XX	XXX	XXXX	Total.
Allegheny,	0	3	27	30	60
Berks,	0	270	353	32	655
Bucks,	0	680	576	49	1,305
Carbon,	0	13	5	1	19
Chester,	0	146	197	98	441
Crawford,	0	140	200	31	371
Dauphin,	0	11	14	0	25
Delaware,	1	169	86	19	275
Erie,	0	70	197	111	378
Lackawanna,	0	11	33	3	47
Lancaster,	0	93	41	0	134
Lehigh,	0	5	2	0	7
Luzerne,	0	8	6	2	16
Montgomery,	0	224	183	22	429
Northumberland,	0	61	156	3	220
Philadelphia,	0	40	75	5	120
Schuylkill,	0	217	543	10	770
Tioga,	0	0	29	1	30
Washington,	0	9	5	1	15
Wyoming,	0	15	27	12	54
Totals,	1	2,185	2,755	430	5,371

X—Exeellent dairies.
XX—Good dairies.
XXX—Fair dairies.
XXXX—Bad dairies.

TUBERCULOSIS

Many persons are of the opinion that the tuberculin test is compulsory in this State. Such however is not the case, except as regards dairy and breeding cattle brought into Pennsylvania from other states.

The Board does not compel herd owners to submit their cattle to the tuberculin test, yet it is ready at all times to co-operate with and assist those who desire to eradicate tuberculosis. The results in this direction during the past year are very encouraging.

Eleven hundred and nine herds containing thirteen thousand four hundred and three animals have been inspected and tested. Thirteen hundred and thirty-four reacted and were removed from the herds. In addition to these, three hundred and twenty-nine head were condemned by physical examination.

In some counties the subject of tuberculosis has been almost entirely neglected. This is probably due to lack of interest or lack of knowledge on the part of herd owners.

Most of the tuberculosis work is carried on by local veterinarians who are temporarily authorized to act as agents. A few communities are without the services of competent veterinarians and we are unable to bring the subject to the attention of interested persons and render them the service that is extended to more favored communities.

The following chart gives a condensed review of the work in each county:

TUBERCULOSIS IN NATIVE HERDS—JANUARY 1, 1911, TO DECEMBER 31, 1911

Counties.	No. Herds Tested. *S	No. Herds Tested. †O	No. Herds Tested. *S	No. Herds Tested. †O	Total number herds tested.	Total number cattle tested.	Number herds examined physically.	Number cattle examined physically.	No. cattle tested and examined.	No. condemned on tuberculin test.	No. condemned on physical examination.	Total number condemned.	Percentage based on number tested and examined.	Untested cattle slaughtered and found to be tuberculous to such an extent as to render flesh unfit for food.
Adams,	3	4	33	40	7	73	10	78	151	15	9	24	15.89+	1
Allegheny,	4	23	49	137	27	186	4	24	210	38	4	42	20 %	1
Armstrong,	1	1	5	4	2	9	2	8	17		2	2	11.7 +	
Beaver,	5	2	46	8	7	54	3	8	62	2	3	5	8.07+	
Bedford,							4	20	20		2	2	10 %	
Berks,	7	26	173	131	33	304	8	60	641	56	11	114	17.78+	98
Blair,							1	2	2		1	1	50 %	
Bradford,	13	66	128	1,029	79	1,162	2	3	1,171	37	1	39	3.33+	21
Bucks,	6	43	81	341	49	422	28	282	704	39	27	66	9.37+	38
Butler,	1	12	20	99	21	111	1	1	112	7	1	8	7.14+	
Cambria,	1	7	1	43	8	44			44	6		6	13.63+	
Carbon,														
Centre,	9	3	139	96	12	235	1	1	236	25	1	26	11.01+	1
Cameron,														
Chester,	36	41	617	856	87	1,473	138	588	2,061	178	43	221	10.72+	48
Clarion,	4		53		4	53			53					
Clearfield,	2	1	10	1	3	11	3	5	16		1	1	5 5/2 %	
Clinton,	1	1	1	1	2	2	1	5	7					
Columbia,	10	10	71	59	20	129	4	26	155	12	4	16	10.32+	
Crawford,	1	9	2	108	10	110	2	2	112	9	1	10	8.92+	1
Cumberland,	12	16	107	199	28	306	6	28	334	19	5	24	7.18+	11
Dauphin,	11	10	138	62	21	200	15	163	363	53	13	66	18.18+	5
Delaware,	3	31	83	534	34	617	2	3	620	79	8	87	14.03+	8
Elk,	1		6		1	6								
Erie,	5	30	94	545	35	639	12	179	818	100	11	111	13.56+	7
Fayette,		6		12	6	12	5	20	32	1	2	3	9.37+	
Franklin,	5	20	18	87	25	105	4	17	122	3	4	7	5.73+	1
Forest,	1	1	5	1	2	6								
Fulton,														

Greene,		3		66	3	66								
Huntingdon,	1		1		1	1	2	2	3					
Indiana,	1	9	8	12	10	20			20	2		2	10 %	
Jefferson,	1		1		1	1	2	2	3		2	2	66 2/3%	
Juniata,														
Lackawanna,	6	25	127	318	31	445	2	17	462	86	1	87	18.83+	
Lancaster,	10	17	110	133	27	243	72	695	938	56	74	130	13.85+	23
Lawrence,	1	5	13	42	6	55	3	26	81	9	3	12	14.8 +	2
Lebanon,	10	4	81	15	14	96	11	51	147	11	11	22	14.96+	3
Lehigh,	4	18	21	346	22	367	1	1	368	12	1	13	3.53+	13
Luzerne,		9		33	9	33			33	4		4	12.12+	
Lycoming,	3	9	21	31	12	52	1	2	54	8	1	9	16 2/3%	1
McKean,	1	6	31	30	7	61	1	1	62	4	1	5	8.06+	
Mercer,		2		9	2	9	1	1	10		1	1	10 %	
Mifflin,	1	4	10	40	5	50			50	7		7	14 %	
Montgomery,	10	79	217	884	89	1,101	10	65	1,166	62	9	71	6.08+	79
Monroe,	2	4	9	38	6	47			47	4		4	8.50+	
Montour,	1	3	14	13	4	27	4	26	53	1	5	6	11.32+	
Northampton,	4	26	25	154	30	179	1	2	181	27	1	28	15.47	3
Northumberland,	9	6	53	42	15	95	2	8	103	22	2	24	23.30+	6
Perry,	2		14		2	14			14	6		6	42.14+	
Philadelphia,		19		47	19	47			47	7		7	14.8 +	547
Pike,		1		4	1	4								
Potter,		5		160	5	160	17	139	299	7	11	18	6.02+	
Schuylkill,	5	8	22	84	13	106	2	32	138	11	2	13	9.42+	
Somerset,	1	2	9	7	3	16			16	1		1	6 1/4 %	2
Snyder,	1	1	7	4	2	11			11	7		7	63.63+	
Susquehanna,	10	95	130	1,741	105	1,871	12	162	2,033	123	11	134	6.59+	9
Sullivan,	1		12		1	12								1
Tioga,	6	12	56	226	18	282	15	168	450	9	15	24	5 1/3 %	
Union,		1		18	1	18								2
Venango,		6		122	6	122	2	2	124	8		8	6.54+	
Warren,	1	5	195	68	6	263	2	2	265	9	1	10	3.77+	1
Washington,	6	12	152	56	18	208	3	17	225	16	2	18	8 %	
Wayne,	3	8	59	87	11	146			146	4		4	2.73+	
Westmoreland,	3	12	8	101	15	113	5	5	118	15	5	20	16.9 +	
Wyoming,	4	22	69	352	26	427	1	14	435	57	1	58	13 1/3%	1
York,	14	36	79	293	50	372	16	89	461	60	15	75	16.26+	21
	264	837	3,434	9,969	1,109	13,403	444	3,052	16,626	1,334	329	1,711	10.29+	956

*State expense.
†Expense of owner.

The table shows that about ten per cent. of the cattle tested were tuberculous. Herds tested at the expense of the State were known to contain animals which showed suspicious symptoms of the disease. The scope of the work has been too limited to form any definite conclusion as to the extent to which the disease exists throughout the State, yet it is believed to be considerably less than ten per cent. There are approximately one hundred and ninety-one thousand dairy herds in the State with an average of five head to the herd, less than one per cent. of these were tested during the current year. Notwithstanding this apparent small showing certain sections are rapidly gaining the reputation of being comparatively free from tuberculosis.

The increasing demand for dairy products with the consequent increase in demand for dairy cattle have stimulated the importation of such animals into the State. To supply this demand has led some to endeavor to import cattle from other states without complying with the law which makes an inspection and tuberculin test compulsory. Active measures have been adopted to suppress this illegal traffic.

During the year reports were received on twenty-three thousand nine hundred and eighty-two head of breeding and dairy cattle shipped into the State and tested under the act approved May 26, 1897, and amended by the act of April 5th, 1905. Of this number three hundred and thirty head were condemned as tuberculous. It may appear inconsistent that 9.95 per cent. of our native tested animals should react while only 1.38 per cent. of the interstate cattle tested should fail to pass the test.

It should be noted that the test is applied to our native cattle in most cases where tuberculosis is suspected. On the other hand those purchased from other states and tested for us are from herds believed to be free from the disease. We should not conclude from these figures that the difference is due to trickery or dishonesty entirely, or that other states have less tuberculosis than we do.

CATTLE IMPORTED INTO THE STATE FOR DAIRY OR BREEDING PURPOSES AND TUBERCULIN TESTED UNDER ACT APPROVED MAY 26, 1897, AS AMENDED BY THE ACT OF APRIL 5, 1905.

From January 1st, 1911, to December 31st, 1911

	Tuberculin tested.	Number reactors.	Disposition of Reactors.
Cattle imported on permit and tuberculin tested at destination.	15,392	108	Killed.
Cattle discovered to be shipped without permit and afterwards tuberculin tested at destination.	4,612	93	Killed.
Cattle shipped without permit detained and tuberculin tested at Pittsburg Stock Yards from Sept. 1st, 1911, to Dec. 31st, 1911.	1,242	15	Killed.
Cattle shipped without permit detained and tuberculin tested at Lancaster Stock Yards from Sept. 1st, 1911, to Dec. 31st, 1911.	423	5	Killed.
Cattle tuberculin tested previous to shipment into Penna.	2,313	109	Not shipped: 1 shipped into Penna. and afterwards slaughtered.
	23,982	330 1.38%	

The first concerted efforts for the control of tuberculosis in dairy herds were made in eighteen hundred and ninety-six. The work has been continued each year in proportion to the amount of funds available for the purpose. During that time the percentage of reactors has fluctuated, but there is shown a steady decrease from approximately twenty-two per cent. in eighteen hundred and ninety-six to less than ten per cent. during the past year. This decrease may be due to various influences, but it indicates that the conservative measures adopted have been fruitful and if gradually extended will eventually accomplish the desired object. In connection with this, herd owners should realize the economic importance of building up their herds from the produce of their own healthy animals and not depend so largely upon buying animals of doubtful origin to take the places of those turned off.

The following table has been compiled as a comparative summary of the conditions found in native herds during the entire period over which the work has extended:

RECORD OF TUBERCULIN TESTS ON NATIVE CATTLE

Year.	Number of herds tested.	Number of cattle tested.	Number of cattle reacted.	Number of herds with no reactions.	Percentage of animals reacted.	Percentage of herds with reactions.	Percentage of herds with no reactions.
1896,	43	5,430	1,191	187	21.9	56.7	43.2
1897,	626	7,613	1,099	298	14.4	52.2	47.6
1898,	582	6,515	1,162	220	17.8	62.1	37.8
1899,	429	6,443	1,107	158	17.1	63.1	36.8
1900,	651	8,475	1,314	254	15.5	60.9	39.1
1901,	545	8,662	1,203	235	13.8	57.	43.
1902,	375	6,066	1,024	142	16.8	62.1	37.8
1903,	337	5,573	1,060	132	19.02	60.8	39.1
1904,	322	5,159	891	114	17.4	64.5	35.4
1905,	529	7,774	1,179	290	15.1	45.1	54.8
1906,	733	7,073	981	262	13.8	64.2	35.7
1907,	402	7,153	950	177	13.2	55.9	44.1
1908,	501	7,083	1,037	264	14.5	47.3	52.6
1909,	731	9,942	1,440	410	14.4	43.9	54.8
1910,	1,085	13,288	1,810	617	13.6	43.1	56.8
1911,	1,109	13,403	1,334	685	9.95	47.24	61.76
Totals and averages, per cent.,	9,339	125,453	18,782	4,445	14.96	52.44	47.59

Respectfully submitted,

WM. S. GIMPER,
Director.

To C. J. Marshall, State Veterinarian.

Respectfully submitted,

C. J. MARSHALL,
State Veterinarian.

REPORT OF THE ECONOMIC ZOOLOGIST

Harrisburg, Pa., *February 5, 1912.*

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

Dear Sir: It is my duty and pleasure to submit the following report for 1911, being my Ninth Annual Report as Economic Zoologist of the Department of Agriculture of Pennsylvania:

The work of the Bureau of Zoology is discussed under the following heads:

1. Correspondence, Examining Specimens and Answering Ques tions.
2. Investigations and Experiments.
3. Publications.
4. Lectures.
5. Inspection of Nurseries and Private Premises.
6. Inspection of Imported Plants, Seeds and Fruits.
7. Making Collections.
8. Inspection of Orchards.
9. Demonstrations.
10. Exhibitions.

1. CORRESPONDENCE

During the past year the correspondence of this office has been exceedingly heavy, the copied letters showing a total of 8,530, as follows:

General correspondence, ...	6,215 letters
Model Orchard correspondence, besides circulars, ...	1,347 letters
Inspectors' letters, besides circulars, ...	968 letters

The fact that the correspondence is constantly becoming heavier can be taken as an indication of the way the people in this State regard this office and apply to it for such help as it can give. It is our rule to respond to all letters just as promptly as possible, and just as fully as time permits and occasion demands, and also with absolute accuracy. This has resulted in begetting the confidence of the public, as is shown by many hundreds of commendable letters received, such as the following extract, which is a typical example: "I have raised quantities of peaches and of fine quality too, by observing your instructions and ideas, and I feel that whatever you say along this line is truth. I thank you kindly for whatever you have heretofore informed me as well as for the present desired information."

By far the greater part of our letters are in answer to inquiries concerning the methods of pest suppression, kinds of spray material to use, kinds of apparatus that are advisable, or orchard manage-

ment. It is remarkable to what extent orcharding is developing in the State of Pennsylvania at the present time, and the keen interest in this subject naturally causes many persons to write to this office for help along the line. As a rule, the communications pertaining to other subjects than those which we regard as belonging properly to that of Economic Zoology are referred to respective specialists for reply. We give the public to understand that our specialty includes pest suppression and related subjects, as well as general entomology, zoology, etc.

2. INVESTIGATIONS AND EXPERIMENTS

The work of the office in correspondence, publication, inspection (of nurseries and private premises), and demonstrations has been so heavy during the past year that to a great extent the investigations and experiments were reduced in numbers. However, those that were conducted brought out some points of great value. Among these are the following:

(a) Spraying with Lime-sulfur Solution. It has been proven beyond controversy that the lime-sulfur solution is the best, safest and cheapest material to use in spraying all trees, shrubs and vines while dormant, and proper horticultural practice calls for the thorough spraying of all stone fruits, whether infested with scale insects or not. We have been surprised with the cheapness and ease with which the concentrated lime-sulfur solution can be made. In an ordinary galvanized iron boiling tub over a crude furnace we boiled lime-sulfur solution fast enough to keep one tractor sprayer going all the time, and did not demand the services of an extra man to do the boiling. By simply putting the powdered sulfur into the water, and putting in the fresh quick lime, and stirring it a little to keep it from settling to the bottom before boiling commenced, we were able to thus start the boiling, which continued while the previously boiled and diluted material was being sprayed out of the tank. On return from the orchard the spray tank was filled with the boiled product, diluted and properly tested with a hydrometer, and while one man was making the solution to the proper strength, the other was preparing the next batch for boiling. A brisk fire with an abundance of fuel was than kindled, and the boiling left to itself until the return for another spray tank full—thus requiring but two men to do the spraying and boiling at the same time.

Variation of the Lime-sulfur Formula: We have further proven our earlier statement that the lime-sulfur solution can vary a great deal and at the same time always bring good results, if used strong enough and thoroughly applied. The easiest prepared formula which we have used calls for two pounds of quick lime and one pound of sulfur, boiling for one hour in each gallon of water, using these proportions for a larger quantity. A modification of this formula shows that good material can be made by boiling sixty pounds of fresh lime with one hundred and twenty-five pounds of sulfur in fifty gallons of water for one hour. Several other modifications of the concentrated formula are given and will do well. Thus we have entirely forsaken the old home-boiled "seventeen-twenty-two-fifty" formula. This is for the purpose of getting rid of the sediment and making a storable solution. After the material is boiled by the concen-

trated formula it should be strained or permitted to settle, and can then be stored in stone, wooden or metal vessels (excepting copper), and kept as long as wanted.

Our experiments have shown that this concentrated material does not freeze, and even the dilute material does not freeze easily, and it is not injured by freezing. It can thus be kept during the winter and summer if desired. When ready to use it should be diluted with a hydrometer such as is made by the Carbondale Instrument Company, of Carbondale, Pa., according to the directions, to test 1.03 for the dormant spray. This means one part of the concentrated material in about seven or eight parts of water.

We take this opportunity to correct the statement that is now generally going the rounds concerning the supposed need of technical chemical knowledge and apparatus in order to make the lime-sulfur solution. No special knowledge nor special apparatus of any kind whatever is required. It is not necessary even to strain it if one will let it settle and save the red liquid, which is the part that kills the scale. In our own practical work, however, we mix it, stirring the sediment with it, and apply it to the trees, as it helps to make a market which shows where the spraying was done and where retouching is needed.

In our spraying work of last spring we found that we could spray until the pink of the blossoms could be seen. This was after the green leaves had commenced to appear, and they were not materially injured by the spray liquid, which was applied at the usual San José scale strength. It is, of course, not best to delay the spraying until after the buds have actually burst, but if it must be done after that time it will not be as injurious as one might think.

To prevent the peach leaf curl the spraying should be done before the buds open. Where we sprayed after they had opened there was some curling, but, strange to say, the leaves were white instead of red, and dropped very soon, and the trees carried a good crop of fruit and foliage.

(b) Treatment for Borers. Our experiments for treating peach-tree borers were continued last summer and gave very interesting and remarkable results. The lime-sulfur was made just as described above for the dormant spray, was applied with a tractor sprayer, or one in which the power comes from the gearing on the wheels. It was applied to the trees by taking off the nozzle, but using an extension rod with one-eighth turn, and applying at least one-half pint of the liquid around the base of each tree one or two feet above the ground, and permitting it to run down and settle around the trees. This was done after the earth had been removed from around the tree enough to form a little hollow close to the trunk in which the liquid settled.

The only addition to the regular lime-sulfur solution was one ounce of arsenate of lead or of London purple in each gallon of liquid, which made practically three pounds to fifty gallons.

After the liquid was dry on the trunks of the treated trees they were mounded with earth to a height of one-half foot. The first treatment was given the middle of June, the second treatment was given the middle of July, and the third the middle of August. We found that were it was applied only once, or the middle of June, the

borers returned in the late fall, but were present although very small, and were almost all on the outside of the tree, but few had reached beneath the bark. The explanation of this is found in the fact that they were yet very young, and come only from eggs that were deposited very late in the season, and which would have been prevented or destroyed by the later treatment.

(c) Our summer experiments with the lime-sulfur solution, extra dilute, proved conclusively that it could be used in many instances as a spray to take the place of the Bordeaux mixture as a fungicide. To this was added arsenate of lead at the same rate as to the Bordeaux. To make the dilute lime-sulfur solution for the pome fruits (apple, pear and quince), as well as for grapes and potatoes, we made it the regular dilution to the San José scale strength of 1.03 on the hydrometer, and then took one part of this dilute solution in ten parts of water, which would make the hydrometer test of 1.003, but which is really too dilute for accurate reading by the ordinary hydrometer. Two or three pounds of arsenate of lead is added to fifty gallons of this extra dilute solution to kill chewing insects. About the same strength, or at least a satisfactory strength, is obtained by taking one gallon of the concentrated solution in forty gallons of water.

It was found that the dilute lime-sulfur did not satisfactorily take the place of the Bordeaux mixture on grapes, and it is not yet certain that it will do so on potatoes. It is, however, positive that it does not russet the pome fruits,—or apple, pear and quince,—as does the Bordeaux when used during damp weather.

On the stone fruits the self-boiled lime-sulfur solution, according to Scott's formula of eight pounds of stone lime and eight pounds of sulfur in fifty gallons of water, slaked together by its own heat, is preferred, although the concentrated solution can be used by diluting it about four times as much as for the pome fruits.

(d) Experiments with spraying apparatus have shown more and more the efficiency of the compressed air sprayer, and we are now safe in predicting that the power sprayers will come more generally into use in this State, and among these the compressed air sprayer run by a small gasoline engine in connection with a small air compresser, carried on the spray wagon, will prove to be of great value to orchardists.

The further general and very extensive use of the conical strainer, which we invented some years ago and gave to the public without patent, proves that this particular piece of apparatus is by all means the most satisfactory form of strainer that can be used, and in every feature so far excels the "mud box strainer," which was recently brought before the public, that there is no comparison in the merits of the two. There is absolutely no valid objection whatever to the conical strainer. It is light and convenient, and does the work properly. From the illustration shown herewith one can have it made by a tinner.

The cone of the strainer is of brass wire cloth built upright over a supporting cone of coarser galvanized iron wire, of about four meshes to the inch. The brass wire cloth should not be coarser than thirty meshes to the inch. The diameter of the galvanized wire funnel should be about fifteen inches or more.

During the many years that this has been used by thousands of persons we have received but one complaint, and when we replied to the correspondent telling him to pour the liquid into the strainer rather slowly, and in such a way that it would strike the top of the cone and wash the sediment down into its angle from which it could be thrown out, he replied that he was having no further trouble with it, as this was due solely to his not knowing how to use it.

(c) The Peach Bud Mite. In the investigations of this office we took up and investigated the important subject of the Peach Bud Mite, with the assistance of our Inspector, Mr. Francis Windle, and brought forth the following facts: (See Fig. 1.)

During the summer of 1911 a trouble was found in nurseries in the eastern United States which affected the growth of both seedling and budded stock of peach trees. Large numbers of trees were dwarfed, abnormally branched, short, and unshapely. The color of their foilage was an unnatural, deep green. In these trees the tender terminal buds of the early growth had been killed, and successively as they branched from buds below the growth of the leading twig would be largely checked in a similar way resulting in short, semi-broomlike trees.

This condition had been noticed to some extent for many years, but as it had not caused serious loss, little or no attention had been paid to it. As this trouble had been observed only in spots it was at first attributed to poor soil or some undesirable soil condition. This year the condition of the peach stock was really serious in some nurseries. It affected many acres or whole fields, causing heavy loss. Various experts were called upon to investigate the cause or causes, soils were analyzed and trees were critically examined. Different views were expressed, some thought it was due to an insect called "Thrips" and another thought a small plant bug was the mischief-maker, while as an additional basis of suspicion a fungus was found in the dead buds. Finally it was found that the cause of the existing condition was a very small mite feeding on the tender terminal buds and stopping their growth. A careful examination of the injured buds was made in several nurseries and very small mites were found in numbers. We also occasionally found a Thrip on the buds which doubtless did some injury, and a fungus was also present in most of the dead buds or tips of twigs. It later became apparent that this fungus followed the injury caused by the mites rather than preceding it.

Further investigations showed that the mites were invariably present in these injured buds. Numbers of the buds were placed in small bundles and kept at the temperatures of a living room where they bred and multiplied considerably, and where they continued to do so during the winter as long as kept warm.

DESCRIPTION OF THE MITES

Some are probably one three-hundredth or one one hundred and fiftieth of an inch long and half as wide. It is elliptical oblong, but varies considerably in shape according to its age. The adult is amber colored. The young larvae are nearly white with intermediate shades toward amber according to age. The adult has four pairs of legs. The two front pairs are grouped near the head and the two posterior

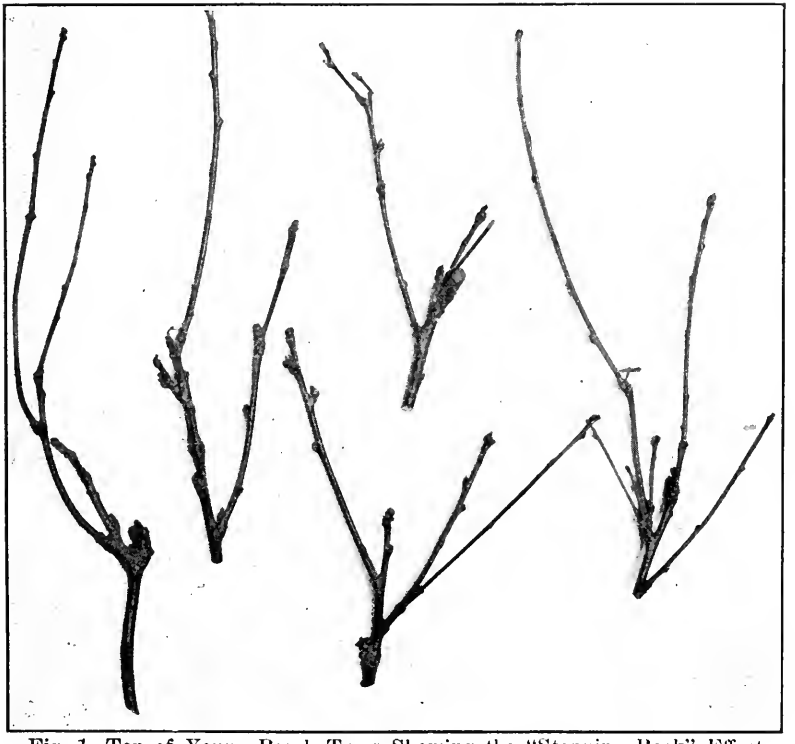


Fig. 1. Top of Young Peach Trees Showing the "Stopping Back" Effect by the Peach Bug Mite.

pairs are far to the rear, appparently on the abdominal region. The larvae as in other mites are minus the hind pair of legs. In the adults the hind pair of legs have slender bases which exterminate in slender whip-like pairs in place of a tarsus. The other legs terminate in anchor-like bidactyle clams on a pedicel, and between the claws is a small pad. The head projects with a proboscis like a hog snout. The mouth parts are apparently much consolidated or possibly aborted and they may feed by puncturing or rasping the tissue and sucking.

They are very active, rapid crawlers enabling them to migrate rapidly from bud to bud. They may spread by means of the wind and by team and man in culture.

HISTORY LAST SEASON

They evidently began feeding and breeding early in the spring. Some of the buds of budded trees, although having formed again, failed to grow, and of those that made a start, some were stopped. Branches followed which again were stopped. The extent of this stopping was evidently according to the activity of the mites and seemed to be a battle between growth and mites, and those who saw one of these battlefields at least would have little trouble in determining which was the victor. Their work continued until late in the season, but with reduced activity after the heavy fall rains began.

It is known that the ravages of mites or certain species of them are governed by weather conditions favoring or checking their increase. The hot, dry season such as we had last year is favorable to their multiplication and will account in part for the unusual damage in extensive peach nurseries.

Some of the mites are to be found in the dead buds or terminal injured twigs as late as December 26, indicating that they winter there. Whether or not they may also winter elsewhere has not been determined.

There is little known of this species of mite. It is said to be unnamed and undescribed excepting that Prof. M. B. Waite, Plant Pathologist of the Bureau of Plant Industry, Washington, D. C., who found it several years ago burrowing in the tender tips of the terminal buds of peach shoots, called it the "Peach Shoot Mite," and Prof. Banks is reported as saying that it belonged to the genus Tarsonemus ("Thread footed").

Prof. Washburton, in his classification of the Acarina or mites, says of the family Tarsonemidae, "It is composed of a number of minute vegetable feeding mites which have been little studied, though they are probably the cause of considerable injury to the leaves and buds of plants." As specialists are now at work on the study of this little pest we may expect soon to have a technical name and description for it. It may, however, take a longer time to learn fully its life history. It has been said that "the life history of a mite seems a trivial matter, but it takes much labor to unravel, yet we must know it with its vagaries to enable us to attack it as the most vulnerable point if we hope to succeed in its control." This mite has been reported in the buds of ash, pear, plum and perhaps some other varieties.

Since there is so little known, but little can be said on the subject of its treatment. Sulfur in some or any form is a recognized specific for mites. The question would seem to be "How can these pests be reached?" Prof. Waite who found the mite wintering in the buds late in the season observed trees sprayed with lime-sulphur at winter strength were nearly free from them, and advises thorough spraying of young orchard or nursery stock that may be used for getting buds, and also spraying seedlings during the growing season at intervals before budding time with a self-boiled lime-sulfur solution prepared as for a fungicide.

There may be considerable doubt as to the efficiency of the lime-sulfur spray or any other spray for that matter. One nursery company dipped the scions in lime-sulfur solution and the trees from these buds showed the greatest injury from the mites of those anywhere observed. This may probably be due to the fact that by dipping and then allowing to stand without ventilation the buds were liable to be injured, and after injury and washing by rain the mites would be likely to start where there is more or less dying tissue.

The habit of burying themselves in the young buds and in the tissues of the dead tips of twigs would seem to make it almost impossible for the spray material to reach them. They are no doubt more exposed during the growing season when they are feeding and migrating to fresh buds than in the winter or dormant season, but the best recommendations that can be given for their suppression are first, to spray thoroughly during the dormant season with lime-sulfur solution the same as for the San José scale, and second, during the growing season of the peach trees spray with the self-boiled lime-sulfur solution. It must be remembered that the peach bud mite works only in the buds and we have observed it only in nursery stock, therefore, there is not much danger of introducing this pest into orchards when infested trees are used for planting and are properly cut back. The writer has recently purchased several thousand infested trees and has them healed in ready for his own planting. This is enough to show he does not consider this pest as a serious cause of injury to growing trees, nor the infested nursery trees as a serious menace to his mature orchard. The chief loss is to the nurseryman whose trees are spread or made wider by the mite and thus not be sold as tall trees under the present method of selling trees according to height. These very short, branchy, strong peach trees cannot be sold at half as good price as the taller trees, although they are much more valuable to the grower than straight trees at the same height. They are thick and stocky, but with the severe close pruning that is needed in transplanting them there is no reason why they do not make good trees in orchards.

(f). The Apple Seed Chalcis. We also made investigations of the apple seed chalcis, which is becoming a destructive pest in the northern portion of this State, making original observations and investigations, which resulted in the following important circular issued from this office: (See Fig. 2.)

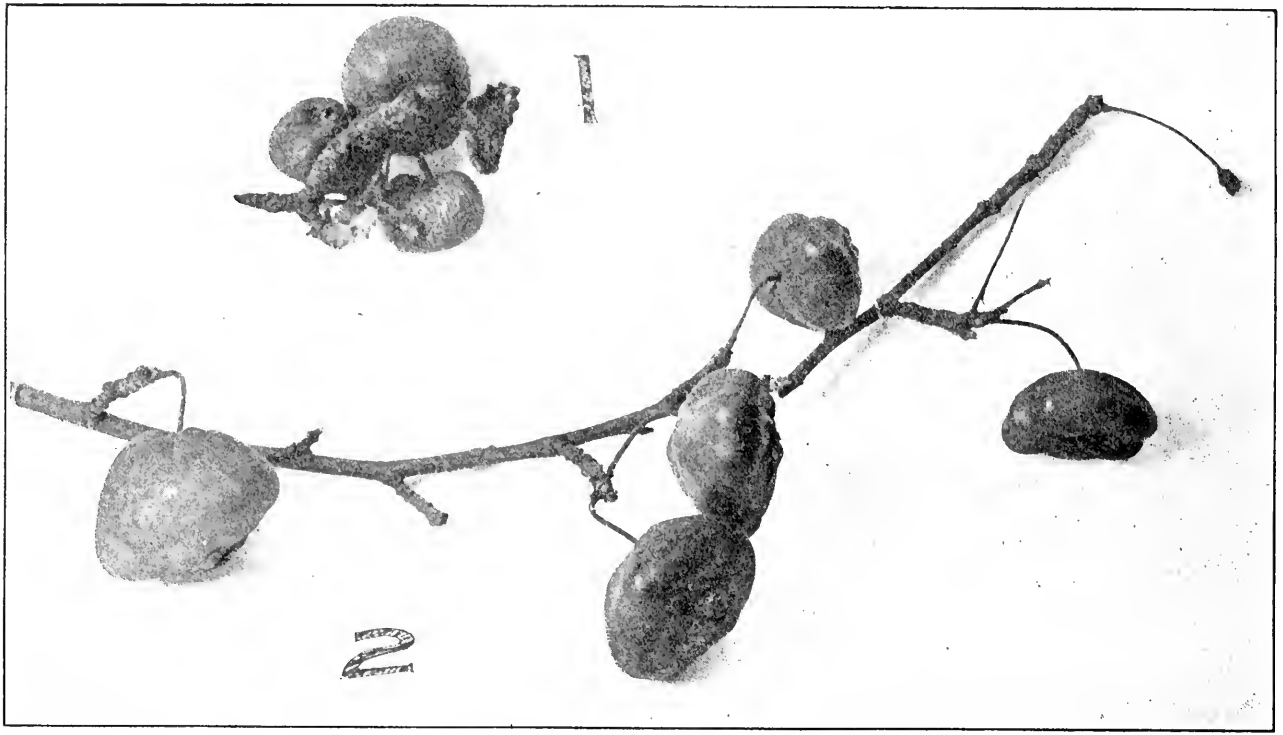


Fig. 2. 1. Wood of Apple Stunted by the Apple Aphis. 2. Apples Injured by the Apple Seed Chalcis. Photographed in the office of the Economic Zoologist.

DEPARTMENT OF AGRICULTURE—DIVISION OF ZOOLOGY
THE APPLE SEED CHALCIS
(SYNTOMASPIS DRUPARUM)

This is a small green-colored gnat-like insect, in its mature state about one-eighth of an inch in length. The eggs are deposited in the seeds of apples when the fruit is one-half inch or more in diameter. On warm sunshiny days in June the female alights upon the young apples, and drives her long ovipositor into the apple, through the flesh and into the seeds. The eggs are pure white, and hard to see in the young seeds. From the eggs hatch grub-like larvae, having brownish heads. They feed on the soft contents of the kernels until September, at which time they become full grown larvae, having devoured the entire kernel of the seeds. They pass the winter inside the seed shells in the pupae state, emerging from the apple as mature insects early in the following summer.

The damage done to fruits by the Chalcis consists principally in dwarfing and gnarling the apples in a characteristic manner. Infested apples are not only undersized, but misshapen, and lacking in symmetry. The point at which the eggs were introduced appear as a black dot occupying a depression on the surface of the fruit. From these punctures a brownish line of hardened tissue extends to the infested seeds.

Treatment: Since the insects remain in the seeds throughout the winter, it is necessary to destroy the apples left under the tree in the fall, as well as such as remain upon the tree. The complete destruction of all such apples grown, both in the orchard and of seedlings elsewhere, will prove an effective remedy where this practice is followed generally in infested localities.

(g) Carbon Bisulfide for Round-headed and Flat-headed Apple-tree Borers. Our experiments have proven conclusively the correctness of our recommendation to use carbon bisulfide for the round-headed and flat-headed borers which infest apple, pear and quince trees. It is to be noted that this is not recommended for the borer of the peach, which is discussed above, and for which we have found an adequate preventive.

Carbon bisulfide is a clear, foul-smelling, heavy liquid which readily volatilizes and of which the fumes are offensive, poisonous and explosive. It is not quickly poisonous as hydrocyanic gas, and it is much more safe to use, but fire should be kept away from it. It is not a preventive of borers as is the lime-sulfur wash, but is used as a remedy for them after they have entered the tree.

The proper method of using it is to put the liquid in a spring bottom oil can, and insert the tip of the can into the hole of the borer, and inject a jet of the liquid and close the hole with clay, mud, putty or grafting wax. Where the hole is large and irregular a wad of cotton can be satured with the carbon bisulfide, and held in place by a handful of mud fastened over it against the tree.

A number of persons have cleaned up their orchards by this method. Among these is Mr. P. M. Amberson, of Waynesboro. It is not necessary to spend time, or to injure the trees by cutting with a knife or attempting to follow the holes of the borers with a pliable wire. This information is worth a great deal to the owners of young apple, pear and quince trees who in many cases find both the round-headed and flat-headed borers to be among their very worst pests.

As a means of preventing the borers from entering the trunks of trees, we find that an application of the lime-sulfur solution, with the sediment present, made and applied as for the peach-tree borer, is efficient and is hereby recommended. We have further proven the value of pure white lead and linseed oil as a paint, made about as thick as house paint and applied about the middle of June. All preventive washes of this kind for borers should be applied about this date. Oil paint should not be applied to trees that are declining or feeble, but can safely be used on those that are vigorous. It is not recommended for peach and plum, and is really not needed for these, as the lime-sulfur is efficient, if frequently and properly used.

Other investigations and experiments are being conducted but have not yet reached such stage of conclusion as to justify a report upon them. It is to be hoped that we shall have funds sufficient for assistance capable of conducting some further experiments in this line during the coming year.

3. PUBLICATIONS

The publications of this office have been chiefly as follows:

(a) The regular *Bulletin,* which was changed from a monthly to a bi-monthly, and which has appeared regularly, and seemed to be even more successful and gratifying to the public and in the monthly form. The subjects discussed in the respective numbers of Volume I of the Bi-monthly Bulletins for the past year were as follows:

January, Formulae. Pests and their treatment.
March, San José scale. Spraying Apparatus and Material.
May, Model Orchard Work in Pennsylvania.
July, Economic Entomology. Short Articles. Part I.
September, Economic Entomology. Short Articles. Part II.
November, Zoological Conservation. Business Features of Horticulture. Index to Volume I.

The last number of the Volume was fully indexed, giving the subjects and pages treated in the entire volume. Some extra copies were published for distribution to those who have not already received them.

(b) Our Annual Report. Further publications of this office consisted of the Annual Report, the Report of the Ornithologist of the State Board of Agriculture, who is also your Economic Zoologist, a number of special articles written for magazines and journals, and circulars, and the Weekly News Letter.

(c) Circulars. This office has found it very helpful to issue a series of one-page circulars, which can be inserted into envelopes and used in correspondence work to answer most of the inquiries that would come along the lines of certain topics. Those which were prepared during the past year were as follows:

Fig. 1. Pure bred two-year old Shorthorn steer bred in Greene County. Fed at Pennsylvania State College.

Destruction and Treatment of San José Scale.
Oyster-shell and Scurfy Scale.
Lecanium Scale.
Woolly Aphis.
Borers.
Pear Blight, Black Knot and Peach Yellows.
Curculios.
Codling Moth.
Canker Worms.
Tent Caterpillar.
Bud Moth.
Aphids or Plant Lice.
Apple Seed Chalcis.

(d) The Weekly Press Letter. With the exception of our Bi-monthly Bulletin, by far the most important publication of this office has been the Weekly Press Letter. This is our letter prepared weekly in printed galley or proof form, and sent to the newspapers of the State, ready for copying. It has been prepared regularly, and issued on time every Tuesday morning. Generally about three short articles are treated in about one-third column each, making about one column of newspaper articles that are appropriate to the season and conditions in this State.

The publishers of papers have come to regard it as a regular contribution of matter of interest and of great value to their readers, and most of the newspapers in this State now regularly hold space for this letter and maintain a "Department of Plant Pests" by using it. It is sometimes copied in some of the leading newspapers of the United States, and occasionally used in the various horticultural and agricultural journals.

This was the best plan that we have ever devised or known to be used for reaching the public with popular, timely articles. It has been very inexpensive, since the cost of publication, envelopes, and mailing is much less than one dollar per week. The great value in this service is in the fact that we have the co-operation of the newspapers, and thus the good work of this office is multiplied many fold without additional expense. It has undoubtedly been one of the great means of awakening men in the State of Pennsylvania to the production of better crops. Anyone who is awake to the agricultural interests in this State will not deny this statement, and, in fact, it could be made much stronger with equal truth.

4. LECTURES

The Economic Zoologist has been called upon to deliver lectures in all parts of this State, and has responded to such an extent as his time from other duties would permit. These lectures have been chiefly devoted to the subjects of zoology in some of its broader or narrower fields, and also to orcharding, spraying, crop growing, soil improvement, implements, etc. Naturally the theme that is uppermost in the mind of the public in writing to this office is that of plant protection or pest suppression. We have delivered several illustrated lectures at the various meetings of county horticultural societies, county fairs, and other organizations and clubs, and have felt that some good must come from such efforts.

Besides the addresses given by the Demonstrating and Inspecting force, the Economic Zoologist, himself, has delivered forty-five addresses in the State of Pennsylvania during the past year, many of which have been illustrated with original lantern slides. We are now fortunate in having with us in the office as Artist, Mr. John O. Smith, who is particularly proficient as a photographer, and who is able to make, from our own photographs, slides which are especially interesting and useful.

5. INSPECTION OF NURSERIES

The work of nursery inspection has continued as usual, with Mr. E. B. Engle as Chief Nursery Inspector, assisted by such members of the office and field force as were available for special service when needed. A full report of the Nursery Inspection work for 1911 is published in the Bi-monthly Bulletin of the Bureau of Zoology for January, 1912. This shows that there were 200 nurseries inspected in the State of Pennsylvania during last year, comprising 3,130 acres.

As these nurseries are inspected twice per year, during midsummer and again during the latter part of the winter, it can be seen that this work is a great task, but it is certainly efficient in insuring far better and healthier nursery stock than could be expected without it.

It is my great pleasure to report that the attitude of the nurserymen has, in general, been very favorable in regard to the nursery inspection. Instead of feeling that the law is one which was established solely for the benefit of the tree grower, and against the nurseryman, they have come to see that it is of mutual advantage, and the people of this State now know that they can buy good, clean, healthy trees in this Commonwealth, and that no others are permitted to be grown, sold, or shipped, and they are rightly buying and planting home-grown trees and reaping the advantage thereof. In fact, as a result of our campaign in nursery inspection and against fraudulent tree agents, we are hearing less and less of the rank frauds formerly practiced among our agricultural people by the travelling tree agent or jobber.

6. INSPECTION OF IMPORTED PLANTS, SEEDS AND FRUITS

Not only are the nurseries carefully inspected to prevent the dissemination of pests from them, but it is likewise essentially important that all plants and seeds brought into this State for propagation purposes shall be free from obnoxious or injurious pests. Thus the inspection of imported plants is something of great value to our growers in all parts of the State, and it has been pushed with all vigor and faithfulness possible.

The people of this State will scarcely realize the wonderful extent of the plant inspection that is done by this office. For example, during the spring of this year we received a report that nine carloads of imported plants were coming to one of our large Eastern nurserymen. When these immense boxes contained tens of thousands of small trees and shrubs were opened, we had several inspectors present, and all were inspected with a thoroughness, efficiency and expediency that was remarkable and gratifying.

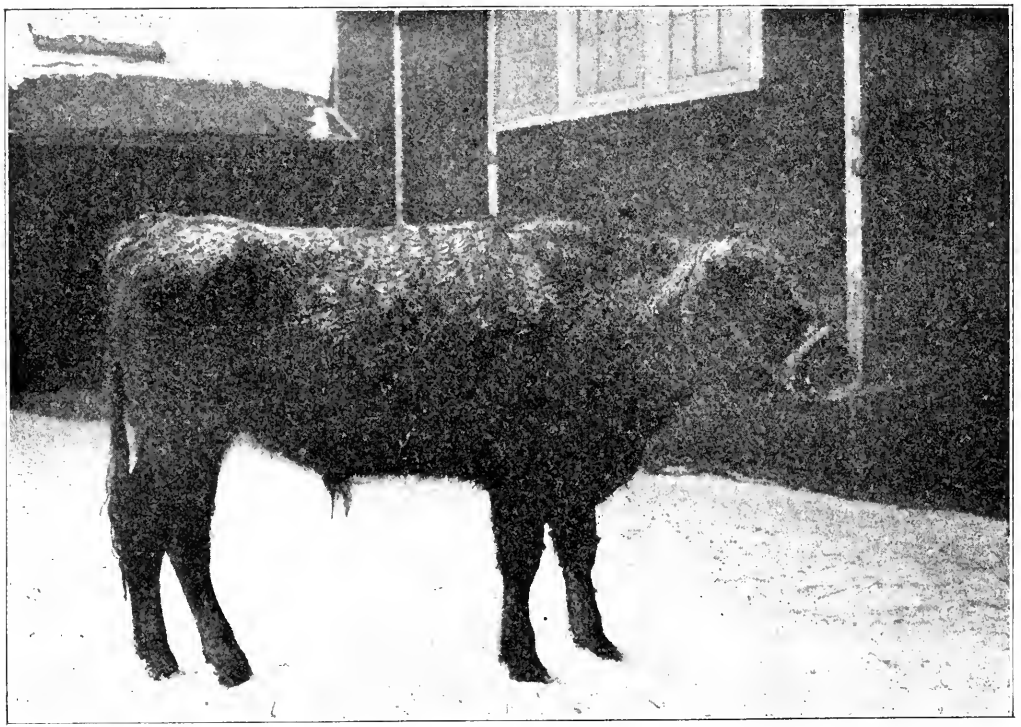


Fig. 2. Two-year old scrub steer, purchased upon open market, unprofitable to producer, feeder and killer.

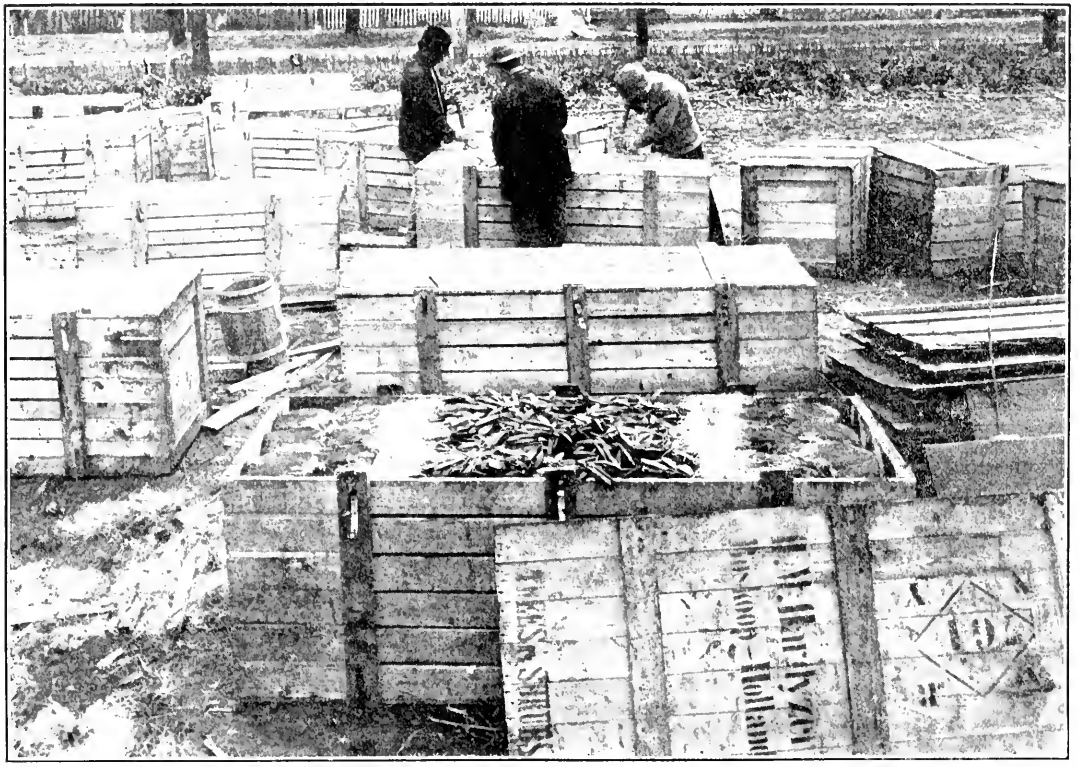


Fig. 3. Boxes of Imported Nursery Stock Showing a Portion of one of the Hundreds of Imported Shipments Inspected by the Bureau of Zoology.

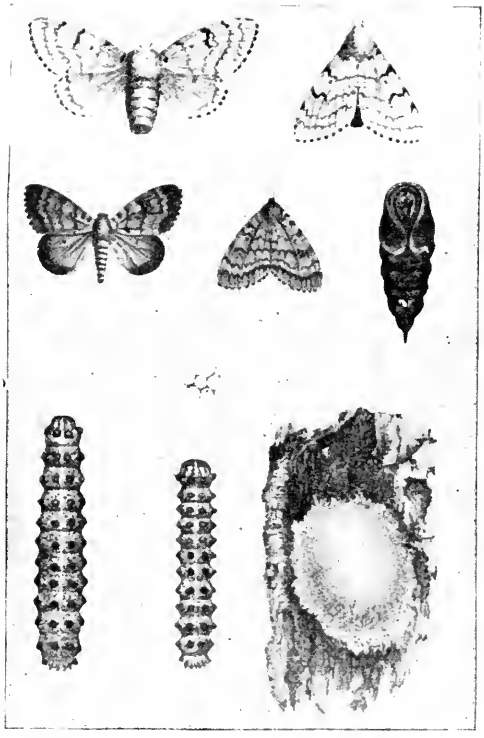


Fig. 4. Gypsy Moth in its Various Stages.

By such inspection work it has been possible—up to the present—to prevent the introduction into this State of such very objectionable pests as the Gypsy moth, the Brown-tail moth, the Pine-tree blight, the Potato tuber disease and numerous other insects and diseases which might otherwise prove every far more serious than those which we have at present. The accompying plate, Fig. 3, shows a portion of an imported shipment of stock received by one of our large nurserymen. It must be understood that each box contains sometimes thousands of plants, and that all of these were examined with great care.

In this inspection of importations, we have the close co-operation of the United States Department of Agriculture. Dr. L. O. Howard, United States Entomologist, regularly informs us immediately of all nursery stock, cuttings, bulbs, seedlings, etc., coming into any port of entry in the United States, and destined for Pennsylvania. The Custom House officers likewise are courteous in giving us reports of the same, and it is our regular method, as soon as these reports arrive, and we learn that the shipments have reached their destination, to have an inspector present to see that they are free from injurious insect pests and plant diseases.

GYPSY MOTH (See Fig. 4)

Growers in the foreign countries now realize that this inspection work in America is not a farce, and that their infested or infested trees are liable to be thrown back on their hands or destroyed at their loss. Therefore, they have become much more careful than formerly in regard to the shipment of stock carrying insects or diseases and, in fact, they are placing their own inspectors in the supervision of their exported stock to make certain for themselves that such pests are not carried with the treees. The results of this is shown in the fact that while a few years ago we found thousands of the winter nests of the Brown-tail moth containing tens of thousands of living larvae, and masses of eggs of the Gypsy moth and other pests that might prove quite serious, we have not, during the past period of inspection, found any very serious pests, although hundreds of thousands of trees and bushes were imported and inspected. Without such careful work on the part of this office, we are certain that the Gypsy moth and the Brown-tail moth would now be devastating the vegetation in the State of Pennsylvania the same as they are doing in the New England states. (See Figs. 5 and 6.)

The importance of careful nursery inspection and the proper inspection of importations is better comprehended when we remember that "a large percentage of the imported insect pests and plant diseases in this country have been brought in on imported stock. Among these recently so introduced are the San José scale and, in New England, the Brown-tail moth, and in past years, more than 50 per cent. of the major fruit and crop pests and plant diseases which now infest this country.

The government is now appropriating $300,000.00 annually, in an effort merely to control the Brown-tail and Gypsy moth, in a small section of New England, and the New England states of themselves are spending upwards of $1,000,000.00 annually in the same effort.

The imported bulbs and seeds are also inspected in regard to making sure that they are free from injurious insects and diseases, but there is no inspection in regard to the adulteration, weed seeds, or low vitality, which is a subject not provided for by law.

The new Federal law in regard to imported and shipped nursery stock is of great value, and will be very helpful to our citizens.

APIARY INSPECTION (See Fig. 7)

The Legislature during the early part of this year passed a bill, which was signed by Governor Tener and became a law, providing for the inspection of apiaries in the Commonwealth of Pennsylvania, looking toward detecting and eradicating the diseases of bees,—particularly the two very destructive diseases known as American Foul Brood and European Foul Brood.

This work is to be done in the Bureau of Zoology of the Department of Agriculture, and will be taken up in a manner as vigorous as possible as soon as the funds are available for the purpose. It is rather unfortunate for the bee-keepers that the bill intended to provide funds for this was crowded out in the rush of legislation toward the close of the session. This is a very important service, not only for the bee-keepers, but also for the fruit growers, and we trust to see ample provisions made for it by the next Legislature.

7. MAKING COLLECTIONS

The collections made by this office have been carefully preserved in a room in the Capitol Building, where they are not arranged for display, but are kept in a compact manner with all data concerning them. Although this is a young collection, it has already become famous for the number and quality of specimens which it contains, and the great bulk of data so carefully preserved. Specialists in the study of various groups of insects have come to Harrisburg to see our collection, and have pronounced the specimens the best they have observed. While our collection contains chiefly insects in the various stages, showing also their characteristic work or effects, their enemies, life histories, etc., we have also preserved fishes, amphibians and reptiles of all kinds occurring in this State, and birds and mammals.

We have not made a special effort to collect birds and mammals for the reason that many popular museums contain these features, and we do not have a taxidermist to help with their preservation. While our collection is not made with the intention of its being a popular exhibition, it certainly contains records which no scientific student of the subject can now afford to be without. It is the basis for the study and publication of the life histories of beneficial and injurious insects, and their friends and enemies. Special attention has been given to preserving duplicates of those insects that are more interesting and important, in order that we can build up school collections.

SCHOOL COLLECTIONS

The time is now at hand when, with but a slight amount of money set aside for the purpose, we can prepare and put into at least one high school in each county of the State, a representative collection of the beneficial and injurious insects of each respective region.

Fig. 5. Winter Webs of the Brown Tail Moth. Found in Numbers on Some imported nursery stock.

Fig. 6. Webs of Brown Tail Moth and Tree Defoliated by this Pest.

When such specimens are properly prepared, labeled and exhibited they will not only help the teachers a great deal in Nature study, but also will be of vast economic importance in showing to pupils farmers and orchardists which are their friends and which their foes, and in throwing light on essential points in the knowledge of their life history, which must be recognized in the work of practical insect warfare to save our crops from annual loss of over a million dollars, which I fully believe is not too high an estimate to place upon the annual damage of insect pests to cultivated crops alone in this State.

Whenever insects occur in devastating numbers we aim to collect specimens of them and their work, provided we do not have them already represented in the collection. We also make a study of their natural enemies and the various plants upon which they feed. As the duplicates are preserved in good condition they can be used in the school collections or in exchanges.

We have not yet developed a system of making exchanges, but the time is at hand when it is worth while to undertake this work and attempt to make the collection as complete as possible in those species occurring in Pennsylvania or liable to come into this State.

During the year 1911 there were 1,090 accessions of specimens added to our catalog pertaining entirely to zoology; also, much material was received (not pertaining to zoology) from as many more contributors, that were not given any accession numbers. Some of these numbered accessions include insects and other material, such as birds, reptiles, etc.

The number of accessions may not be as large as during previous years, but the material collected by the office employees on their own time was placed under one accession number for the entire year.

Total number of accessions,	1,090
Number pertaining to insects,	1,026
Number pertaining to invertebrates other than insects,	73
Number pertaining to fishes and reptiles,	15
Number pertaining to birds,	8
Number pertaining to mammals,	3

BREEDING CAGES

Whenever we have collected or received specimens of living insects, the life history of which is not fully known, or which are in their immature stages, and hence not to be determined, we have kept them enclosed in glass and cloth covered vessels, commonly called "breeding cages," for the purposes of making a careful study of them in every detail, and also procuring specimens in their various stages of transformation.

Often the only good specimens obtainable by the collector are to be had by the one method of rearing them to maturity in breeding cages. Thus it becomes important to keep these cages and study the transformations of the pests. The dates for practical remedies often depend very decidedly upon the exact dates of the transformation of the insects. For example, there is no satisfactory remedy for the Lecanium Turtle-shell, scale of peach and plum excepting to watch for it at the time of its hatching, and then apply a comparatively

mild contact insecticide, such as extra dilute lime-sulfur solution, soap solution, or kerosene emulsion, etc. This, in general, occurs during the early part of June in this State, but may vary with seasons, and the only way this is to be determined with accuracy is by observing their transformations under normal conditions.

During the past year we kept thirty-nine breeding cages, watching them carefully, and keeping records of the insects they contained. We should have kept many times this many, but we are handicapped for lack of facilities for containing the breeding cages and making observations of the insects in normal conditions. These cages at present must be kept in a room that is artificially lighted and heated. Observations of transformations on a natural basis can not thus be made, as the dates of changes in these cages are abnormal. There is nothing that this Bureau needs more than a small outdoor room, perhaps in connection with the greenhouse here, where insects could be reared and studied under normal conditions of temperature, moisture and light, and where their dates of transformation would thus be the same as those in fields, orchards, gardens and forests, so that we could notify the people of this State as to the time when they could expect these pests to appear in their respective destructive stages, and, consequently, save a considerable amount of loss by being fully prepared to meet them. Such a room is called an "insectary," and is in use by most of the leading entomologists of the world. We urgently request that such be provided, if possible, in connection with the greenhouses in Capitol Park.

Insects of the Year. In our observations and correspondence our attention was called to some unusual features of insects during the year 1911, which should here be recorded. Among these are the following:

There was a serious outbreak of the Flea beetle, *Crepidodera rufipes*, in this State during the last spring and summer, especially in the counties of Lancaster, York, Cumberland and Dauphin. Specimens were received during the entire summer from all parts of the State. We recommended spraying with one ounce of arsenate of lead in each gallon of water or in the Brodeaux mixture, and have many reports of highly satisfactory results, while the vines not treated were unproductive.

The Hessian fly, *Mayetiola destructor*, was received from a great many localities throughout the State, and was especially bad during May, as the spring brood were the immediate descendants of those of the previous fall, which were far worse than usual in this State. However, in the fall of 1911, the Hessian fly did not appear nearly as destructive as a year ago. This is probable, partially, because of the development of its parasitic enemies, but chiefly because the growers took the lesson given by us and planted late. It is worthy of record that many fields of wheat throughout the southern and eastern portions of Pennsylvania, during the summer of 1911, were so badly injured by the Hessian fly that they did not produce more than two or three bushels to the acre.

Unusual outbreaks of the Chinch bug, *Blissus leucopterus*, were reported from a number of localities in Pennsylvania, especially doing considerable damage to corn. It is not often that this particular pest is found so abundantly in Pennsylvania, although it is one of the common destructive insects of the Mississippi Valley.

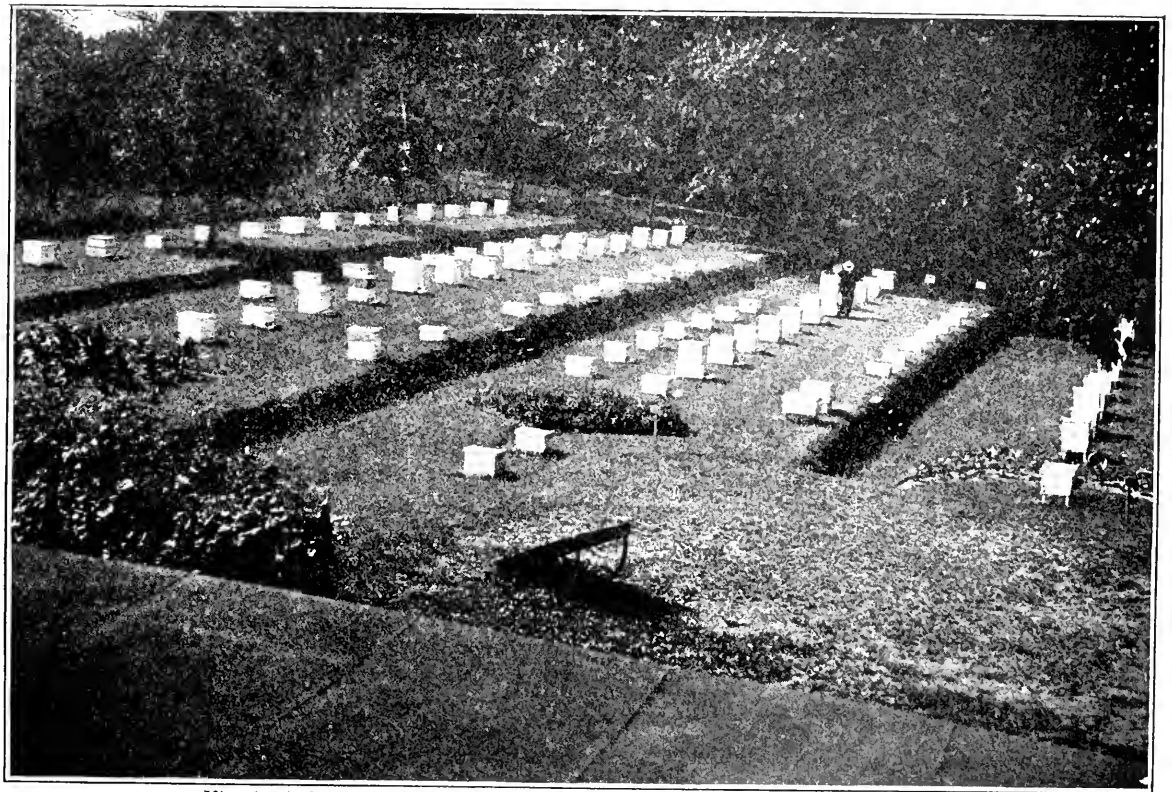


Fig. 9. Apiary in Pennsylvania Reported as Wiped Out by Bee Diseases.

The Margined blister beetle, *Epicauta marginata,* was injurious in many places to truck crops, flowers, etc., and was sent to us by various correspondents. While it is alarming to observe it at the time of its appearance, it does not remain long, and can, without great difficulty, be driven away from the premises or destroyed by using bunches of fine whips, vigorously applied.

The Pear leaf blister mite, *Eriophyes pyri,* was reported from a number of counties infesting the fruit and leaves of pear and apple, especially from the northern part of the State. It was destructive as far south as Mechanicsburg, Cumberland county, Pennsylvania. This is becoming more and more destructive in this Commonwealth. It does not appear to be as well known as it should be, and, consequently, it is not recognized. The mite itself is too small to be seen plainly with the unaided eye, but it makes black, sooty blotches in the leaves of apple and pear, and these are quite distinct and conspicuous. The tissue of the foliage is seriously injured, and the leaves fail to perform their full normal functions and drop soon. Fortunately, our tree growers are learning more and more to spray during the dormant season with strong lime-sulfur solution, and those who do this are keeping the Blister mite in check. It appears that this pest passes the winter beneath the bud scales on the trees, and is destroyed by a dormant spraying such as is applied for scale insects. The following circular was sent out from this office:

Leaf Blister-Mites. The Blister-mites are small white, or pinkish-white mites which produce open galls or blisters, looking like blotches of soot on the under surface of leaves, fruits and fruit stems of apple and pear. They spend the winter under the scales of the buds. As soon as the leaves unfold in the spring they leave their winter quarters and enter the stomata, first on the young leaves near the base of the growing bud, spreading to the leaves toward the end of the twig as the season advances. The eggs are deposited in the tissue of the leaves some time in April and early May. The young mites hatching from these eggs burrow through the epidermis of the under side of the leaf, and feed upon the tissues in the interior, and this irritation produces a sooty thinning of the leaf, which is known as the gall or blister. Other eggs are deposited throughout the season within the galls, and the young mites after hatching tunnel in all directions, thus enlarging the galls. Through an opening in the under surface the mature mites emerge and pass to other localities, where they form new galls. There are numerous generations throughout the season, as they breed for a period of about six months. In October the adult mites seek shelter for the winter in the buds.

The injury from these pests first manifests itself by small green, red, or yellow patches or pimples which enlarge, run together, and form irregular dead areas, turning brown and dark later in the season. Severely infested leaves lose their fresh green color, acquire a variegated appearance, and drop from the tree. The affected fruits are either destroyed, or, if they recover from the early attacks, become stunted, and develop into fruit of poor quality.

Treatment: Spray infested trees in the fall as soon as the leaves have fallen from the trees, and again in the spring, thoroughly, with one of the following materials:

1. Lime-sulfur Solution (Home-boiled, Concentrated). Slack 1 pound of high grade lime, adding 2 pounds of ground or powdered sulfur, and boil in 1 gallon of water for one hour. Use this proportion for any larger quantity. If necessary add water to make up for any evaporation; strain and store in closed vessels until needed, or in open vessels, keeping the solution covered with a thin film of oil. When ready to spray dilute one part with 7 or 8 parts of water, or (better) to specific gravity, as shown by Hydrometer test, of 1.04 to 1.03.

2. Lime-sulfur Solution (Home-boiled, dilute.) This is made by slaking 22 pounds of quick lime (fresh stone lime), to which is added 17 pounds of finely powdered or ground sulfur previously mixed into a paste with a little water to break up any lumps which may be present. Boil in an iron kettle in sufficient water for an hour, and dilute to make 50 gallons. Strain this well through a fine brass wire netting, having about 30 wires to the inch. Spray at once, or before the mixture gets cold. The objections to this are the great amount of sediment, and the necessity of immediate use.

3. Lime-sulfur Solution (Commercial Concentrated). Many manufacturers are placing upon the market ready-made Concentrated Lime-sulfur Solutions, and these are found satisfactory and about as effective as the Home-boiled Solution. They should be diluted, as a rule, by adding to one part of the Concentrated Mixture 7 or 8 of water, or (better) to specific gravity, as shown by Hydrometer test, of 1.04 to 1.03.

4. Kerosene Emulsion. Made by dissolving one pound of soap in one gallon of hot water, and adding to this 2 gallons of kerosene or common coal oil, stirring and whipping it until it forms a thick, creamy mass. To this stock solution add 5 times its bulk of water.

Special care must be taken in spraying apple trees to soak the buds and twigs thoroughly. Since the treatment for Blister-mites with Lime-sulfur Solution is the same as that which we recommend for San José scale, it is evident that where both pests are present a spray applied for one of them will destroy the other.

H. A. SURFACE,

Economic Zoologist.

The Southern Cotton worm moth, *Aletia argillacea,* appeared all over the State of Pennsylvania from September 21, to October 7, in such numbers, as one correspondent expressed it, "not by the hundreds nor yet by the thousands, but by the millions, so as to fill the air and darken the lights as by a snowstorm." Many specimens of this moth were sent to us simultaneously from different parts of the State, with inquiries as to their identity and significance.

It is evidently a source of much satisfaction to our alert citizens to know that this was only a visitor, which is not known to feed upon vegetation in Pennsylvania, and which has migrated into this State from the southern country where it normally feeds on the cotton plant.

It is worthy of note that we observed these moths doing considerable damage to the late peaches, such as Salway, which were ripening just at the time of their invasion. They alighted upon the ripe

fruits and punctured them, inserting the long proboscis, and sucking out the juice in a circle within a radius of about one-half inch. Around this circle the surface of the fruit was stained brown by the liquid deposited by the moth. This damage was very conspicuous and considerable. It is also reported that they injured grapes in the same way.

The Apple seed chalcis, *Syntomaspis druparum*, was a very considerable pest in the apples of the northeastern part of Pennsylvania. Our inspectors in that region found it in many of the orchards which they visited. They particularly found it abundant and destructive to the fruits of old, neglected or wild apple trees. We worked out the life history of this insect, and published a circular upon it which is inserted in a foregoing portion of this report.

The Apple maggot or Railroad worm, *Rhagoletis pomonella*, was also very abundant and destructive in apples in the northern part of Pennsylvania, and as it is a pest that is not usually recognized, and for which many fruit growers have as yet done but little, it is important for us to call attention to its results, and the need of checking it.

This so-called "worm" is really the larva or maggot of a fly not larger than a house fly. The egg is laid about the time the fruit is ripe, and the little larva bores around through the pulp of the apple in a winding or sinuous manner, and hence is given the name "Railroad worm." It does not confine itself to the vicinity of the core, as does the codling moth, but bores all through the fruit, and practically renders it unfit for use, as well as making it rot much sooner. It is much worse in the soft, early apples and sweet apples. As it lives for some time in the fallen apple before going into the ground to pupate, there is a satisfactory means of preventing further loss by it. This is to destroy the fallen fruit within a half week from the time it drops. If the orchard is pastured with sheep or hogs it will not be a difficult matter to prevent the further ravages of the Railroad worm.

As this pest is carried in fruits washed down stream, it is liable to be spread southward across the State of Pennsylvania, along the shores of the Susquehanna River, and thence spread back into the adjacent country. All growers should be on the lookout for it, and be sure to destroy the fallen fruits promptly. There is no spraying remedy that is efficient or recommended.

The time has come for us to call attention to the importance of a law providing for the destruction of all worthless, forsaken, dying and seedling fruit trees in this State. We here emphasize the point that plant sanitation is fully as important to the plant grower or tree grower, as is animal sanitation to the live stock grower. It is far better for the interests of our citizens that they destroy the breeding places of plant foes, and prevent their multiplication, rather than depend upon local applications to check their increase. For example, one old seedling apple tree left standing along a fence, and particularly along the line fence where each owner hesitates to destroy it because of the supposed partial interest in it by the other, will be able to supply enough pests in the form of Codling moths, Apple seed chalcids, Railroad worms, San José scale, Oyster Shell scale, Fire blight, Canker worms, Tent caterpillars, etc., to infest and infect the entire orchard for quite a distance around it,

Such a tree should be destroyed. No man has any business to attempt to grow an orchard in this State with worthless trees living near it, which are fit only to propagate pests and cause trouble. It is as unsanitary to the orchards to have dying trees and rotten fruits lying neglected near their premises, as it is to live stock to have the remains of animals that have died of anthracnose, foot and mouth disease, tuberculosis, hog cholera, etc., around the pasture fields, where the animals feed and drink.

The time has come when the horticultural interests of Pennsylvania demand a Sanitary Plant Regulation, intelligently made and vigorously enforced. A wild or seeding apple tree is but a producer of diseases and insects. The same can be said of all other kinds of fruit trees when neglected. An old, dying and rotten tree may cause an immense amount of loss and hard work by continuing to spread its germs with every wind that blows through it or any bird that alights upon it. It should be destroyed.

The orchard infested with unchecked San José scale has no business to exist. It will become more and more worthless, and the sooner it is destroyed or properly treated the better. Osage Orange hedge infested with San José scale should also be destroyed promptly. Such a hedge is a nuisance, even though not infested. It would be to the benefit of the agricultural people of this State if local measures or legal enactment were made to destroy at once every Osage Orange plant that can be found.

The slothful man who does not spray his apple, pear and quince trees for Codling moth leaves a breeding place that may serve to infest his neighbors' trees for quite a distance away. Should this be permitted in the plant kingdom? We have taken the most stringent and effective means to prevent the spread, and, in fact, eliminate certain livestock diseases in this State. The same sanitary principles applied to the productions of plant life would be exceedingly beneficial, especially in view of the wonderfully extensive planting of orchards now being done. This is becoming more and more important. We urge the enactment of legislation providing for the destruction of all trees and other plants that are a menace to others. This can be done with great profit to the tree-growers by the appointment of enough competent country inspectors, through the Department of Agriculture, who should be stationed in each county to render the service that is there needed. It should be made his duty to see to it that land owners destroy or properly treat all fruit trees and other trees, shrubs and bushes upon their premises which contain pests that may spread. Such service properly rendered, would return to the State more than an hundred fold.

8. INSPECTION OF ORCHARDS

The importance of the inspection work is indicated in the above remarks. Legislation has provided for the inspection of premises for certain pests, but we have not had enough funds to put out more than one-half of the inspectors that are needed. In Pennsylvania there are sixty-seven counties, in each of which the citizens are justly calling for the aid which they now know with certainty our inspectors can give, and which will amount in many cases to hundreds of dollars for each citizen. We have the funds to keep in the

field but twenty-five men, which is not one-half the number actually needed. However, we are doing the best that is possible. During the past year, besides the extensive demonstration work in every county of the State of Pennsylvania, there were inspected, through this office's inspectors 3,037 premises, and in their county inspection work they inspected 9,416 orchards.

Wherever an orchard is inspected and found to have pests of any kind, the owner is informed in writing, and a copy of the same report is sent to this office. At the proper season of the year for treating the pests reported, we communicate again with the owner, by mailing to him detailed directions telling exactly what to use and how. Printed literature, containing formulae for treating the pests, is mailed to him, and he thus knows what pests are present and how to treat them. The following is the form of report used by the inspectors:

Circular 8. REPORT OF ORCHARD INSPECTOR. Date: .....

(To be filled for each place inspected.) Time of day: .....

Dear Sir: I have today inspected your trees and shrubs at (P. O.) .....

Twp.....Co..... .....and it is my duty to report as follows:

Name of Owner.....Address.....

Name of Tenant.....Distance and direction from Post Office.....

		San Jose.	Scurfy.	Oyster S.	Lecan.	Other Pests (to be Named.)
No. Apple Trees,	Young, ...Insects found.					
	Bearing, ...Insects found.					
No. Pear Trees,	Young, ...Insects found.					
	Bearing, ...Insects found.					
No. Peach Trees,	Young, ...Insects found.					
	Bearing, ...Insects found.					
No. Plum Trees,	Young, ...Insects found.					
	Bearing, ...Insects found.					
No. Cherry Trees,	Young, ...Insects found.					
	Bearing, ...Insects found.					
Shrubbery, (Name), ...						

Has this Orchard been treated for San Jose Scale?.....How many times and when?.....

With what Material?.....At what strength?.....What Results?.....

Marks: + = infested slightly; + + = considerably infested; + + + = badly infested; — = not found.

For further information address Prof. H. A. SURFACE, State Zoologist, Harrisburg, Pa.

My address:..... .....Authorized Inspector.

We are pleased to report that, with very rare exceptions, the inspector is cordially received and closely questioned. The Pennsylvania fruit grower is rapidly becoming educated in the care of his trees, and now understands better than ever before that this work

is a continuous campaign of education for the benefit of all persons who have growing plants of any kind that are liable to be injured by pests. It is quite gratifying to this office to receive the many encouraging letters which come into our hands. As the years pass and this work is continued it becomes each year more popular, important, and fruitful in practical results.

Our inspectors are, in many cases, the persons whom we took some years ago to the Pennsylvania State College and there gave instruction, and whom we have met in semi-annual conference regularly during each year for definite instruction in their special work. Everyone is enthusiastic in recognition of the important work he is doing, and under such conditions good results must be obtained. That these men are accomplishing much for the farmers and fruit growers is evidenced by the flood of requests which we received calling for their services. While the real work of inspection is done systematically, going from place to place, finishing one township at a time, yet we aim to comply with all requests for special instruction, when this can be done without too much additional expense.

In this inspection work many injurious pests are found in their incipient stages, and serious loss is prevented thereby. For example, I was invited by a friend to inspect his orchard at Enon Valley, in Lawrence county. I did this, and found one very young apple tree badly infested with San José scale, growing near a large apple orchard of vigorous trees, in their prime. The farmer did not know the scale, and would not have recognized it until its effects had become apparent upon his larger trees, which would have been too late to have saved them without very considerable expense and trouble. Under the circumstances the infested small tree was immediately destroyed and the danger of infestation was eliminated, as readily as a fire is prevented by extinguishing a match.

LIST OF INSPECTORS

The list of the inspectors and their respective districts is as follows:

Allaman, R. P., Somerset, Bedford, Fayette, Greene.
Benn, M. L., Tioga, Potter, Cameron, Elk.
Bergy, James, Mifflin, Juniata, Huntingdon, Blair.
Bowers, E. C., Lancaster, Franklin, Fulton.
Briggs, J. S., Beaver, Allegheny, Westmoerland, Indiana, Montgomery.
Bullock, W. H., Wayne, Pike, Monroe.
Burke, P. H., Erie, Warren, McKean, Forest.
Cox, J. W., Crawford, Butler, Lawrence, Mercer.
Ebert, Carl, Berks.
Fertig, F. R., Lebanon, Lehigh, Carbon, Dauphin.
Finn, A. O., Susquehanna, Lackawanna, Luzerne.
Foster, T. C., Union, Snyder, Centre, Perry.
Knuppenburg, D. A., Bradford, Wyoming, Sullivan.
Loux, E. L., Bucks, Cambria, Clearfield, Jefferson.
Moore, B. S., Northampton, Schuylkill, Washington.
Murray, D. E., Northumberland, Montour, Columbia.
Peirce, E. F., Adams, York, Cumberland.

Shay, M. E., Delaware, Philadelphia.
Stichter, G. B., Venango, Clarion, Armstrong.
Wilson, J. C., Lycoming, Clinton.
Windle, Francis, Chester.

9. DEMONSTRATIONS

It is in the demonstration work that this office has been particularly active, and has rendered the most remarkable service during the past year. The public demonstrations were continued both at private premises and at certain orchards belonging to public institutions. Better results from this work were shown than ever before. The calls for the work of the demonstrator were such that we were obliged to continue the supervision orchard system, by which we could at least send a man to look over the orchard with the owner and lay out plans for its management and visit it occasionally during the year to supervise the work and help with any points demanding special attention or assistance.

The amount of work that was accomplished in the demonstration and supervision orchards is almost incredible. The statistics concerning these are as follows:

Number of demonstration orchards,	245
Number of demonstrations held in these orchards,	930
Number in attendance at the demonstrations,	14,092
Number of supervision orchards,	1,064
Number of visits by inspectors to the supervision orchards,	1,972
Number of trees in demonstration orchards,	151,286
Number of trees in supervision orchards,	493,364

Amount of fruit produced in the 159 demonstration orchards reported:

Apples, 85,160 bushels, valued at,	$75,000.00
Pears, 814 bushels, valued at,	500.00
Peaches, 2,000 bushels, valued at,	4,000.00
Total,	$79,500.00

It is intersting to note that other states are introducing demonstration work along the lines which have proven so beneficial with us. The magnitude of this work in this State is better understood when we call attention to the fact that the last annual report of the State of Maryland, for example, shows that during the year they have had twenty-six demonstrations; in Virginia twelve demonstrations were given; and in Indiana, which has recently organized this work, there were ten demonstrations. We can safely say that more public demonstrations were given in Pennsylvania during the past year, than in all other states, territories and countries of the world combined. We are satisfied that a careful study of reports and statistics will reveal this fact. The benefits for our citizens have likewise been proportionately great.

When this work was undertaken, your Economic Zoologist said to a representative of one of the leading newspapers of Pennsylvania, that it would be "either the most stupendous failure or the most remarkable success that has attended the work of this office." We can see more and more that the latter is the inevitable result.

Applications from every county asking for demonstrations to be given in orchards owned by the writers have been coming to us by the hundreds, so that at this time we have about sixteen hundred applications on file, and are puzzled as to which to select that will give the best results. Consequently we thought to make an entire change, if practical, and drop many of the demonstration orchards of last year, and substitute new ones this year. We sent out a circular asking for expressions of opinion in this regard, and, with few exceptions all persons replied saying that the work has resulted in great practical good for them, and they wish it continued, if not in their orchards, then certainly in their own immediate vicinity.

The magnitude of this work is wonderful, and to show how it is extending into each of the sixty-seven counties of Pennsylvania, it is best to report it by counties, as follows:

ADAMS COUNTY

E. F. Peirce, Inspector and Demonstrator.

Location of Demonstration Orchards:

George Oyler, Gettysburg.
George F. Sites, Fairfield.
Mrs. C. N. Weaver, New Oxford.

Location of Supervision Orchards:

William Bighams Sons, Gettysburg.
H. C. Brinton, Hanover, R. D. No. 3.
John C. Cluck, Biglersville, R. D. No. 2.
Jos. W. Cooley, Biglerville, R. D. No. 2.
George L. Culp, Biglerville.
George E. Fohl, Biglerville, R. D. No. 2.
Jacob Gochenour, Aspers.
D. H. Guise, Emmittsburg, Md.
G. O. Heckenluber, Biglerville.
E. N. Hoffman, Biglerville, R. D. No. 2.
D. M. Hoffman, Biglerville.
W. C. Hoffman, Aspers.
Willis H. Hoffman, Biglerville, R. D. No. 2.
David Hoke, Hanover.
John S. Hollinger, Emmittsburg, Md.
Daniel Clarence Jacobs, Gettysburg, R. D. No. 5.
Henry B. Jacobs, East Berlin.
H. M. Keller, Gettysburg.
O. S. Knouse, Biglerville, R. D. No. 2.
John R. Kuhn, East Berlin.
Reuben Lower, Biglerville, R. D. No. 2.
R. H. Lupp, Biglerville, R. D. No. 2.
A. W. McCauslin, Biglerville, R. D. No. 2.
George W. McCauslin, Biglerville.
S. S. Mehring, Littlestown.
I. D. Mickley, Cashtown.
Alvis E. Monter, Biglerville, R. D. No. 2.
David H. Orner, Biglerville.
Ira D. Pitzer, Biglerville.
H. V. Rahn, Abbottstown.

J. H. Smith, Biglerville.
E. H. Snyder & Son, Jacks Mountain.
C. E. Tawney, Gulens.
H. W. Taylor, Biglerville.
Ira P. Taylor, Biglerville, R. D. No. 2.
R. W. Taylor, Biglerville.
S. J. Taylor, Biglerville.
R. E. Wible, Gettysburg.

Number of public meetings held in this county: 16.
Number of supervision visits made in this county: 66.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 100 acres or more: 4.
Number of orchards of 50 to 100 acres: 6.
Number of orchards of 20 to 50 acres: 25.
Number of orchards of 5 to 20 acres: 137.

Peaches:
Number of orchards of 50 to 100 acres: 2.
Number of orchards of 5 to 20 acres: 12.

Pears:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 5 to 20 acres: 6.

Other fruits:
Number of orchards of 5 acres or more: 2.

ALLEGHENY COUNTY

J. S. Briggs, Inspector and Demonstrator.

Location of Demonstration Orchards:
Boys' Industrial Home of Western Pa., Oakdale.
M. C. Dunlevy, Carnegie, R. D. No. 1.
William Flinn, Pittsburg.
Harry T. Magill, Harmarville, R. D. No. 1.

Location of Supervision Orchards:
W. A. Adams, Coroapolis.
G. W. B. Allter, Tarentum.
C. M. Barthberger, Pittsburg.
C. E. Behrhorst, Pittsburg.
Beechmont Farm and Fruit Co., Oakdale.
Mrs. Alice R. Bentley, Glenshaw.
John R. Brown, Parnassus, R. D. No. 2.
E. C. Carter, Oliver Bldg., Pittsburg.
Harvey Childs, 813 Penn Ave., Pittsburg.
C. C. Dawson, Tarentum, R. D. No. 2.
O. R. Gegelman, 433 Wood St., Pittsburg.
B. M. Dickinson, Keenan Bldg., Pittsburg.
Dixmont Hospital, Dixmont.
August G. Espe, Perryville, R. D. No. 1.
James Fergus, Elizabeth, R. D. No. 3.
L. N. Fife, Venetia, R. D.
C. L. Flaccus, Pittsburg.
A. B. Gilfillan, Bridgeville, R. D. No. 1.

A. C. Gumbert, 511 Fourth Ave., Pittsburg.
L. C. Haler, McKeesport, R. D. No. 1.
George M. Johnston, Wilmerding.
Stewart Johnston, 1208 House Bldg., Pittsburgh.
W. C. Kroegher, 315 Laurel Ave., Bellevue.
John Lachman, Hays.
A. L. Lewin, 3703 Penn Ave., Pittsburg.
J. C. Monroe, Turtle Creek, R. D. No. 1.
James L. Orris, Carnegie.
J. W. Rutherford, Tarentum.
Wilson A. Shaw, Forbes & Morewood Ave., Pittsburg.
Dr. Laura G. Shrom, 503 Bijou Bldg., Pittsburg.
R. W. Tener, Coraopolis, R. D. No. 2.
W. A. Thomas, 322 Park Bldg., Pittsburg.
R. L. Trax, Library.
Tuberculosis League of Pittsburg, Allison Park, R. D. No. 2.
F. M. & G. E. Wilson, Wilkinsburg, R. D. No. 1.
R. J. Wilson, Library, R. D. No. 1.

Number of public meetings held in this county: 13.
Number of supervision visits made in this county: 30.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 100 acres or more: 1.
Number of orchards of 20 to 50 acres: 12.
Number of orchards of 5 to 20 acres: 286.
Peaches:
Number of orchards of 50 to 100 acres: 2.
Number of orchards of 5 to 20 acres: 10.
Pears:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 6.
Other fruits:
Number of orchards of 5 acres or more: 6.

ARMSTRONG COUNTY

G. B. Stichter, Inspector and Demonstrator.

Location of Demonstration Orchards:
T. J. Frederick, Spring Church.
Rev. J. S. Hill, Latrobe.
H. A. Marshall, Dayton.
J. W. Patterson, Apollo.

Location of Supervision Orchards:
J. R. Borland, Dayton.
S. P. Butler, Dayton.
J. H. Canfield, 5895 Barlett St., East End, Pittsburg.
J. R. Hill, Freeport.
E. H. Kramer, Rimer.
T. W. Niel, Dayton.
Orchardcrest Fruit & Poultry Farm, Sewickley.
Thomas I. Schaffer, Vandergrift.
Fred Snyder, Olivet.

Miss K. Stubrich, Kittanning, R. D. No. 7.
George E. Templeton, Kittanning, R. D. No. 2.
A. W. Woodrow, Freeport.
Number of public meetings held in this county: 17.
Number of supervision visits made in this county: 34.
Number of other inspections made in this county in 1911: 1,162.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 5 to 20 acres: 47.
Peaches:
Number of orchards of 5 to 20 acres: 5.
Pears:
Number of orchards of 5 to 20 acres: 1.
Other fruits:
Number of orchards of 5 acres or more: 1.

BEAVER COUNTY

J. S. Briggs, Inspector and Demonstrator.

Location of Demonstration Orchards:
Dr. John J. Allen, Monaca.
A. P. Goodwin, Industry, R. D. No. 1.
W. A. Hoeveler, 1150 Penn Ave., Pittsburgh.
George S. Reed, Baden, R. D. No. 2.

Location of Supervision Orchards:
R .C. Coleman, Rochester, R. D. No. 1.
Walter C. Dunlap, West Bridgewater.
J. S. Elder, Darlington.
John G. Engle, New Sheffield, R. D. No. 3.
C. A. Ewing, Beaver, R. D. No. 2.
G. H. Hildebrand, Beaver, R. D. No. 2.
F. C. Hodkinson, 710 Bailey-Farrell Bldg., Pittsburg.
Walter S. Kidd, Beaver.
Hugh Lauglin, Georgetown, R. D.
Allen McDonald, Hookstown, R. D. No. 1.
R. J. Miller, Beaver, R. D. No. 2.
W. J. Morgan, Baden, R. D. No. 1.
Fred J. Nannah, 407 Tenth St., New Brighton.
Number of public meetings held in this county: 9.
Number of supervision visits made in this county: 20.
Number of other inspections made in this county in 1911: 154.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 100 acres or more: 1.
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 87.
Peaches:
Number of orchards of 20 to 50 acres: 3.
Number of orchards of 5 to 20 acres: 7.
Pears:
Number of orchards of 5 to 20 acres: 2.

Other fruits:
Number of orchards of 5 acres or more: 2.

BEDFORD COUNTY

R. P. Allaman, Inspector and Demonstrator.

Location of Demonstration Orchards:
William Claar, Queen.
Wm. T. Donohue, Flintstone, Md.
Samuel F. Piper, Everett.
Top Roland, Chapmans Run.
Samuel Snyder, Woodbury.

Location of Supervision Orchards:
County Home, Bedford.
Bruce Croyle, Osterburg.
George W. Deibert, Bedford, R. D. No. 1.
Dr. A. Enfield, Bedford.
E. S. Ferry, New Enterprise.
A. F. Foon, Everett, R. D. No. 5.
A. S. Guyer, Bedford.
Dr. Charles Long, Altoona.
W. S. Madore, Hyndman.
Hon. John M. Reynolds, Bedford.
R. E. Smith, Hopewell.
Truman Tewell, Artemas.
J. Wilson Weaver, Saxton.
Roger Williams, Rainsburg.
Levi Wolford, Buffalo Mills.

Number of public meetings held in this county: 16.
Number of supervision visits made in this county: 27.
Number of other inspections made in this county in 1911: 1.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 50 to 100 acres: 7.
Number of orchards of 20 to 50 acres: 37.
Number of orchards of 5 to 20 acres: 430.

Peaches:
Number of orchards of 50 to 100 acres 2.
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 9.

Pears:
Number of orchards of 5 to 20 acres: 5.

Other fruits:
Number of orchards of 5 acres or more: 1.

BERKS COUNTY.

Carl Ebert, Inspector and Demonstrator.

Location of Demonstration Orchards:
Bethany Orphans' Home, Womelsdorf.
D. Owen Brooke, Birdsboro.
W. H. Fromm, Sinking Spring.
Dr. W. C. Kline, Myerstown.

S. Lauer, Blandon.
E. M. Zerr, Geigers Mills.

Location of Supervision Orchards:
Adam D. Bagenstose, Mohrsville, R. D. No. 1.
Bertolet & Hunter, Reading.
F. M. Bowers, 612 Highland Ave., Chester.
County Home.
John P. Dauth, Mohnton.
Jeremiah Dierolf, Bechtelsville.
C. S. Dreibelbis, Shoemakersville.
Harvey M. Fisher, Mt. Aetna.
W. H. Grim, Hamburg.
Dr. Samuel S. Hill, Wernersville, State Insane Asylum.
S. O. Hobart, Pottstown.
Wilson A. Klopp, Rehrersburg.
Cosmos D. Kutz, Lyons.
Dr. W. W. Livingood, Robesonia.
George W. Melcher, Bally.
Franklin S. Merkel, Fleetwood.
George Moll, Bernville.
E. N. Morgan, Reading.
Charles W. Potteiger, Reading.
Claude K. Reber, Mohrsville.
Rick & Herr, 434 Oley St., Reading.
R. B. Rutter, Pine Iron Works.
Wilson E. Schmick, Hamburg.
Clayton H. Snyder, Lime Kiln.
Snyder, Fry & Rick, 434 Oley St., Reading.
S. K. Spang, Lime Kiln.
Joel D. Sunday, Virginville, R. D. No. 1.

Number of public meetings held in this county: 32.
Number of supervision visits made in this county: 53.
Number of other inspections made in this county in 1911: 628.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 50 to 100 acres: 2.
Number of orchards of 20 to 50 acres: 3.
Number of orchards of 5 to 20 acres: 28.
Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 7.
Pears:
Number of orchards of 5 to2 0 acres: 3.
Other fruits:
Number of orchards of 5 acres or more: 1.

BLAIR COUNTY

James Bergy, Inspector and Demonstrator.

Location of Demonstration Orchards:
C. S. Clark, Bellwood.
H. H. Hudson, Roaring Springs.
D. Shelly Kloss, Tyrone.
J. C. Mattern & Sons, Hollidaysburg.

Location of Supervision Orchards:
Lynn A. Brua, Hollidaysburg.
Alfred Cherry, Bellwood, R. D. No. 1.
T. A. Coleman, Altoona, R. D. No. 1.
W. H. Cowen, Roaring Springs, R. D. No. 1.
Abe L. Fleck, Tyrone.
J. J. Frazier, Hollidaysburg, R. D. No. 1.
Wm. Hahman, Altoona.
W. H. Herr Estate, Altoona.
M. W. Hunt, 611 Fourth Ave., Altoona.
M. Blair Isenberg, Hollidaysburg.
John McKerihan, Martinsburg.
Joseph Rodkey, Frankstown.
Blair Treese, Williamsburg.
J. G. Wolf, 908 Third Ave., Altoona.
W. J. Woodcock, Hollidaysburg.

Number of public meetings held in this county: 14.
Number of supervision visits made in this county: 26.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 100 acres or more: 6.
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 6.
Number of orchards of 5 to 20 acres: 80.

Peaches:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 12.

Pears:
Number of orchards of 5 to 20 acres: 4.

Other fruits:
Number of orchards of 5 acres or more: 4.

BRADFORD COUNTY

D. A. Knuppenburg, Inspector and Demonstrator.

Location of Demonstration Orchards:
Fred Bohlayer, Troy.
Gen. Joseph M. Califf, Towanda.
F. L. Estabrook, Athens.
Mrs. Caroline Reynolds, Ulster.
Vern T. Struble, Athens, R. D. No. 24.
C. B. Williams, Canton.

Location of Supervision Orchards:
R. S. Andrews, Ulster, R. D. No. 20.
F. H. Beeman, Laceyville, R. D. No. 36.
F. P. Case, Troy.
John B. Clark, Ulster, R. D. No. 21.
F. P. Corcoran, New Albany.
E. J. Cramer, Monroeton, R. D. No. 43.
Darius Bollock, Wellsburg, N. Y., R. D. No. 37.

Mrs. G. A. Dayton, Towanda.
W. W. Dimock, Towanda, R. D. No. 3.
Job Griffin, Milan.
D. L. Horton, Towanda, R. D. No. 7.
William T. Howie, Towanda, R. D. No. 1.
Prof. C. P. Howland, Milan, R. D. No. 22.
C. H. Jennings, Towanda.
J. P. Kirby, Towanda.
H. Lamb, Towanda, R. D. No. 3.
H. C. Larcom, East Smithfield, R. D. No. 23.
Erwin McCoon, Towanda.
Dr. C. J. Marshall, Harrisburg.
D. P. Munn, Athens, R. D.
J. K. Munn, Athens, R. D. No. 26.
G. L. Overpeck, Rummersfield, R. D.
Frank L. Owens, Wellsburg, N. Y., R. D. No. 55.
J. N. Palmer, Ulster, R. D. No. 21.
J. F. Park, Monroeton.
Mrs. Mary Preston, Canton, R. D. No. 73.
J. B. Shaddock, Alba.
William Shumway, Laceyville, R. D. No. 37.
A. J. Stacy, Troy, R. D. No. 63.
Thomas E. Stevens, Towanda, R. D. No. 4.
W. E. Sturdevant, Laceyville, R. D. No. 36.
W. B. Taylor, Standing Stone.
W. I. Teed's Sons, 206 Desmond St., Sayre.
R. Templeton & Son, Ulster.
D. C. Tyrrell, Nichols, R. D. No. 3.
F. R. West, Milan.
S. L. Woodward, Wellsburg, N. Y.

Number of public meetings held in this county: 21.
Number of supervision visits made in this county: 68.
Number of other inspections made in this county in 1911: 601.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 20 to 50 acres: 3
Number of orchards of 5 to 20 acres: 40.

Peaches:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 12.

ears:
Number of orchards of 5 to 20 acres: 1.

BUCKS COUNTY

E. L. Loux, Inspector and Demonstrator.

Location of Demonstration Orchards:
H. T. Adams, Perkasie, R. D.
George Buckman, Newton.
O. D. Nathans Estate, Centre Bridge.
National Farm School.
H. L. Shelly, Quakertown.

Location of Supervision Orchards:

David E. Applegate, Churchville.
John S. Ash, Holicong.
Garrett Barcalow, Southampton.
J. A. Berry, Davisville.
Joseph B. Briggs, Yardley.
W. T. Briggs, Woodbourne.
E. A. Carpenter, Taylorsville.
Joseph Carrell, Jr., Neshaminy.
Joseph Clark, Doylestown, R. D. No. 1.
John Asher Clemens, Point Pleasant.
William Covert, Mechanicsville.
David D. Cressman, Sellersville.
S. B. Denlinger, Doylestown.
Joseph T. Diehl, Perkasie.
W. A. Dietterick, Kellers Church.
M. E. Ely, Yardley.
A. C. Fluck, Springtown.
J. Oscar Fretz, Perkasie.
A. D. Gearhart, Doylestown.
John Gehman, Plumsteadville.
Mahlon Gross, Doylestown.
Mrs. Margaret R. Grundy, Bristol.
F. T. Himmelwright, Doylestown.
A. W. Hunt, Quakertown.
Benjamin B. Johnson, Ottsville.
E. R. Johnson, Centre Bridge.
Dr. Loxley Kelly, Taylorsville.
C. S. Kriebel, Doylestown.
Leidy M. Landis, Wismer.
E. Oppenlander, Passer.
Erwin M. Overholt, Doyles town.
Dr. J. W. Patterson, Bristol.
Perkasie Fruit & Poultry Farm, Perkasie.
J. D. Postell, Richland Centre.
C. Wilson Roberts, Franklin Bldg., Philadelphia.
George Rogers, Centre Bridge.
George W. Row, Yardley.
Isaac E. Rowland, Chalfonte.
Charles T. Scott, Churchville.
G. N. Shappee, New Hope, R. D. No. 1.
John B. Shoe, 608 Rittenhouse St., Germantown.
Charles J. Smith, Buckingham.
Clarence H. Smith, Wycombe.
A. P. Stradling, Oxford Valley.
Charles Thatcher, Richland Centre.
E. J. Thomas, Doylestown.
J. J. Tierney, Newton.
Henry Arnold Todd, Doylestown.
Warren Edgar Tryon, Langhorne.
Wilmer A. Twining, Wycombe.
J. Wilson Vandergrift, Furlong.
G. Zakeosian, Richland Centre.

Number of public meetings held in this county: 22.
Number of supervision visits made in this county: 103.

Orchard statistics at hand for this county:

Apples:
Number of orchards of 20 to 50 acres: 4.
Number of orchards of 5 to 20 acres: 144.

Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 22.

Pears:
Number of orchards of 5 to 20 acres: 1.

BUTLER COUNTY

J. W. Cox, Inspector and Demonstrator.

Location of Demonstration Orchards:
J. S. Campbell, Butler.
J. J. Riddle, Prospect.
W. W. Vandivort, Calley, R. D.
William Velte, Mars.

Location of Supervision Orchards:
Benvenue Homestead, Miss F. C. Sweet, 132 S. Centre Ave., Pittsburg.
J. H. Brunner, Harmony.
Butler County Home, Butler.
H. H. Campbell, West Sunbury.
C. G. Conn, West Sunbury.
C. B. Frisbee, Valencia.
O. P. Graham, Callery, R. D. No. 2.
Mulligan C. Kilpatrick, Valencia.
George Kramer, Valencia.
F. W. McCaw, 1733 Perryville Ave., Allegheny.
J. A. McGowan, Prospect.
O. T. Murphy, Slippery Rock.
R. H. Oliver, Portersville.
Ferd Reiber, Butler.
W. M. Studebaker, Slippery Rock.
W. M. Sullivan, Butler.
Harry E. Taylor, Chicora.
S. H. Templeton, Baldwin.
A. S. Young, Evans City, R. D.

Number of public meetings head in this county: 12.
Number of supervision visits made in this county: 42.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 20 to 50 acres: 7.
Number of orchards of 5 to 20 acres: 69.

Peaches:
Number of orchards of 5 to 20 acres: 3.

Pears:
Number of orchards of 5 to 20 acres: 2.

Other fruits:
Number of orchards of 5 acres or more: 4.

CAMBRIA COUNTY

E. L. Loux, Inspector and Demonstrator.

Location of Demonstration Orchards:
Frank P. Barnhart, Johnstown.
Cambria County Home, Ebensburg.
Anslem B. Kirsch, Nicktown.

Location of Supervision Orchards:
H. A. Albert, Johnstown.
Henry Barnhard, Johnstown.
Bruce H. Campbell, Johnstown.
S. M. Clark, Mountaindale.
James Davis, Johnstown, R. D. No. 1.
H. R. Geer, Johnstown, R. D. No. 5.
Fred Krebs, Johnstown.
Joseph F. Mayer, 1061 Franklin St., Johnstown.
W. S. Meales, Dunlo.
A. F. Seaman, Wilmore.
John H. Waters, Johnstown.
North West, Johnstown.
Number of public meetings held in this county: 11.
Number of supervision visits made in this county: 16.
Number of other inspections made in this county in 1911: 624.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 100 acres or more: 1.
Number of orchards of 20 to 50 acres: 4.
Number of orchards of 5 to 20 acres: 43.

Peaches:
Number of orchards of 5 to 20 acres: 2.

Pears:
Number of orchards of 5 to 20 acres: 2.

CAMERON COUNTY

M. L. Benn, Inspector and Demonstrator.

Location of Demonstration Orchards:
Dr. R. P. Heilman, Emporium.
S. S. Miller, Driftwood.

Location of Supervision Orchards:
F. X. Blumle, Emporium.
S. G. Ostrum, Emporium.
William L. Thomas, Emporium.
Number of public meetings held in this county: 9.
Number of supervision visits made in this county: 6.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 5 to 20 acres: 10.

CARBON COUNTY

F. R. Fertig, Inspector and Demonstrator.

Location of Demonstration Orchards:
Reuben Boyer Est., Weissport.
Wilson Deitrich, Weatherly.
S. W. Gangwer, Rockport.

Location of Supervision Orchards:
John F. Hottenstein, Lehighton.
Edw. Lienhard, Mauch Chunk, R. D. No. 1.
William & Daniel Merkham, Palmerton.
David Rose, Lancaster.
Alfred J. Solt, Weissport.
Number of public meetings held in this county: 12.
Number of supervision visits made in this county: 7.
Number of other inspections made in this county in 1911: 3.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 5 to 20 acres: 57.

Peaches:
Number of orchards of 5 to 20 acres: 8.

CENTRE COUNTY

T. C. Foster, Inspector and Demonstrator.

Location of Demonstration Orchards:
John I. Gray, Port Matilda.
Mrs. Elizabeth D. Green, Bellefonte, R. D. No. 1.
Newton C. Neidigh, State College, R. D.
C. P. Reese, Snow Shoe.
Howard T. Struble, Zion.

Location of Supervision Orchards:
A. E. Bartges, Millheim.
D. A. Boozer, Centre Hall.
W. F. Bradford, Centre Hall.
J. Elmer Clark, Stormstown.
W. K. Corl, State College.
John S. Dale, Bellefonte, R. D. No. 3.
George Durner, Zion.
J. W. Forster, Aaronsburg.
Dr. J. S. Frain, Mill Hall, R. D. No. 1.
G. S. Frank, Millheim.
W. H. Gardner, Howard.
John A. Haagen, Howard.
Lem. Hampton, Bellefonte, R. D.
G. Edward Haupt, Bellefonte.
S. P. Hockman, Mingoville.
H. H. Laird, Port Matilda.
Wm. H. Lee, Spring Mills.
Benjamin Limbert, Spring Mills.
Mrs. G. W. Lonberger, Pleasant Gap.

D. B. Lowder, Oak Hall.
John Elmer Miller, Madisonburg.
Col. W. Fred Reynolds, Bellefonte.
D. D. Royer, Rebersburg.
Wm. Showers, Nittany.
S. W. Smith, Centre Hall.
E. B. Way, Stormstown.
Thomas M. Weaver, Sr., Bellefonte, R. D. No. 2.
John H. White, Bellefonte, R. D. No. 2.
Frank Wion, Bellefonte, R. D. No. 2.

Number of public meetings held in this county: 22.
Number of supervision visits made in this county: 46.
Number of other inspections made in this county in 1911: 520.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 100 acres or more: 2.
Number of orchards of 50 to 100 acres: 2.
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 53.

Peaches:
Number of orchards of 20 to 50 acres: 8.
Number of orchards of 5 to 20 acres: 18.

Pears:
Number of orchards of 5 to 20 acres: 1.

Other fruits:
Number of orchards of 5 acres or more: 1.

CHESTER COUNTY

Francis Windle, Inspector and Demonstrator.

Location of Demonstration Orchards:
Elwood B. Hayman, Berwyn.
A. B. Reynolds, Avondale.

Location of Supervision Orchards:
F. A. Alexander, Oxford.
D. W. Bowman, Phoenixville.
Sumner Brosius, Lansdowne.
Chester County Home, Embreeville.
S. L. Cement, Coatesville, R. D. No. 1.
William B. Coates, Cochranville, R. D.
Stephen C. Harry, Corinne.
Park B. Edwards, Malvern.
William L. Hanthorn, Coatesville.
Richard Haughton, Paoli.
George Henderson, Paoli.
Francis W. Hicks, Avondale.
Jacobs Brothers, Malvern, R. D. No. 1.
Miss Sarah Leeds, Chadds Ford.
William E. Lockwood, Jr., Glenn Loch.
William H. MacNeal, Parkesburg.
Lawrence McCormick, Bellevue-Stratford, Philadelphia.

George C. Maule, Gun Tree.
Milton Mendenhall, Mendenhall.
J. R. Moore, Kennett Square.
R. Frank Moore, Glenmore, R. D.
Fred Peirson, Downingtown.
Edward A. Pennock, Chatham.
William F. Peters, Downingtown.
Charles S. Powell, Frazer.
Clavin S. Romig, 142 N. Thirteenth St., Harrisburg.
J. W. Scattergood, Lansdowne.
Charles C. Townsend, West Chester.

Number of public meetings held in this county: 6.
Number of supervision visits made in this county: 44.
Number of other inspections made in this county in 1911: 39.

Orchard statistics at hand for this county:

Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 3.
Number of orchards of 5 to 20 acres: 30.

Peaches:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 13.

Pears:
Number of orchards of 20 to 50 acres: 4.
Number of orchards of 5 to 20 acres: 4.

Other fruits:
Number of orchards of 5 acres or more: 1.

CLARION COUNTY

G. B. Stichter, Inspector and Demonstrator.

Location of Demonstration Orchards:
Miss Hannah Fox, Foxburg.
James Shick, New Mayville, R. D. No. 2.
Sidney Shirley, Sligo, R. D. No. 3.

Location of Supervision Orchards:
B. B. Ferguson, New Bethlehem.
Daniel Galey, Pollock.
J. H. Harrigh, Sligo, R. D. No. 3.
Prof. N. E. Heeter, Clarion.
D. J. Hetrick, New Bethlehem.
P. M. Kaster, Rimersburg.
D. A. Kesk, Fairmount City, R. D. No. 1.
J. M. Kritchgau, East Brady.
Samuel Mohle, Miola.
L. E. Pence, New Bethlehem.
A. C. Peterson, Knox.
William Walley, Crown.
Abraham Yeaney, New Mayville, R. D. No. 1.

Number of public meetings held in this county: 12.
Number of supervision visits made in this county: 24.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 5 to 20 acres: 7.
Peaches:
Number of orchards of 5 to 20 acres: 2

Other fruits:
Number of orchards of 5 acres or more: 1.

CLEARFIELD COUNTY

E. L. Loux, Inspector and Demonstrator.

Location of Demonstration Orchards:
Frank Hahne, DuBois.
W. K. Johnston, Berwinsdale.
George R. Mock, Philipsburg.

Location of Supervision Orchards:
Bilger & Betts, Clearfield.
Clearfield County Home, Clearfield.
John W. Patchin, Glen Hope.
T. L. Wall, Clearfield.
Number of public meetings held in this county: 14.
Number of supervision visits made in this county: 8.
Number of other inspections made in this county in 1911: 167.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 100 acres or more: 1.
Number of orchards of 5 to 20 acres: 42.

CLINTON COUNTY

J. C. Wilson, Inspector and Demonstrator.

Location of Demonstration Orchards:
Dr. E. J. Baird, Lock Haven.
C. B. Grieb, Mill Hall.

Location of Supervision Orchards:
T. B. Bridgens, Mill Hall, R. D. No. 2.
Mrs. Marie R. Carskaddon, May, S. C.
J. H. Chatham, McElhattan.
F. T. Rahorn, Jersey Shore.
C. H. Rich, Woolrich.
Number of public meetings held in this county: 11.
Number of supervision visits made in this county: 13.
Number of other inspections made in this county in 1911: 413.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 5 to 20 acres: 8.

Peaches:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 2.

COLUMBIA COUNTY

D. E. Murray, Inspector and Demonstrator.

Location of Demonstration Orchards:
Henry C. Barton, Lime Ridge.
Hon. Wm. T. Creasy, Catawissa.
T. E. Hyde, Bloomsburg.
J. L. John & Son, Millville.
Adam Rarig, Catawissa.

Location of Supervision Orchards:
John A. Deldine, Millville.
A. G. Everett, Unityville.
N. U. Funk, Bloomsburg.
J. O. Gardner, Millville, R. D.
T. A. Hartman, Stillwater.
W. H. Kirkendale, Berwick, R. D.
E. P. Kisner, Berwick, R. D. No. 3.
A. B. McHenry, Stillwater.
W. C. Miller, Catawissa, R. D. No. 1.
J. W. Richards, Berwick, R. D. No. 1.
Delmar Sharretts, Berwick, R. D. No. 3.
E. H. Sloan, Orangeville.
E. D. Tewksbury, Catawissa.
J. M. Welsh, Orangeville.
A. P. Young, Millville, R. D.

Number of public meetings held in this county: 18.
Number of supervision visits made in this county: 34.
Number of other inspections made in this county in 1911: 71.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 5 to 20 acres: 27.

Peaches:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 3.

CRAWFORD COUNTY

J. W. Cox, Inspector and Demonstrator.

Location of Demonstration Orchards:
J. A. McLain, Meadville.
Miss Minerva Weed, Titusville.

Location of Supervision Orchards:
Hon. C. A. Bentley, Monongahela.
A. B. Birchard, 221 Columbia Ave., Boston, Mass.
W. M. Fuller, DeYoung.
William A. Hammon, Conneautville.
G. W. Harvey, Titusville, R. D.

C. F. Housel, Blooming Valley.
W. D. Pierce, Spartansburg.
C. F. Post, Centerville.
Elmer E. Ross, Centreville.
D. M. Shontz, Conneaut Lake.
J. M. Snyder, Meadville, R. D. No. 1.
George A. Wellmon, 232 E. Tenth St., Erie.

Number of public meetings held in this county: 7.
Number of supervision visits made in this county: 22.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 5 to 20 acres: 3.

Pears:
Number of orchards of 5 to 20 acres: 1.

CUMBERLAND COUNTY

E. F. Peirce, Inspector and Demonstrator.

Location of Demonstration Orchards:
F. C. Bosler, Carlisle.
W. J. Neron, Walnut Bottom.
W. J. Rose, Bowmansdale.

Location of Supervision Orchards:
J. C. Bucher, Boiling Springs.
U. G. Barnitz, Barnitz.
U. S. Indian School, Carlisle.
Simon Heberlig, Newburg.
George W. Himes, Shippensburg.
Charles W. Otto, Boiling Springs.
G. Arthur Rea, Newville.
H. C. Snyder, Newville.
W. F. Swigert, Mechanicsburg.
J. S. Weibley, Carlisle, R. D. No. 8.
Rev. S. S. Wylie, Shippensburg.

Number of public meetings held in this county: 16.
Number of supervision visits made in this county: 15.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 100 acres or more: 1.
Number of orchards of 50 to 100 acres: 2.
Number of orchards of 20 to 50 acres: 12.
Number of orchards of 5 to 20 acres: 40.

Peaches:
Number of orchards of 50 to 100 acres: 3.
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 13.

Pears:
Number of orchards of 5 to 20 acres: 1.

DAUPHIN COUNTY

F. R. Fertig, Inspector and Demonstrator.

Location of Demonstration Orchards:
Emaus Orphans Home, Middletown.
H. L. Lark, Millersburg.
Hon. Charles DeVeny Row, Williamstown.

Location of Supervision Orchards:
J. A. Bingaman, Pillow.
John Crone, Piketown, R. D. No. 6.
John B. Curry, Swatara.
Dauphin County Almshouse, Harrisburg.
P. F. Duncan, Duncannon.
John C. Fitting, Enders.
J. W. Hartman, Berrysburg.
Isaac S. Hoffman, Halifax, R. D. No. 1.
C. G. Layman, 423 Harris St., Harrisburg.
F. W. Lenker, Killinger.
W. B. Meetch, Millersburg.
Dr. W. W. Painter, Penbrook, R. D. No. 2.
J. Harry Stroup, Harrisburg.
J. Paul Teas, Harrisburg.
George M. Weaver, Killinger.

Number of public meetings held in this county: 12.
Number of supervision visits made in this county: 25.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 90.

Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 9.

Pears:
Number of orchards of 5 to 20 acres: 2.

DELAWARE COUNTY

M. E. Shay, Inspector and Demonstrator.

Location of Demonstration Orchards:
Dr. A. N. Cleveland, Chadds Ford.
Richard T. Ogden, Swarthmore.
Josiah Smith, Esq., Chester.

Location of Supervision Orchards:
Percy C. Belfield, Swarthmore.
Dr. Horace Howard Furness, Wallingford.
F. L. Gallup, 208 Broad St., Chester.
House of Employment, Lima.
Nathan Kite, Moylan.
J. Howard Mendenhall, Gradyville.
Charles T. Schoen, Media, Box 7.

Walter Smedley, Media.
Dr. George C. Speirs, 4831 Baltimore Ave., Philadelphia.
Number of public meetings held in this county: 8.
Number of supervision visits made in this county: 13.
Number of other inspections made in this county in 1911: 29.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 18.

Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 2.

Pears:
Number of orchards of 20 to 50 acres: 3.

ELK COUNTY

M. L. Benn, Inspector and Demonstrator.

Location of Demonstration Orchards:
Joseph Lanzel, St. Marys.
R. I. Spangler, Weedville.

Location of Supervision Orchards:
E. G. Schreiber, Dagus Mines.
Number of public meetings held in this county: 10.
Number of supervision visits made in this county: 2.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 9.

ERIE COUNTY

P. H. Burk, Inspector and Demonstrator.

Location of Demonstration Orchards:
H. L. Grubbs, Fairview.
E. W. Hatch & Sons, Union City.
Dr. G. M. Kelley, North East, R. D. No. 7.
Penna. Nursery Co., Girard.

Location of Supervision Orchards:
E. A. Baron, McKean.
Rodney Bloss, East Springfield.
Dr. C. B. Chidester, Erie.
H. N. Fleming, 410 Downing Bldg., Erie.
Wm. H. Forster, 323 W. Sixth St., Erie.
Charles Himrod, Waterford.
B. D. Love, Erie, R. D. No. 2.
Rollo McCray, Waterford.
George R. Metcalf, Erie.
Robert A. Patterson, Jr., Corry.

Miss Annie S. Phillips, Avonia.
J. W. Pinar, Erie.
Amos C. Remington, North East.
J. G. Seltzer, Union City.
A. W. Sergeant, Albion.
H. N. Thayer, Wesleyville.
G. G. Thomas, Waterford.
J. W. Wyncoop, Erie, R. D. No. 5.

Number of public meetings held in this county: 15.
Number of supervision visits made in this county: 25.

Orchard statistics at hand for this county:

Apples:
Number of orchards of 50 to 100 acres: 2.
Number of orchards of 20 to 50acres: 1.
Number of orchards of 5 to 20 acres: 41.

Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 12.

Pears:
Number of orchards of 5 to 20 acres: 5.

Other fruits:
Number of orchards of 5 acres or more: 1.

FAYETTE COUNTY

R. P. Allaman, Inspector and Demonstrator.

Location of Demonstration Orchards:
Eliza Warman, Cheat Haven.

Location of Supervision Orchards:
George G. Cochran, Dawson.
Wm. H. Cook, Uniontown.
Edgar S. Francis, Perryopolis.
Thomas N. Gummert, Tarentum.
L. C. Harris, Perryopolis.
"Parshall Farms," McClellandtown.

Number of public meetings held in this county: 3.
Number of supervision visits made in this county: 5.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 5 to 20 acres: 4.

Peaches:
Number of orchards of 5 to 20 acres: 2.

FOREST COUNTY

P. H. Burk, Inspector and Demonstrator.

Location of Demonstration Orchards:
J. E. Gaul, Marienville.
John T. Henderson, East Hickory.

Location of Supervision Orchards:
H. H. Harp, Marienville.
C. F. Hunt, Marienville.
Number of public meetings held in this county: 10.
Number of supervision visits made in this county: 4.

Orchard statistics at hand for this county (not completed
Apples:
Number of orchards of 5 to 20 acres: 3.

FRANKLIN COUNTY

E. C. Bowers, Inspector and Demonstrator

Location of Demonstration Orchards:
P. N. Amberson, Waynesboro, Pa.
Eagle Mountain Orchard Co., Chambersburg.
Irvin C. Elder, Esq., Chambersburg, Pa.
Mercersburg Academy, Mercersburg, Pa.

Location of Supervision Orchards:
G. W. Diffenderfer, Edenville, Pa.
Irvin C. Elder, Esq., Chambersburg, Pa.
J. A. Foust, Mowersville, Pa.
W. H. Horn, Chambersburg, Pa., R. D. No. 10.
Dr. J. J. Koser Est., Shippensburg, Pa.
R. W. McAllen, Fannettsburg, Pa.
R. B. McCoy, Baltimore, Md.
A. D. Morganthall, Waynesboro, Pa.
Jacob W. Newcomer, Waynesboro, Pa., R. D. No. 1.
Geo. F. Raifsnyder, Marion, Pa.
E. S. Rinehart, Mercersburg, Pa.
J. S. Stoner, Chambersburg, Pa., R. D. No. 11.
J. R. Whitmore, Milnor, Pa.
J. H. Wishard, Leitersburg, Md.
John A. Zullinger, Orrstown, Pa.
Number of public meetings held in this county: 4.
Number of suprvision visits made in this county: 19.
Number of orchard inspections made in this county in 1911: 313.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 100 acres or more: 12.
Number of orchards of 50 to 100 acres: 13.
Number of orchards of 20 to 50 acres: 26.
Number of orchards of 5 to 20 acres: 112.

Peaches:
Number of orchards of 100 acres or more: 5.
Number of orchards of 50 to 100 acres: 10.
Number of orchards of 20 to 50 acres: 9.
Number of orchards of 5 to 20 acres: 28.

Pears:
Number of orchards of 100 acres or more: 1.
Number of orchards of 5 to 20 acres: 4.

Other fruits:
Number of orchards of 5 acres or more: 1.

FULTON COUNTY

E. C. Bowers, Inspector and Demonstrator.

Location of Demonstration Orchards:
R. J. McCandlish, Hancock, Md.
J. B. Runyan, McConnellsburg, Pa.

Location of Supervision Orchards:
John L. Lehman, Fairmount, W. Va.
F. P. Plessinger, Locust Grove, Pa.
B. H. Shaw, Hustontown, Pa.
Number of public meetings held in this county: 2.
Number of supervision visits made in this county: 3.
Number of orchard inspections made in this county in 1911: 463.

Orchard stitistics at hand for this county (not completed):
Apples:
Number of orchards of 100 acres or more: 1.
Number of orchards of 50 to 100 acres: 2.
Number of orchards of 20 to 50 acres: 4.
Number of orchards of 5 to 20 acres: 68.

Peaches:
Number of orchards of 5 to 20 acres: 1.

GREENE COUNTY

R. P. Allaman, Inspector and Demostrator.

Location of Demonstration Orchards:
C. K. Cornelison, Waynesburg, Pa., R. D. No. 4.
B. J. Pauley, Jefferson, Pa.
Perry M. Rush, Sycamore, Pa.

Location of Supervision Orchards:
Children's Home, Waynesburg, Pa., R. D. No. 1.
Samuel M. Hoge, Rogersville, Pa.
Richard S. Huffman, Time, Pa.
W. D. Jacobs, Washington, Pa.
W. E. Minor, Carmichaels, Pa., R. D. No. 1.
G. N. Pennington, Carmichaels, Pa.
L. R. Phillips, Brock, Pa.
Number of public meetings held in this county: 3.
Number of supervision visits made in this county: 7.
Orchards statistics at hand for this county (not completed):

HUNTINGDON COUNTY

James Bergy, Inspector and Demonstrator.

Location of Demonstration Orchards:
W. J. Black, Alexandria, Pa.
David O. Saylor, Todd, Pa.
S. L. Smith, Mill Creek, Pa.

Location of Supervision Orchards:
W. A. Crotsley, Colfax, Pa.
T. H. Donnelly, Iseli, Pa.
Amos C. Gill, Neelyton, Pa.
R. G. Coheen, Penn Furnace, Pa.
Mt. Union Tanning Co., Mt. Union, Pa.
Wm. A. Neff, Warrior's Mark, Pa.
Penna. Industrial Reformatory, Huntingdon, Pa.
Rev. M. C. Piper, Huntingdon, Pa.
Hayes H. Schirm, Alexandria, Pa.
U. S. Troutwine, Manor Hill, Pa.
A. S. Wilson, Mentzer, Pa.
O. M. Wright, Calvin, Pa.
B. F. Yingling, Huntingdon, Pa.

Number of public meetings held in this county: 3.
Number of supervision visits made in this county: 13.

Orchard statistics at hand for this county:

Apples:
Number of orchards of 100 acres or more: 2.
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 89.

Peaches:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 11.

Pears:
Number of orchards of 5 to 20 acres: 1.

Other fruits:
Number of orchards of 5 acres or more: 3.

INDIANA COUNTY

J. S. Briggs, Inspector and Demonstrator:

Location of Demonstration Orchards:
Frank Daugherty, Indiana, Pa.
A. G. Glenn, Garman's Mills, Pa., R. D. No. 1.
J. H. Rochester, Marion Centre, Pa.
D. H. Wyant, Covode, Pa.

Location of Supervision Orchards:
Arthur L. Barbour, Cherry Tree, Pa., R. D. No. 1.
R. J. Becket, Sidney, Pa.
John Dorn, Marchland.
C. S. Duncan, New Florence, Pa., R. D. No. 3.
Geo. H. Elbel, Rossiter, Pa., R. D. No. 1.
Ira H. Gahagen, Smicksburg, Pa.
Graff Brothers, Blairsville, Pa.
Elmer Haagen, Cherry Tree, Pa.
D. A. Hetrick, Indiana, Pa.
Thomas Harris, New Florence, Pa., R. D. No. 3.
T. C. Hood, Saltsburg, Pa., R. D. No. 1.

J. H. Lute, Grip, Pa.
Walter Muir, Blairsville, Pa.
J. T. Park, Marion Centre, Pa.
J. A. Rose, Harrisburg, Pa.
Chas. Sides, Blairsville, Pa., R. D. No. 4.
M. C. Wineburg, Juneau, Pa.

Number of public meetings held in this county: 4.
Number of supervision visits made in this county: 18.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 47.

Peaches
Number of orchards of 5 to 20 acres: 6.

Pears:
Number of orchards of 5 to 20 acres: 1.

JEFFERSON COUNTY

G. B. Stichter, Inspector and Demonstrator.

Location of Demonstration Orchards:
Dr. J. G. Bethune, Punxsutawney, Pa.
E. B. Henderson, Brookville, Pa.
W. E. Kearney, Brockwayville, Pa.

Location of Supervision Orchards:
Rev. J. K. Adams, North Point, Pa.
Charles Brian, Brockwayville, Pa.
J. M. Brosius, Brookville, Pa.
A. J. Bullers, Brookville, Pa., R. D. No. 6.
J. R. Conser, Lindsey, Pa.
A. L. Cowan, Brookville, Pa., R. D. No. 4.
D. B. Dickey, Baxter, Pa.
Francis Harper, Horatio, Pa.
B. E. Hoover, Winslow, Pa.
W. F. Hutchinson, Falls Creek, Pa.
L. M. Jones, Brookville, Pa.
J. E. Knisely, Brookville, Pa., R. D. No. 2.
F. A. Lane, Lane's Mills, Pa.
L. W. Long, Big Run, Pa., R. D. No. 2.
J. D. London, Cloe, Pa.
Rev. W. P. McGray, Sterling, Kan.
Joseph M. Martin, Punxsutawney, Pa., R. D. No. 5.
Thomas A. Mayes, Hazen, Pa.
Fred A. Moore, Reynoldsville, Pa.
C. A. Morris, Oliveburg, Pa.
A. S. Motter, Baxter, Pa.
Edward G. North, Punxsutawney, Pa., R. D. No. 5.
Wm. H. Pomeroy, Punxsutawney, Pa., R. D.
Ladd M. & Harry W. Reitz, Brookville, Pa., R. D. No. 3.

J. A. Stockdale, North Point, Pa.
D. Wheeler, Reynoldsville, Pa.
Number of public meetings in this county: 3.
Number of supervision visits made in this county: 27.
Number of orchard inspections made in this county in 1911: 37.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 5 to 20 acres: 12.

Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 5.

Pears:
Number o forchards of 5 to 20 acres: 1.

JUNIATA COUNTY

Jas. Bergy, Inspector and Demonstrator.

Location of Demonstration Orchards:
Wilber D. Keemer, East Waterford, Pa.
M. Kilmer, Kilmer, Pa.

Location of Supervision Orchards:
Isaac Book, Honey Grove, Pa.
Francis T. Cooper, Spruce Hill, Pa.
John G. Graham, Spruce Hill, Pa.
Francis Hower, Mifflintown, Pa.
James H. Junk Est., Honey Grove, Pa.
Rev. Joseph C. Kelly, Sunbury, Pa.
C. H. Mauck, Harrisburg, Pa.
Thad. Musser, McAllisterville, Pa.
John H. Shellenberger, McAllisterville, Pa.
Samuel C. Telfer, Pleasant View, Pa.
Number of public meetings held in this county: 9.
Number of supervsion visits made in this county: 21.
Number of orchard inspections made in this county in 1911: 1.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 5 to 20 acres: 24.

Peaches:
Number of orchards of 20 to 50 acres: 4.
Number of orchards of 5 to 20 acres: 30.

Pears:
Number of orchards of 5 to 20 acres: 1.

LACKAWANNA COUNTY

A. O. Finn, Inspector and Demonstrator.

Location of Demonstration Orchards:
A. A. Chase, Dalton, Pa., R. D.
C. L. Clark, Olyphant, Pa., R. D.
Frank Radle, Dalton, Pa., R. D.

Charles H. Wells, Waverly, Pa.
Lionel Winship, Moscow, Pa.

Location of Supervision Orchards:
George Coons, Ransom, Pa.
A. B. Cowles, Waverly, Pa.
Mrs. Jas. P. Dickson, Dalton, Pa.
B. F. Evans, M. D., Clark's Green, Pa.
Mrs. Ellen Gibbons, Moscow, Pa., R. D.
Hon. A. F. Hobbs, Dalton a La Plume, Pa.
A. W. Kenyon, Carbondale, Pa.
J. S. Luce, Dalton, Pa.
James B. Murrin, Carbondale, Pa.
Milo Reynolds, Factoryville, Pa.
T. H. Reynolds, Moscow, Pa.
Harry E. Smith, Dalton, Pa., R. D. No. 3.
A. G. Snyder, Jermyn, Pa., R. D. No. 7.
J. A. C. Stone, Clark's Summit, Pa.
Dr. Chas. E. Thompson, Scranton, Pa.
Chas. Wademan, Fleetville, Pa.

Number of public meetings held in this county: 20.
Number of supervision visits made in this county: 24.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 4.
Number of orchards of 5 to 20 acres: 90.

Peaches:
Number of orchards of 5 to 20 acres: 1.

Pears:
Number of orchards with 5 to 20 acres: 1.

LANCASTER COUNTY

E. C. Bowers, Inspector and Demonstrator.

Location of Demonstration Orchards:
C. R. Farmer, Marietta, Pa.
Hon. Chas. I. Landis, Lancaster, Pa.
John H. Shenck, Manheim, Pa.
Frank J. Trout, Quarryville, Pa.
Dr. F. Winger Est., Eprata, Pa.

Location of Supervision Orchards:
R. M. Adams, Lancaster, Pa.
A. H. Bear, New Holland, Pa., R. D.
H. H. Bomberger, Lititz, Pa., R. D. No. 1.
James Caithness, Philadelphia, Pa.
S. E. Ebersole, Bainbridge, Pa., R. D. No. 1.
J. H. Eby, Mountville, Pa.
Elizabethtown College, Elizabethtown, Pa.
A. C. Eshleman, Terre Hill, Pa.
Jonathan Fisher, New Holland, Pa., R. D.
Henry Fletcher, Marietta, Pa., R. D.

R. M. Friday, Mountville, Pa.
Hugh R. Fulton, Lancaster, Pa.
Harry E. Groff, Lancaster, Pa.
S. Milo Herr, Lancaster, Pa., R. D. No. 4.
Enos J. Hershey, Paradise, Pa., R. D. No. 1.
Hon. Michael R. Hoffman, Maytown, Pa.
Home for Friendless Children, Lancaster, Pa.
D. N. Horst, Farmersville, Pa.
Dr. J. E. Hostetter, Gap, Pa., R. D. No. 1.
B. Huber, Lititz, Pa., R. D.
S. H. Imboden, Lititz, Pa., R. D. No. 5.
J. W. Johnson, Lancaster, Pa.
Frank S. McLaughlin, Quarryville, Pa.
Manheim Fruit Co., Manheim, Pa.
B. F. Metzler, Lancaster, Pa.
John Musselman, New Holland, Pa.
J. H. Nissley, East Petersburg, Pa.
Forest Preston, Nottingham, Pa., R. D. No. 1.
H. C. Reinhold, East Petersburg, Pa.
H. F. Ruhl, Manheim, Pa.
Mrs. Mary B. Schofield, Peter's Creek, Pa., R. D. No. 1.
L. H. Shank, Ronks, Pa., R. D. No. 1.
C. B. Snyder, Ephrata, Pa., R. D. No. 1.
Horace B. Staman, Washington Boro, Pa.
John F. Steinman, Lancaster, Pa.
John Sterline, Columbia, Pa., R. D. No. 2.
L. K. Stubbs, West Chester, Pa.
H. E. Trout, Manheim, Pa.
Adam B. Vogel, Lititz, Pa., R. D. No. 3.
Alvin P. Wenger, Bareville, Pa., R. D. No. 1.
Geo. M. Woods, Leaman Place, Pa.
A. J. Zercher, Conestoga, Pa.

Number of public meetings held in this county: 19.
Number of supervision visits made in this county: 88.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 100 acres or more: 1.
Number of orchards of 5 to 20 acres: 11.

Peaches:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 13.

Other fruits:
Number of orchards of 5 acres or more: 1.

LAWRENCE COUNTY

J. W. Cox, Inspector and Demonstrator.

Location of Demonstration Orchards:
C. C. Cox, Pulaski, Pa.
Philip A. Young, Enon Valley, Pa.

Location of Supervision Orchards:
J. Audley Boak, New Castle, Pa., R. D. No. 4.
A. M. Clark, Pulaski, Pa.
J. W. Cummings, New Wilmington, Pa.
Rev. J. C. M. Johnston, New Wilmington, Pa.
James Johnson, Volant, Pa., R. D. No. 2.
Thos. & Geo. A. McKee, New Castle, Pa.
New Castle City Farm, New Castle, Pa., R. D. No. 6.
James Potter, Volant, Pa.
James A. Ray, New Castle, Pa., R. D. No. 4.
Mrs. D. W. Taylor, Mahoningtown, Pa.
D. C. Thomson, Pulaski, Pa.
J. A. Totten, Volant, Pa.
Arthur H. White, Mgr., Pulaski, Pa.
Number of public meetings held in this county: 3.
Number of supervision visits made in this county: 32.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 6.
Number of orchards of 5 to 20 acres: 87.

Peaches:
Number of orchards of 5 to 20 acres: 7.

LEBANON COUNTY

F. R. Fetig, Inspector and Demonstrator.

Location of Demonstration Orchards:
James M. Bohn, Onset, Pa.
J. G. Eisenhower, Myerstown, Pa.
J. W. Mohler, Richland, Pa.
Noah P. Walborn, Myerstown, Pa.

Location of Supervision Orchards:
M. L. Bachman, Lebanon, Pa.
Miles W. Baney, Lebanon, Pa., R. D.
Ephriam R. Erb, Richland, Pa.
Dr. A. L. Hauer, Annville, Pa.
Nathaniel L. Hauer, Lick Dale, Pa.
Chas. T. Hickernell, Scheafferstown, Pa.
L. H. Hostetter, Richland, Pa.
Imperial Lime Stone Co., Lebanon, Pa.
E. S. Kase, Lebanon, Pa.
Alfred S. Krall, Schaefferstown, Pa., R. D.
Lebanon County Almshouse, Lebanon, Pa.
John H. Light, Avon, Pa.
S. A. Louser, Lebanon, Pa.
Adam B. Miller, Lebanon, Pa.
Mrs. Mary E. Mohn, Myerstown, Pa.
Adam Rank, Lebanon, Pa., R. D. No. 9.
James C. Reber, Reading, Pa., Box 267.
Mrs. Elizabeth Royer, Myerstown, Pa., R. D. No. 4.
John L. Royer, Myerstown, Pa., R. D. No. 4.

William Royer, Myerstown, Pa.
Jacob E. Shirk, Annville, Pa.
John H. Ulerich, Grantville, Pa., R. D.
Samuel Uhrich, Myerstown, Pa.
U. B. Yingst, Myerstown, Pa., R. D. No. 4.

Number of public meetings held in this county: 18.
Number of supervision visits made in this county: 53.
Number of orchard inspections made in this county in 1911: 3.

Orchard statistics at hand for this county:

Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 8.

Peaches:
Number of orchards of 20 to 50 acres: 3.
Number of orchards of 5 to 20 acres: 6.

LEHIGH COUNTY

F. R. Fertig, Inspector and Demonstrator.

Location of Demonstration Orchards:
Fred. S. Dickensheid, Zionsville, Pa., R. D. No. 2.
D. G. Hopkins, Orefield, Pa.
William H. Mohr, Allentown, Pa., R. D. No. 5.

Location of Supervision Orchards:
Oscar J. Butz, Breinigsville, Pa.
Dan Dressler, Allentown, Pa.
Dr. F. A. Fetterolf, Allentown, Pa.
Henry W. Klein, Switzer, Pa.
John N. Lawfer, Allentown, Pa.
Mennonite B. in C. Orphange, Centre Valley, Pa.
G. W. Seagraves, Allentown, Pa.
Fred. Seiberling, M. D., Allentown, Pa.
Joseph P. Snyder, Allentown, Pa.
David Wert, Lynnville, Pa.

Number of public meetings held in this county: 16.
Number of supervision visits made in this county: 15.

Orchard statistics at hand for this county:

Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 53.

Peaches:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 5 to 20 acres: 14.

LUZERNE COUNTY

A. O. Finn, Inspector and Demonstrator.

Location of Demonstration Orchards:
Irvin Chapin, Shickshinny, Pa.
Edward Krewson, White Haven, Pa.
Albert Lewis Lumber & Mfg. Co., Alderson, Pa.
Ratchford Bros., West Nanticoke, Pa.
Stephen D. Yost, Sugarloaf, Pa.

Location of Supervision Orchards:
D. W. Bronson, Sweet Valley, Pa., R. D. No. 1.
Stanley H. Brown, Dallas, Pa., R. D. No. 2.
W. H. Coray, Pittston, Pa., R. D. No. 1.
L. B. Hilbert, Alderson, Pa.
Silas C. Ide, Alderson, Pa.
R. M. Keefer, Dallas, Pa.
W. J. Lewis & Bro., Pittston, Pa.
Francis J. McCanna, Pittston, Pa.
W. F. Newberry and two associates, Wilkes-Barre, Pa.
A. L. Roth, Sugar Loaf, Pa.
Anna Ruhs, Pittston, Pa., R. D. No. 1.
O. E. Smith, Nescopeck, Pa., R. D. No. 1.
Emery Steel, Larksville, Pa.
C. A. Van Tuyle, Pittston, Pa.
Chas. H. Wolfe, Pikes Creek, Pa.
Dr. Sarah D. Wyckoff, Wilkes-Barre, Pa.
Number of public meetings held in this county: 17.
Number of supervision visits made in this county: 26.
Number of orchard inspections made in this county in 1911: 511.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 100 acres or more: 1.
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 6.
Number of orchards of 5 to 20 acres: 122.

Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 4.

Other fruits:
Number of orchards of 5 acres or more: 4.

LYCOMING COUNTY

J. C. Wilson, Inspector and Demonstrator.

Location of Demonstration Orchards:
W. H. Banzhof, Muncy, Pa.
William A. Ellis, Muncy, Pa.
Jonathan Kurtz, Loyalsock, Pa.
Sheadle Sisters, Jersey Shore, Pa., R. D. No. 4.
Henry E. Warner, Pennsdale, Pa.
W. G. Winner, Calvert, Pa.

Location of Supervision Orchards:
O. R. Artley, Linden, Pa., R. D. No. 1.
G. G. Bigger, Unityville, Pa.
Daniel Callahan, Slate Run, Pa.
G. Decker, Montgomery, Pa., R. D. No. 2.
Rev. John R. Ebner, Muncy, Pa.
J. W. Heilman, Montgomery, Pa., R. D. N. 1.
David J. Heim, Cogan Station, Pa.
W. H. Losch, Jersey Shore, Pa., Lock Box 61.

Walter F. MacVeagh, Williamsport, Pa.
Rev. Uriah Myers, Catawissa, Pa.
W. G. Pearson, Williamsport, Pa.
James A. Pugh, Williamsport, Pa.
Mrs. E. E. Powers, Pennsdale, Pa.
E. M. Snyder, Montgomery, Pa.
Nelson D. Welschans, Jersey Shore, Pa., R. D. No. 4.
Williamsport City Home, Williamsport, Pa.

Number of public meetings held in this county: 25.
Number of supervision visits made in this county: 41.
Number of orchard inspections made in this county in 1911: 316.

Orchard statistics at hand for this county:

Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 4.
Number of orchards of 5 to 20 acres: 128.

Peaches:
Number of orchards of 50 to 100 acres: 2.
Number of orchards of 20 to 50 acres: 1.

McKEAN COUNTY.

P. H. Burk, Inspector and Demonstrator.

Location of Demonstration Orchards:
S. R. Dresser Est., Bradford, Pa.
R. J. Gates, Mount Alton, Pa.
D. C. Young, Smethport, Pa.

Location of Supervision Orchards:
Leo V. Goding, Port Allegany, Pa.
M. J. Lowe, Bradford, Pa.

Number of public meetings held in this county: 9.
Number of orchard inspections made in this county in 1911: 349.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 5 to 20 acres: 17.

MERCER COUNTY

J. E. Cox, Inspector and Demonstrator.

Location of Demonstration Orchards:
George Jr., Republic, Grove City, Pa.
Mercer County Home, Mercer, Pa.
Dr. Theo. B. Roth, Greenville, Pa.
H. M. Wilson, Sharon, Pa.

Location of Supervision Orchards:
W. H. Allison, Mercer, Pa.
A. P. Elder, Stoneboro, Pa.
W. P. Elder, Clark's Mills, Pa.
A. M. Fell, Greenville, Pa.
J. A. Glenn, Mercer, Pa., R. D. No. 4.

D. L. Heckathorn, New Wilmington, Pa.
E. A. Homer, Transfer, Pa.
W. H. Long, Volant, Pa.
R. G. McGarr, Sandy Lake, Pa.
J. R. Partridge, Hadley, Pa., R. D. No. 33.
Patterson Smith, Grove City, Pa., R. D., No. 13.
Vete Porter, Sandy Lake, Pa., R. D. No. 24.
Daniel Redfoot, Fredonia, Pa., R. D. No. 3.
James Reynolds, Sandy Lake, Pa., R. D. No. 25.
Wm. Ride, Jackson Centre, Pa.
H. M. Thorpe, Grove City, Pa.
J. A. Young, Fredonia, Pa., R. D. No. 37.

Number of public meetings held in this county: 12.
Number of supervision visits made in this county: 27.
Number of orchard inspections made in this county in 1911: 1.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 49.

Peaches:
Number of orchards of 5 to 20 acres: 6.

Pears:
Number of orchards of 5 to 20 acres: 2.

MIFFLIN COUNTY

James Bergy, Inspector and Demonstrator.

Location of Demonstration Orchards:
A. F. Gibbony, Belleville, Pa., R. D. No. 1.
M. M. Naginey, Milroy, Pa.
William P. Woods, Lewistown, Pa.
J. O. Yeager, Yeagertown, Pa.

Location of Supervision Orchards:
J. H. Harshbarger, Mattawana, Pa.
Thurston Liddick, Lewistown, Pa.
James McFarlane, Reedsville, Pa.
Mifflin County Home, Lewistown, Pa.
Henry L. Rhine, Lewistown, Pa., R. D. No. 4.
V. Stoneroad, Yeagertown, Pa.
Dr. H. W. Sweigert, Lewistown, Pa.
David H. Yoder, Belleville, Pa.

Number of public meetings held in this county: 10.
Number of supervision visits made in this county: 17.
Number of orchard inspections made in this county in 1911: 238.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 11.

Peaches:
Number of orchards of 5 to 20 acres: 2.

MONROE COUNTY

W. H. Bullock, Inspector and Demonstrator.

Location of Demonstration Orchards:
H. B. Decker, East Stroudsburg, Pa.
Harry C. Lockwood, Mt. Pocono, Pa.
A. T. Shinn, North Water Gap, Pa.

Location of Supervision Orchards:
Wm. E. Comstock, West Pittston, Pa.
H. E. Geissinger, Mountainhome, Pa.
S. F. Laury, Saylersburg, Pa.
John Peschko, East Stroudsburg, Pa.
Chas. H. Sebring, Analomink, Pa.
Ely U. Sebring, Stroudsburg, Pa.
Howard T. Shafer, Stroudsburg, Pa., R. D.
Number of public meetings held in this county: 11.
Number of supervision visits made in this county: 14.
Number of orchard inspections made in this county in 1911: 154.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 50 to 100 acres: 3.
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 32.

Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 10.

Other fruits:
Number of orchards of 5 acres or more: 2.

MONTGOMERY COUNTY

J. S. Briggs, Inspector and Demonstrator.

Location of Demonstration Orchards:
Irvin P. Knipe, Arcola, Pa.
Chas. A. Livezey, Spring House, Pa.
I. M. Moll, Red Hill, Pa., R. D.
Dr. Jas. S. Neff, Philadelphia, Pa.
School of Horticulture for Women, Ambler, Pa.
State Hospital for Insane, Norristown, Pa.
Dr. Wm. J. Wilkinson, Colmar, Pa.

Location of Supervision Orchards:
A. C. Colly, Skippack, Pa.
Louisa Gibbons Davis, Ambler, Pa., Box 36.
H. B. Deetz, Telford, Pa., R. D. No. 1.
Harry C. Francis, Philadelphia, Pa.
Rev. W. E. Frederick, Pennsburg, Pa., R. D. No. 2.
William S. Hallowell, Penllyn, Pa.
O. B. Lessig, Pottstown, Pa.
Daniel Lewis, Fairview Village, Pa.
Frank E. Martin, Hatfield, Pa., R. D. No. 2.
Frank D. Mawhinney, Dresher, Pa.

T. H. Morgan, Philadelphia, Pa.
Wm. T. Patterson, Ambler, Pa.
Francis Rawle, Esq., Philadelphia, Pa.
Wm. B. Reed, Conshohocken, Pa.
Dr. Harry Walter, Philadelphia, Pa.
James H. Ziegler, Red Hill, Pa., R. D. No. 1.

Number of public meetings held in this county: 30.
Number of supervision visits made in this county: 39.
Number of orchard inspections made in this county in 1911: 262.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 5.
Number of orchards of 5 to 20 acres: 52.

Peaches:
Number of orchards of 20 to 50 acres: 8.
Number of orchards of 5 to 20 acres: 28.

Pears:
Number of orchards of 20 to 50 acres: 2.

MONTOUR COUNTY

D. E. Murray, Inspector and Demonstrator.

Location of Demonstration Orchards:
J. Miles Derr, Milton, Pa., R. D. No. 1.
State Hospital for Insane, Danville, Pa.

Location of Supervision Orchards:
W. Anstock, Bloomsburg, Pa.
W. O. Dewitt, Bloomsburg, Pa.
P. S. Cromley, Danville, Pa., R. D. No. 6.
J. X. Grier, Danville, Pa.
Edward Oyster, Strawberry Ridge, Pa.
John H. Wertman, Strawberry Ridge, Pa.
Miss M. Ida Yorks, Danville, Pa., R. D. No. 4.

Number of public meetings held in this county: 10.
Number of supervision visits made in this county: 11.

Orchard statistics at hand for this county:

Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 5 to 20 acres: 16.

Peaches:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 3.

NORTHAMPTON COUNTY

B. S. Moore, Inspector and Demonstrator.

Location of Demonstration Orchards:
Roscoe Heller, Bangor, Pa.
Enoch Reimer, Bangor, Pa.
D. D. Wagener, Easton, Pa.

Location of Supervision Orchards:
Jonas Buzzard, Bangor, Pa.
Joseph Frutchey, Bangor, Pa., R. D. No. 1.
H. H. Greiner, Bethlehem, Pa.
Benjamin F. Hall, Walnutport, Pa.
Weston Killpatrick, Easton, Pa.
Oscar Mack, Flicksville, Pa.
Minnich & Wright, Easton, Pa.
H. H. Moore, Nazareth, Pa.
J. D. Nevin, Easton, Pa., R. D. No. 3.
R. R. Oplinger, Danielsville, Pa.
P. G. Ott, Bangor, Pa.
Edwin E. Repsher, Flicksville, Pa., R. D. No. 1.
Stewart Shaffer, Nazareth, Pa.
John Stead, Easton, Pa.
S. A. Trein, Nazareth, Pa., R. D. No. 3.
D. A. Yale, Walnutport, Pa.
Number of public meetings held in this county: 15.
Number of supervision visits made in this county: 44.
Number of orchard inspections made in this county in 1911: 266.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 20 to 50 acres: 4.
Number of orchards of 5 to 20 acres: 59.

Peaches:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 3.
Number of orchards of 5 to 20 acres: 18.

Pears:
Number of orchards of 5 to 20 acres: 3.

NORTHUMBERLAND COUNTY

D. E. Murray, Inspector and Demonstrator.

Location of Demonstration Orchards:
Percy W. Hastings, Milton, Pa.
Willow Brook Truck Farm, Sunbury, Pa.
Charles N. Marsh, Milton, Pa.
J. K. Rissel, Pottsgrove, Pa.
P. N. Swank, Elysburg, Pa.

Location of Supervision Orchards:
R. Scott Ammerman, Danville, Pa., R. D. No. 6.
John Bowden, Danville, Pa.
R. M. Cummings, Montandon, Pa.
A. S. DeWitt, Fisher's Ferry, Pa., R. D. No. 1.
I. A. Eschbach, Milton, Pa., R. D.
James Ferster, Urban, Pa.
Walter A. Godcharles, Milton, Pa.
Mr. & Mrs. Isaac M. Gross, Sunbury, Pa.
Wm. H. Hilands, Milton, Pa., R. D. No. 3.
W. H. Hoff, Elysburg, Pa.

W. L. Mettler, Danville, Pa., R. D. No. 7.
Wm. M. Moore, Watsontown, Pa.
H. L. Purdy, Sunbury, Pa.
Lewis F. Rissel, Pottsgrove, Pa.
G. R. Ruggles, Northumberland, Pa., R. D. No. 1.
W. H. Rohrbach, Paxinos, Pa.
C. E. Schmucker, Watsontown, Pa.
H. R. Slifer, Watsontown, Pa.
E. W. Snyder, Leck Hill, Pa.
Lloyd J. Tressler, Herndon, Pa.
Morris W. Tucker, Sunbury, Pa.

Number of public meetings held in this county: 20.
Number of supervision visits made in this county: 40.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 20 to 50 acres: 3.
Number of orchards of 5 to 20 acres: 60.

Peaches:
Number of orchards of 20 to 50 acres: 3.
Number of orchards of 5 to 20 acres: 12.

Other fruits:
Number of orchards of 5 acres or more: 1.

PERRY COUNTY

T. C. Foster, Inspector and Demonstrator.

Location of Demonstration Orchards:
Mrs. Laura Gish, Newport, Pa.
Simon Lick, Marysville, Pa.
Edward E. Marshall, Newport, Pa.

Location of Supervision Orchards:
G. B. M. Bair, Newport, Pa.
James B. Black, Newport, Pa., R. D. No. 1.
H. B. Cumbler, Logania, Pa.
Samuel Fleisher, Wila, Pa.
H. S. Gabel, Newport, Pa., R. D. No. 1.
C. W. Hardt, Camp Hill, Pa.
C. W. Heishley, Marysville, Pa.
Ed. C. Johnston, New Germantown, Pa.
John P. Kohr, Marysville, Pa., R. D. No. 1.
Scott S. Leiby, Marysville, Pa.
R. C. Neal, Harrisburg, Pa.
David Nealy, Newport, Pa., R. D. No. 2.
Charles G. Rice, Newport, Pa., R. D. No. 2.
M. L. Ritter, Newport, Pa.
S. B. Sheibley, Alinda, Pa.
Mrs. Margaret H. Sheller, Duncannon, Pa.
Wm. Stewart, Landisburg, Pa.
Tressler's Orphanage, Loysville, Pa.
C. E. Zeigler, Duncannon, Pa., R. D. No. 1.

Number of public meetings held in this county: 14.
Number of supervision visits made in this county: 34.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 25.

Peaches:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 34.

PHILADELPHIA COUNTY

M. E. Shay, Inspector and Demonstrator.

Location of Demonstration Orchards:
Joseph H. Maurer, Manayunk, Pa.
Frank Shuman, Tacony, Pa.

Location of Supervision Orchards:
H. T. Markley, Torresdale, Pa.
Henry Reiners, Holmesburg, Pa.
Harmon Robinson, Philadelphia, Pa.
Edwin M. Thomas, Torresdale, Pa.
Hon. Henry F. Walton, Torresdale, Pa.
Number of public meetings held in this county: 5.
Number of supervision visits made in this county: 10.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 6.

Peaches:
Number of orchards of 5 to 20 acres: 1.

PIKE COUNTY

W. H. Bullock, Inspector and Demonstrator.

Location of Supervision Orchards:
Anthony Stumpf, Milford, Pa.
E. A. Schweitzer, Delaware, Pa.

Location of Supervision Orchards:
Rev. Wm. E. Palmer, 1756 Richmond Terrace, W. New Brighton, Borough of Richmond, N. Y. City.
G. E. Swartwood, Matamoras, Pa.
J. D. Weston, Mast Hope, Pa.
Number of public meetings held in this county: 6.
Number of supervision visits made in this county: 7.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 10.

POTTER COUNTY

M. L. Benn, Inspector and Demonstrator.

Location of Demonstration Orchards:
Austin Hunting & Fishing Club, Austin, Pa.
Art S. Burt, Ulysses, Pa.
Bernard Tompke, Germania, Pa.

Location of Supervision Orchards:
A. A. Allen & Son, Costello, Pa.
C. E. Buck, Ulysses, Pa.
William Green, Galeton, Pa., R. D. No. 1, Box 44.
William J. Grover, Newfield, Pa.
William Neinrich, Galeton, Pa., R. D. No. 1, Box 44.
L. B. Howe, Ulysses, Pa.
Fred. C. Menkis, Germania, Pa.
H. R. Lewis, Coudersport, Pa.
H. J. Miller, Coudersport, Pa., R. D.
Potter County Home, Coudersport, Pa.
John F. Stone, Coudersport, Pa.
F. M. Van Wegen, Coudersport, Pa., R. D. No. 2.
Leonard Zundell, Galeton, Pa., R. D. No. 1.

Number of public meetings held in this county: 15.
Number of supervision visits made in this county: 26.
Number of orchard inspections made in this county in 1911: 87.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 20 to 50 acres: 6.
Number of orchards of 5 to 20 acres: 173.

Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 1.

SCHUYLKILL COUNTY

B. S. Moore, Inspector and Demonstrator.

Location of Demonstration Orchards:
Edwin P. Berkheiser, Summit Station, Pa.
W. H. Blumenstien, Pottsville, Pa.
Robert A. Breisch, Ringtown, Pa.
M. M. Shellhamer, Chain, Pa.
Smith & Campion, Mahanoy City, Pa.
Irvin E. Teter, New Ringgold, Pa.

Location of Supervision Orchards:
G. C. Davison, Ringtown, Pa., R. D. No. 2.
Daniel Deckert, Schuylkill Haven, Pa.
Leon Eckert, Mahanoy City, Pa.
John Fertig, Pottsville, Pa.
Girard Estate, Girardville, Pa.
J. H. Greenawalt, Pine Grove, Pa., R. D. No. 1.
M. S. Greenawalt, New Ringgold, Pa., R. D. No. 1.
Wm. P. Heffner, Friedensburg, Pa.

A. F. Kimmel, Orwigsburg, Pa.
Frank S. Krebs, Kutztown, Pa.
William Kunkel, Barnesville, Pa.
F. H. Neiswender, Pitman, Pa., R. D. No. 2.
James Pritchard, Adamsdale, Pa.
Charles Riland, Cressona, Pa., R. D. No. 1.
W. H. Riland, Cressona, Pa., R. D. No. 1.
Wm. F. Seddon, Barnesville, Pa., R. D. No. 1.
C. S. Shindel, Tamaqua, Pa.
Allen W. Stenner, Pottsville, Pa.

Number of public meetings held in this county: 29.
Number of supervision visits made in this county: 65.
Number of orchard inspections made in this county in 1911: 177.

Orchard statistics at hand for this county:

Apples:
Number of orchards of 50 to 100 acres: 2.
Number of orchards of 20 to 50 acres: 6.
Number of orchards of 5 to 20 acres: 273.

Peaches:
Number of orchards of 20 to 50 acres: 3.
Number of orchards of 5 to 20 acres: 13.

Pears:
Number of orchards of 5 to 20 acres: 1.

Other fruits:
Number of orchards of 5 acres or more: 2.

SNYDER COUNTY

T. C. Foster, Inspector and Demonstrator.

Location of Demonstration Orchards:
W. W. Bruner, Paxtonville, Pa.
Dr. Percival Herman, Kratzerville, Pa.
H. H. Lamb, Jr., Beaver Springs, Pa., R. D.

Location of Supervision Orchards:
G. A. Batdorf, Freeburg, Pa.
W. H. Bingaman & Son, Beavertown, Pa.
Francis E. Boyer, Mt. Pleasant Mills, Pa., R. D. No. 1.
Freed & Tobias, Beavertown, Pa.
C. L. Kremer, Sunbury, Pa.
B. J. Moyer, Middleburg, Pa.
C. H. Moyer, Middleburg, Pa., R. D. No. 4.
Phares Reinard, Port Trevorton, Pa.
H. H. Renninger, Middleburg, Pa.
E. A. Shafer, Port Trevorton, Pa.
Harrison H. Thomas, Beavertown, Pa.
Mrs. Anna E. Williams, Port Trevorton, Pa.

Number of public meetings held in this county: 10.
Number of supervision visits made in this county: 26.
Orchard statistics at hand for this county:

Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 17.

Peaches:
Number of orchards of 100 acres or more: 1.
Number of orchards of 20 to 50 acres: 18.
Number of orchards of 5 to 20 acres: 106.

SOMERSET COUNTY

R. P. Allaman, Inspector and Demonstrator.

Location of Demonstration Orchards:
W. H. Barnett, Boswell, Pa.
Daniel Ott, Windber, Pa., R. D. No. 1.
J. P. Rhoads, Friedens, Pa.
Somerset County Home, Somerset, Pa.
D. W. Will, Glade, Pa.

Location of Supervision Orchards:
Samuel M. Berkey, Somerset, Pa., R. D. No. 2.
N. A. Mosteller, Friedens, Pa.
H. M. Poorbaugh, Glencoe, Pa.
Number of public meetings held in this county: 15.
Number of supervision visits made in this county: 5.
Number of orchard inspections made in this county in 1911: 342.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 77.

Peaches:
Number of orchards of 5 to 20 acres: 1.

Pears:
Number of orchards of 5 to 20 acres: 1.

Other fruits:
Number of orchards of 5 acres or more: 1.

SULLIVAN COUNTY

D. A. Knuppenburg, Inspector and Demonstrator.

Location of Demonstration Orchards:
Mrs. Jessica Kneller, Dushore, Pa., R. D. No. 1.
J. G. Scouton, Dushore, Pa.
J. J. Sick, Sonestown, Pa., R. D. No. 1.

Location of Supervision Orchards:
V. B. Holcombe, Dushore, Pa.
Number of public meetings held in this county: 10.
Number of supervision visits made in this county: 2.
Orchard statistics at hand for this county:

Apples:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 36.

Peaches:
Number of orchards of 5 to 20 acres: 1.

SUSQUEHANNA COUNTY

A. O. Finn, Inspector and Demonstrator.

Location of Demonstration Orchards:
M. M. Benson, Susquehanna, Pa., R. D. No. 5.
Geo. Carlton Shafer, Montrose, Pa.
C. E. Van Gorden, Meshoppen, Pa., R. D. No. 1.

Location of Supervision Orchards:
J. M. Borden, Thompson, Pa., R. D. No. 2.
W. M. Bunnell, Scranton, Pa.
H. S. Chamberlain, Gibson, Pa.
Walter Cobb, Dundaff, Pa.
A. S. Colvin, Clifford, Pa.
Crane & Lathrope, Agts., Carbondale, Pa.
W. C. Cruser, Montrose, Pa.
F. N. Gillespie, New Milford, Pa., R. D.
Allen Jayne, West Auburn, Pa.
A. L. Kessler, Brandt, Pa.
G. G. Lewis, Thompson, Pa.
F. I. Lott, Montrose, Pa.
M. W. Palmer, Kingsley, Pa.
E. C. Pickering, Kingsley, Pa., R. D. No. 3.
Beach Sanitarium, Susquehanna, Pa.
F. W. Sheldon, Susquehanna, Pa., R. D. No. 3.
J. Schoonmaker, Meshoppen, Pa., R. D. No. 1.
J. T. Smith, Montrose, Pa.
Henry Snyder, East Lenox, Pa.
Elridge Snyder, Lenox, Pa.
D. E. Stone, Thompson, Pa.
B. F. Thomas, Factoryville, Pa.
C. F. Watrous, Jr., Montrose, Pa.
Legrand Wells, Uniondale, Pa., R. D. No. 1.

Number of public meetings held in this county: 5.
Number of supervision visits made in this county: 47.
Number of orchard inspections made in this county in 1911: 391.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 20 to 50 acres: 6.
Number of orchards of 5 to 20 acres: 114.

Peaches:
Number of orchards of 5 to 20 acres: 1.

TIOGA COUNTY

M. L. Benn, Inspector and Demonstrator.

Location of Demonstration Orchards:
G. G. Close, Lawrenceville, Pa.

Dorsett Bros., Mansfield, Pa.
F. J. Everett, Jackson Summit, Pa.
H. A. Gardner, Westfield, Pa., R. D. No. 1.
David J. Jones, Wellsboro, Pa., R. D. No. 10.
James Rarick, Mansfield, Pa., R. D. No. 3.
John W. Zeafla, Liberty, Pa.

Location of Supervision Orchards:
L. B. Andrews, Lawrenceville, Pa., R. D. No. 1.
Lucy D. Baldwin, Lawrenceville, Pa.
Henry Badmone, Middlebury Centre, Pa., R. D. No. 1.
C. J. Beach, Mansfield, Pa.
M. V. Benson, New York, N. Y.
Henry Brecker, Gaines, Pa., R. D. No. 4.
A. A. Callahan, Wellsboro, Pa., R. D. No. 6.
D. E. Casbeer, Osceola, Pa., R. D. No. 2.
Mead P. Close, Tioga, Pa., R. D. No. 4.
E. O. Connelly, Covington, Pa., R. D. No. 1.
N. C. Davy, Westfield, Pa.
Wm. Dennison, Blossburg, Pa. (Star Route).
Jasper Emick, Morris, Pa., R. D. No. 1.
Joseph E. Fischler, Wellsboro, Pa., R. D. No. 3.
Lyman Hall, Tioga, Pa., R. D. No. 4.
George T. Hatherill, Wellsboro, Pa., R. D. No. 1.
Homer B. Howe, Wellsboro, Pa., R. D. No. 3.
Victor H. Hurd, Millerton, Pa., R. D. No. 1.
J. H. Kernan, Westfield, Pa., R. D. No. 4.
John Kohler, Mansfield, Pa., R. D. No. 6.
James W. Lain, Jackson Summit, Pa.
W. H. Landis, Liberty, Pa., R. D. No. 1.
J. N. Lloyd, Galeton, Pa., R. D.
Murray Mase, Liberty, Pa.
F. C. Moore, Wellsboro, Pa.
M. J. Neal, Liberty, Pa.
Ralph E. Pierce, Nelson, Pa.
Wm. J. Reed, Wellsboro, Pa., R. D. No. 4.
Remwalt Bros., Gaines, Pa.
R. Irwin Richmond, Mansfield, Pa., R. D. No. 1.
Robert Ryan, Elkland, Pa.
C. H. Sheive, Seely Creek, N. Y., R. D. No. 2.
G. W. Simmons, Westfield, Pa., R. D. No. 1.
N. I. Strait, Gaines, Pa.
Mrs. J. K. Thompson, Mansfield, Pa.

Number of public meetings held in this county: 27.
Number of supervision visits made in this county: 61.
Number of orchard inspections made in this county in 1911: 51.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 5 to 20 acres: 91.

Peaches:
Number of orchards of 5 to 20 acres: 3.

UNION COUNTY

T. C. Foster, Inspector and Demonstrator.

Location of Demonstration Orchards:
J. Newton Glover, Vicksburg, Pa.
U. R. Swengel, Lewisburg, Pa.
B. S. Schoch, New Berlin, Pa.

Location of Supervision Orchards:
James Beaver, Mifflinburg, Pa.
John A. Beck, White Deer, Pa., R. D. No. 1.
Wm. R. Follmer, Lewisburg, Pa.
C. V. Michener, Allenwood, Pa.
H. J. Nogel, Lewisburg, Pa.
Edward Raker, Shamokin, Pa.
Dr. D. M. Samsell, Winfield, Pa.
Mrs. Sarah Starook, Lewisburg, Pa., R. D. No. 1.
Geo. W. Wolfe, Lewisburg, Pa., R. D. No. 3.
Number of public meetings held in this county: 12.
Number of supervision visits made in this county: 22.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 10.

Peaches:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 18.

VENANGO COUNTY

G. B. Stichter, Inspector and Demonstrator.

Location of Demonstration Orchards:
A. J. Morse, Titusville, Pa., R. D.
R. M. Sterritt, Jackson Centre, Pa.

Location of Supervision Orchards:
Lewis L. Bodine, Franklin, Pa., R. D. No. 2.
Homer C. Crawford, Cooperstown, Pa.
John H. Crawford, Emlenton, Pa.
P. D. Cutshall, Franklin, Pa.
Institution for Feeble Minded, Polk, Pa.
Alfred Lamb, Pleasantville, Pa.
J. G. Pfielsticker, Oil City, Pa.
L. A. Russell, Polk, Pa., R. D. No. 1.
J. E. Williams, Carlton, Pa.
E. J. Young, Franklin, Pa.
Number of public meetings held in this county: 12.
Number of supervision visits made in this county: 20.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 100 acres or more: 2.
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 18.

Peaches:
Number of orchards of 5 to 20 acres: 1.

Pears:
Number of orchards of 5 to 20 acres: 1.

Other fruits:
Number of orchards of 5 acres or more: 1.

WARREN COUNTY

P. H. Burk, Inspector and Demonstrator.

Location of Demonstration Orchards:
W. C. Averill, Tidioute, Pa., R. D. No. 1.
H. Y. Miller, Sugar Grove, Pa.

Location of Supervision Orchards:
Henry E. Clark, Tidioute, Pa.
C. C. Cooper, Sugar Grove, Pa.
Heath & Allen, Sugar Grove, Pa.
James Hewitt, Warren, Pa., R. D.
John A. Kinsman, Sugar Grove, Pa.
A. R. Mix, Russell, Pa.
Norris, Tarone & Holtham, Northeast, Pa.
D. H. Wright, Sugar Grove, Pa.
Number of public meetings held in this county: 8.
Number of supervision visits made in this county: 18.

Orchards statistics at hand for this county:
Apples:
Number of orchards of 20 to 50 acres: 2.
Number of orchards of 5 to 20 acres: 17.

WASHINGTON COUNTY

B. S. Moore, Inspector and Demonstrator.

Location of Demonstration Orchards:
J. W. Cleaver, Beallsville, Pa., R. D. No. 1.
McClelland Bros., Canonsburg, Pa., R. D. No. 4.
D. C. Purrin, Avella, Pa., R. D. No. 2.
W. S. Russell, Bulger, Pa., R. D. No. 1.

Location of Supervision Orchards:
Robt. M. Carrons, Washington, Pa.
Chas. E. Carter, Canonsburg, Pa., R. D. No. 3.
S. L. Day, Dunn's Station, Pa.
Dorsey Bros., W. Brownsville, Pa., R. D. No. 1.
J. W. Emery, Washington, Pa.
Lawrence N. Fife, Venetia, Pa., R. D. No. 2.
John H. Gregg, Speers, Pa., R. D. No. 1.
T. M. Johnson, Rea, Pa.
James A. Jordan, Washington, Pa., R. D. No. 9.
S. A. Lacock, Canonsburg, Pa.
Dr. G. C. Lake, Pittsburg, Pa.
R. J. McCready, Pittsburg, Pa.
Levi A. McMurray, Canonsburg, Pa., R. D. No. 4.

Wm. M. Meloy, Claysville, Pa., R. D. No. 1.
Henry Mesta, Finleyville, Pa., R. D. No. 1.
J. M. Raab & Bro., Midway, Pa.
John Reed, Washington, Pa.
Mrs. Margaretta Russell, Hickory, Pa.
John G. Sampson, Monongahela, Pa., R. D. No. 1.
Isaac S. Sprowls, Monongahela, Pa., R. D. No. 3.
Mrs. J. M. Thomas, Thomas, Pa.
W. M. Thompson, Washington, Pa., R. D. No. 7.
Geo. Vanderslice, Monongahela, Pa.
J. M. Wallace, Finleyville, Pa., R. D. No. 1.
F. L. Watring, Washington, Pa., R. D. No. 1.

Number of public meetings held in this county: 12.
Number of supervision visits made in this county: 14.

Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 5 to 20 acres: 4.

Peaches:
Number of orchards of 5 to 20 acres: 1.

WAYNE COUNTY

W. H. Bullock, Inspector and Demonstrator.

Location of Demonstration Orchards:
W. W. Baker, Gravity, Pa.
Hull Brothers, Waymart, Pa.
Hon. Alonzo T. Searle, Honesdale, Pa.
W. J. P. Warwick, Narrowsburg, N. Y., R. D. No. 1.

Location of Supervision Orchards:
E. E. Avery, Honesdale, Pa., R. D. No. 4.
B. F. Box, Clemo, Pa.
Samuel A. Collins, Prompton, Pa.
F. H. Curtis, Waymart, Pa., R. D. No. 1.
F. C. Deiterick, Aldenville, Pa.
Harvey Emery, Gravity, Pa., R. D. No. 1.
Forest Lake Club, Mast Hope, Pa.
Mrs. Bernard Grote, Waymart, Pa., R. D. No. 1.
William Gutheriez, Winwood, Pa.
Wm. M. Hager, Roselle, N. J.
L. W. Healy, Scranton, Pa.
Stanley H. Hine, Orson, Pa.
Chas. McKinney, Gravity, Pa., R. D. No. 1.
C. A. Masters, Gravity, Pa.
F. W. Osgood, Ariel, Pa.
W. E. Perham, Pleasant Mount, Pa., R. D.
J. G. Schwighofer, Torrey, Pa.
J. W. Stanton, Waymart, Pa., R. D. No. 3.
Clifford Swingle, Ariel, Pa.

Number of public meetings held in this county: 20.
Number of supervision visits made in this county: 36.
Number of orchard inspections made in this county in 1911: 699.
Orchard statistics at hand for this county (not completed):

Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 5.
Number of orchards of 5 to 20 acres: 113.

Peaches:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 1.

WESTMORELAND COUNTY

J. S. Briggs, Inspector and Demonstrator.

Location of Demonstration Orchards:
Calvin Barber, Apollo, Pa., R. D. No. 1.
J. B. Fretts, Scottdale, Pa., R. D. No. 1.
E. M. Gross, Greensburg, Pa.
Clarence L. Kepple, Leechburg, Pa.
M. J. Patterson, Blairsville, Pa., R. D. No. 2.

Location of Supervision Orchards:
R. J. Beck, Delmont, Pa.
A. P. Blackburn, Irwin, Pa.
Felix R. Brunot, Greensburg, Pa., R. D. No. 5.
G. H. Brunner, W. Newton, Pa., R. D. No. 1.
Westmoreland County Home, Greensburg, Pa.
J. W. Fullerton, Yohoghany, Pa.
C. B. Jamison, Saltsburg, Pa.
Harry C. Long, Arona, Pa., Box 92.
Harriett McElwain, Parnassus, Pa., R. D. No. 2.
W. C. McNutt, Bellevernon, Pa., R. F. D.
James Masters, Wiester, Pa.
Charles Metcalf, Leechburg, Pa., R. D. No. 2.
W. T. Moffitt, Ardora, Pa.
Wm. M. Parkin, New Kensington, Pa.
W. I. Robinson, Bolivar, Pa.
Sisters of Charity, St. Joseph's Academy, Greensburg, Pa.
Howard H. Smith, Latrobe, Pa.
Dr. X. O. Werder, Pittsburg, Pa.
Mrs. Kate M. Yinger, Manor, Pa.

Number of public meetings held in this county: 14.
Number of supervision visits made in this county: 32.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 20 to 50 acres: 1.
Number of orchards of 5 to 20 acres: 49.

Peaches:
Number of orchards of 5 to 20 acres: 6.

Pears:
Number of orchards of 5 to 20 acres: 1.

Other fruits:
Number of orchards of 5 acres or more: 9.

WYOMING COUNTY

D. A. Knuppenburg, Inspector and Demonstrator.

Location of Demonstration Orchards:
W. C. Allen, Tunkhannock, Pa., R. D.
Felix Ansart, Wilkes-Barre, Pa.
Hon. S. R. Brunges, Tunhannock, Pa.
Fred B. Keeney, Laceyville, Pa., R. D. No. 37.

Location of Supervision Orchards:
R. N. Capwell, Factoryville, Pa.
P. F. Coyle, Nichalson, Pa.
G. P. Dershimer, Tunkhannock, Pa.
J. A. Dewitt, Falls, R. D. No. 1.
O. C. Ferris, Skinner's Eddy, Pa.
Geo. L. Hadsall & Son, South Eaton, Pa.
J. H. Hadsall, Baumont, Pa.
F. L. Herman, Eatonville, Pa.
Miss Virginia Loomis, Tunkhannock, Pa., R. D. No. 2.
Francis J. McCanna, Falls, Pa., R. D. No. 1.
Mrs. Vincent Malikowski, Osterhout, Pa.
W. E. Michall, Factoryville, Pa.
Randall & Vaughn, Lovelton, Pa.
H. W. Rubright, Tunkhannock, Pa.
H. C. Stark, Nichalson, Pa.
B. M. Stone, Stull, Pa.
Mrs. W. H. Swartwood, Ransom, Pa., R. D. No. 1.
E. W. Thompson, Factoryville, Pa.
B. L. Townsend, Factoryville, Pa.
C. E. Treible, Vosburg, Pa.
W. L. Utley, Nichalson, Pa., R. D. No. 2.
C. E. Van Gordon, Meshoppen, Pa.
Truman S. Vaughn, Lovelton, Pa.
J. E. Wiggins, Tunkhannock, Pa., R. D. No. 4.
Orlando Wright, Vernon, Pa.

Number of public meetings held in this county: 11.
Number of supervision visits made in this county:56.

Orchard statistics at hand for this county:
Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 11.
Number of orchards of 5 to 20 acres: 125.

Peaches:
Number of orchards of 5 to 20 acres: 7.

YORK COUNTY

E. F. Peirce, Inspector and Demonstrator.

Location of Demonstration Orchards:
J. E. Belt, Wellsville, Pa.
A. P. Hartman, York, Pa., R. D. No. 5.
G. M. King, York, Pa.

G. F. Miller, New Freedom, Pa.
Albert Shorb, Hanover, Pa., R. D. No. 2.
Wm. H. Sweitzer, Stewartstown, Pa.

Location of Supervision Orchards:
Geo. W. Givens, York, Pa.
D. S. Auchey & Son, Hanover, Pa.
M. H. Baer, Menges Mills, Pa.
John E. Bentz, York, Pa.
Abner Brenneman, Spring Forge, Pa.
W. E. Brillhart, New Freedom, Pa.
A. R. Brodbeck, Hanover, Pa.
E. E. Brunner, York Haven, Pa.
R. S. Clark, Dillsburg, Pa.
Alex. Dietz & Bro., Hellam, Pa., R. D.
E. B. Hawkins, Delta, Pa.
H. B. Goodling, Glen Rock, Pa.
N. E. Hassler, Spring Forge, Pa.
Dr. Vallie Hawkins, Fawn Grove, Pa.
Edward Helb, Railroad, Pa.
Chas. Kauffman, Stony Brook, Pa.
E. F. Kauffman, York, Pa., R. D. No. 3.
Prof. W. D. Keeney, Manheim, Pa.
C. P. Kibbler, York, Pa.
Capt. W. H. Lanins, York, Pa.
L. B. Lau, E. Berlin, Pa.
Chas. Leber, Wrightsville, Pa.
Henry Logan, York, Pa.
H. H. Loose, Menges Mills, Pa.
Mrs. U. A. McPherson, Muddy Creek Forks, Pa.
C. E. Overdeer, Middletown, Pa.
W. F. Overmiller, Glen Rock, Pa.
Ervin C. Raver, Glen Rock, Pa., R. D.
A. W. Sechrist, York, Pa.
Samuel A. Shroff, York, Pa.
Henry Small, York, Pa.
T. S. Snyder, Brodbecks, Pa.
A. H. Sprenkle, Bair, Pa.
Chas. M. Stock, Hanover, Pa.
Samuel Swartz, Spring Forge, Pa.
J. C. Wiley, Bridgeton, Pa.
D. E. Winebrenner, Hanover, Pa.
Thos. E. Yohe & Son, Spring Forge, Pa.
York County Almshouse, York, Pa.
Wm. N. Zeigler, Stewartstown, Pa.

Number of public meetings held in this county: 23.
Number of supervision visits made in this county: 89.
Number of orchard inspections made in this county in 1911: 343.

Orchard statistics at hand for this county (not completed):
Apples:
Number of orchards of 50 to 100 acres: 1.
Number of orchards of 20 to 50 acres: 18.
Number of orchards of 5 to 20 acres: 86.

Peaches:
Number of orchards of 20 to 50 acres: 5.
Number of orchards of 5 to 20 acres: 27.

10. EXHIBITIONS

As the Secretary of Agriculture received communications from various County Fair Managers, asking if we could make exhibitions of specimens, apparatus, machinery, chemicals, etc., for the Fairs, we replied in the affirmative, and at once made arrangements to do so.

At the Erie County Fair, at Corry, and at the Cumberland County Fair, at Carlisle, we made extensive exhibitions, and also shipped the same to the Bradford County Fair, at Athens, but, unfortunately, the shipment was delayed, and did not reach its destination in time. These exhibitions consisted of charts of many species of insects, greatly enlarged, showing their life history, actual photographs from orchards, showing properly pruned, cultivated and sprayed trees, fruit of many kinds, spraying apparatus, chemicals, specimens of beneficial and injurious insects, and many mounted birds and mammals. The wisdom of making and preserving a collection of economic birds and mammals in their relation to agriculture, primarily designed for the St. Louis Exposition, and for which a gold medal was awarded to the writer, is now well shown. These specimens were nicely preserved (notwithstanding a report to the contrary), and were exhibited at the County Fairs named above and elsewhere, and were a source of considerable instruction, attracting a large crowd at all times.

At the meeting of the State Forestry Association we made an exhibition of injurious and beneficial insects in the forests, which attracted much attention and was the subject of most cordial commendation by the officers of that Society.

The important educational factor of the demonstration trains is recognized, and we are co-operating with the railroad companies, as with all other agencies, for the good of the cause which we mutually represent, and arrangements are being made to run a series of demonstration trains in the State of Pennsylvania in the year 1912.

That the fruit growers of this State recognize the value of the work of this office is shown by the fact that at the last meeting of the State Horticultural Association of Pennsylvania, at Pittsburg, Pa., strong resolutions were passed commending this service and requesting its continuation.

NEEDS OF THE OFFICE

In conclusion, we must again emphasize the needs of this office in the important work it is doing.

(1) We need a larger appropriation in order to let us add more demonstrators to the force and to extend the service more thoroughly and fully to those who need it.

(2) We need more office room. Our rooms are crowded, and the work is becoming more burdensome because more extensive. Two additional rooms for office purposes are very seriously needed, and the work will be handicapped seriously if these can not be provided.

(3) We need an insectary, like a small greenhouse room, for maintaining outdoor conditions for the breeding eggs, containing insects of which the life histories should be studied and observed carefully in normal conditions.

(4) We need at least a small tract of a few acres conveniently situated where experiments can be performed, testing spraying apparatus and materials, and other features of warfare against pests, in order to let us keep always to the front with the latest and best practical information for our citizens. It is not proper that we should be obliged to depend only upon the study of what comes to us in the form of literature from our Experiment Station and from other states. With facilities for some experimental work much valuable information could be gained concerning new materials, apparatus, methods of tests, etc., and reports can be given on those which are worthy of recommendation and general adoption in practical use.

Respectfully submitted,

H. A. SURFACE,

Economic Zoologist of Pennsylvania.

PAPERS READ AND ADDRESSES DELIVERED AT THE ANNUAL MEETING OF THE FARMERS' NORMAL INSTITUTE, HELD AT LANCASTER, PA., MAY 23-26, 1911

ADDRESS OF WELCOME

By HON. FRANK B. McCLAIN, Lancaster, Pa.

Mr. Chairman: I have come here not to make a speech as you might perhaps expect. I have come here not as a teacher, but as a student to listen and to learn of the great science of agriculture from those competent to instruct in it. There is a little maxim which says, "He who by the plow would drive must either hold themselves or drive." I have neither held nor have I driven, and the information that I possess concerning agriculture, therefore, has not come to me through holding the plow. I have, however, had some experience with a certain branch of agriculture covering a great many years. I refer to the cattle growing and cattle feeding industry. But under existing market conditions, a dissertation upon that subject at this time would mean, in view of the experience I have had as well as some of the gentlemen sitting near me feeding cattle this winter, would be to them a somewhat harrowing tale, I fear.

It would be a superfluity for me to tell a body of intelligent, practical farmers like you that Lancaster county for a good many years has enjoyed the proud distinction of occupying the place of No. 1 among, not only the counties of Pennsylvania, but as well the counties of the United States in the annual value of her farm products. This has been true not so much because of the superior quality of our soil, but we feel because of the superior quality of the people who have tilled the soil. There are fair lands to westward which possess a far richer and deeper loam than does the soil of Lancaster county. It is true that their lands are not peopled so extensively as ours, but it is also true that to them has not been applied the same intensive application of human energy as has been applied to the soil of Lancaster county by its sturdy sons.

One thought suggested to me—it may not be a popular thought with you gentlemen and I may be entirely wrong in my surmise—but it seems to me that in these days the tendency is to run too much to machine farming. After all it is not the number of machines you may use upon the farm, but the character of your soil which produces that crop. It is the personality and the willingness to do work of the farmer. I do not mean to decry the use of these labor saving devices. Many of them in use to-day are very helpful. But I contend that the unlimited use of machinery upon farms has a tendency to instill the

idea that crops can be grown and harvests can be gathered without the laying on of hands, without the employment of the tools which Nature intended should be used in conjunction with hers to be the most effective agency in crop production. Criticism is frequently heard that the farmers of Lancaster county are not quite as progressive as farmers of some other sections. This probably is true if the comparison is to be based upon the number and kinds of machinery of every character employed by the Lancaster county farmers, but the comparison becomes ridiculous when the results here are compared with the results achieved by those who criticise Lancaster county. And the reason that we do achieve so in contradistinction to the achievements of farmers in other sections of the country where their soil is as good is because here, as I said before, we think we have intelligent, earnest application of human energy joined with scientific methods. And it is this fact, coupled with the native thrift, that has made the Lancaster county farmer the most prosperous of his kind not only throughout Pennsylvania, not only throughout the United States, but the world over.

Meetings such as you are holding here to-day do much to advance the cause of agriculture. They furnish opportunity for exchange of opinions, presentation of new ideas and the formulation of more effective methods of treating the soil and growing corps. You did wisely in selecting Lancaster for your place of meeting, accessible as it is from all points of the compass. To you who have come here from a distance, I say welcome, and whether you be from near or far I here now extend to you the greetings of welcome to the city of Lancaster.

RESPONSE TO ADDRESS OF WELCOME

By DR. W. T. PHILLIPY, Carlisle, Pa.

Mr. Chairman, Honorable Mayor, Ladies and Gentlemen: I assure you that it affords me a great deal of pleasure to respond in your behalf to the pleasant words of greeting and welcome that have been extended to us as we gather here in our Annual Normal Institute this afternoon. My friends, I know that we feel already that we are welcome in your city of Lancaster and in this great County of Lancaster which is a part of the great Commonwealth that is represented here to-day. I know that we have all heard of Lancaster county. We hear of Lancaster county it does not matter what part of the State we are in. There is always someone will say: "Have you ever been to Lancaster county? Have you ever passed through it? Have you ever had the privilege or opportunity of viewing its rich green fields as you passed down over the Pennsylvania Railroad?" I want to say to you, my friends, and the Honorable Mr. Mayor, that it has been my privilege to be in this county a number of times. I have had the pleasure and privileges of appearing at institutes and I know from the interest that was manifested there and the class of people that we

were called upon to talk to at Lancaster county is progressive. Its citizens are awake to the opportunities that are presenting themselves, and they are making the best of these opportunities upon their farms.

My friends, it has been so well said and so much better than I can say it, Lancaster county has been the foremost county not only in this Commonwealth of ours, which we are also proud of to-day, but as well the banner county of the United States in its annual production of farmers' products. I know that you will agree with me, that we were glad to accept the kind invitation to some over here to hold this Normal Institute in this beautiful city. It has been my privilege to visit parts, its colleges, its public schools and some of its great charitable institutions as well as it has been to travel over this county, over its railroads and its trolley system and view these rich and fertile fields of Lancaster county and I know, my friends, before you get away from our meeting that you will have the opportunity, if you have not already had it, of seeing some of the fertile farms that are lying around the City of Lancaster. Now, my friends, I want to plead with our good Mayor this afternoon in your behalf. You know when we get away from home we sometimes may step out of the path that is laid down and I want to plead with you, Mr. Mayor, if any of them may be brought before you, please be easy.

Just last evening, I do not know who would advertise our coming to this city, but I have a good friend from the western end of the State and he came into the City of Lancaster last night. I am not going to tell you his name, but I will tell you he belongs to the "duck" family, and he went into one of the prominent hotels and said to the proprietor: "What are your rates here?" And the proprietor said two dollars and up. And my friend said: "Well, sir, I am an institute lecturer of the State of Pennsylvania." The proprietor said: "I am glad to meet you sir. Then it is two dollars down." Now I suppose that somebody had advertised our coming here, but I hope that there will be nothing more serious than that. I just want to tell you a little incident that happened last evening. We all have a good friend from Pennsylvania and he comes from Allentown, but I am not going to tell his name, but he is a chicken man. He is recognized all over the State and not only in the State of Pennsylvania but throughout this great country of ours. We were coming up street last night and he met a gentleman who said to him: "My friend, the next time you send me any chickens don't send me any of your airoplane kind." Well, I thought that was something new, and I waited for developments. And my friend said: "What do you mean?" And the gentleman said: "The last chickens you sent me were all wings and machinery and there was no meat on them." I hope he will get through this week without arrest or anything of that kind. But my friends, you have heard and you all enjoyed the address of welcome that our good friend has extended to us, and we are here this week to enjoy the instruction that will be given to us in the different sections of this institute and I feel that it would be folly for me to waste my words this afternoon in trying to say anything further; but I want to say in behalf of our friends who have assembled here, Mr. Mayor, that we thank you very kindly for the warm and hearty welcome that you have extended to us during this meeting, and I hope that we all, one and all will be able to say when we go away

from here that we have had not only a profitable week but a week of pleasure and you will not be afraid or ashamed to ask us back sometime in the future.

THE PRODUCTION OF SANITARY MILK.

By D. H. BERGEY, M. D., *University of Pennsylvania.*

By sanitary milk we understand a milk that is free from extraneous things of whatever kind that may affect the health of those using it. The production of sanitary milk is not a difficult matter at all, although it requires constant vigilance on the part of the producer and attention to a great many details. Bacteria are found in the milk ducts of most cows and, subsequently, it is impossible to obtain considerable quantities of milk without the admixture of bacteria. The bacteria in the milk ducts of apparently healthy cows are principally those who are concerned in the natural souring of milk. These bacteria are, therefore, regarded as normal constitutents of milk.

The most common organism found in freshly drawn milk is micrococcus lacticus. In many of its characters this bacteria resembles micrococcus aureus, which is the most frequent cause of pus formation in man and domestic animals. Another organism found in freshly drawn milk is streptococcus lacticus. This bacterium is not easily distinguishable from streptococcus pyogenes, another of the bacteria causing pus formation. These two organisms found in the milk sinews of apparently healthy cows appear, from the effects which they produce in milk, to be normal inhabitants of this portion of the cow's udder and, therefore, have no hygienic significance.

Milk may be said to be contaminated with bacteria when it contains organisms which differ from those mentioned. The contaminating bacteria may be derived from a variety of sources. The principal sources of contamination of milk in the course of production and marketing are to be sought in the dairy itself. The chief sources of contamination are the cow from which the milk is obtained; the stable; the bedding; the fodder; the milker or the utensils in which the milk is collected.

The cow may be the source from which contaminating organisms are derived and these organisms may gain access to the milk because the animal is ill and the bacteria causing the disease are given off with the milk; or second, the contamination may be derived from the fur of the cow or from a dirty udder.

Cows do not suffer from many diseases to which human beings are also liable. The principal diseases that may be disseminated from the cow to the consumer through the milk are the various types of inflammation of the udder giving rise to disturbances of the digestive organs in those using the milk; tuberculosis; foot and mouth diease; and

very exceptionally diphtheria and anthrax. Cows suffering from tuberculosis usually give off considerable numbers of the tubercle bacillus, even though the disease is located in some other part of the animal's body than the udder.

The controversy which has continued for some years as to whether tuberculosis of cows is transmissible to human beings remains unsettled. In 1901 Koch contended that bovine tuberculosis was not transmissible to man. Since then there have been so many cases of tuberculosis, especially in children, in which the bovine variety of the tubercle bacillus was found, that it appears wise to regard the bovine type of the disease as a distinct menace to man. Foot-and-mouth-disease is transmissible to man through the milk. As we have not yet discovered the causative agent of this disease, we cannot make any definite statements concerning its transmission to man. There is abundant circumstantial evidence in support of the opinion that diphtheria may be disseminated through milk. Usually the milk is found to have been contaminated by persons who suffer from a mild form of this disease, or who are in intimate contact with cases. Klein, of England, has long contended that cows may suffer from diphtheritic infection with lesions on the udder. However, it has remained for Dean and Todd to show definitely that this form of infection in cows is possibble, and that those who consume the milk in an uncooked state are liable to contract the disease. Anthrax is a highly infectious disease and there is a possibility of its transmission to man through the use of milk. There are no authentic cases of such transmission on record, but every precaution should be taken to exclude the milk of infected dairies.

The bacteria derived from the fur of the cow or from a dirty udder are principally those found in the excrement of the animal. These bacteria cause decomposition and putrefaction of the milk, and, in this way, render it unfit for consumption, or, at least, change its character to such an extent as to make it dangerous to the consumer.

The contamination of milk through bacteria derived from the fur of the animal and from the udder could be obviated to a considerable degree by careful attention to cleanliness of the cow. Currying and brushing the cows serves to remove adherent filth and loose hair. The cows should be cleaned some time before milking is begun in order to allow the dust to settle. Washing the udder and flanks of the cow previous to milking aids in reducing the number of bacteria that may be dislodged and gain access to the milk. While in a moistened state bacteria are not distributed very freely. It is only when the fur of the animal is dry that the bacteria are easily dislodged.

The stable is an important source of contamination of the milk and is a factor which has by no means received the attention which it merits. The type of barn found on many farms does not make it possible to stable cattle under the very best conditions. The amount of space allotted to each animal is insufficient to provide the requisite amount of ventilation. A human being requires about three thousand cubic feet of fresh air per hour and, in order to supply this amount of fresh air in dwellings, about one thousand cubic feet of space should be allotted to each individual. The cow is a much larger animal and requires proportionately larger quantities of fresh air. In the main it may be stated that a cow requires at least a quantity of fresh air equal to

that needed by an average person; and, in order that this amount of fresh air may be supplied regularly without the production of drafts, the amount of space allotted to a cow should be, in proportion to her size, one thousand to twelve hundred cubic feet. Many of the stables in older barns are too low to make it possible to bring about satisfactory ventilation, though an undue height of stable is also undesirable. It may be stated that a height of ten to twelve feet is a fair average.

With proper allotment of space and satisfactory provision for ventilation in stables, the purity of the air can be more readily maintained; and where pure air prevails one of the principal sources of contamination in the stable, that is, dust, can be largely eliminated, because the smaller the stable and the greater the overcrowding, the greater the amount of dust floating in the air, and this dust finds its way into the milk during the process of milking.

The dust of stables is a fruitful source of bacteria which cause decomposition and putrefaction in milk. The dust particles and the bacteria adherent to them are derived from the cows, the bedding, the fodder, and the attendants. For this reason, the nature of the bedding and the time of feeding play an important part in the production of sanitary milk. Straw bedding contains a greater number of bacteria than do peat or shavings.

The handling of fodder during the time of milking disseminates large quantities of dust, a considerable portion of which finds its way into the milk, and, for this reason, it is customary to recommend that feeding time and milking time should be separated so as to avoid as much as possible this source of contamination. The nature of the bacteria derived from fodder is similar to that of the bacteria derived from bedding.

The following table, compiled from the experiments of Backhaus of Konigsberg, will show the possible sources of contamination at a glance:

TABLE I

Elements of Contamination.	Sources of Contamination.	Bacteria.
1. Infection,	Fresh milk,	6,660 per c. c.
	After passage through six vessels,	97,600 per c. c.
2. Bodily cleanliness,	Milk from clean cow,	20,600 per c. c.
	Milk from dirty cow,	170,000 per c. c.
3. Litter,	Peat,	2,000,000 per gm.
	Good straw,	7,500,000 per gm.
	Bad straw,	10,000,000 per gm.
4. Influenee of the litter on the number of bacteria in milk.	With peat litter,	3,500 per c. c.
	With straw litter,	7,330 per c. c.
5. Food (dust of, in the byre),	Oil cake,	457,500 per gm.
	Bran,	1,361,000 per gm.
6. Milking,	Milked dry,	5,600 per c. c.
	Milked wet,	9,000 per c. c.
	First milk,	10,400 per c. c.
	Last milk,	Sterile.
7. Vessels,	Washed udder,	2,200 per c. c.
	Unwashed udder,	3,800 per c. c.
	Enamelled vessel,	1,105 per c. c.
	Tin vessel,	1,690 per c. c.
	Wooden vessel,	279,000 per c. c.
8. Cleaning of vessels,	Sterilized pail,	1,300 per c. c.
	Simply rinsed,	28,600 per c. c.

The milker is undoubtedly a source of contamination, especially so if wet milking is permitted. However, the clothing of the milker, if not clean, is also a source of contamination. Strict cleanliness of the hands of the milker and of his clothing will help to eliminate an important source of contamination. The milker may also contribute disease producting bacteria if he is suffering from some of the communicable diseases, or if he has been in attendance on persons suffering from such diseases. The diseases which may be communicated by the milker are: tuberculosis, diphtheria, scarlet fever, and typhoid fever. No one suffering from, or associating with, persons suffering from any of these diseases should be permitted to take part in the production of milk.

Dirty utensils are also a fruitful source of contamination, and it is quite a task to keep the milking utensils in proper condition of cleanliness to prevent this kind of contamination. Utensils that have been cleaned with soap and hot water, or some other reliable cleansing material, and then scalded, are relatively free from bacteria which are injurious to the milk. They can be made absolutely free from bacteria by subjecting them to a sterilizing process.

The following tables give some indication of the extent to which bacteria are contributed to normal milk during ordinary procedures, especially where the milk is strained and cooled through apparatus that is not sterilized:

TABLE II

Bacteriological Examination of Milk Derived From Separate Cows in Ordinary Dairies; Samples Collected at Various Stages of the Process of Milking and Cooling.

No.	Udder.	Bucket.	Strainer.	Cooler.	Can.	Bottler.
1,	100	350	23,650	120,400	----------	----------
2,	25	1,250	21,225	508,200	----------	----------
3,	0	75	----------	----------	4,050	----------
4,	0	325	----------	16,200	----------	----------
5,	400	850	60,900	34,550	173,600	84,000

TABLE III

Influence of Unclean Apparatus Upon the Bacteria Content of Milk.

Dairy No.	Straining Apparatus.			Cooling Apparatus.		
	Beginning.	50 quarts.	100 quarts.	Beginning.	50 quarts.	100 quarts.
1,	21,225	12,800	1,375	508,200	21,700	2,600
2,	4,200	1,685	----------	15,950	2,900	----------
3,	14,925	12,325	----------	1,700	8,800	----------

The type of milk pail employed in milking is also a matter of importance. Several types of pail are in common use and I have had no personal experience in testing their efficiency; but those who have studied this question are generally agreed that some form of pail with the top partly covered in is much better than the old type of pail which is open. The pail with visor used in the dairy department of Cornell University serves the purpose of limiting the amount of dust falling in the milk. The shape and size of the visor has been slightly changed by Professor Harding of Geneva.

The milk should be cooled as soon as possible and kept at a low temperature (about 50 degrees Fahrenheit) until consumed. At a low temperature the bacteria in the milk do not multiply rapidly, but at higher temperatures they multiply quickly; for instance, at the body temperature, a single organism may produce as many as 200 in three hours; 10,000 in six hours; 10,0000,000 in nine hours, and 2,000,000,000 in eighteen hours. Conn has shown that at 50 degrees Fahrenheit bacteria multiply five times in twenty-four hours, while at 70 degrees Fahrenheit, they multiply seven hundred and fifty times.

These bacteria develop at the expense of the chemical constitutents of the milk and produce alterations in the character of the milk far in excess of what is indicated by the mere increase in numbers. In order to keep the number of bacteria as low as possible, milk must be shipped in refrigerator cars, or packed in ice.

Sanitary milk, it will be seen from what has already been said, is simply clean milk obtained from healthy cows and maintained under proper hygienic conditions. Sanitary milk cannot be produced in unsanitary dairies, and, even though it may be in a sanitary condition when collected, if not marketed under proper conditions it will not reach the consumer in a satisfactory state.

It will be necessary, therefore, in order that the consumer may be supplied with sanitary milk, that extreme precautionary measures be carried out not only on the farm in collecting the milk but that the measures be extended all along the line from the farm to the consumer, so that milk that is in a satisfactory condition as collected may maintain that state until it is to be used. It is an encouraging fact that recently transportation companies have announced that they are ready to supply refrigerator cars for the transportation of milk, and through this means it will be possible to allay a great deal of the criticism of the methods employed in conducting dairies that should have been directed against methods of transportation.

ESSENTIALS OF BUTTER MAKING

By MRS. JEAN KANE FOULKE, *West Chester, Pa.*

I feel as if I were undertaking a great deal in attempting to tell an audience of farmers how to make butter, because I am not what is termed an "expert" myself; that is to say, I am not a trained butter maker, never having taken a course in butter making in any agricul-

tural school, or indeed in any school save that of experience. However, as you all know, experience is credited with being a good teacher, if a hard one, and it is possible, therefore, that mine may have taught me some lessons that may be of use to some of you.

To make good butter is not such a simple matter as it appears, and it demands a care and attention that is seldom given to it. This fact accounts for the amount of bad butter that you see sold and used, and is one reason why oleomargarine and other patent butter is in such demand. They not only are cheaper or as cheap, but they run more evenly good, keep better and taste better.

The first essential for good butter is to have good rich milk and clean milk, milk that is free from any extraneous flavor such as may be absorbed from the atmosphere, feeds or plain dirt. To get this care must be taken as to the kind of feed used, especially if the milk is for butter. Milk that tastes all right and *is* all right for other purposes, when used for butter will not do at all. One can often distinguish the different tastes of feeds in the butter, and any radical change in the feeding may be at once detected. A little too much silage will spoil butter, and in cases where several cows' milk or the produce of the whole dairy is used, a knowledge of what each cow is getting, the amount, etc., should be carefully watched and known, and the effect upon her milk noted. This should be done in every dairy, as a matter of fact, as it is only thus that the feeding can be profitably done. Many cows do not need, and others do not digest, the kind of food or the amount of it that their fellows in the same stable should have. It is this knowledge of the individual that is a most important feature in any sort of dairying, and it is essential in a butter herd as a cow's milk is affected by her condition and this quickly affects the butter.

Having made sure that there is no taste in the milk from the feed that will show in the butter, the next thing is to be sure that the milk is cleanly drawn—that the milker has clean, dry hands, that the cow's sides and udder have been brushed and freed from manure and dust, loose hairs, etc., and that the milk is taken as soon as possible from the stable to prevent the contamination from the unavoidable odors and dust of a cow barn or milking shed. Care should be taken that the cans and pans are not exposed to road dust and manure and that they are scalded and washed thoroughly clean.

The milk is now ready for the dairy, and it depends very much upon whether it is to be separated or hand-skimmed what is to be immediately done with it; but as I am speaking of profitable butter making I assume that it is to be separated. In my opinion, milk for butter making should never be thoroughly cold. It should be *cool,* but never thoroughly chilled. In the dairy of which I have charge the milk is separated at a temperature of about 75 to 80 degrees. It is necessary to hold it over night, as we separate but once a day, so that the evening's milk is set in coolers or cans in the spring. These coolers hold about 12 quarts, a convenient size to lift.

Our spring water keeps about 56 degrees. I have a coal stove in the spring or dairy proper and keep a low fire all winter, keeping the temperature about 60 degrees and we try not to have it vary more than a degree or two one way or the other, and are very careful about ventilation and to prevent coal gas, dust, etc. Men are not allowed to enter the dairy in their working shoes nor is smoking allowed there. Care

must also be taken after white washing. This dairy is an old fashioned spring house and has been made over somewhat to suit modern methods and increased trade. Of course it would be better if it could be heated by pipes and thus do away with the stove, which in this case necessitates covering the cream each time it is raked and the ashes removed, and great care in seeing that there is no coal gas which would affect the cream at once.

The cream should be stirred down every day and thoroughly mixed. To do this I have a round disk of tin, with a row of inch holes, fastened on a steel rod about two and a half feet long, about like a poker. This disk or tin plate is just large enough to fit inside the coolers and be moved up and down, allowing the cream to come through the holes and thus becoming thoroughly mixed. Cream should not be allowed to fall far from the separator to the can, as the air in the froth on it seems to make it rancid very soon and stirring down into the can ruins the whole can of cream.

Ripe cream is *sweet* cream *soured*. Soured cream has a pleasant smell and is not rancid or strong. It tastes good and is pleasant to eat. I know of no better dessert than a saucer of soured cream and a slice of soft ginger bread, and can think of nothing worse than to have to eat a saucer of *sour* cream even if accompanied by "angels' food."

Sour cream is cream that is spoiling and on the way to putrefaction, but soured cream or what is called ripe cream is luscious and sweet. It has reached a point of fermentation where it is still fresh and unspoiled, and has not yet begun to decay. To bring cream to this state at the time desired is a delicate matter. In my own case I have the coolers lifted out of the spring and stood on the cement floor, and into each one I put a little more than one-half pint of souring from twenty-four to thirty-six hours before churning. This in an atmosphere with a temperature of 60 degrees will ripen the cream sufficiently for butter making, although if the dairy temperature is lower it may take longer.

The souring is made fresh each butter day—we churn twice a week, each Monday and Thursday—by taking six quarts of separator skim milk and adding two quarts of fresh butter milk, which is well mixed and kept stirring each day, the top being taken off before being used for souring.

The public demands butter of a good rich color, but except in Summer, and not always then, do even Jerseys given cream that will make yellow butter. Therefore the butter maker must resort to some of the many kinds of butter coloring that are on the market and are sold under the pure food laws. I have used "anato," which is a South American gum or root which comes in a powder very finely ground, a purely vegetable compound and entirely harmless. I know of but one place where it may be had and that is at Hansell's, No. 8 S. 18th Street, Philadelphia. I used to buy it by the pound but now it must be bought in five pound packages. It should be kept in a dry place. Preserve jars make good tight receptacles for it, and by opening one jar at a time the balance may be kept safely. I use at this season of the year and through the Winter one tablespoonful to seven coolers of cream, mixing it first in about 1 quart of luke-warm water, and then stir it in the cream with the mixer described before.

The cream is now ready for the churn and to get the churn ready for the cream is the next step. I want to say here that scalding water,

and plenty of it is a necessity to successful dairy work, and if one can have steam also it facilitates the work of cleaning and sweetening the dairy utensils, churn, separator, etc., enormously. The churn should be thoroughly scalded and rinsed, then chilled with plenty of fresh, cold water, after which it is ready for the cream, and we may begin churning. In this cleaning work use no soda and no soap except possibly to wash the rubber rings of the separator.

It should require about half an hour for the butter to come and as soon as you have butter the size of shad roe or very small marbles it is time to stop churning. After that to continue churning merely injures the texture of the butter. You get no more out of the cream but merely gather it into large greasy lumps.

Draw off the butter milk through a wire sieve to catch the butter that will flow out with it. Then rinse the butter with cool, not cold, water and take it from the churn.

While the churning is being done, one should have scalded all the paddles, prints, etc., to be used, also the butter worker, and should have chilled them afterward and left them in cold water. We set ours in the spring to await our needs.

The butter is put on the worker and the salt is spread over it. We allow half an ounce to the pound, and it should be weighed, not guessed at, unless you have buckets to hold the butter and measures for the salt that have been tested, so that you know what you are doing.

A sponge with a bit of cheese cloth about it makes a very useful thing in working butter. One should stand sideways to the worker, with a sponge in one hand the paddle in the other, and keep turning the butter up and over to the worker, and keep constantly patting it with the sponge, thus absorbing the water more quickly and lessening the danger of destroying the grain by over-working to get dry. The water and the salt should, however, be well worked out, not only the experience can tell one when this is sufficiently done; but there is a look that means a little to the experienced butter maker that the butter is worked.

In butter, as in everything else that we want to sell, appearance counts for much and care should be taken to have the prints sharp and well cut, so that the butter may take the impression clearly, after which it should be neatly wrapped in butter paper and set in pans to harden. In Summer the butter is often too soft, when first printed, to wrap and should be laid on open papers in the pans and wrapped later. The triangular point of paper at each end of the package should be turned under, rather than upwards, in wrapping as it makes a neater package. Some persons have naturally cool hands and these are fortunate if they must handle and wrap butter. For myself, I have a warm hand and so must be continually dipping my hands and arms to the elbow in cold water to keep my fingers cool and dexterous.

Too much care cannot be given to the cleaning up after butter making, for much of the success of the next butter depends upon the sweetness of the utensils used; and especially when they are wood is it necessary to scald and scrub and steam them, clean, chemically clean, so that no animal fat may enter the grain to decay and thus destroy the possibility of making good butter or keeping the dairy tools sweet. It is impossible to get them thoroughly clean if once the grain gets full of rancid fat and grease.

A dairy should be light and cool and well ventilated; not a dark, damp little cave as many of them are. It is impossible to make good butter without clean, sweet milk and cream, and clean, sweet surroundings; and it is this cleanliness and sweetness that makes the charm of the churn and that are the essentials of butter making.

WHAT'S THE MATTER WITH THE PENNSYLVANIA FARMER

By T. D. HARMON, *National Stockman and Farmer, Pittsburg, Pa.*

It is an old and true saying that "Our friends tell us our faults; our enemies encourage them." It is upon this theory that a few thoughts along this line might not be amiss on this occasion. Without the remotest idea of fault-finding or criticising any one or any condition, "with malice toward none and charity toward all," it shall be the aim of the speaker to point out *some* of the shortcomings of *some* of the farmers of our grand old Commonwealth, and if possible offer some suggestions for overcoming the same.

No man is perfect. The trained mechanic, the learned professor, the teacher, the doctor, the business man—each make mistakes. Then why should we not expect to find errors in judgment among those who till the soil or tend the herds, and while looking for those things which might be made better among the farmers of Pennsylvania, it is only justice to say that in other states worse conditions prevail and criticisms could be applied more fittingly than in our own.

I honestly believe that the first and greatest fault to be found with the farmers of this or any other state could be placed under the head of *Laziness*. I anticipate a storm of protests from those who hear this, from those who have been putting in from fifteen to eighteen hours out of each twenty-four hours of the day during this busy season we are just now passing through, but I stick to the original proposition. It is said that God, as a climax to His creative genius, made Man; that he made him a little lower than the Angels; that He gave him reason and the power to think; that He then placed him in the Garden of Eden and gave him power and dominion over every other living creature. Later on in the Good Book we are told that He classified the peoples of the earth, making some of them kings and princes, overseers, hewers of wood and bearers of burdens. There is a significance in all this. If the allwise Creator has done all this—has recorded in His Divine Word an outline of His idea as to what man should do and man should be, then it is our duty to study His designs and purposes and follow them out as nearly as possible. If God gave you more brains and less muscle than the ox, then He intends that you should use your brains more than the ox and your muscle less than the ox. Herein is where the word "lazy" applies to too many men—whether they are farmers or follow other vocations. I believe, however, that it will apply more often and more directly to those who till the soil than to any other class of people.

In making this broad assertion, the term lazy is to be applied to mental and not physical labor. In other words, to the use of the brain instead of the muscle. How many men do you know, and you can possibly include yourself in this, who would not cheerfully go out and plow all day or chop wood or do any other hard manual labor rather than sit down and study out some difficult problem in farm management; or on the needs of his soil, or his livestock, or even write a nice long love letter to his wife if she is away from home, or an urgent letter to his wife's mother, urging her to come and spend the winter with him.

It is mental laziness that is referred to not physical, and is as common among farmers as good healthy thirsts are in dry territory. It is great thoughts that make great men. Clear thinking puts in motion actions that bring big results. We take our hats off to the great thinkers of this country. Did you ever stop to consider that one man was just as much of a thinker as another? He can't help but be. God put brains into his head, wound them up and started them off—just like the watch-maker puts wheels and springs into the watch and starts it. He can't help but think. He'd die mentally if he didn't. The only surcease is when he is asleep—and even then some men dream things that are more rational than their thoughts when awake. The neglect, or delay, or abhorrence of getting right down to work on lines of thought that stand for something and mean something for mankind in general, and the thinker in particular, constitute a laziness that has meant failure in more cases than has ever been recorded against the sluggard or the tramp.

David was a shepherd boy. That would mean to-day that he was a farmer boy. He tended the flock and possibly did the chores and churned the butter and answered the telephone and cranked the automobile and oiled up the flying machine for Jesse, his father. Possibly he pumped the pianola and run the phonograph for his mother. These are some of the things that he would have to do to-day if he acted in the capacity of a farmer's boy. But David did one thing more. He kept his thinker going in the right direction and acted upon his thoughts. He heard the sweet songs of the birds while in the groves. It put an idea into his head and he worked it out. His mind ran something like this: If the birds are capable of making such sweet music, why can't I? The same hand that gave the birds their songs gave me brains, more brains than all the birds in the mountains round about. I am superior to all other living things because God made me so. It is a great responsibility but I accept it and will use my talents. David did some good, clear thinking. Result: the mastery of the harp—music that inspired the highest thoughts of those who heard it and enabled the player to write songs in later life that for beauty and grandeur of thought have never and never will be equaled.

But David did another thing that brought him into the limelight probably more than his playing the harp. He learned to throw straight to hit the mark. He may have learned this while chasing the woodpeckers out of the cherry tree or pelting the cats in the backyard, but he learned the art and he did it well. A big lesson lies right here. It is the easiest thing in the world to throw a stone and the hardest thing in the world to throw it absolutely straight. Goliath used his muscle to carry his armor and sword, which would

have crushed the stripling, but David used his brains not only to select his sling and his pebble, but to find the soft spot in the enemy's anatomy. If Goliath had been hit on his muscles the stone probably would have deflected like a projectile hitting the armor plate on one of our modern battle ships for he had exercised his muscles only and they were like steel. His soft spot was his head. He had neglected to exercise it and it could not withstand the attack of even a smooth pebble into hands of a mere youth. There are too many men in all vocations that are just like this big ugly giant, they go about boasting of the mighty things they can perform, the amount of work they can do in one day, the men they can whip, the tricks they can play on their neighbors in a horse trade, or their ability to get the other fellow to carry the heavy end of the log, while their brain, their intellect, their ability to think better thoughts and do better things has been dwarfed for lack of use because they have been too lazy mentally and morally to develop into that broad manhood, those higher ideals that the allwise Creator made possible for them to enjoy and which will be the answer to the prayer which we have all been taught at our mother's knee, "Thy Kingdom Come."

Pennsylvania was the pioneer agricultural district of the American Continent. Her soil, her climate, her industries, thrifty citizens and her geographical position made her the leader, giving to the new world and the new nation the best that the land would produce in grains, fruits and livestock. This preeminence was maintained without question until the sturdy sons and daughters of her prosperous people were allured toward the land of the setting sun, where homes could be secured for less money and prospects for prosperity seemed greater. This exodus of the children of Pennsylvania certainly did not rob her of her brains and honesty and integrity, but it must be admitted that with it went a liberal percentage of her enterprising and enthusiastic citizenship. The motive which lead men to venture into new territory imbued them with the idea of other new ventures and as a result we find the livestock interests of the Western states are far in advance of those in our own state, and I confidently believe that one of the greatest things that "is the matter with the Pennsylvania farmer" to-day is his neglect, rather his lack of interest in keeping up his herds and flocks. It is said that livestock and agriculture go hand in hand in making a country prosperous. In some sections of this State but little livestock is found that was reared on the local farm, hogs, sheep and poultry excepted. This is wrong. It is expensive. It is a bad system and should be corrected. Not long since I saw upon the farm of one man in a central county of this State as fine a farm team as could be found any where on earth. Upon inquiry I learned that the team had been purchased from a western shipper, who had distributed hundreds of good horses through that section. The team referred to, I learned cost the owner a sum of money that would require a thousand bushels of wheat or nearly two thousand bushels of corn to equal. This was robbing Peter to pay Paul. The cost of that team represented the crops for two years of the farm on which it was working. This farm was saving at the spigot and wasting at the bunghole. Besides all this he was hauling away the fertility of his soil which could and would have been maintained by raising these horses instead of buying them.

Livestock is the crying need of the greater part of our State and the full and lasting prosperity of our farmers will never be attained until the fact is realized that the fertility of our soil is the salvation of our country, and that fertility can be produced and kept up better and cheaper by marketing our grain crops on the hoof than in any other way. A prevalent fault or misfortune of most farmers is their inability to see the advantages of first class blood in all kinds of livestock and their unwillingness to pay a fair price for the kind of animals that will produce the kind that brings the best prices in the market. With a general awakening along these lines, Pennsylvania could step at once to the front as a livestock state, for she has the soil, the climate and the proximity to the best markets of the world. There is no question but what the valuation of the farms and farm products of the State be enhanced possibly many fold if the lowing of the kine, the bleating of the lambs, the contented grunt of the hog and the neighing of the young colts was heard on every homestead of our great commonwealth.

Lack of knowlege as to how to co-operate is one great misfortune of our farmers. Individually by inheritance, by training and by practice, they are slow to understand the benefits of concerted thought and action. Community interests bring to our people some of the very best things in modern life. Citizens of villages, towns and cities have learned that the welfare of their many interests are better conserved by planning and working together. Business men find that by mutual understandings and combinations of efforts many things can be brought about that would be impossible in any other way. The independent thinking of farmers and the pride in their personal opinion makes it a hard matter for them to get together and work together for their mutual benefit. The commercial interests of agriculture has suffered more than this lack of co-operation, possibly, than from any other cause. A close study of the markets, conditions of prospective crops, supply and demand and many other features of the commercial side of farming, farm topics that can be discussed to advantage and ideas formulated after considering the views of the many instead of the individual, and they are always more nearly correct than those based upon the opinions of the individual. Co-operation in every phase of country life and country conditions will be highly profitable from a social and commercial standpoint.

Conservatism is the stumbling block of more farmers to-day than possibly anything else. Slow to believe, slow to take hold and slow to take advantage of things that are to their interest they let slip by opportunities that would benefit for all time to come. Within the past ten or fifteen years science has done more for the farmer in a practical way than had been done in centuries before. Scientists learned that if their work was to be appreciated it had to be practical. Commercialism had set a price on things that were useful. Everything else went into the discard. Scientists caught on. They always do when their bread and butter is at stake. They began to develop things that men who did not have such useless appendages as A. B., D. D., L. L. D., and D. M. P. H. L. after their names could understand and put into practice. It began to work. It was what the common herd wanted. It helped the farmer get hold of more dollars. In turn the "learned men" got more dollars and they worked on and

harder and made their work more and more practical. To-day scientists are leading the farmers out of the wilderness by a shorter route than Moses lead the children of Israel. But Moses had his doubters. Many of those old Jews were "from Missouri". No doubt they told him so. It is so today. Human nature has changed but little since Eve ate the apple. "Show me" is the slogan that too many have adopted. "I'll try," should be substituted, and if one thing stands in the way of progress in agriculture more than in another it is the habit of doubting the progress that science is making along the lines of better farming. The only difference between a rut and a grave is its length. You might as well be in one as the other. I do not say that all this applies to all farmers, but it unquestionably does apply to too many, and it is undoubtedly the duty of those who have safely landed on the banks of the ruts to help their unfortunate brothers out.

Too much pride in the ownership of land is another common fault. Large landed estates is the bane of any community. It seldom adds to the happiness or wealth of the owner. Take a concrete example. Suppose that a man owns 100 acres of land. He has accumulated in cash $10,000. Another 100 acre farm adjoining can be bought for $100 per acre. Would it not be much better for him to use his surplus cash in improving his own farm rather than spending it to doubling his acreage. Think what $100 per acre would do if used under scientific methods in the improvement of the soil. Think what $10,000 would do in the way of stocking a farm with all kinds of pure bred livestock; what profits would accrue from the increase of the flocks and herds and how a man would be improved himself morally, mentally and every other way by associating with the higher types of animal nature. It is, indeed, more elevating often to be associated with a high grade hog than a low grade man. Think what $10,000 would do in the way of installing conveniences on a farm. No dwellers in cities could boast of such healthful surroundings. The drudgery of farm life could be eradicated. Health and happiness could be enhanced and life prolonged. The proud possessor of 100 acres of land under these conditions could add to his own happiness, to the happiness of his family and be a blessing to the community in which he lived. It is things like this rather than acreage that measure success and places the man in the front rank among his fellow men.

Another weak spot among farmers is their lack of appreciation of leadership. Our armies have their generals, our navies their admirals our governments their rulers and our political parties their "bosses." Much as it is to be regretted that that word "boss" has to be applied so often, it is nevertheless that no organization or party could be maintained long without some one to control it and direct its policies. There is a difference between a boss and a leader and there is but little danger of the former lasting long at the head of any organization or forward movement among the agricultural classes. Some men are endowed by nature to be leaders. Others fit better in the ranks. When thrown together for the betterment of a common cause they find their respective places as naturally as water finds its level. Petty jealousies, misunderstandings, etc., are the sins of some communities. They retard progress and prevent the accomplishment of much general good. Farmers should rally their most capable leaders

in every community and support them in his every effort to bring about better conditions, more prosperity, less friction and a square deal for the producer.

Modesty, or rather, false modesty might come in for just criticism among the farmers of Pennsylvania. There are men in this State doing things so much out of the ordinary that if the things were done in some of our Western states the public press would be crowded exploiting their great deeds. Boasting is abominable, but we are commanded in the Good Book not to hide our light under a bushel.

Many and various other weak spots might be dwelt upon under the title of this talk. It is not with a view to holding up to ridicule the weakness of our fellowman that reference is made to any of them. We are all mortal. It is said, "A wise man will change his mind; a fool never does." Upon this theory it is our duty to find out our faults and correct them. The world depends upon the farmer to be fed. Financiers look forward to your bounteous harvests to know how to figure on all their large financial transactions. Our nation is depending upon you farmers to furnish it with its presidents, its statesmen and its leaders. The most of our rugged, honest, fearless men in all the higher callings of life came from the farm. As the states make the nation so do farmers make the state. It is not our cities that furnish the brains to plan and the bone to build. It is the farmer's son who steers his course whether in commerce, statemanship or the pulpit—straight as his father guided the plow. The simple, fearless faith of our forefathers is waning. The rush of business, the strain of commerce, the love for notoriety in statemanship do not encourage it. If perpetuated at all it must be perpetuated on the farms of this country. You, as farmers, are entitled to all the honor that such a condition imposes. But with it rests a responsibility. Meet it like men and if then there is anything the matter with the Pennsylvania farmer that is not in accord with the most critical mind it will all be forgiven.

"THE COUNTRY LIFE SITUATION." (Abstract)

By L. H. BAILEY, *Cornell University, Ithaca, N. Y.*

Mr. Chairman, Ladies and Gentlemen, I come to Pennsylvania at this time with a great deal of satisfaction. For the past two or three years I have had a grudge against the State, because you took Dr. Hunt from us. I am coming to you to-night to speak and to get even with you.

I shall speak a few words about the "country life situation," as I see it. Two movements are now much in evidence touching country life. One is the "country life movement" itself, and the other is the "back to the land" agitation. These two movements are not at all synonymous; in fact, to a large extent they are antagonistic the one to the other. The country life movement is the effort to effectualize

country life for those who are a part of it, to better the agriculture, to improve the schools, churches, roads and whole economical situation and the social condition. And as the effort to improve any society is fundamentally sound, so the effort to make country life more effective is socially and economically a sound movement. It is not necessary for us to assume that country life of itself is less developed or more developed than city life, but only to bear in mind that country life is not as effective as it is capable of being.

The "back to the land" movement is very largely a city impulse; in part a desire of cities to relieve themselves from congestion; in part a desire or effort to find work for the unemployed or to find possibilities for the "ne'er-do-wells;" and to a considerable extent the effort of real estate dealers to sell land.

Of course, we need good farmers and it does not matter whether these men are country-bred or city-bred if only they are qualified by experience, by type of mind and by other qualifications, to be farmers. But a large part of the city-to-the-country movement is socially and economically unsound as a solution of rural ills. A great many persons, undoubtedly, who are now going from cities to country will be very much disappointed. This will not be because farming is a poor business, but merely because many of those persons who go, will not be qualified to be farmers. Ordinarily it is unsafe for any man to change greatly the character of his life or activity after he is thirty-five or forty years of age. There are some inexperienced city persons who go to the country past that age who makes a success; but I am convinced, as compared with the whole number, that they are few. I am interested not in the "city to country" movement, because I am not a student of city affairs. I feel that other means must be invoked to solve the city matters than merely to send the surplus to the country districts. I am interested primarily in the re-direction of country life.

The theme that I wish to develop in your mind to-night is this: it is very necessary that at least a part of our civilization have contact with real experiences, real situations, with elementary conditions. The tendency of the time is the splitting and the complexing of our civilization and the developing along partial lines. There is a lack of wholeness in our lives. This is illustrated in our common manufacturing. For example, we no longer use the whole wheat for bread. We refine it out, first taking one thing and another out of it with the idea that apparently the value of bread lies in its whiteness and not in its completeness. It lies largely in its looks and baking quality. It is very necessary that a good part of our civilization have direct contact with Mother Earth and with types of experiences that bring many native qualities into play.

The farmer's business has relations with a large line of effort, which altogether makes up his type of life and his philosophy; whereas a man working in a shop does largely the same thing day after day and his philosophy of life may not be connected intimately with the character of the work that he follows for a livelihood. In the farmer's business, the philosophy of life grows out of the situation in which he naturally finds himself. The farmer is a real part of his background. He is as much a part of his farm as the trees, or the livestock or anything else on his place. It has often been said that farmers ought to

live in towns, as the European farmer does. My conception is quite the reverse. There is the greatest necessity that a good man live actually on the farm. You cannot look after a farm when staying in the town; and the better the man the better also ought to be the farming. The greater complexity of the farming business, the greater is the necessity, of a good man being constantly with the business. The farmer has a different relation to his business from that of any other man. The merchant or manufacturer may plan his business from a distance and may not live in his store or his shop. The farmer is in his business day and night and is a part of the weather, and the crops and the soil.

I sometimes wonder what the farmer is going to do with all the advice he is now receiving. I wonder if he is going to be confused with the multiplicity of leaders, whether he is going to assimilate all the new work and make use of it. But with all the advice and talk and exhortation, the farmers have never yet been in a stampede or riot. That is not so true of city conditions. It is because they themselves are so closely in touch with the fundamental situation that they do not lose their heads. The new ideas are to be worked out, if at all, by persons who are a part of the situation. I would not capture a man and put him into a community for the purpose of working out any idea I may have. I would prefer to drop the ideas into the midst of the farming people and let them discuss them, and work them out in detail and slowly and fundamentally. There will be the teacher and preacher, the good farmer and forward man and woman here and there who will take up the work and try to work it out. If the new notions are allowed to be freely discussed by the farmers themselves, all those which are impracticable and chimerical will not persist, and those that are useful will in time bear fruit. We may count on the wild notions to fall on stony ground.

Again, in regards to fairs. I do not know how it is in Pennsylvania, but I am convinced that in general no money is given for agricultural purposes which produces such small results as that given to the fairs. Now, the difficulty with fairs is that they have grown away from their natural purposes and reasons. They are gaudy with gimcracks and geegaws and all kinds of extraneous and meaningless things. I know many fairs that are serving their communities admirably, but, I am speaking in the large. I would not eliminate the county or local fair, not by any means. A man came into my office last winter and said, "our town fair is dead;" I said, "good." But he also said "we want to reorganize our town fair;" and I said "good" again. I suggested that he ask twenty of the best farmers whether they would come together for a plowing match with their best turnouts, their best men, harness and plows, and exhibit the most skillful practice in plowing. Why not make this the centre of a town fair rather than horse jockeying, and gather the other things around it, with good entertainments and good games, and bring into it all the good speaking you can about the good art of plowing; and around this centre build up exhibitions and exhibits of real value to the small locality. I think a local fair should exist only for educational purposes. I use "education" in the broadest sense. Of course, I would have recreation. I would have games and good entertainment, but I should try to have the enterprises develop out of the real affairs of that community as rapidly and as fast as pos-

sible. Too many of our fairs are colored by the events and the men who go from one fair to another, and which have no particular relation or connection with the development of the community that the particular fair represents. I am not opposed to horse-trotting as such, but if I had it I should want it to have some relation to the development of the horse types and welfare of the community or the State.

Now about the schools. It is most interesting that the schools do not represent the localities in which they exist. Our schools are yet male. The schools are attended by girls, but the studies are the old boys' studies. The centre of our civilization is the home, and no school in any community can rise to its possibilities until the home and family are the centre of its effort. The object of education is to teach persons how to live, if that is the proper definition, then the schools of the community must have direct relation to the welfare of the community. It must have relation to good cooking, to good housekeeping of all kinds, to sanitation, as well as to farms and business. A person said to me a few days ago: "Do you think a person can be an educated man or woman unless he has had Latin?" The person first took the precaution to ask whether I had Latin, and I had confessed I had. I wished then I had not had it, to have seen what the line of argument would have been. If the definition of an educated man is one who has had Latin, then it is easy enough to determine whether a man is educated,—we may ask him. I would not eliminate Latin or Greek. I would have a great deal more of it. My point is that no one subject is the exclusive means of education. Persons may be taught to think just effectively by study of farm-management as by the study of mathematics or Latin, if it is equally well taught. It has not been so well taught in the past, we must admit. The older subjects are better organized and solidified; but I contend that in themselves they have no greater or unique educational power. I had in my office for a long time a placard on which was a remark dropped by Dean Hunt: "Teaching, not telling." This is the core of education. It is not merely filling up on facts. I would not have our common schools merely inform the children about farming. That would not be education. But I would develop a system whereby the schools could teach the common activities of life for the purpose of training a person how to live, and to procure the mental training and application of it at the same time. I should not eliminate the prevailing subjects from the schools. Progress must come by a gradual process of evolution. The schools are teaching in an elementary way the things that colleges and universities have taught, I mean to patch the new ideas on and on, until finally the patch will be the larger part of the garment. If we were to begin the schools all over again, of course, we should begin with the locality and the affairs of it and let the children grow out to the other affairs as they develop. The school should represent its place and its station, and then the exterior subjects should come as fast as the child has the ability and the school has the reach. I would not eliminate mathematics. They come as part of the process. The study of arithmetic is not an end in itself. It is merely a means of working out some of the conceptions of life.

But I wish to say something about religion. It is on my mind because the demands from churches and religious bodies, young men's Christian associations and other organizations is now very great. They are beginning to feel the call to more than they have done for the

country life situation. I assume in the beginning that the mission of the church is to preach the gospel. What I have to say therefore is aside from that question. It is sometimes said that the school is going to be the center of rural communities. I doubt it. I believe that some institution of religion is going to be one of the social centers in the end. That you may get my thought, let me say that whatever our theory or philosophy of life may be, everyone of us begins where Genesis begins, "in the beginning, God." Well then, if the earth is God's handiwork, it is holy; and if the earth is holy then all the things that grow out of it they also are holy; and if the materials are holy, then all the good, honest, constructive effort put into the development of materials is holy. Now, no farmer in the last analysis, owns his land, not even in Lancaster county, Pennsylvania. A man does not take it with him into the next world. Society, that is, government, allows a man as the agent of society to hold a piece of land, and for two things: that he may make a living from it, and that he may help the rest of us to live. He produces more wheat than he wants, and the loaves of bread are for the rest of mankind. The remainder of us cannot live on the earth unless the farmer produces more than he wants.

Farming is a quasi-public business, and will be so recognized in time to come. The earth is holy, and it belongs to all the people. The farmer is the agent of society, or the people, to use land for the good of us all, as well as for the good of himself. No man has a right to skin the surface of the earth. Good farming is at the foundation a religious business. No, it may not have been necessary in times past, when society has been unadjusted, for persons to skin the land in order to be able to live. If so, society has been at fault. That will not be so true in the future. Every man who tills land owes a responsibility to society and to God for the use that he makes of it. Now, farming is at the bottom of our whole economics and social structure, because it provides the materials of subsistence. It is more important that the farmer has a religious reaction than that any other man whatever have such a reaction. Now, every person is fundamentally religious. The religious impulse must be developed or educated. It is the function of some organization to develop it. It is at present the function of the organization called the church. Here I come to the rural church. The contact of the rural church with the agricultural situation, if it is to meet its responsibilities, is absolutely fundamental and it cannot be evaded.

Now I hope that I have put into your minds a conception of the elementary character and position of the man who stands on the land. I am not complimenting the farmers. They do not need compliments. The time was when people complimented farmers. The time has come when public men criticize farmers just as they criticize anybody else, and the farmer does not resent it. What we need to do is to tell the truth and let the situation work itself out.

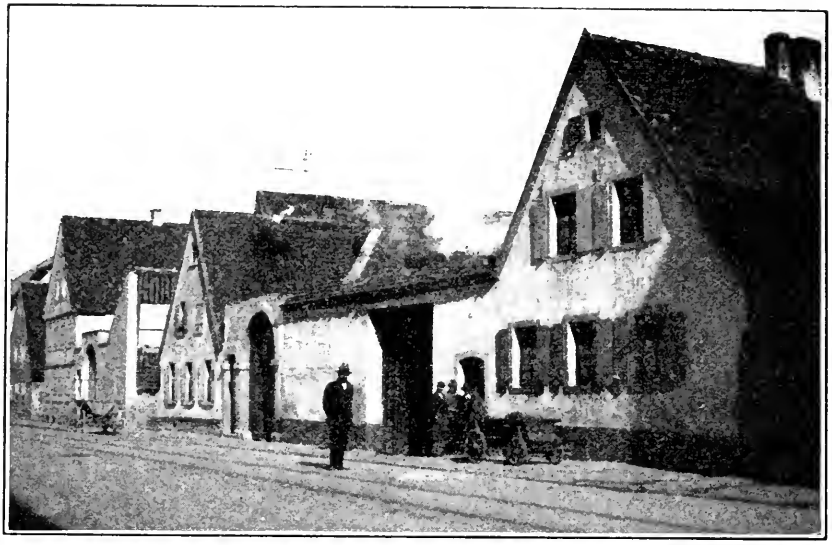


Fig. 1. A street in the German farm village of Edigen, near Heidelberg, Inside the door, where the men are standing, spelt is being threshed by steam power. There were about ten men engaged and it is estimated that they were threshing from five to ten bushels per hour.

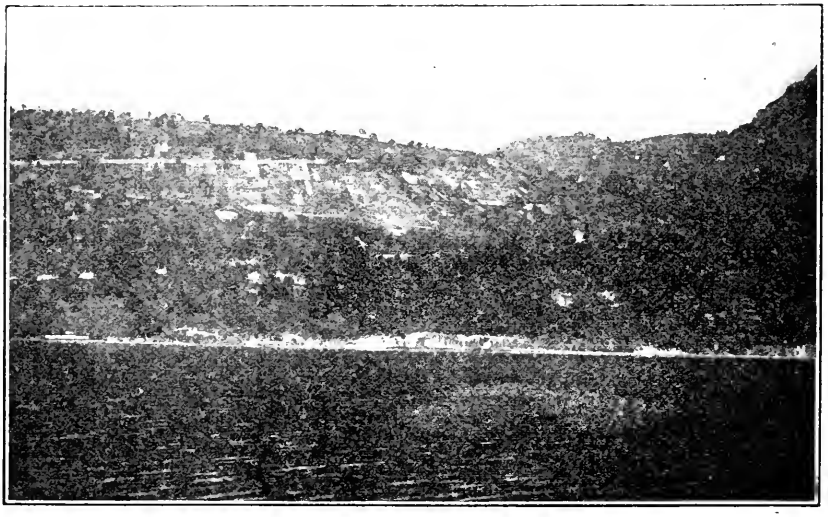


Fig. 2. Cultivated slope at Guten, Lake Thun, showing ribbon-like appearance of the country.

OBSERVATIONS ON GERMAN AGRICULTURE

By DR. THOMAS F. HUNT, *State College, Pa.*

Returning from a vacation of eight months on the continent of Europe, I had made up my mind that I would not undertake to discuss European agriculture at least until the subject had had time to assume its proper perspective. Eight months is too short a time to understand the genius of any foreign country, let alone six foreign countries which we visited. Upon reaching my desk, however, I found that Mr. Martin, Director of Institutes, had been promised that I would give an address at this meeting, and that he had especially asked that I give some account of European agriculture. This evening I shall confine myself wholly to observations on German and Swiss agriculture. These are just such observations as any one might make traveling by train through any country. They are merely car-window observations.

The first thing that will impress an American traveler through Germany is the lack of country life as we understand it. The farmers of Germany live largely in farm villages. (See Fig. 1). The farm village of Grenshof, near Heidelberg, is but one of the thousands of such villages. This little village consists of about two dozen homes built in a solid rectangle facing a little park or inner court. The houses all face this court and the entrance is at one corner, so constructed that when this entrance is closed there is no possible entrance to the village or to the houses. About half a mile away there was a well-kept cemetery, showing that the people who lived in the village were well-to-do people. This little farm village reminds one of an oasis in a desert, except that it was in the center of a fertile and intensely cultivated plain. On another day I walked from Norsingen to Wengen, two miles; from Wengen to Shalstat, three miles; and from Shalstat to St. Georgian, three miles. Between these villages there was neither house nor fence, but hundreds of people earned their living from the fertile soil. Doubtless, there is more than one reason for the farm villages and for the lack of country life, but everywhere one goes in Europe, whether in the villages, towns or the great cities, he is impressed with the fact that a man's house is his castle. As Mr. John Burroughs says: "Paradoxical as it may seem, the city is older than the country. Truly man made the city. After he became sufficiently civilized, not afraid of solitude, and knew on what terms to live with Nature, God permitted him to live in the country. The necessity of defense and fear of enemies built the first city; built Rome, Athens, Carthage and Paris. The weaker the law, the stronger the city. After Cain slew Abel he went out and built a city, and murder or fear of murder; robbery or fear of robbery have built most of the cities since."

Even in the larger towns to-day a stranger rings the bell at the gate. The latter is usually locked at night. Is the present day custom the result of tradition, social exclusiveness, or fear? As

recently as 1870 blood ran in the streets of many of the towns and villages of France and Germany, and the inhabitants suffered the evils which always follow war. At present Europe is an armed camp. One can not escape the feeling that the people believe that they are safer to-day behind solid brick or stone walls and iron gates. However, not all the sections practice the village system. In some places scattered farmhouses are to be found. They are more common in Switzerland than in Germany. That Switzerland has a Republican form of government is perhaps not without its significance in this connection.

One of the great surprises to me in visiting Europe was the relatively large amount of level open country. Perhaps you have not made this mistake, but I had supposed that Europe was a rough and often mountainous country on which it was not possible to use to advantage modern agricultural machinery such as we employ so exclusively in America. The reason for this impression grows out of the fact that it is almost impossible to take a satisfactory picture of a level stretch of the country, and out of the further fact that travelers generally are not interested in the level tracts but hurry through them to what they consider the more beautiful mountain scenery. It is comparatively easy to take pictures of the mountains, and thus Americans see many illustrations of mountain scenery but scarcely none of the level areas.

The next thing which will impress the observer from the car-window is the ribbon-like appearance of the country, due to the fact that the land is divided into small rectangular plots. If one looks out over these intensely cultivated areas it looks just as though the land were covered with large numbers of different colored ribbons. The picture shows a mountain side. (See Fig. 2). I was able to get the picture from the steamboat because the land was on a mountain side. When in the level sections, however, which are much more characteristic, it is almost impossible to get any photographs of the country which would given an idea of what the traveler sees.

Figure 3 shows the plots rather than the hop holes. The plot on which the hop holes stand is about 450 feet long and 30 feet wide. On the left is a strip of clover, and on the right a strip of volunteer grass, and next to this a strip of vetch. From the point where this picture was taken hundreds of acres could be seen which were laid off in plots with road-ways at the ends, and looked for all the world like a mammoth American Experiment Station. For miles in every direction the land was divided into similar areas. There were no fences, and, as previously explained, the people all live in farm villages.

In some parts of Germany, the sub-division of the land through inheritance, or otherwise, has gone on to such an extent that the Government has stepped in and by law re-distributed the land. As it is now, one man may own a dozen of these little tracts of land in various parts of the region in which he lives. The Government has in some cases re-distributed the land so that he should have all his land in one tract.

An incident occurred at the Agricultural Experiment Station at Bonn, Germany, which will illustrate the intensive character of some of the farming. I was shown some experiments in transplanting rye. It was explained that if rye is transplanted at just the right time, and planted a little deeper than it grew originally, the yield would be in-

Fig. 3. Photograph showing method of dividing land into small rectangular areas.

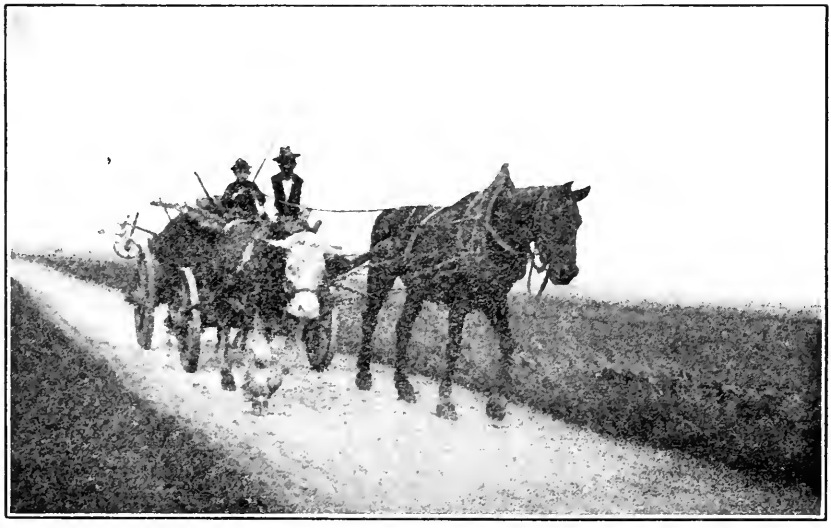


Fig. 4. Horse and steer used together in Southern Germany. This roadway connects two small farm villages. It is not a high-way; it is a by-way.

Fig. 5. Tedding hay near Zurich, Switzerland, illustrating large amount of hand labor.

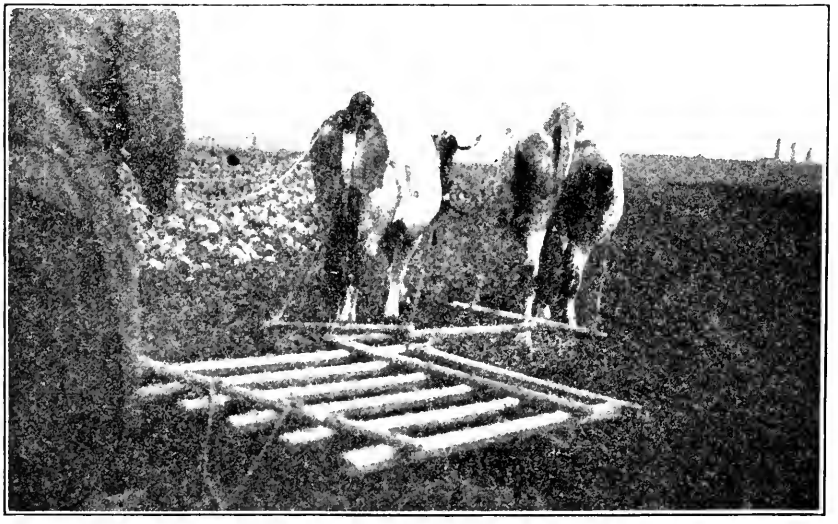


Fig. 6. Two cows hitched to typical harrow, Southern Germany.

creased. The question on which they were experimenting was to find just what was the best time in the growth of the plant to transplant it. "Well," I said, "what of it? After you have made the discovery will it be of any practical importance?" The reply was, the smaller land owners could make use of it."

After looking over the beautiful, level, fertile areas, without a fence or a house for miles, every inch of which, except for the roadways, is under cultivation, I could not help wondering what an Iowa or a South Dakota farmer could do on that land if he would go in there with modern American machinery. There is no more difficulty in cultivating the land in 80-acre or 800-acre tracts than there is in South Dakota, except the separate ownership. Ownership is an artificial condition. It seemed to me that the natural conditions must prevail; the artificial conditions must give way. Later, however, I visited a farm of 300 acres conducted very much as an American farm is conducted. Here I found Polish women being used to pull the sugar beets. There is a law in Germany, as in this country, against contract labor; but they found it necessary, in order that crops on these large farms may be harvested, to allow the bringing in of Polish laborers during the harvest season. These people can only live in Germany six months, and then must be returned to Poland. I asked why they used women instead of men, and they said because it was cheaper. In other words, the Germans find it impossible to employ native labor cheaply enough to produce sugar in competition with other countries, or with the small land owners. After seeing this farm, I concluded that I would not try to reform the German Land System.

Another thing which will impress the traveler in Europe, and the longer he stays and the more he gets in to the by-ways, the more he will be astonished and impressed. I refer to the good roads. Everywhere in Europe the high-ways are veritable boulevards, and the by-ways are similar to the road as shown in Fig. 4. In Europe they do not know what a thank-you-ma'am. If you investigate the matter you will also be surprised at the comparatively recent character of many of these road-ways. France, for example, has been inhabited more or less exclusively for eighteen or nineteen centuries. At the beginning of the nineteenth century France had 30,000 miles of road-way; the close of the century she had 300,000 miles of road-way, which would probably average as good as the one shown in this picture. During the same period of time, the raw agricultural products have increased in value from three billion francs to nine billion francs. No one, of course, would for a moment claim that the increased value of agricultural products in France was merely the result of good roads, but it is incontestable that the good roads of France are a factor in her increased well-being.

The next thing that will impress the hurried traveler is the general lack of improved farm machinery. I passed through Germany during the fall haying season. Everywhere men and women were working in the hay fields, (See Fig. 5) and in all Europe I saw just three mowing machines at work. I saw two horse hay-rakes, but only one of them was in use. Everywhere you see men mowing grass with a scythe, and women raking with a hand rake.

Necessarily a correlative to the lack of modern farm machinery is a large amount of hand labor. Women work in the fields quite as frequently as the men. I was shown into a barn in Southern Germany

where five persons were running a steam threshing machine, and every person was a woman. The hurried traveler is very likely to conclude from what he sees that in Germany men wear uniforms and the women do the work, and I am afraid he is about half right. At any rate I have said, half seriously, that I believe Germany would starve to death if it were not for the severe toil of its women.

The employment of other animals than horses for traction purposes is another of the significant features of Europe. During a walk in Southern Germany, I estimated that of the animals used in farm work about one-third were horses, one-third steers, and one-third cows.

While Fig. 7 shows a very common form and size of cart in Germany, attention should be called to the fact that immense carts, drawn by single draft horses, are also not uncommon. In some cases a single horse is said to move, on two wheels, six tons. Instead of criticising or being amused at the use of dogs, (See Fig. 7) or cows, or donkeys or even man-power, we should learn a lesson from the experience of these older countries. The facts are, it seems to me, that in many ways the problem of transportation is better worked out in Europe than it is in our own country, and one of the factors is the adaptation of power to the economic need. It is not good economy to run a 50-horse power boiler and engine when only 5-horse power is needed. The dog, the donkey, the cow, and the steer finds a place in Europe along the side of the most modern up-to-date methods of transportation because each serves present economic needs.

If the traveler will descend from the train, and go out into the fields, he will be impressed with the tremendous fertility of the soil in many places. I saw land in Europe that had been cultivated for twenty centuries that is as fertile as any land in America. The Rhein Valley, between Freeburg and Frankfurt, had been farmed for the last 1,200 years. It raises two crops which contribute largely to that fertility, viz.; Alfalfa and mangel-wurzel or stock beets. The alfalfa furnishes succulent and protein food for livestock and keeps up the nitrogen supply of the soil, while the mangel-wurzel takes the place of our Indian corn. As a matter of fact, mangel-wurzels are watered-concentrates, so that with alfalfa and these stock beets the farmer has two ideal crops, both from the standpoint of milk production and of keeping up the fertility of the soil.

In addition to this Germany has, as America well knows at moment, the potash supply of the world. Thus, the German farmer has a cheap supply of potash, and by means of its basic slag it has supplies of phosphoric acid in one of the best known forms.

In view of all that has been said of the lack of farm machinery in Germany, and what seems to an American the primitive methods of farming, one must not fail to call attention to the general prosperity of the German farmer. To the casual observer it is a puzzling fact, for not only are the people in German cities prosperous, but the German farmer appears prosperous. When one studies it seems almost impossible that it should be so. I talked with a young Canadian, who spent three years in Europe studing History and Political Economy, concerning these conditions. His explanation was as follows: "America exported agricultural products and imported manufactured products, therefore, our tariff system protected the industries rather than agriculture. That perhaps in America, with its fresh lands and

Fig. 7. Common hand cart drawn by boy and dog.

farm machinery, they could carry this burden for the benefit of the industrial classes without feeling it." In Germany, however, he claimed the situation was just the reverse. Germany imports agricultural products, competing in the world's markets with its manufactured products. Now, he said, when a country competes with other nations of the world for a market, its protective tariff system is of no avail. On the other hand, he claimed, that science, as applied to industry, had reached the highest development of any country in the world, and the industries could afford to be taxed for the support of the farmers of Germany. In other words, he claimed, that the protective tariff in Germany made the farmer more prosperous; while in America it made the manufacturer more prosperous. This gentleman was a Canadian, and consequently looked at those things somewhat differently from those who live under a protective tariff. He did not state the problem fully. The German Scientist has calculated, it is said, just how many more people can be supported on the farms of Germany if the crops which are raised are fed to livestock, and the manure put back on the land, then if the crops were sold.

The German Emperor is in favor of keeping the largest possible population upon the farms, because it means for him a strong army and a strong navy. The German Government, therefore, maintains a fiscal system which promotes the keeping of domestic animals, and to offset the burden which the industries must carry, in connection with this fiscal system, applies the highest scientific intelligence to its industrial enterprises.

There is one further impression which has ripened up in my mind since I have visited Europe. I find that I have been giving too much emphasis to our natural resources. I have given too large a place to the advantage which we derive from the fact that we are a comparatively new country. No one will seek to deny that we have great natural resources, or deny that we should conserve these natural resources in every possible way; but, it seems to me, that the agricultural possibilities of France are to-day as great as any similar area in America of which I have any knowledge. A former Consul to Canada from Argentina once said to me; "I do not look upon the United States as a nation, I look upon it as a new civilization." I did not then understand what he meant, but I think now I have some notion of it. The fundamental reason for America's prosperity does not lie so much in its natural resources as in its civilization. I have, therefore, come to believe as I never believed before that this country-life-movemnt, of which Director Bailey has spoken to-night, is the most important problem which we have to face. We can not rest upon our natural resources; if our children are to inherit the earth, progress is necessary.

CANDLING THE APPLE CROP

By C. J. TYSON, *Floradale, Pa.*

Before taking up the handling of the apple crop, as is my purpose to do, I would say that I consider this one of the most profitable crops to be grown on the farm; a crop, to the growing of which, many

parts of our State are well suited. Five hundred to one thousand dollars per acre are not unusual gross returns, giving net figures of more than fifty per cent. of these amounts. One eleven-year old Pennsylvania orchard, last year, returned over $250.00 per acre: this on a 40-acre area. Another ochard twelve years old, gave nearly $400.00 per acre. We hear stories of the large profits from orchards on the Pacific coast, where good orchard land is selling around $1,000.00 per acre. The figures given above were realized in our own State of Pennsylvania, on land that a few years ago could have been bought for $50.00 to $75.00 per acre. Not a particle better than thousands of other acres in the State that may still be bought at these prices, or less.

I hear some persons saying that too many trees are being planted, and that very soon there will be no market for the great quantity of apples produced. There need be no immediate fear of over-production so long as we devote ourselves to growing only good fruit. Someone has said: "Apples will not be over-produced until every man, woman and child in the land has all the apples he can use, and gets them at a moderate price." I believe that condition to be very far remote.

Handling the apple crop for home use probably need not be considered here, except that care against bruising, and protection from evaporation will add much to apples intended for home consumption. Apples wrapped in paper will keep much better than when not wrapped. This is particularly true with high quality apples of the Grimes Golden, Jonathan, Stayman Winesap type.

We shall consider the matter then from a commercial point of view; and for this purpose, the orchard interests in any place should be on a fairly large scale to give most satisfactory returns. I mean by this, than an acre of orchard here, and another there, remote from other interests, will probably be disappointing, unless a strictly retail trade is to be supplied. There should be enough trees in a place to produce at least one carload; and from that point up, the selling conditions will improve as the quantity increases. The reason for this is very plain. Many of us prefer to sell our fruit and produce for cash at the loading station. The largest and best cash buyers go only to neighborhoods where large quantities of fruit or produce can be bought, for the reason that expense of looking after small lots is too great, consequently competition is greater, and better prices almost invariably are paid where fruit is plentiful. I therefore recommend that fruit growing be conducted either on a large scale by individuals, or by a community of small growers. Handling the apple crop is clean, pleasant work, which anyone may engage in honorably. It affords opportunity for careful, painstaking effort, and plenty of employment for the brains of the operator.

In the first place, we shall assume that the fruit has been well-grown; that the trees have been pruned, so that each limb and branch has room to bear its load of fruit without crowding or seriously shading any other loaded branch, the centers open to admit sunlight, and a free passage of air; that the tree and fruit have been carefully and thoroughly sprayed for scale, if that pest is present, for codling moth, which is always present, and for the many fungus troubles of fruit and foliage; that the trees have been well fed with a ration balanced to meet their needs—a matter which only experiment in your own orchard will decide; that the question of moisture has been carefully

seen to in the orchard by thorough cultivation where conditions will permit, or by heavy mulching where the ground is too steep for cultivation; and that the fruit has been thinned when trees have set an overload. This is a practice not generally followed in the East, and yet when thinning will increase the value of apples fifty per cent., which the past season has proven, we may well look into it. Thinning not only improves the size, but removes a working place for insects and fungi, which operate between close-hanging fruits.

Shortly before starting to pick, all dropped fruit should be gathered from the ground, and removed—partly to save it from decay and trampling by the pickers, and partly that the later falling fruit shall not be mixed with it.

Do not pick the apples too early. To my knowledge thousands of barrels of apples are each year hurried from the trees and into market in a green and immature condition, which interferes with selling at full prices, and even affects the keeping quality of the fruit. Apples should hang on the trees until they have attained nearly the full normal color for the variety, and until they can be picked without pulling out stems or breaking off fruit spurs. Good, full color adds almost one-half to the market value of an apple. This is not entirely a matter of looks, either, for the consumer has learned that the matured apple has a greater amount of sugar, consequently, better flavor, than a green one.

Apples that are mature and well colored are found to scald in storage much less readily than immature fruit. In this connection many growers overlook the fact that apples grow wonderfully in the last ten days before full maturity, adding bushels every day that they so hang; much more than balancing the small loss that may occur from dropping.

At this point we must consider the package. Large quantities of western apples have been coming to our markets in boxes, holding about a bushel. In most of these boxed shipments each apple is carefully wrapped and placed in the box by hand. Other shippers do not wrap; and still others lay a face only and pour in the balance of the apples. Some eastern growers have tried box-packing in the past few years, and are finding it decidely profitable. I strongly recommend that more of our growers look into this method and try it, at least in a small way. Personally I have had but limited experience in box-packing, and shall not attempt any extended discussion of the process.

I must acknowledge that I do not share the opinion of some public speakers and many writers, that the time is fast approaching when the box will entirely replace the barrel as a package for apples. Indeed I question whether the proportion of boxes to barrels will ever become much greater than in the past season.

Owing to the greater cost of box-packing, this method is not profitable except in case of the best grades of fruit. Not all apples are good enough for box-packing, and must be handled in some other way. Moreover, box-packing is slower; and in the rush of handling a large crop, it is not always practical, on account of time. Then, too, certain trade demands apples in barrels, even the best grades. Especially is this true of the Southern trade, which is now taking a great many Pennsylvania apples.

The box has its place with the consumer who wishes to buy only about one bushel of apples at a time, either through regular trade

channels or direct from the grower. This trade will undoubtedly grow, but probably not out of proportion to the regular trade in barreled apples. Many dealers who formerly bought boxed apples, because of the uncertainty of barreled fruit, are learning that there are growers of apples whose brands can be relied upon, and are now buying eastern grown apples in barrels. They can get an equal value at a lower price.

Do not understand me to say that I favor packing poor apples in barrels, for I most emphatically do not. Poor stuff, barreled and put up regularly on the market, in competition with good apples, has a demoralizing effect on the whole market. The apple trade of the season of 1907-08 was a very good illustration of this point, where an already weak market was completely destroyed by being flooded with thousands of barrels of poor apples. Similar conditions seriously hurt the market the following season. In fact, certain sections have gained such a reputation for barreling poor fruit that many years of fair dealing will be required to set them right with buyers of apples.

It is much better to sell these low grades locally, if possible, to supply the small town trade from wagon, if the supply is small; or, if the quantity is great, sell to cannery, fruit evaporator, or cider-mill. If none of these give a satisfactory outlet, load the second grade stuff in bulk cars and ship in that way. In recent years the market for bulk apples has come to be a regular thing, and much of the cheap trade in the cities is supplied in that way, without adding cost of barrel package.

If two or more varieties of apples are to be shipped loose in the same car, it is very important that they be divided by a wooden partition. Attention to this point will often add one-third to the returns from the car.

The ideal solution of this poor grade problem is, of course, to grow up no low grade fruit, and we have not secured the best that our business affords until we have closely approached this ideal. Lack of thoroughness in the things we already know is the reason why most of us fall short in this respect.

In barrels, as in other packing, we should have in mind the safe and satisfactory arrival of the fruit in the hands of the consumer or retailer, not only its passage from our hands in exchange for a sum of money. For, if we are in the fruit business to stay, either as grower or dealer, no other kind of advertisement will go as far, or carry so much weight, as well-graded and well-packed fruit, plainly branded with the name and address of packer.

Then let us see that the fruit is handled carefully. It is not always possible for us to control this matter absolutely; but it should be watched all along the line.

Half-bushel, drop handle baskets, each provided with a light iron hook to hang from ladder step or limb, will bruise the apples much less than when picked into a bag. There are two reasons for this; first, in the basket the apples lie where they fall, while in a bag they are constantly moving over each other with every motion of the picker's body, resulting in many slight bruises, not noticeable in many varieties, perhaps never in Ben Davis; but in most kinds detracting greatly from the appearance of the fruit after being stored a little while. Then, nearly always a few apples in such bag are bruised be-

tween the picker's body and the ladder steps or limbs of the tree, to such an extent that they must be discarded at once. I have had an opportunity to watch this matter very carefully and it does work out.

In picking apples, where trees are not too high, I like a step ladder. A convenient height is eight or ten feet, and the ladder should be made with but three legs, so as to stand solidly on uneven ground. For high trees I use a ladder, the side rails of which come together in a point at the top. This ladder can be pushed up between branches without knocking off fruit, and requires but one point of support at the upper end. In picking apples from a tree heavily loaded with green fruit on the under side of limbs, I am satisfied that it is entirely practical to make two pickings; and that the green apples, left ten days or two weeks, will improve enough in size and color to pay well for the extra work. Picking should begin on the lowest limbs, and proceed upward. This saves many apples from being knocked to the ground by pickers.

For barrel packing, if at all possible, the fruit should go directly from tree to a packing or sorting table, and at once enter the barrel. If, for any reason, this cannot be done, another course is open. Either pour carefully into bushel crates or into the barrels, which are to be used later. Remove the heads and place them in the bottom of the barrel; and lay a corrugated cap or paper cushion on top of the head, to prevent cutting of the fruit. Then haul to the barn or packing shed, and store till ready to barrel. In this way all the available help may be employed in picking; and the packing may be done on rainy days. Neither boxes nor barrels should be made quite full.

Never, except under the most extreme necessity, pour into piles on the ground. This will mean unnecessary bruising, a good deal of decay and a lot more work every time.

The sorting table may be made in several ways. My preference is for a frame of three by four stuff, six feet long by three feet wide, and covered with burlap, canvas, old carpet, or any strong material which will form the bottom of the table; faced all round with a board, which extends an inch above the frame, to form an edge. This edge, with the sag of canvas cover, gives capacity for two or three barrels of apples. The table is supported by two trestles or by three barrels. It stands as nearly level as may be, and each apple must be picked from the table by hand. The operation is not a slow one. The operator, looking before him sees one side of the fruit. He takes two apples in each hand, (unless very large) and turns up the other side, then, with a quick motion of the fingers, the grades are readily divided into their respective baskets, at side and end of table. For this purpose a round half-bushel, drop handle basket is best. This basket can be lowered to the bottom of the barrel and then turned over by hand. I like this method, because I belive more thorough culling and better grading can be accomplished with less bruises than with any other form of table.

Use good barrels, of full standard size, head 17½ inches, bulge circumference 64 inches, length of stave 28½ inches. This is the standard New York apple barrel, and contains 7.026 cubic inches.

If possible, get barrels made from well dried staves, by expert coopers. Green staves will dry out after filling, and leave the barrels loose, while poorly made barrels will result in much vexatious delay

at a time when every moment must be made to count. The importance of a neat substantial package is often overlooked. Avoid barrels made with sawed staves, which gather dirt from the time they leave the cooper; and often arrive at market in a dingy condition. Insist, also, upon cut hoops of good quality, and upon clean white heading, preferably of some rather hard wood.

See that the croze, or groove, is cut to a good depth, and yet that the ends of the staves are not cut off. Chestnut staves make a good, substantial barrel and are my preference. Elm is substantial and looks well; but beware of willow, cottonwood, or any similar soft material for staves. I speak strongly on this point, having had some costly experience.

The next operation is to cooper the barrel. Turn up the face or head end, drive down the quarter hoop and put in two nails; tighten the end hoop, and drive four nails, starting the nails near the upper edge of the hoop and slanting them well toward the ends of the heading. Use 1½ inch polished cut nails for this purpose. Nail head-liners, which have first been soaked in water, across the ends of the heading, using three or four ¾ inch polished cut nails to each liner. Some persons do not use head-liners, but it gives the barrel a more substantial appearance and is required on export apples before they will be accepted by vessels at point of loading. A good deal of annoyance will be avoided if liners are of good, tough material. Elm is probably best with one edge rounded.

Liners need not be more than twelve inches long, greater length being harder to put in place. Now, reverse the barrel, drive down and nail the other quarter hoop; loosen the top hoop and remove the head. Next comes the facing or lining paper, to protect the face of the apples from bruises and dirt. It may be a corrugated cardboard cap, laid with smooth side next to apples; or it may be a simple white paper cap, which keeps out dust and looks neat when the barrel is opened. Handsome red fruit shows up nicely when a lace paper circle is used.

I believe in facing the barrel. When properly done it has the same effect as a neat package or a handsome label. It helps to give the purchaser a good first impression. The apples in the "face" should be clean, bright specimens of about average size for the barrel. Unfortunately, the practice of facing is often abused, all of the fine large specimens being selected for this purpose, and the balance of the barrel filled with poor apples. In such cases the purpose is entirely one of deception, and the good first impression gives away almost at once to a feeling of anger and disgust, and a determination to buy no more of your fruit.

The face should be laid in rings, beginning at the outside of the barrel, and should be fitted as firmly as possible. A second layer is usually placed by hand; then a basketful is turned on top to hold the face from shaking. At this point, or sooner, the barrel should be stood on a solid plank about a foot wide and two inches thick. As each subsequent basket of apples is emptied, the barrel should be well jarred down on the plank. When the barrel is full the top should be leveled off and a ring of apples laid around the edge of the barrel. If the apples have been thoroughly jarred down throughout the filling it will not be necessary for the barrel to be filled much above the level of the staves. A cushion head will help greatly in leveling and settling down the apples.

Putting in the head is the next operation, and for this purpose I much prefer a screw press. It settles the apples gradually and allows free use of both hands. This end also is nailed with four cut nails and secured with liners.

The barrel is then turned back and stenciled with the variety name. In addition to this the packer should be willing to stand back of his work, and should express this willingness by plainly branding each barrel with his name and address. I have followed this practice for several years and have found the results very satisfactory. This means that nothing must go into the barrel that will fail to give value to the man that pays his money for it.

A FORTUNE IN FIFTEEN YEARS, AND FRUIT THE FACTOR

By SHELDON FUNK, *Boyertown, Pa.*

Mr. Martin has kindly asked me to say a few words on this subject, and the request coming so unexpected as it did has found me entirely unprepared to talk before such an assemblage as we have here this morning composed of the most prominent men in agriculture throughout this great old State of Pennsylvania; and being sandwiched in between Mr. Tyson, the apple king of Pennsylvania, one one side and Mr. Farnsworth, the peach king of Ohio, on the other side, I find myself not in the most pleasant position. I hope that you ladies and gentlemen who are so much older both in age and experience will pardon me for these meagre and very hasty remarks. In regards to my talking upon the subject of "A Fortune in 15 Years, and Fruit the Factor," that is entirely beyond me because I have not made a fortune and besides, being an unmarried man it has so fallen to my lot to receive the smiles of misfortune and not dame fortune.

Nevertheless, having been upon Dr. Funk's place during these particular 15 years and having been associated with him during this time I have become somewhat familiar with his methods and operations in building up a most successful fruit orchard, and it is about these experiences and these observations that I would ask you to bear with me this morning for a few minutes.

It is the concensus of opinion that apples are more profitable and are better adapted to the general conditions than are peaches. First, they don't require as careful a handling, and then again the possibility of being preserved for such a greater period of time it is not as easy to glut our markets. You all know, however, that it requires from twice to five times as long for the apple tree to come into bearing as the peach tree, and this period between the time that the apple tree is set and the time that you harvest your first fruit is the period which the majority of men of small means fear, and it is one of the problems that must be solved in the apple orchard, that problem of supporting the apple orchard until it comes into bearing. How grandfather

solved that problem was by using peach fillers which came into bearing with us the third summer. I know a great many people claim, both in this State and other states, that it is better to use apple fillers than to use peach fillers. All well and good if they can solve that particular problem, then I say use apple fillers; but with us the placing of apple fillers paid practically nothing upon the investment. We support the peach trees by planting potatoes between the rows the first two years. After the second year we practice clean cultivation and cultivate constantly from the beginning of spring until the middle of July, depending on the weather conditions. In the apple orchard, however, owing to the fact that it is situated on a very steep hill we have thrown it into sod so as to prevent erosion.

Peaches so far have been very profitable with us. I cannot give you the exact figures for last year's operations. The prices were lower than in some preceding years, but I think I am safe in saying that the gross proceeds for the season averaged close to one dollar a basket. Our transportation charges are five cents. We have a good and easily accessible market in Reading. The picking, packing and hauling cost seven or eight cents. Although this prunning, thinning, spraying and cultivation costs considerable, you notwithstanding can easily see that there is still a very handsome profit on your investment. Grandfather has about 20 acres in apples. I think 14 or 15 years old and this last year he had close to 900 barrels which realized him about $5,000 together with the pickups and culls; so that you can see that there again is a very nice profit, and this orchard is just coming into its prime and this year there promises to be a greatly increased yield.

Now one of the chief reasons, in my mind, for this success is the fact that he thoroughly understands the fundamental principles of fruit culture and carries them out to the minutest detail. Many a time that good peach money went into that apple orchard and those trees had to be treated just right; they had to be nursed through babyhood until now they are becoming giants ready to bring forth their luscious fruit and pay back in golden sheckles for the careful treatment they received in younger days. And therein, gentlemen, lies the fact why there are so many failures not only in horticulture but in general farming as well. If we would become a successful horticulturist it is not sufficient that we know that if we put the tree into the ground and if it receive a fair supply of rain it will grow and produce a large tree and will bear beautiful fruit. No, we must know why that tree grows and how it grows. We must carefully keep trace of the statistics of this State and other states so that we may be able to determine when we wish to plant an orchard what kind or class of fruit is going to be in most demand in our locality.

After we have determined the class, we have to determine the particular varieties, the best adapted to our soil, climate and market conditions. We have got to know what kind of fertilizer to use to produce the maximum quantity of that fruit. We have got to prune, spray and cultivate it. In short, we have got to know all the fundamental principles covering the growth of that tree from the time it is a sapling until it reaches mature age; and when we know these we have a golden opportunity before us when we plant our orchard. Of course, in this world there are all kinds of opportunities for some men and none for others. For instance, I see a fertile field out here. If I

know nothing of farming that is no opportunity for me. I would starve to death. If I am an ordinary farmer, practicing the same methods as my remote ancestors, possibly I can make a living from that field; but if I am a scientific farmer that field is a great opportunity for me and presents great possibilities. The other day in Harrisburg one of the legislators seemingly ridiculed this farmers' institute work, that there was too much theory in it. Gentlemen, I have never been afraid that the majority of our farmers will get too much theory into their practice. I think they should have more theory. To make them think and sit down and work out the problems and try a little bit of theory in their general farming operations. There are too many things on which we do not have the whys and wherefores. For instance, about this time of the year we fruit men are spraying for codling moth and curculio. What would it avail us if we knew nothing of the habits of life and the methods of control. It would avail us nothing. And this, gentlemen, is the reason why some farmers are able to make a success and other farmers make a failure. There is no doubt a great opportunity in this old State of Pennsylvania, for the right kind of men, for Pennsylvania is being stirred up along the lines of horticulture such as never before, and if there is any one reason why I am proud of being a Pennsylvanian it is because she is able to produce fruit of the highest quality and within the next decade she is going to increase that fame until distancing all competitors.

HORTICULTURE: PAST, PRESENT AND FUTURE

By W. W. FARNSWORTH, *Waterville, O.*

This topic has a wide range because I did not know the character of the audience I was to address. In coming here from Ohio yesterday, speeding along past the farms and cities, my mind went back to the time 75 years ago when my mother left this country, traveling across the country to the Far West of Ohio in the old Conestoga wagon, and I thought of the great changes in transportation since that time and wondered if the agriculturists and horticulturists had kept pace with improvements in other lines, and I thought possibly just a few moments spent in looking over the advance in horticulture might be of value to us in forming a little better analysis and arriving at a better understanding of our conditions at the present time. That does not mean that I am going to give you the history of the apple from the Garden of Eden to date because most of us live in the present. But we realize that in the early days of horticulture it was a simple matter of planting and God did the rest and fruit throve luxuriously. All that was necessary was to plant and harvest, and the market was uncertain and unreliable; sometimes a little demand, but in the main it was well supplied with the products of the farm orchard. Then later there came a period when the insect and fungus enemies began to arrive and we had no means of combating them. Horticulture was

shrouded with superstitious and foolish theories without any sense or foundation. Once in a while they hit it but oftener missed it. I remember about that time I was secretary of our State Horticultural Society, and one of the questions which I put on the program was this: "Will it pay to plant an apple orchard on land worth $100 an acre?" and leading horticulturists of our State discussed this question and decided it would not; that the apple crop was so uncertain and when we received a crop the price was poor; that the part of wisdom was to plant lands of no value for anything else and what was received would be clear gain. But at the present time we feel that the best way to receive a profitable return from land worth one or two hundred dollars an acre is to plant an apple orchard.

What has brought about this change? About the time I speak of scientists, agriculturists and orchardists began to study these problems. They began to realize the fallacy of laying down hard and fast rules: such as sow your turnips on the 25th of July, and other fallacies; and they began to understand that we must study the underlying principles and know more of the requirements of our trees and then to try to provide these requirements under the most available conditions, and the progress has been such in the last 15 to 20 years that horticulture has risen from an occupation of uncertainty and mystery and unsatisfaction and has now attained a state where it is considered one of the safest and most profitable of commercial ventures, and business men and men of all ranks and professions of the city are beginning to realize not only its pleasures but its profits. I think we had a splendid demonstration of that this morning and just as soon as we have such a young man as Mr. Funk in every township of Ohio and Pennsylvania then horticulture will make wonderful advance and will become one of the most profitable and interesting industries in our country.

We need more men who will study the needs of the trees. Dr. Roberts, of Cornell, was once asked by a dairyman how a certain ration or combination of foods would affect the dairy cow. His answer was: "Don't ask me; ask the cow." We want our trees. It is well enough to ask each other what food to give the orchard, but after all we must ask the trees themselves; we must study nature closer and watch the effect on the trees. The experiment station and agricultural society can make suggestions and can help wonderfully, and I do not think anybody can attain the highest measure of success, can do himself justice, unless he gets all the aid possible from them. Life is too short to try to dig these things out for himself, but he must take their suggestion and put them into practice. The experiment station can give us the verdict but we have to execute it ourselves. We must modify all their requisites to suit our individual cases.

I was much interested in the statement of Mr. Funk that while he would not advise putting manure on the young peach orchard it was all right later on when a particular case was cited. In handling the peach orchard we must have a good growth early and cover crop later in season. I am not afraid of excessive growth early in the season. I have a bearing Elberta orchard, bearing moderately in 1909, and we gave it a liberal application of manure from the steers sheds, reinforced with acid phosphate. We got a great crop in 1910. This year we are putting on the manure again not on the young trees but the mature trees, and have another heavy crop on the trees; so if we say

in a general way, use manure on your peach orchard and you don't use judgment it would do you greater harm than good. It would be like the gentlemen who imagined he had many physical ailments and he read all the circulars of patent medicines and all medical reports and prescribed for himself, and a medical friend said: "I am afraid if you are not careful some of these times you will die of a misprint." Some of those who are accepting all reports with an occasional misprint in them can realize what that means, and if we are going to take these statements without analyzing them ourselves and questioning whether they apply to our own needs, some of the trees and orchards will die of a misprint.

We want to realize that there are certain requirements that all trees have in order to succeed. One of the first of these is moisture. Now to secure that moisture we must store up and utilize as much as possible the natural rainfall, for I take it that irrigation is not to be considered in this climate; in fact, I do not consider it necessary in orchard culture; but if the soil is not naturally well drained it should be underdrained thoroughly. This will not apply to all Pennsylvania conditions, but it does with us because my orchard ground is thoroughly underdrained with tile three feet deep. We not only remove the surplus water objectionable to the tree but build up an aerated soil and reservoir to save and take up the moisture that falls during the winter and spring and then by cultivation or mulching, for I use both methods, we preserve that moisture for the use of the fruit, for you realize that fruit is largely composed of moisture and we know that the more water we can get into the peaches and pears the larger the price we receive. There is another aid to storing moisture and that is filling the soil with humus. We cannot get the best results in fruit culture unless ye have a soil full of vegetable matter. This not only adds a food value to the soil by adding that which is positively plant food but it makes available the plant food already in the soil, the manural elements of the soil and also fits it for storing a largely increased amount of moisture for the needs of the tree and fruit during its development.

There are various ways of securing this humus in the soil. No one way is best fitted to all conditions and cases. Orchardists will follow different methods. Now possibly to give you the greatest information in the limited time I will occupy I might just briefly speak of my own methods in this connection. Sometimes it may seem egotistical, but after all we like to hear a man tell what he knows about rather than theorize on what may be done or should be done. The life history of my orchards may be divided into three classes or ages. First, the young orchard for several years after planting. I mean apples, pears, peaches, plums and cherries. We plant the young orchard and grow other vegetables, potatoes usually or small fruits in it, and in the small fruits we grow mostly strawberries and currants. I formerly grew raspberries and blackberries in the orchard but don't think they they are quite as well adapted, and for the last few years am not growing blackberries or raspberries for the reason that the marketing of them interferes with the harvest of our currants and cherries which we find more satisfactory and more profitable. In the peach orchard we grow nothing but potatoes. I have grown strawberries in the peach orchard once or twice. The first year after strawberries are planted it is a good crop for the peach although the strawberry wants to be

cultivated late in the season and there is a little danger, in excessively rich ground in planting strawberries on the peach orchard, of forcing a late growth the first year. But if you can avoid this you can safely plant strawberries in the peach orchard, especially if you take the plants away from the trees the next spring and then throw a liberal amount of mulch up around the tree to preserve moisture. But it is not an ideal crop for the peach orchard. We prefer potatoes the first two years. After that we cultivate clean the forepart of the season and how much and how late we cultivate depends on whether they are making little or full growth. This, of course, you understand is to preserve the moisture and make available the plant food.

So much for the peach. With the apple, pear and the plum especially we prefer to plant currants. We don't want our whole acreage in currants; but on the richer ground we find them an ideal crop to grow in the orchard. In other words, in the orchard where we don't plant currants we grow potatoes and strawberries and alternating, keeping this up for five or six years until the trees begin to bear quite freely, not heavily, of course. Then we begin the second stage of the life of the orchard, and this consists of cultivation and clover crops, beginning as early in the spring as possible. This is where many make a mistake, especially those divided between orcharding and farming. We plant the corn and sow oats and then go in and plow the orchard; and that corn crop may yield between $20 and $40 per acre and to get that in the best condition you are neglecting a crop that may return you all the way from $400 to $1,000 an acre, as Mr. Tyson and Mr. Funk have stated. The orchard needs that moisture that is being lost every day the ground is not stirred, the orchard needs that and will return better pay than the oats field or corn field.

Work at the orchard first. There may be a little modification of this in some instances. For instance, you have sand vetch growing in the orchard,—and I consider that an ideal cover crop in many instances,—if the orchard is reasonably young and not needing a heavy supply of moisture, you will be justified in leaving that stand late, for the sand vetch is not quite the ideal from the fact that the ideal cover crop should make its growth in the fall, die down and be plowed under in the spring. We have not found that ideal cover crop yet, but sand vetch does not seem to rob the ground of moisture as rapidly in the spring as other crops. If we let it stand a week or ten days later than this and then plow under in our orchard the little moisture we lost is compensated by the vast increase in fertility. I have another orchard that I have rented, several miles from home where we can not apply barnyard manure. We have not tried to grow anything in it and this year we are using soy beans. I have had the ground plowed and will drill in soy beans in a few days. This orchard is planted 35 feet apart each way and the trees are young and we can grow a cover crop during the coming seson. For a cover crop to occupy the ground at this time of the year I think there is nothing equal to soy beans. We put them in with a grain drill, allowing every third hole to run and cultivate with the sulky cultivator. That means cultivation of the orchard through growing season and at the same time you are growing a great deal of fertility there that is valuable. I believe as a rule you can grow fertility in a young orchard cheaper than you can buy it in sacks; I believe as a general rule you can do this. This

is the second stage of our orchard. Then in some of our orchards, especially the apple orchards, where we made a mistake early in life by planting too closely together, we have adopted the mulch method, letting a little grass grow and hauling in old straw and corn stalks and coarser manures, anything to make mulching material, and mulching those trees. If I had unlimited quantities of mulch I would prefer that method to cultivation, as it answers the same purpose and has the same advantage, but it requires a great amount of material, and I think those situated on level ground where we can cultivate will find cultivation better, although I have seen at the Ohio Experiment Station their plots mulched have made better growths than the cultivated plots; but on my own soil I have not got those results, so that wherever possible I practice clean cultivation. Perhaps that is enough time spent on the cultivation.

Now just a word or two in regard to spraying. I feel we are learning new things every year about spraying. I believe we have been taking these recommendations too generally without discriminating, I think, as to our own particular needs. We have not stopped to ask whether we needed a fungicide or insecticide and have not been thorough enough in application and prompt enough. I believe it will pay every orchardist to use every means in his power to have plenty of power and spraying material on hand, keep one or two extra outfits on hand, so that if anything happens we can go on with the work to advantage and at the right time and we must have outfits enough to use the winds when just right. It is an advantage to give over three spraying and four if possible. Last year I only gave two sprayings. Don't understand I am advising this. I would not advise it under many conditions, but in our region we are not troubled with the bitter rot and other fungii and when spraying through the dormant season we spray for San Jose scale and scab, and that with us is sufficient; and then as soon as the blossoms fall we give another spraying, drenching the trees from three or four sides with dilute lime-sulphur and arsenate of lead and then feel secure that our crop will be perfect. Last year I had some careful tests made. Prof. Green and his assistants conducted the experiments, and after being there a week he found less than one-half of one per cent. of wormy apples. This was after one spraying after the blossoms fell. That was not in old neglected orchard. I did not think it would be possible by the most diligent work to secure these results the first season in such orchards. This was an orchard sprayed for twenty years and in good condition to begin with.

There is another point that I think perhaps is not thoroughly understood by some in the cultivation of the plum. We have some perfect results in the cultivation of the plum in protecting them from the curculio by spraying three or four times. Our method is simple. We spray with the lime sulphur concentrated solution, 33° Baume diluted one to forty for plum, cherry and pear; add 2 pounds of arsenate of lead to 50 gallons of the mixture. This was for the first spraying after the blossoms fell. We prefer to spray the plums from one side and then wait for three or four days and spray from the other side and then again repeat. We have sprayed last year I think five times, three times on the one side and two from the other. The second time over we omit the lime-sulphur and use milk of lime in its stead with the arsenate. There is cumulative effect of lime-sulphur when used

once or twice successively and used with the same strength a half dozen times in succession there is danger of injury from the left-over accumulative effect and in order to avoid this the second spraying we omit the lime-sulphur. I spent half an hour yesterday looking through our plum orchard and did not find a single plum showing the curculio mark. This year we have only sprayed three times. We had a full set of plums and no signs of curculio and if a few should appear we have plenty of fruit left. About the time the plums color we repeat this process, using the same mixture and about the same number of applications. The great bugaboo in plum culture has been the curculio and rot. Last year we had practically no rot. I told my son to count carefully all the plums that showed it. He packed 83 bushels one day and reported he found three plums in the day's picking had any indications whatever. You know what that means.

Let me give you another lesson we learned last year, in regard to thinning. We make a practice of thinning all our fruit and last year after thinning the peaches we went into the plum orchard, thinning all the orchard excepting the south half of two rows, then cherry picking came on and we did not get back to the plums for five or six weeks when the rest of them were thinned. At picking time we found those that were thinned early were easily fifty to seventy-five per cent. larger than those thinned later, and when blooming time came this spring where we did not expect fruit we found that the entire orchard was full of bloom and set plenty of fruit except those two half rows that were thinned late. They had nothing while the other end, the same variety, thinned earlier, had plenty of bloom and set a heavy crop of fruit.

Probably I might just as well speak of thinning here as later. I think Mr. Tyson spoke of the advantage. I know the larger grower of fruit will say it is impractical but it is not, it is much better to do it early. The time to remove and pick off part of that fruit is from June to July. Some thin up to October. Suppose you have a tree with 10,000 apples on and it should not have over 5,000, which is the easier and better? to pick 5,000 of the small ones of early and then in the fall pick off 5,000 good first class apples that will bring good prices and please the customer; or to leave them all on and have them all of an inferior size and quality to pick off in the fall if they have not broken the tree or prematurely fallen. Thinning makes less work in the whole and is more profitable. I spoke of 10,000. I wonder if you ever counted the number of apples on a tree? Last year when the thinning test was being made they counted the apples taken from one Grimes Golden 23 years old. They removed at least 5,000 and still left too many on for a good big crop; another tree they removed 6,500 from.

Just a few words in regard to the marketing and picking and I will leave the rest of the time for questions and discussion, for I believe that is the most valuable part of the meeting. We can only undertake in these scattering remarks to hit the mountains, but when you ask the questions I know the information you are after and I may be able to give some. I was glad to listen to Mr. Tyson's remarks in regard to handling fruit. I believe more people fail in gathering and marketing them in growing and especially is this true with those whose education is largely as farmers. It does not require much skill

to grow a crop of wheat or corn and haul it to the elevator. Another thing, there is not an awful margin between No. 2 and No. 3; and that is one of the reasons why skill and excellence and care pays a larger premium in growing fruit. To begin with, to harvest a crop properly, we must have the fruit well grown; it must be thinned and as early as possible after the June drop, for every day that the fruit remains on these trees it is sapping that much of the energy and vitality of the tree that should be preserved to perfect these specimens left.

We find it a decided advantage to have varieties and succession of fruit. One of these advantages is you can keep the uniform help throughout the season. The most of our fruit is sold to grocers and consumers; very little through commission men. We get up a trade and hold it, starting with strawberries and lasting the entire season. We have early apples, peaches, pears and plums, so that it is a continuous performance from the time the strawberry begins until next spring when the last storage apples are gone; and having trained help we get better work and more careful work, because the steady employment will improve them. The question was asked in regard to preventing the scars pinched with the ends of the fingers. There is nothing that helps as much as object lessons. I had some new pickers one year and we started on Grimes Golden which shows the bruises rapidly. I picked up half dozen apples which were picked with the ends of the fingers and I told the pickers to look at them the next day. The result was a little black spot. That meant a great deal more to them than any words I could express. I think it pays to make a point. We had two or three peach trees in the sour cherry orchard and not spraying the sour cherries for scale we neglected the peach trees and the result was we had a lot of curled leaves. I took occasion to call the attention of the new men to it and the old men too. It don't hurt any of us to be reminded of what we know, and there is no way in the world that you can impress the importance of things I think as by showing the results. I think one of the things the apple growers want to do is to grow apples of quality and the next thing is to get them direct to the consumer with as few go-betweens as possible. This won't apply to all. Those who are growing large quantities of apples in a commercial way, who don't do anything else and have not the transportation to reach the consumers direct will do better to sell in carload quantities. But there are a great many of us who could do better by storing our own fruit and going direct to the consumer, and that will appeal to the consumer and customer and will be likely to get more for you. That is the opening for the Eastern apple, and if Pennsylvania, Ohio and New York will live up to the opportunities in this direction and take pains and care to grow the best they can grow and put them on the market in distinctive packages and with a distinctive label so that the customer may know when he gets them and realizes that they come from Pennsylvania, Ohio or New York, we can drive out the Western apple from our market; and we must educate those who know quality by appearance only, because we can beat them in quality and very nearly equal them in appearance; and if we put in the orchards the skill and expense that the Western grower does, we have the market at our door which will take up firsts, seconds and everything. I have solved this problem by building a cold storage house in which the apples are stored as soon as gathered, all the winter apples being put in there without sorting, and, by the way if you

thin the apples there will not be much sorting to do and if carefully handled very few bruised ones. I think it was Mr. Tyson who spoke of the value of color. The apple that should be red and is not red is of no value to me. We are 15 miles from Toledo so that we supply the leading grocers there on orders. They phone in their orders twice a week for 20 to 40 baskets and they are freshed packed and covered with netting; and especially in that case we find that an apple without color not only has no flavor but has no appearance. In many instances I leave the apples hang on the trees, not picking them too early. Possibly in some instances they keep better in common storage if picked early but not in cold storage. An apple should be allowed to hang on until it ripens and colors up, and if sprayed thoroughly you will not have so many rotten, and if free from worms you will not have many to drop.

In regard to the discussion on fillers that was brought out—this is a kind of scattering talk—we have found the Rome Beauty one of our best fillers. The Wagener is good but with us the Rome Beauty is a better apple and sells better, while the quality is not equal to Wagoner; and I have been using this method of using Rome Beauty and Jonathan. I had 25 to 30 dwarf apples I set out 18 years ago and they did not bear any more than the standard trees. We have now only 12 or 15 left, and judging from my experience I would not use the dwarf apple. I have no use for the peach as a filler, for the simple reason it would be difficult to spray the one without interfering with the other. I know some do it. My plan is this: I plant my permanent trees 40 feet apart each way and right in the center of the square I put another of the permanent varieties. That means just as many more of the permanent trees. Then I put in between the fillers until I have my trees 20 feet apart each way. That requires a little care in the selection of varieties and in management and pruning. It would not be wise to plant Baldwins or any of those slow growing varieties 20 feet apart because before they bore you would have to chop down part of them. I can take any young orchard and by the wrong kind of pruning and wrong time of pruning I can keep that orchard from bearing fruit for five years longer than its normal period. Cutting off too many of these lateral branches and pruning too vigorously will check bearing and promote wood growth. I would not go to the other extreme of not doing any pruning at all. If I do prune I take pains in shaping my young apple tree. We don't do much pruning for a few years. You are not going to get such an excessive growth as to require a great deal of pruning after you have got them bearing. The peach is a tree that requires continuous pruning and a good deal of it; but in the case of the apple, pear, plum and cherry we try to do just as little as possible. They say sour cherries don't need any pruning. You know sour cherries will throw out a multitude of fine branches that cross in the centre of the tree. These intercrossing limbs must be kept cut out.

I believe that most of us will find it advisable to grow as nearly as posible a succession of fruits covering the entire season, fruits of good quality. We have a wonderful advantage over our Western competitors in having the markets at our doors, and while they grow fruit that will not bear transportation we can let the fruit ripen on the tree, handle it with care, grade it carefully and meet them every time. If you have No. 2, mark them No. 2. Grade them carefully and put

your mark on them. Every package of our fruit bears a pink slip with our name and device, a four leaf clover, and that stands back of it as a guarantee. We thought it did not amount to much until last fall. We ran out of slips and we sent out peaches without them and the next day we got notice from one of our dealers that they did not want us to send any more without the pink slips. He lost a sale because a lady thought he was trying to bunco her. We have pride in our name and reputation and if you put your name on it and build up a reputation it is not a question of getting the money for your goods. It is simply a question of getting enough good quality fruit to supply the demand.

SYMPOSIUM: MANAGEMENT OF FARMERS' INSTITUTES

DEPUTY SECRETARY MARTIN: Mr. Chairman, Friends and Fellow Workers: You must not think when I hold up this manuscript that I am going to read it all to you. We have here in a condensed and tabulated form the attendance at all the institutes that were held last winter in Pennsylvania; not only the attendance, but the number of State Lecturers who attended these meetings, the number of local people who addressed these institutes, the number of sessions that were held, where they were held in the different counties and the attendance by session by two and one day institutes, and the attendance by counties, the final summing up of the attendance in the entire State; hence I have brought this tabulated manuscript with me in case questions might arise relative to the work in the different counties that we could not have this manuscript for reference in that event. I might say that last year's work with the institutes has marked what we might call the highwater mark. The attendance was greater than ever before. The interest manifested, so far as reports have come to me, was never so intense as last year. Indeed, farmers and other citizens, men in business vocations and in other callings have manifested an interest in the development of agriculture not heretofore known or heard of and the requests we receive at the office for additional institutes and movable schools are such as shows to me and to you the work is on the increase everywhere. You might be interested to know something of the attendance in some of the counties in Pennsylvania. The attendance ranges from 1,000 to 14,685. The county this year having the largest attendance is the county in which we are now holding this Normal Meeting, the County of Lancaster. No word of mine could in any manner do justice or credit to the standing of this great county amongst the farming communities of the world. It stands out as the one county showing an example of thrift and prosperity and agricultural advancement excelled by no county in the history of the world, and hence we are proud to hold our Annual Meeting amongst farmers of such great excellence and ad-

vancement. Lancaster county had 14,685 people in attendance; at all their sessions. Then the next county is York, with 11,715; then the County of Tioga, 7,180; Schuylkill, 4,785; of Montgomery, 5,560; Indiana, 4,485; Dauphin, 4,790; Chester, 5,265; and the County of Bradford, 4,225; and of Berks, 4,083. The counties that I have enumerated are those having the largest attendance. Now when I say the largest attendance I don't want to be understood as saying that they gave the largest attendance in proportion to their number of farms or population. You know that there are some counties in Pennsylvania with a population of but a very few thousand that have given an attendance practically equal to the number of farms; that is, proportionately equal to the others, and in some cases excelling, in proportion to the number of farms in that county, by considerable. Thus you see we are only enumerating this great attendance as phenomenal, but if we were to analyze this attendance we would possibly develop the fact that in some of those counties which have only two and three day sessions the attendance in proportion to the population would be greater than Lancaster county.

You are possibly interested in some of the subdivisions of the work, and hence we have some data here that ought to be of interest to you. These meetings have been divided into some four subdivisions. We have what is known as the Special Institute. These Special Institutes have grown up within the last two or three years, in which the farmers' organizations, the farmers' unions, farmers' clubs, local granges, in different parts of the State are exceedingly anxious to procure instructors along a certain line of farm operations. A correspondence is developed with the Department through which we send to these various localities one or two instructors, joining with the locality in the development of this work, and hence we call these meetings Special Institutes, joining with the local people both in the development of their community and their institutes in this direction. Now there were in attendance at these Special Institutes last year 10,376. At the Regular Institutes, the institutes that have been scheduled regularly in our bulletin, the attendance was 162,809. Then we have still another division of this work that is rapidly developing in Pennsylvania, and of no mean importance, I refer to Harvest Home Picnics. You know one of the grandest things and probably one of the best organizations that we have in Pennsylvania for developing the social side of farm life are these Harvest Home Picnics. There the farmer and his wife, sons and daughters, the young and the old people of the territory, coming from miles and miles, assemble together out in some beautiful grove, and in lieu of spending that time in amusements that would be worthless and unprofitable they have invited the Department to join with them and send lecturers in order to devote at least two hours of the day to the development of the great work upon their farms, and we join with them in that work and so far as means and speakers are available we have afforded the same, and at these Harvest Home meetings last year our speakers addressed over 20,000 people. There is also another division of the Farmers' Institute work that I will refer to and that is what is known as our Movable Institute Schools. These Movable Schools were held last year in the following counties: Potter, Warren, York, Lackawanna, Columbia, Venango, Erie, Crawford, Westmoreland, Chester and Lehigh. I stop for a moment for a word in reference to these Movable Schools. No one of

these schools was held at the last season occupying less time than four days. In the County of Columbia, where there were two of these schools held, there were eight days of Movable Institute Schools. These meetings differ from the ordinary Farmers' Institutes in that they take time to deliberate and develop a certain line of subjects. Thus far we have taken up for the past two years three distinct branches of operations carried on by the farmers of Pennsylvania, namely, and possibly of first importance, the dairy interest. You know the importance of this is a vast interest in Pennsylvania, and do you know, my fellow farmers, to increase that nearly a million of dairy cows in Pennsylvania it would possibly be a financial advantage to the owners of the same if one-third of these cows were to-day turned off to the butcher and the balance stabled, fed and cared for as the most approved methods of the day in which we live would teach. In these schools there is demonstration means of instruction. The Babcock test in learning of the butter fat contents, for instance; and in most of the places certain members of the class take hold of this work and learn quite readily how to handle that little implement that tells so much as to the profit or loss the dairyman is receiving from each of his cows if he will only follow its direction. Indeed, in many of these cases not only is the Babcock test used but the churn was actually brought into these meetings and the butter churned and they figured out the contents as to butter making in the lessons given. You listened yesterday to the excellent instruction given by one of our lady butter makers in Pennsylvania, developed along exactly the same line; and hence the importance of this cannot be made too emphatic. The profit to be attained from the dairy interests of the State to-day, my fellow workers, depends upon the manner in which each and every cow is handled and our efforts is to develop greater profit from them.

Now again the other two lines taken up in this school work are poultry and horticulture. Horticulture requires a line of cultivation to develop the growth of the tree and fruit from the soil of Pennsylvania and by reason of its peculiar conditions is indeed tending to develop probably the highest type of manhood, and hence we employ the best experts that we can procure to develop lessons in the various and most important lines in selection of the trees the selection of the plot for the orchard, the planting, cultivation, harvesting of the fruits and the marketing of the same.

And then again the last of the three lessons developed at these movable schools is that of poultry. We are just beginning to realize, my friends, the possibilities, the reasonable business possibilities and profits that can be attained in poultry lines. Indeed, the best figures that I can procure from Pennsylvania for last year are that from the sale of eggs alone in the State of Pennsylvania over $20,000,000 were procured. That says nothing about the value of the poultry, the value of the poultry buildings and the money invested in all these things. I am guaranteed in saying that there has not been developed a greater profit for the money invested in poultry in either the cow or the orchard. So we are developing along in these movable schools, teaching the most approved methods in the modified class form. They seem to be rapidly taking fast hold on the farmers of Pennsylvania. I have many requests for movable schools in several of the counties where they have not yet been held and most of the counties that has had schools within the last two years are to-day asking for same the coming season.

I should say here, lest I forget, that counties desiring the movable school (this is for the County Chairmen) when they make their report requesting and naming the places where the regular institute is to be held, should in that same circular, make the request for a school at the same time, and naming the place, I can assure you in just so far as the means at our disposal are available the counties asking for these schools will get them, providing the conditions under which they are attained are observed. One of the conditions is that we would not send a movable school anywhere in Pennsylvania unless twenty men or women sign a paper agreeing to attend all the sessions of that school. Now I believe that is right. We are not searching for some place where 5,000 or 6,000 people will attend. That is very encouraging indeed. In fact there are many of these schools where the attendance has been so great that we had to cast aside the question of class observation entirely and develop in more general manner the work. But a class of 20 in any given locality in Pennsylvania, young men or old men and women, who will come there with a full determination to arrive at a proper conclusion on the matters of the development of the interest in which they are engaged, are a sufficient number to guarantee a school, and we believe if we can get 20 men and women in a locality so earnest that they will come for three or four days in the week to take in and absorb the lessons developed there, the object lessons standing out in that community practically are to have better agriculture.

Now, my friends, I believe the program said that I would open this discussion. I think I have occupied my full time.

DR. CONARD: Do you have the attendance at the schools?

DEPUTY SECRETARY MARTIN: I forgot that. May I read it now. At these movable schools last year there was an attendance of 16,198.

Now let us sum up a little and see just what our attendance was. Total attendance, Special Institutes, Movable Schools, Regular Institutes, Harvest Home Meetings, 209, 383 people attending last year. The days of Regular Institutes scheduled in our Bulletin were 395 days; the days of Special Institutes, 24; days of Movable Schools, 58. We had $18,000 to expend on lecturers and hall rent at Regular and Special Institutes, of which we held 477 days. You know it costs something for these things. We have looked over the records of many of the states, and I challenge any state to show us a record that will excel ours, when all things are considered, for economy of work. These institutes include hall rent, everything connected with the work in the different localities, including the expenses and per diem pay of all instructors, and everything is $35.00 per day all considered. Many of the states are not higher than $50.00 and when we come to consider the character of the instructors and the character of the instruction, have reason to feel proud of the record of 1910-11.

In addition to this we hold annually our Normal Institute, the same meeting as we have it here. Meetings of this character cost us a little less than $3,000 all told. There are other expenses connected with this work, such as local postage and work of that kind, about $500. So that for the $22,500 that we have had to expend this last year we have accomplished such splendid results.

Now, my friends, we have devoted this afternoon session to the development of the great work. Here before me are the County Chairmen of Institutes and I want to say a word about that, gentlemen. I can think of no number of men anywhere that for the past twelve years have accomplished more disinterested, generous work than those men, without pay. An impression sometimes goes abroad over Pennsylvania that these fellows that have charge of institutes in the counties somehow or other get a pull. I want to say to you men now, you were invited to Harrisburg two or three days ago and the strength of your argument before that Appropriation Committee was such that I could say to them that here is a body of men that for the past 12 years have devoted about a month of their lives each year to the advancement of agricultural interests without a cent of pay. That closed the mouths of all parties for it is the truth, and the plain unvarnished truth, and they listened to you and they heard your arguments.

I want to say something more. The strength of these Farmers' Institutes in Pennsylvania is just disinterested work of such broad-minded men, who have been willing to do it because of the interest they have had in it for the last 26 years. I hope the time will come, and it will come and you men will show forth your strength in Pennsylvania to get what is rightly coming to you, that you should be worthy of your hire in this matter.

And now just a word to these other gentlemen and ladies. One of the things that we hope to develop in the future to a greater extent than has already been developed is that of women's work at these institutes. I am proud to say that we have in Pennsylvania in this institute work a corps of lady workers efficient and faithful to all the trusts wherein they have been trusted. They have gone forth over Pennsylvania through storm, cold, sunshine and cloud, teaching and meeting with the people, with the women and with the ladies, developing the questions of household economics, sanitation, education and teaching the development of home life; of all which I am very proud, and hope the day will soon come when we can go to the law making power,—and demand something practical, equal that given to the regular farmers institutes, for the development of women's work on the farm and in the home. It is coming. Now the men workers, we have a corps of over 70 instructors in Pennsylvania. The State College and Experiment Station has, so far as the duties of their strenuous work would permit, sent out their very best instructors to join with us in this great work, and I express here and now my hearty thanks to that great institution that is doing so much for agriculture in Pennsylvania and for the work they are accomplishing with us in this State. And the other men who are engaged outside of them are men almost universally who have by actual practice upon their farms and by their research connected with that developed full success in certain lines of agriculture; men of mature judgment and deliberation, sent forth in Pennsylvania to develop with the farmers of this State the highest order and conditions of agriculture. If there is any one thing I have reason to be more proud of than another it is that the Pennsylvania Farmers' Institutes have an organization of men in every county who are actually engaged in farming with their sleeves rolled up, and that we have a corps of instructors of ripe experience and actual practice upon the farms of Pennsylvania, and men of deep

scientific research in agriculture, chemistry and botany as applied to agriculture. Thus we hope and expect that as the years pass on greater development, more thorough instruction in all of its lines will be developed.

Now, my friends, I shall not talk any more. It is your time to talk, to develop any questions that may come before you. I thank you for your attention.

MR. STOUT: I don't want to force myself upon the audience as the first speaker or one who has superior knowledge, but while I sat here this forenoon I thought out a few lines that I noted down on this paper and now whether I will be able to read them or not remains to be seen. But listening to these discussions, some things have suggested themselves that I noted down. While it seems like thrashing over old straw it is likely there is some grain left in the chaff.

Continuing of the same opinion that I entertained and expressed at previous meetings, it may be profitable to repeat that the theory that the farmers in general have been neglecting the elementary in agriculture is not well founded. There is too much catering to the class of agriculturists who have great estates and incomes to devote to ornamentation and display. To present glowing pictures of mansions, lawns, poultry plants, model farm buildings, costing hundreds of thousands, is neither edifying or instructive to the average farmer who must depend upon his own efforts with no other resources than that taken out of the soil by his hands and his family's. The beautiful pictures presented by Dr. Hunt of the Alpine scenes, the towering mountains and glaciers presented to our view, we might desire to mount the high pinnacles of those glaciers, but we cannot. They are like the glowing pictures and discussions of some of our institute lecturers whose practical experiences consists of a view from a distance. Our schools are classified so as to reach all ages and conditions and it may be advisable to obtain two kinds of instructors; one group to instruct agriculturists and another to visit rural districts, cross road villages and isolated sections where primitive conditions prevail. In order to overcome some of the inconveniences encountered in this work it may be advisable for the Department to furnish conveyances on the order of the old Conestoga wagons or prairie schooners, supplied with some beds, blankets and robes and such conveniences as may suggest themselves while on the itinerary going from one place to another, and thus avoid the theoretical work of farmers' institutes. There has been complaint about institute speakers compounding the situation where large audiences had assembled at night to hear the discussions, and because the accommodations were limited and not equal to those furnished in the cities at $3.00 a day houses the lecturers went away without carrying out the program. These are a few of the views I entertain and if the Department can use any of these suggestions to improve the agricultural instruction of rural communities they are welcome to them.

MR. KAHLER: Mr. Chairman, our worthy Director has given us a lot of statistics showing the development and improvement in institute work. It is easy to make assertions. Now I think it is our business to give our ideas whether the institute is improving or retrograding. I have had the honor and misfortune of being an institute mana-

ger for twelve to fifteen years, and I am not saying this to the detriment of the men who were doing it before that. The point I want to make is, are we going uphill or downhill. I think it would be a good thing for all of us men to show that up. There is an Act of Assembly that says we shall publish when we shall have a meeting in our respective counties to receive applications for holding institutes. I supposed when I was first elected that I would meet a lot of fellows there and I met myself there a great many times and nobody else; nobody there at all. Now in the last two or three years if I don't go to the Court House at all to hear the applications I would have about three times as many as I could accept, by letter; and for the last two or three years in our county they don't only wait for that but they send a delegation to press, "give us an institute now." I can see it in what little time I have devoted in other counties, comparing it with twelve years ago when you would see a lot of fellows, four or five retired farmers probably come to the meeting, flat headed fellows that had left the farm. The men that we wanted to reach were not there, as a rule. At night we would have a full house, have to get a big house to accommodate them. Most of them came there—it is a place to go to see your best girl and all that sort of thing—but if it was not funny it would not amount to anything. Half the people have no idea in the first place of the institute work, what it was like or its purpose. I often think about it. I was sent to a certain portion of this State to an institute at one time and, to use the farmer's phrase, I was off in my feed. I played my part of it and went back to the hotel. It was a fairly good community, too. I sat down there and after awhile a gentlemen in the office, a commercial traveler, said to another gentlemen of the same kind who had just come in: "Well, James, where have you been?" "Oh, I was down here to a meeting. I have been traveling over this country and every once in a while I see a great deal about the farmers' meeting, a great outpouring of farmers. I had no idea what a farmers' institute would be, so I had a little leisure and I thought I would drop in and see what was doing at the farmers' meeting." "Well, what is it like?" "Very poor meeting," he says. "I got in there," he says, "and there was a big six foot huckster talking to a lot of people about feeding calves. Don't that beat you?" he said. I think some of our men have as poor an idea of what the purpose of our institute is as he had. But I don't want to take up your time, but I want to say that a great deal is in our hands to advertise. We have a blue print of what is to do and it depends a good deal upon the men to work that out. It is not doing what some of us would like to see it do. I had a conversation once with a friend of mine, a minister. He says, "I have been paying a great deal of attention to farmers' institute work. Is it doing any good?" "Well, I hope it is; probably not as much as we would like but we are not discouraged in the matter." He said, "I cannot see that it has accomplished anything." I said, "I would like to ask you a question." I said, "You are a minister of the gospel. Do you convert all the people you talk to?" "No." "Do you get discouraged and give up the business then? Don't you put on more stress every evening to impress your people to do what they already know than to give them any other information?" If you can make an impression in any community along your line of work on two or three men who have a good influence it will spread and you will soon see a widespread interest and I hope it will go on.

MR. SHUEY: I have a point that I would ask the Department to look after for the coming year; that is the clover question. Now we all know that we are lacking in growing clover as we used to twenty years ago and I have asked some of the lecturers that have been to my county on that very point and they would not give me the answer I wanted. They claimed that clover froze out. But it don't. There is something the matter with the clover, something working with the roots and it is dying off in the fields. I would like if the Department would get someone at work to examine that and in the next winter's lectures to have some competent persons to explain that and whether it could be prevented or not. That is one of our important points that we need in Pennsylvania, to keep clover more than one year.

And as the advancement that is made in the institutes in the counties, I must say for our small county that since these farmers' institutes are started—I guess I was one of the first that attended institute in our county. I know we held institute with six persons present when we started in first. Now it is sometimes difficult to get a hall large enough, especially in the evening, to hold the people all. And there is a great advancement made in every part of the agricultural lins in Lebanon county and especially in the fruit lines. We have some few persons that took hold of it that I don't think can be beat in the State of Pennsylvania. They bring the best quality of fruit and make it their business to study up and have the scientific fruit put in the market.

MR. STOUT: I want to answer the question that he brings up in regard to this clover. We had that discussion up at our institute last winter. There is a little insect called the clover root borer. I gathered some and exhibited them up in Blair county and I found them at home earlier in the season. About this time they have escaped and are laying their fresh brood on the young clover now growing and they practically destroy the clover crop that has stood for one year, and it is a question whether it is a benefit to have it destroyed, because I think it is better to have it plowed down for the coming year.

MR. J. ALDUS HERR: I have a few suggestions for our county. While our institutes have grown and are growing rapidly, yet the needs of our county I think are different from those of most of the counties in the State. What we would like to have would be persons who come here as speakers to be practical men, men who are practical cattle feeders. That is one of the main objects. We as a county feed cattle, what we call stockers, ready for the block. We want practical tobacco men. We have some but we need more. And we want more good men who are practical corn growers. These are essentials which right in our county confront all of us as farmers, and unless the men or speakers can appear before the audience and give their practical experiences and results I am afraid their labors will be futile here, with all due despect to the men whom you have sent here. We have made advances and if you go out over our fields you will find we are trying to improve as fast as we can, but we want practical men.

Another thing that is growing here within the last four years when we had our first exhibits at our institutes. Last winter we had over 1,250 exhibits. At one of the meetings we had to hire an adjoining

hall to put the poultry exhibits in. We had a great exhibition. Now, if you can, would it not be possible to send us speakers that are versed in these different lines, who can score the different exhibits according to their merits and, if you please, have the person who grew them or exhibited them explain to the audience how they were procured. We can get the people, and there is not any doubt with a little push and with my assistance and Mr. Hibshman's we can make the institutes of Lancaster county a miniature winter fair, with the speakers coming here capable of awarding the merits of the different exhibits that we bring here. I don't doubt it in the least that we can get the different halls we have for our audiences two-thirds filled with exhibits. There is nothing so instructive or that inspires a person so much as to see the living object right before him. (Applause).

MR. PEACHEY: Mr. Chairman, what I am going to say I think will be more directly in favor of the farmers' institute lecturers' business than what it will be with reference to the work that is to be done at the institutes. I don't want my portico to get bigger than my house. For that reason I want to tell you that the thing I am interested in is getting rid of that Saturday evening institute session, and I know that some of them will shake their heads. It don't make any difference. I have seen them shake their heads before, but I know this and I am going to talk it from the standpoint of the institute lecturer that has been on the road all winter and not several weeks during the winter, and I am going to tell you that it grows mighty monotonous to work six days in the week and do your work and take it as it comes, which sometimes is pretty rough and was even last winter in one or two districts of a certain section of the State where you were required then to sleep in a place where you should not sleep and on Sunday morning take the train and travel thirty or thirty-five miles and stop at another hotel and then in the afternoon, towards evening start again and get to a place a little late at night and next morning get up for the 6.30 trolley and travel along to a station and then ride eight miles out in the cold to get to the institute on Monday morning. I am going to say right here that it is an imposition upon the members of the institute force and you may as well use plain terms because I want to be understood. I tell you that reminds me of a young man and lady that were going together and she had been somewhat tanned and sunburned and she said the hide on her hands and face were not just what she would like. The young man said she should not say hide; she should say skin. He said that is more proper. Then they went to church. The hymn was announced, "Hide me, Oh, My Saviour, Hide me;" and the young lady began to sing "Skin me, Oh my Saviour skin me." And so I want to say just this that when you are subjected to such things as that it comes near to "skin me, oh my Saviour skin me," working in the institute work that way and I would rather "hide me, oh my Saviour hide me," in a hotel over Sunday than do that kind of work. Now then you understand my position. Some of them come up and tell me, "we have got to have that Saturday evening session in order to make up our numbers." Why these numbers on Saturday evening might be all farm people or they might be all people that came to be entertained, and I know that I have tried to entertain them. And so I am interested in that from the fact that it

saps the vitality out of the farmers' institute lecturer to work six days in the week and then travel on the seventh, and I want to know why we cannot use all the commandments just as well as a few of them. I believe that six days belongs to us as farmers institute lecturers, but I don't believe that we ought to work the seventh, and last night Dr. Bailey in his talk here spoke about the religion of the men on the farm, and I think we ought to take care of that on Sunday; and I am going to say right here as I said before, that it is not doing justice to the farmers' institute lecturer to require him to travel then. If you are going to have that Saturday evening session have it at the place where the institute lecturers can get in a hotel on Saturday night and have what he ought to have, and that is good accommodations over Sunday; and I am going to tell you this, that I have a lot of sympathy for that farmers' institute lecturer that is running away from these meetings on Saturday night in order to get to a good hotel on Sunday, from the fact that I believe that it belongs to him. Sometimes, I am going to say this; that as I look at the county, we commence at the wrong end, and I have traveled as much as eighteen to twenty miles after Saturday night's session to get to a place on Sunday, and I know others have done it. Now I don't know the sentiment of the institute lecturers but I know the sentiment of some of them. I don't know the sentiment of the farmers' institute managers with reference to this, but I know that of some of them, and I know that some of them have been very careful along this line and have endeavored also to arrange these affairs so that following a Saturday night meeting we were at a place where we could stop. Another story: You know a man was sick and he was very sick and just suddenly he became a little bit better. He did not know where he was. He woke up and said to his wife: "Oh, I feel so good. Am I in heaven?" "Oh no; I am with you yet; I am still with you;" she said. Well now, if we cannot get to that heaven of a good hotel on Saturday night to remain on Sunday, why please don't have the other end just as bad as it has been made for us sometimes.

Another thing I want to say: Last winter some of my mail went wrong. The folks at home did not know where I was and I know some of them cared. I knew where they were and I could write to them. We have that rural mail all over the country and it is a good thing all right. But if they don't know where to write to because sometimes the places of holding farmers' institutes have been changed to what the bulletin says and these things want to be right. I tell you it is a hard life to be hauled over the country under such conditions and I don't want to do work under such conditions and more than that, I am not going to very long; and so far as that Saturday night is concerned I am going to tell you here, county chairmen, I want you to do your best and if you have done your best I am going to do all I can possible for the institute work and there is no man here dare say I ever shirked my duty along the line of institute work or ran away from institute work when I was needed, and I am working for the best interest of that farmers' institute work; but if you are going to hold me out late on Saturday night, away from civilization and good hotels, you are going to be badly disappointed about four or five o'clock if there is a livery team anywhere near to get me out, because I am going to get those hotel accommodations and look

after the business because Sunday is mine. It belongs to me and if you want to hold me and have me to work on Sunday I want you to pay me, and when you pay me I want double pay just as they do in many other instances where they require a man to work on Sunday. I hope I have made myself understood. (Applause).

MR. BOND: I just want to say that I have never been affected with fear of accommodations or sickness. If I was I would carry my medicine chest along or quit the business.

MR. WOODWARD: I have a very warm and sincere sympathy with the criticism that Mr. Peachey has made. I believe he is absolutely right. It has been a long time since I have been on the institute roster. I concluded that the audiences of Pennsylvania had enough of me and I dropped out. Since then I have not given it attention except in my own county and I appreciate very much what he said. I had the same experience when I was in the work and I appreciate it so much that in my annual conventions I take pains to avoid the conditions that he objects to in my own county. There are two methods by which it can be avoided. I have practiced them both at some places and at other times separately. The speakers need relief. It is a hard burden upon their physical constitution, six days and six nights in the work and they do work six nights, and the average institute workers, the better ones of them at least, make an average of fourteen or fifteen speeches a week. They are worn and weary and they need comfortable places where they can get a bath and hot and cold water and a warm room to sleep and retire, a warm room to write home and bring up reports. I do not critcize the Department for making the program out, but sometimes I think it would have been better if it could have been placed otherwise, but I am not acquainted with the conditions that the Department has to contend with. I may name the places four our own county and the Department takes up sixty-seven counties divided into sections and in establishing the itinerary for each section has to make an economic use of the funds as can be and I have no criticisms of that. But when I find that the speakers are to be in my county in places that are out of the way and where inconvenient or impractical for them to spend the Sabbath, where there are no good hotel accommodations—you may say yes but there are farmers will take them in and treat them to the best they have and as one of family, but he is not at home, not at liberty. He wants to go to the best hotel where he can write and rest and be comfortable. I know from a long experience. I provide for it by arranging to have three sessions on Friday and two on Saturday, eliminating the Saturday night meeting entirely in order to give them a chance to get away if I can or if necessary, I arrange that the State speakers be relieved from the Saturday night meeting and that the local speakers take up the work. One of them may be compelled to remain, but I take every means in my power to relieve them of what I know from personal experience of long years absolutely unfits them to do justice to institute work. It is hard work and no man can be expected to work six days and travel the seventh and be fit to go in for another week. And I say, without reference to the Department, that it lies in the hands of the county institute managers to relieve them to a large degree. I have not succeeded in doing

away with the Saturday night session entirely in my county but I have succeeded in relieving them in that way in my county so that there is no complaints at all.

DEPUTY SECRETARY MARTIN: Just for a moment. I have learned that a gentleman very largely interested in good roads is present and can only be here for a few moment, Dr. McCaskey. The audience will listen to him for the few moments in reference to some things he has to say on this subject. You know we just passed a resolution this forenoon and unanimously referred it to the Legislature regarding good roads; and Dr. McCaskey can only be present for a few moments and we will suspend this discussion for that length of time in order that we may be favored with the remarks of Dr. McCaskey.

DR. McCASKEY: Mr. Chairman and Gentlemen of this Institute: This road question seems to me to be almost as important as the various ways we try to figure out raising cattle and avoiding disease in our crops, because if you don't have a good way to get your stuff to where you can sell it, why the expense of transporting our products is going to eat up a good bit of the extra profit you make by knowing how to grow and improve our stock. When I was asked to come here to-day I felt that I did not have any particular message to give, because you men know as well as I what we are up against on this road proposition. The thing is, how are we going to better it? That is the point we have to decide. Now there are several ways and the first and most important way is for each one of us in our own sphere to ask ourselves what we can do where we live, in our own circle, our own Senate. That is what I did. I am a country physician. I am not a road maker by scientific study. I simply am a practical road supervisor, because I asked myself that question: "What can I do in my own county, on my roads in my township, under the antagonism of my section? And here is how I got into it. There is a road called the Witmer Road one and one half miles long, made of earth, just ordinary glue when the frost is coming out of the ground. My practice called me over that road five or six times a day. I drove it both by horses and auto. All efforts to get that road improved were of no avail. The road was like this: Hollow in the middle, high on the sides, full of deep sink holes. Sometimes you would sink half ways down to the axle. There were rough rocks sticking in the road and no efforts made to drain it. After every storm the water lay there for a week or ten days. I asked my supervisors nicely and as politely as I could to fix it. I said: "Gentlemen, I am up against this proposition. I want you to do something. Won't you please?" Well all I got: "We will do something later on; we have no money now." All right. I waited and waited and got back at them again. Nothing doing. So I got tired. I said, "Well, will you give me permission to repair this road, if you cannot?" I got the permission of two of the supervisors out of the three composing the board of supervisors. Well, I got a drag from the Lancaster Automobile Club, by the way, they furnished drags for nothing to anybody that would use them. I got a drag and started to drag this road to improve it. I did not know much about the principles of dragging and the first time that I dragged it, it was soft and that night it froze and made it a little rough for a day or two, but

after the frost gradually came out I kept at it and dragged that road for several months and finally got it in such shape it was passable and respectable and it was a good road. I paid the bill myself. It did not amount to more than a few dollars. The supervisors then had a roadmaster and he did not like this. It was in his territory and he felt the reflection. It struck him that nobody should take some of his responsible from him and make improvement. If that man would only have been too glad not to bother about it. He didn't, so I did. They waited on me and said: "Doctor, you got to cut this out. You are damaging the road." Well, they could not show where I had damaged the road and, as I had the official consent of two members of the Board of Supervisors, I said: "Gentlemen, this road has got to be fixed and I got your consent and I am going to go ahead and fix it. It is up to me." I put it up to them and went ahead and dragged the road and got in it good shape and by the middle of May, just about this time, the Supervisors came to Lancaster and they swore out a warrant. They had an injunction served on me for injuring the road and they had that injunction served by the local constable and stopped me from my right which I used and which was improving their own township property. Well, of course, after the injunction I cut it out but the road was fixed, at least passable. But I wanted to know why these men had secured this injunction, just like any of you men, if they would come to your door and say you can't do it. You want them to show you. So I brought these supervisors right into this court room. The witness box is right here, and I made them tell the court why the injunction should not be dissolved. They had their witnesses and I had mine. I had the farmers that lived along the road for thirty years, and we had pictures of the road before anything was done to it and after I had used the drag on it. We showed these photographs to the court. We had men testify that knew the road before and after; took the testimony down by means of the court stenographer and the court reserved decision for a period of a month or two and then they made a decree to the effect that the wrong legal procedure had been taken and so of course the thing fell at once. But I used what the court stenographer had written down and published it, what these men said. I printed that and distributed it all over the township so that the farmers could ascertain the truth, just what was said by the road officials and the farmers who used the road and by myself who fixed the road, and the outcome, gentlemen, was very clear. Just like it would be in your own county. Where everybody knows the truth and the facts there is a general verdict. I ran for supervisor and I was elected and that is how I happen to be in the road business. This is what confronts all of us whether road officials or not. It is what each one of us can do in our own way. If you have a bad hole in front of your house or gate and cannot get it fixed why go out and fix it yourself. See your supervisors first, consult with them, see if they won't help you, see if they won't permit you to help them out and, rather than wait, after you have gotten power, go out and fix it yourself. There are lots and lots of ways to help in this road proposition. The ladies that go to church with their husbands, the children that go to school, the farmers that have to haul their lumber and oats and wheat have to use these roads. When you strike a bad place don't only say it ought

to be fixed. Take out a piece of paper and pencil and write down just where that bad hole is and submit it to the road officials and tell them that this thing has been under your observation and that you would like it fixed and see what they are going to do about it. If they say they will do it when they can, that is not the thing. You want to find out what day the repairs will be made and make it your business to be there on that day and if nobody shows us, find out why they don't show up. This may be a rather strenuous policy, but it is the only way I find you get your road improvements. And gentlemen just remember this, that this road proposition depends on us a great deal more than it depends on the Legislature. For example: Mr. Jones, of Susquehanna county, introduced the Jones dirt road bill. He asked three million dollars appropriation for the use of each of our townships so that we could get fifty cents on the dollar for every township that had a cash tax. What happens? Why the Jones bill got knocked in the head and it is almost down and out. And it came out of conference last night there was five hundred thousand dollars to be awarded to the Jones bill for two years, two hundred and fifty thousand dollars a year for this great State with 4,500 townships. Why, look at it.

I am sure, members of this Institute, that this is a pleasure and I trust that you will not forget that it is just as important to have the transportation roads between the places you grow your stuff and sell it, that it is just as important to have these roads improved, and you have a part to play in it, as you know how to sell your stuff at a profit or how to grow it successfully. (Applause).

MR. RANDALL: This is my first attendance on an institute of this kind and I am very grateful that the good Director had fixed the institute in the place he had because as I came down over the hills in my own county and came down to Lancaster county with her vine-clad hills and beautiful valleys and noticed her beautiful farms and came down into her city and got acquainted with her people. I found that she was rich not only in agricultural lines, rich not only in the beauty of her country, but rich in her proverbial hospitality that makes it a pleasure for people to come and have people to meet.

So I say that in coming here to-day I have no criticism to make upon the way institutes have been conducted. I agree with the gentlemen that has spoken about the bad and hard times they have, because they can testify, if they wanted to, that have been in my county or traveled over the hills on Sabbath day twenty to twenty-five miles. I appreciate that, and sympathize with them on that question because I don't believe in working on the Sabbath day, and I don't believe that men ought to be compelled to work on the Sabbath day, and I deplore the necessity of having an institute on Saturday night at a place twenty-five miles out; but when we have it at home we have the court house and then I prefer to have the meeting on some other night because people do not want to come in on Saturday night. I think it is better and I think it is necessary for the lecturers that they should have time to rest and to write and to go to church on Sabbath day instead of riding over the hills. Now the Director has done good work in fixing the institutes. He has sent lecturers both ladies and gentlemen, and they have done excellent work and cannot be criticized for the work done, because the work shows it self and that is proof. Our far-

mers,—of course, we are living in a small county. Our farmers have cleared up their farms and are farming scientifically since the farmers' institutes started and put a little money in the bank besides.

Now I want to tell you that I was going to ask the Director to give us a little more, but when I came to Harrisburg I was knocked out because the appropriation was going to be cut down and we would get less than we get now. What a wonderful thing that would be! To curtail the business of the farmers of this State, to cut down the appropriations that are used to teach the farmers that which they want to know and what they must know if they succeed in arriving at the top of the ladder. I heard last night a lecture on "What is the matter with the Pennsylvania Farmers." I say one thing wrong in Pennsylvania in my estimation is that they don't stand shoulder to shoulder and say to their Legislature we want our share of the money appropriated in this State and we want it put to the greatest advantage and best advantage that it can be put, the agricultural interests of Pennsylvania. Everyone knows it is a great interest. Why we boast in our county of our oil and gas and down here you have your iron and coal, but there is none of them compare with the lessons in agriculture, but still they go into the Legislature and get by some plans or other larger appropriations for most anything along these lines while the farmers get small amounts appropriated to agriculture. Can that be remedied? Yes, it can be remedied by standing shoulder to shoulder, by doing just as they do; give them to understand we have to have that and are going to get it. Just yesterday they appropriated and opened up a way where they can spend ten million dollars to extend the Capitol by appropriating $250,000 now. Yes, it is a good bit, and I want to tell you that men passing over the afternoon of life will never live to see the end of it. That ten or fifteen million dollars will be spent of the State's money to carry that out and if there is no more money for agriculture they will spend that. I say that ought to be broken up.

Another thing, there are some appropriations ought to be made to go to the counties to reduce the local taxation which we know bothers us more than anything else. Now the Legislature in its wisdom thought that we should not have the right to vote upon the question or should not submit the question of local option. They say you cannot have the privilege of voting upon it. Now sir I say if they are to fasten that upon us, if they are bound to give the saloon, these primary schools of the devil, full sway, that we should have the money derived from them to be devoted to agricultural interests in the State of Pennsylvania; every dollar of it. Now if we put our shoulders to the wheel, I tell you if we pull together they will listen to you. I have been there myself. I am a Missouri man that is, you think I am. We can fetch it as sure as we are here to day by working together and in the right direction and make them appropriate enough money for agricultural purposes. We can appreciate and increase the benefits by experiment stations and State College and Farmers Institutes, sending out bulletins and putting the information into use and there should be enough money appropriated and sent to carry out all of these things and I say we can do it.

Now one thing more. I want to make a suggestion. I have no criticism to make of the county institutes. They are doing noble

work. But it occurred to me, Mr. Chairman, that the itinerary of the speakers should be arranged, could be so arranged throughout the State so that they would have their Sabbath rest and let them come back to the Normal Institute the following year and let the leaders make a report, written or oral and have it printed in the proceedings of this convention and have them let the people see what progress has been made in the counties and wherever there is anything necessary to be remedied let them state it and if it hits us poor county chairmen all right, we will stand it. If that could be done and the itinerary so arranged that these good men that come around and assist us and do such good work could make a report to this convention and have it printed, then we could tell how we were progressing. Because we must progress. We cannot stand still. We must, as the gentleman said last night, go to the top of the ladder. We must go on and if that would do it I only make the suggestion for your consideration, and if that can be done it seems to me there will be a little more knowledge of the facts as to whether we are progressing or not.

MR. LIGHTY: Ladies and Gentlemen; I want first of all to make a plea for our county chairmen. Perhaps it was said before but it will bear repetition. I want to say that I would like anyone to go through the State of Pennsylvania and try to find a better, a nobler and a more honorable body of men than the men who have charge locally of the farmers' institutes in the counties of the State of Pennsylvania. They have treated me royally from one end of the State to the other. Brother Herr says that I have never been in his county. I know that the brother is a cantankerous fellow and I have kept out of it.

I want to make the plea that Brother Peachey made. I think there should be a clear understanding about that matter. I want to say to you, my friends, that I don't believe up to this time I ever found a man who could do seven days work in a week and continue it more than about two weeks until he was out of commission so he was unable to do real good work. I made it a rule for the past two years not to do any labor on the Sabbath day, particularly when I was in the institute work, and I want to tell you, my friends, that the county chairmen, not only one of them—I look at one just now, Brother Glover, went out of his way quite a distance to get some men to come and take charge of the Saturday afternoon and evening sessions to let the State lecturers get out and get a little rest, and every county chairman made strenuous effort to do this because before I started out in the work last fall I just kindly requested that they make arrangements so that the State lecturers could have the Sabbath rest. I believe that we should try to give the greatest good to the largest numbers. I believe, my friends, that there are places in the State of Pennsylvania where it is necessary to hold Saturday evening sessions. I believe that you have got to get the people out to do the missionary work and that you have got to hold a Saturday evening session and there is lots of territory in Pennsylvania where there is missionary work needed and we cannot do the missionary work unless we get the people out so that we can talk to them face to face, and Saturday evening is the only evening we can get them out. In the older places where I have been and where they are more up-to-date there is no

trouble at all to get them out any day in the week or any time, but I believe there are places where we should hold the Saturday evening session and under these conditions I am still willing to do a little work if it must be, for the good of the cause, on Saturday night. But I want every county chairman to use every influence in his power to eliminate that Saturday evening session and to do it, please, so that the lecturers can find a place that will correspond with the description that Colonel Woodward gave a few minutes ago. When I am at my own home, when I do a good day's work, I usually take a hot bath in the evening before I try to rest. If I go out into some parts of the State of Pennsylvania I do not find in that hotel even that one bath room that Dr. Hunt spoke about that they had over there at the hotel in Germany. Don't find even the one, so I have to wait until Saturday night and I tell you I go pretty soon for the bath on Saturday night and if I cannot have that bath on Saturday night I cannot keep the Sabbath day holy.

MR. BLYHOLDER: We have heard considerable about the Saturday evening meeting now and I think it is a matter that resolves itself entirely into the hands of the county managers. I do not believe that it would be wise for us to pass a resolution here to eliminate the Saturday evening meetings. As the last speaker has said, there are localities and places where I think it is just as necessary to hold the Saturday evening meeting as there is in any place, but I do think that if the county chairmen use the proper discretion and judgment that they can provide and so arrange the meetings in their counties so that these men will have comfortable places to rest after the Saturday meeting, over the following Sunday, without violating the Sabbath so very much if they don't want to. Now I have done this on one or two occasions: I conferred by writing to our Director of the meetings. I found that as the dates were set in the book I would be compelled to travel a greater distance and have my men out in the county on a Saturday evening where we could not secure that entertainment and bath that they deserved, so with his permission just changed the dates of meetings and therefore found places so that they could rest over the Sabbath day and go to church, too. I hope they did. I always advised them to do so. So that I think it is a matter that we ought to refer, and I am glad this discussion came up and I am sure every county chairman here will take this home with them and arrange accordingly; so I would not have the managers adopt any strong rule on this matter not to have a Saturday evening meeting because there are localities where we can reach the people on Saturday evening where we could not reach them at other times.

There are other things to talk about. It is all well and good to instruct the farmers in the matter of producing more and making two blades of grass grow where but one grew before, but it is just as important to instruct him in other matters affecting his welfare, and one of the live questions that I think he should be instructed in is on the taxation question, to show the people of the State just exactly where the farmers of the State stand in the matter of taxation, and I want to say before this institute that this is one of the live questions for us and for the instructors and lecturers to show to the farmers just exactly what position they occupy on the taxation question and I think

it is something that will wake up the farmers and the farmers' institutes if they stand up and speak on that question and it may be so that we will have equal taxation on all classes of property in Pennsylvania. Many of them will stand up and make that assertion; so that I hope in the future that question will be taken up by the instructors and that they will study the question and find out exactly what taxation is placed on each class of property in this State.

Then the school question ought to be discussed more. I think there are vital changes that ought to be made in our country schools and by discussing matters in farmers' institutes we can arrive at some conclusion and the farmers will be benefited. So I would say that is another of the questions that ought to be taught.

Another thing that ought to be taught—I hesitate not to make the assertion right here although my good brother right in my rear stands at the head of one of the greatest farmers' organization in this section—I want to say that the farmers' institute lecturers ought to teach the farmers to stand together when they go into this organization or that organization or whatever, and show the power of organization and what can be done if the farmers stand together, which we had a lesson of on Monday afternoon. So that I say that is another question that ought to be talked up in the institute, the power of organization and the power of standing together and why that power is necessary.

These are a few things that on the spur of the moment occur to my mind that ought to be taught in these farmers' institutes.

MR. BARNITZ: Mr. Chairman and Gentlemen: While these gentlemen were speaking I was trying to find out how much religion I had left after travelling around on Sunday. It was particularly hard on the preachers and our corps of lecturers had two preachers in it and it was a little bit new to us but we were somewhat relieved in the matter. The chairmen had heard that there were preachers in the crowd so that the congregations very kindly arranged for us to preach in the towns where we stayed Sundays. Now I did a great deal of thinking while Mr. Peachey was talking and I want to say that I know that it was all conscience for I remember out at Tioga when I was sick in bed on Sunday that he and Mr. Fassett pulled me out of bed and made me go to church, and the next Sunday Mr. Peachey happened to be sick and I pulled him out of bed and made him go to church, and that second Sunday though we fellows had to travel that day. There were three of us. We attended three church services and I had the pleasure of preaching once. When I went home the people wanted to know what sort of fellows I had travelled with. I said, good men. What did you do on Sabbath? I said, last Sabbath we went to church three times; we heard three different preachers. And I want to say that I am proud to hear such a discussion here, for I want to say it sort of stretches a fellow's conscience away out until there is not very much temper left in it when he has travelled here and there on Sabbath day, and especially a preacher who was in charge of a church at home and had another minister filling his pulpit. I wish that could be in some way arranged. It is a very difficult question to decide, but it ought to be for our comfort and for our conscience. Isn't that true?

I was thinking of the county chairmen at the institutes I attended and how nicely they treated us fellows. I suggested to some county chairmen the unnecessary questions that were handed in that killed so much time, and I want to advocate here this afternoon the written questions. I don't know how you feel about that but I find that there is lots more hot air in the written question than the question than the question that a man thinks over before he sends it in. There is a whole lot of unnecessary questions. I remember one lecturer was kept on his feet an hour and a half. Seeds here—is that so? Lots of questions that he had answered in his talk and questions that would not have been asked if they had been handed in to the Chairman, and then the Chairman had a conscience and left out the foolish questions. Now a preacher on a lecture corps in a certain sense is in an unenviable position. You ought to have seen. We were consulted about all sorts of questions. One lady wanted to know why it was that there were two preachers on that lecture corps and they didn't open the exercises with prayer. I felt like saying: "My good sister, come right back here if you need prayer so bad and I will pray for you." That was a question that came up many times, the question of prayer, and I had the privilege of solving it pretty often for when the regular preacher was not there the preacher on the lecture corps was put into service. You have been reading about these trials for heresy. I want to say here that I do not believe it is necessary to open farmers' institutes with prayer. You may have your opinions of that but I have mine. It is a matter of business. I advocate that the people ought to do their praying before they get there and back their prayer with their hustling for the farmers' institute. Just as in a church that I took charge of not long ago. I walked down and I said, "Now we will take the offering," and when the plates were returned they stopped for me to offer prayer over the collection and I didn't offer it. I said, "My friends, we won't have a prayer over the collections." I said, "It would not matter how eloquently nor how long I offered prayer, it would not make that collection any larger and it would not go any farther and what is more, if there are any here who have not given to their ability it would not excuse their conscience." I had to leave out some of the questions that came in, and we all laughed, and I believe in a good hearty laugh and good jokes in our talks. As I say, the preacher is in a somewhat unenviable position. He is advertised too much. Why everytime I got up to talk on chickens the chairman would say, "Now this man knows all about chickens. He is a preacher and he is full of chicken." Well, you ought to see the questions. Here was a lady sent a question up to me saying: "I have just had a proposal of marriage and it came from a man who is not a Christian. Would you advise a woman who is a Christian to marry a man who is not a Christian?" I saw the preacher sitting over in the other corner. I said: "I am running a chicken ranch. I will refer it to this preacher over here;" and I walked over and he got scared and he said he hesitated. I said: "I guess I will have to answer this." I told that lady she had better marry him quick for it might be her last chance.

I want to emphasize what this brother said about Sunday. We are away off from our homes and the comforts of our homes in most

places, and what is more we want to go to services and have the rest so that we can enjoy the church services and do our duty as Christians as well as lecturers.

MR. KERRICK: I have no fault to find under the present direction of our county institute management. I do not know but Brother Peachey might be insinuating on me; still I am not positive. I want to say for Brother Peachey and my friend Cornman and Preacher Cox, they did very efficient work in Bradford county.

It seems to me that we have been far from the question this afternoon, how are we to benefit or better the institute? I am not prepared to say. I think, as has been stated by my friends over on the right, that what we want is to stand together shoulder to shoulder and let the people in the State know that the farmers mean to stand by their organization. When the members of the agricultural societies and members of the State Board, the Grange, the Farmers Alliance, all acting together, come down to the Capitol of this great Commonwealth united, shoulder to shoulder, the members of that Legislature will understand that we mean business. We are coming to that, I think, ladies and gentlemen, and I want to congratulate my friend, Brother Martin, for the success that he has made out of this agricultural society. We had the honor of having him with us in Bradford county and the people remember the lecturer and the Director with a great deal of respect. I assure you, ladies and gentlemen, that the work in Bradford county has resulted for good and I am asked from different parts of my county for more institutes, showing that we need more money in the great Commonwealth of Pennsylvania to run these institutes so that we can get to the people. Now, gentlemen, let us get down a little closer to the question. I would like to hear from some of these older members. I don't know how we might better conditions. The thing to do is to get direct to the farmer and get him up to the institute, get him interested in the discussions, in the rations that we feed to the cow and how to produce more corn, more wheat, and so forth. That is what we want to try to do and in managing that matter, if we work it right, we can get them all interested.

As far as Brother Peachey's Saturday evening matter is concerned, I think if he had a good helpmate that there would be no trouble about Saturday evening. Ladies and gentlemen, I thank you.

PROF. MENGES: Mr. Chairman, I don't think that we have discussed the subject this afternoon but a number of things have come up here that I think we ought to bring to a point. The first thing is the Saturday evening session. I don't think that any of the institute managers want to eliminate the Saturday evening session. I know I don't. I would be mighty glad to get rid of it. That is all right. But if it is for the good of the cause I am willing to sacrifice a whole lot for the cause. That is my idea about it. Now then here is one thing that I have been thinking about it:—Mr. Blyholder brought out the idea--That very often we are away out there somewhere in the corner of the county; no railroad; no hotel; and the only possible way of getting out of that place is to drive away on Sunday. I have travelled last winter—one time we drove 24 miles on Sunday morning. I don't

know exactly who to blame. If I knew I would say a little more. I don't know exactly who to blame. I had a notion that if the managers of the institutes and the county chairmen would get together—I better put that this way: if the managers of the county institutes of the sections, if they would get together and start the itinerary at one end of the county and from that county to the next county and in that way have it so arranged that when Saturday night comes these men can be in a place where there are hotels or railroad facilities to get away to hotels, I believe that could be arranged; if the chairmen of the counties of the sections would get together with the manager of the institutes and simply mark out an intinerary from the beginning of the institute to the end of them, that they could manipulate it in such a way that all these difficulties that Mr. Peachey is finding fault with, and that I sometimes growl about, and Mr. Lighty don't like, and the rest of the fellows walk away from when we want to stay, I say I believe that that thing could be arranged and managed so these difficulties could be done away with. I am not ready to offer a resolution but I believe the chairmen of the various sections in the State ought to get together with the county chairmen and make out the itinerary from one end to the other so that we can be put to that place where there is comfort and the possibility to get away if we want to.

The CHAIRMAN: We will have to limit each and every speaker to five minutes.

Mr. Shuey made one reference here that I would like to answer if I may be permitted. I am one of the men that is here to say, and I have said it before at these meetings, I don't want any county chairman to serve without pay. If any men in the State of Pennsylvania deserve pay for the services they do and the services that are telling, it is the county chairmen of the farmers' institutes of the State, and I say they deserve pay.

MR. JOEL A. HERR: Mr. Chairman, I am sorry to say what I have to say. I believe the object of the meeting was to talk about or have a conference on the farmers' institutes, the better manner of conducting them and how to make the best institute; but we have drifted about and have been talking about the subject of Sunday work and the hardships we have to endure and these very fellows are tumbling all over each other to get on the institute force. I don't know whether that is correct or not. I want to say we ought to come down to the subject, how best to conduct an institute and get success; the impressions we leave on the people is what we want to know and instructions in the management of our county institutes. I am not going to make a long speech. We want to impress the people with the importance of our calling. That is the first and foremost thought that ought to be brought out before the farmers' institute, to teach the farmer to respect himself and his business, and if we don't do that nobody else will respect us. This is the first and most important point to make. In order to do that we must speak respectfully of our calling; we must show how to make it more agreeable, how more convenient, how to better our home conditions and circumstances of our assistants and make it more desirable to keep the boys and girls on the farm and to make farming the great business it ought to be. We ought to learn to co-

operate with each other and to help each other; and all these things could be brought about by the farmers' institutes. There is a great scope of work for the farmers' institutes to do, and the question narrows itself down to each community, what shall we do that will result in the greatest good for our community.

I have nothing to say about the care of the farmers' institute speakers. They are well enough cared for. There are instances in which they suffer. I know that I have endured with them and I never was much the worse of the circumstances. If I accept the work I must accept it under the circumstances it comes, and I have always tried to manage to excuse the speakers when it was necessary that they should go home and to use our local talent. Another thing, is to get the people interested, get them to take to the work, and to ask questions, and let the institute lecturers set the conditions before them and instead of talking merely to be heard, talk to say something and tell the people something they ought to know.

MR. WILSON: Mr. Chairman, I think about the Saturday evening meeting, that could be avoided by the county chairman himself. He has three or four days of institute, owing to the size of the county. I was saying this, that the county chairman alone could arrange for the avoidance of any trouble on Saturday evening. He has the number of days for his institute and he can arrange it. If he has a place where there is no good hotel accommodations, let that place come first in the week and then wind up where he has better hotel accomodations and where the man does not have any travelling over Sunday.

Now one of the questions which I think is before us to-day is, how to better our institutes. That one we should have spent this afternoon on. I think the best way to get interest in the institute is for the institute manager and his friends to talk up that institute. You cannot go out for a week or a month, but talk everytime that you get an opportunity; talk to the neighboring farmer, say something about farmers' institutes, tell him what a good thing it is and ask him to come out the next time to the institute; tell what you try to each them, that they are doing things; have everybody and anybody come to that institute in your neighborhood. You cannot take a week to talk about the institute and get interest created, but you can take time to do it. Just as talking about the county fair. You would not expect to prepare for the fair a week or two before. I have been a director of the county fair for many years. We commence months before and talk it up to everybody we meet. And it is the same way we should do with the county institute. Why, take the preachers; they tell their audience what subject they are going to preach on the next Sunday and sometimes they announce a series of sermons away ahead and to-day they are advertising their subjects in the papers away ahead, and in that way they create an interest and get the people talking about it; and you will find the best way to get up interest is to talk to everybody you meet about the farmers' institute.

MR. SCHULTZ: I don't want to take up much of your time. I haven't anything on your subject, but I am interested in the talk the doctor gave us on roads. I believe the success of the farmer brings

up with it the question that he eventually must make the mud roads in his neighborhood. I tell you what I did at my farm. We have a road running through it and half of the farm lies on each side of the road. Everytime it rains we have a split log drag and my men hitch on to the drag and drag that road and that road is in perfect order and keeps in perfect order if you follow it up. You want to have the comb so the water goes into the ditches instead of standing on the road. Let the farmer understand that he is responsible for the road passing his property. The sooner we can do that the better for us all. We must make the road or pay for it and if we make it ourselves we know it is right. If the farmer knows it is in poor condition it is a reflection on his farm, and eventually we have all our roads made, all the mud roads. We can never get away from the mud roads. The stone roads should be made by the State. This is one of the ways to do it, and I think if we would try to do that, that would be a great relief on this road question.

MR. HULL: There has been considerable said this afternoon as to what should be done to interest the farmer. The time has never been within the history of business in this country, the time has never been within the history of everything in this country, when the farmers have been more interested in their calling than they are at the present time. Now I am not willing to give any one department full credit for bringing this about. The Department of Agriculture has done its part without discredit, but the agricultural press has also done its part, and the agricultural colleges and the editorials in our metropolitan farm press. I am impressed more and more with the growth and progress made in the science of farming. Our experiment stations are doing their work and, all in all, I think that the time has never been that the farmers were more generally interested in their calling than they are now. Only a few years ago there was a call made at one of our round-ups by counties so as to know what the effect had been in the trial of raising alfalfa. In very few counties had there been any success. To-day, through the impetus given by our college here, the Department of Agriculture here, the metropolitan press, we are succeeding in all the counties in raising alfalfa, and it is a farm crop that we cannot do without. The spraying of fruit trees and the spraying for potato scab and fungus growth in the different plants have received great impetus. The farmers have got the information necessary to combat these and they are doing it, and the time is coming and near at hand when we will not only be benefitted by the instruction at farmers' institutes, through the press and bulletins, but a better knowledge of the insect foes will be brought about and the means brought about as to how to combat them, for we are going to raise better, fairer fruit than we have been, so that it has been a blessing in disguise. Now I feel that the Department has done its part, that the press has done its part, and that our State College is doing its part, but one thing I want to say right here, that with all the letters that I have received to use what little influence I have in bringing about experiment stations over the State and for my influence over our representatives to have an appropriation for these different branches, I want to say that I am in favor of one central place. I want that the State Farm, and I want that supported so that it will be a credit to the State, and I want it so well supported that

it cannot be discounted by these experiment stations which are springing up, which will grow year by year, becoming top heavy year by year, and require greater amounts of money to be appropriated for their support. Let there be one and that one well supported.

DR. CONARD: It seems to me that we as county chairmen could do very much to assist the Director in arranging the schedule or program for we are all acquainted with the lines of travel in our counties. We have gone over the most of the county and then we know what railroad stations in the county will run us nearest and the best line of travel and best hotels, and if we would, in making our suggestions for the places for the institutes put them in the order that would suggest the line of travel and say that it would be very convenient to travel to those places in the order given, or something of that kind, it would give the Director a little information that we have at hand,—because we live there,—that he would have to look up and it might help the thing along.

I want to talk about the movable schools. The movable schools seem to have led up to a better and more thorough discussion and consideration of the few topics than the institutes. There has been three topics assigned to each movable school, namely dairying, horticulture and poultry husbandry. Those are the three subjects assigned for discussion. The schools consist of four days and evening sessions, allowing two days for dairying. Now, in order to consider dairying thoroughly in two days why you want to take it up in certain order. You want to take up a certain feature first, another second and another third, and so on, and there is nobody knows better how to do that than the ones who are going to teach it. The ones who are going to give that instruction can tell better how they can do it best than any other ones. It will not do in getting up the program for the movable schools to make it exactly like an institute program. The county chairmen will get them out of order, not because they want to oppose the system adopted by the experts but simply because they do not fully realize the difference between the movable schools and the farmers' institutes. Now, I have some topics that are not dairy topics at all and it has so happened that questions were taken up not on the lines of dairying, taking the mind entirely away from the subject under discussion and instead of having a dairy session it was absolutely a miscellaneous session. These programs are printed in advance of our arrival and they are distributed very generally. Nearly always the county chairmen have taken an interest and these programs are distributed out amongst the farmers and they come at certain times expecting to hear certain things and they go away disappointed because we have to tear these programs to pieces. We cannot help it. We have to do it in order to fulfill the logical mission of the movable schools. So they are very generally and very frequently torn to pieces, more or less. I think the county chairmen should consult a little with the Director as to how these programs had best be made. I want to make this suggestion: That in preparing these programs we set certain days for certain subjects exclusively. That is, if we have four days session, give the first and second days exclusively to dairying and the third day say to horticulture exclusively and the fourth day to poultry husbandry exclusively. Now that seems to be a better and more con-

venient way to present these subjects, and have no other questions injected into the dairy sessions but dairying and the same with the other two subjects. I make this suggestion that the county chairmen confer with the Director and get the necessary information and get the programs more in conformity with the object of the movable schools, that we may spend more time on one subject, going further into detail and getting more out of it.

MR. T. J. PHILLIPS: I do not know whether it is hardly worth while for two Chester county men to succeed each other. I suppose Secretary Martin and myself are the only two men possibly in this room who can speak of the institutes from the beginning to the present time. We were both Members of the House and Members of the Agriculture Committee when the bill creating this department became a law. You remember that in the beginning we imported our institute men from other states, Ohio, New York and so forth. There were no men in Pennsylvania thought fit for the work. In a year or two men in this State were equipped for the work. How well they have done it I leave to you to judge, and I speak freely because I have been interested from the beginning until a comparatively recent time. I think I am capable at least of judging what has been done, what has been accomplished. I was prompted to take this thought because of the meeting day before yesterday at Harrisburg to get those city men who control these commitees to give us the funds we need. If they would know of the good work and of the profit in dollars and cents that has been accomplished through this department I am sure they would never hesitate before making that appropriation. We were told this morning that the poultry industry in Pennsylvania amounted to over $20,000,000 in eggs alone, and while I am no poultryman, still I was a dairyman and know more about that end of it. I have not the figures but I honestly believe if it was possible to gather them that $20,000,000 represents an increase of egg production due to the farmers' institutes far greater than any annual appropriation; so that in just that one line of increase in the chicken industry the farmer is entitled to that apropriation.

But that was not the line of thought I wanted to speak about. I speak freely on the subject because in a sense I have graduated from the institute work, but I have been over the country and I find that it has spread abroad in this State a great influence. They have had a great influence. As one of our friends on the other side of the platform said, possibly no greater influence has been exerted than that of elevating the farmer and his calling. He did not consider himself a business man. He was not a professional or even a good business man. To-day he ranks among the first in the land and to be a successful farmer he must be a good business man and he is so looked upon by the youth. Only within the last year a young man came to our town as principal of our high school. He came from another county, an entire stranger to me and after he was there for awhile I learned that as a boy he had heard me discuss a problem in a German county town at noon one day during an intermission in the session of the institute and he said that here was a farmer who could stand upon his feet and talk intelligently. It was an inspiration to him and he determined then and there that he would secure an education and that he would

be able to talk and express his thoughts, stand upon his feet and express his thoughts as that farmer did. And so this shows that you are unconsciously doing a great work in this State, that you know not the good of and no man will ever know and it behooves you to be careful as to what you say and what you do and the manner in which you deport yourselves.

I believe that one of the greatest works of the farmers' institutes in this State has been the elevation of the farmer's wife. We have preached better country homes and from my own personal knowledge I know that the institutes have made thousands of better homes. We have had the farmer spend a little of his money for modern improvements in his home and to-day thousands of them have them because the institutes put the thought and desire in their minds to have them. We have done much to relieve the monotony of the woman's life upon the farm. I was going to say drudgery, but I believe if the institutes will continue along the lines of teaching the doctrine of better homes and elevation of the farm woman in making her labor lighter and getting her hours of rest and all that tends to elevate, the institute workers of the future will continue to do the good work that has been done in the past.

MR. A. P. YOUNG: As I represent one of the counties which has been endeavoring to hold movable schools I want to say that in my own county the movable school is superior to the farmers' institute in that it gives more time to discussion of questions that are taken up. They can be gone into more thoroughly than they can at the farmers' institute and consequently are an advantage. But as to the making up of the program for the movable school, we have never attempted that in our county. We have depended upon the symposium sent out by the Director of Institutes and the arrangement of the topics has been left entirely to the speakers. We had Dr. Conard in our county and Prof. Cooke there and they took up the dairy question, and they showed the handling of milk and all that kind of thing, and judging of cows, went to the cattle and looked over the cow while they explained the different points. Now our schools heretofore have been confined to the topics that were mentioned this afternoon, between three speakers. Now I think it would be well to vary that a little. Let us have the cereal question taken up and perhaps the raising of stock in the different departments, so that we are not confined, so that it does not become monotonous. To my mind the growth of the agricultural interests depends more upon the movable schools of agriculture than upon any other one thing. The institute has become rather lagging. It is no longer as interesting as it should be and the topics should be taken up and treated by men equipped to treat them and capable of treating them and treating them fully so that the people can come there and get ideas and they can go home and sleep over them and come back the next day and get questions answered that have come up in their minds as they thought the matter over. In these things the movable school is superior to the old farmers' institute.

MRS. ZEIGLER: I thought I would like to make a little plea for woman's work in this institute work. We are told to say what we thought would be for the betterment and the interest of institutes and I feel that woman has a great work to do along this line. Indeed it is

very necessary for the women to be helped and taught along their line of work and if the woman has got her share of help and encouragement she can make the satisfactory, solid home that that farmer needs for his rest and recreation when he comes in. I think it is just as necessary for the woman to have some help and encouragement because her work is necessarily more confining than the man's. He goes away from the farm and out to the stores and the town much oftener than the wife does. It is that that causes the humdrum of farm life; and so even if she is a reader she has no time to take along that line and, as I say, life becomes more of a drudgery unless she has help to see the beauty and sentiment of farm life. Now while I think farm life is the life to live I know a great many people think it is lonely, but I would not exchange the farm life and kitchen for the city life, and if we could get our farm men to see this and realize that their own homes would be happier, what a blessing that would be. And then we need to see that we have some help to care for these little lives that are entrusted to their care; this child life and child nature. Help them to teach them purity of thought and action. I see often that we have lost sight of the high sense of honor that our fathers and grandfathers had before us and it is because in this hurry day and age we do not give the right care and the training to our children that we should. We allow the cares and worries of the day to engross our best thoughts. That is all wrong and I know that women will come out to the institutes if they know that there is a woman speaker on the force. I have been at institutes where they came to me and said, this is the first time they had a woman speaker there and they hoped the Department would never give an institute without a woman speaker. And I think if the chairmen would ask to have one of their speakers a woman on the force and send out good earnest workers who have the interests of their sisters at heart that the institutes would be very much improved and bettered and the uplift of the farmer's home will be accomplished in a much shorter time. I know there are men talk along this line but not as many as they should have, and I think that the women who can sympathize with the women and that have gone through all that is required of the women on the farm, can reach the women's hearts much more readily than the men speakers can, and I think it is very necessary that they should be on the force.

Now I have been told that some of the men do not care to have ladies on the force with them. I don't know how true it is. I am sorry if it would be, and I think that any woman that goes into this work makes up her mind to adapt herself to circumstances and take things as they come and will not do any fussing or grumbling if they meet with any unpleasantness any more than the men. Of course, they will have to accustom themselves to be ready when the team is ready so that they do not keep any one waiting, and if the men feel so disposed to show them any little attention or help them along with their luggage the women will be grateful for it. If the women have luggage they feel that they are capable of taking care of their own. I think in that way the men will not object to women on the force, and I hope the day will come when there will be more ladies on the force.

MR. BRONG: Mr. Chairman, I hesitate at this time to introduce a new subject but the question that I will ask can be answered in a few words. The question is this: In our county—I suppose there are

others like it—we have more calls for regular institutes than we can supply; that is, we have calls for more places than we can locate the institutes at. There are certain of these places that have had institutes constantly, not every year but perhaps every other year or something like that, and others of these places that have, as far as I know, never had an institute located at them and therefore the atendance, we anticipate, would be rather light. In fact, last year we located an institute at such a place where there never was one before and our attendance was light. Now the question is this: Is it best to locate an institute where there never was one and where we anticipate a small attendance or to locate them where they have been and where we know we will have from three to four times the attendance?

The CHAIRMAN: In reply to that I would say if it is a good farming country and the farmers want to hold an institute there, give them a trial and if they make a failure the first year charge it up to them and don't go back. That is the way I have adjusted some of the troubles in my county.

I feel that I have got one of the counties of which I believe the Secretary is proud with regard to the attendance in each and every year, regardless of weather conditions. The farmers' institutes of York county have bettered the schools, bettered the homes, bettered the farmers and bettered the Christianity of our county. We have in the last two years been holding an institute in a hall adjoining a hotel and even on Saturday evening we have had good order and I am proud of the people, for during the institutes we have not been troubled with drunkenness and we have never been disturbed. Our hall opened right into the side room of the hotel and it was just as orderly as any church that I ever sat in in Pennsylvania and I believe that the farmers' institutes have done a great deal toward bringing about this betterment in our county. We advertise our institute meeting first and after we have selected the places, on the sheet which I send back to Mr. Martin I designate; for instance, if you are coming to our county on the eastern side such an institute should be held first and following on, coming down in regular order so as to make it convenient for the speakers, and in the last seven years I have always been able to locate the speakers on Saturday night in a place very acceptable to them.

DEPUTY SECRETARY MARTIN: I have been very much interested in this discussion. It gives me information that I cannot procure in any other way. Sometimes, you know, men when they get into the spirit of discussion will say things that they will not say in cooler moments and they are apt to tell the truth there. I was so much interested in that extended discussion about landing our splendid lecturers on Saturday evening out in some remote section of the State we would almost have supposed, had we not known Pennsylvania as well as we do and the hospitality that is so universal in the State amongst the farmers, that we had a lot of territory in Pennsylvania that compared with the wilderness. Now, my friends, just a word or two along this line. I think I am able to appreciate because I have travelled with these gentlemen in season and out of season, in storm and in calm, and I have experienced hardships and I know they exist.

Here is the section known as the First Section. I notice, and I have not time to go over the entire section, but just one or two places that the gentlemen stopped at over Sunday in this County of Lancaster. In the first section they started in at Quarryville two days, Lampeter two days and where do you think they stopped over Sunday? Why in Paradise.

A Member: They came to Lancaster every night from all the institutes over the splendid trolley system.

DEPUTY SECRETARY MARTIN: Who would you suppose would have left Paradise for Lancaster.

Now just a word, my friends. There are some things that are possible and some things that are impossible. The most county chairmen understand me with me that when the schedule of places is sent in I take up that schedule and under the act covering it I fix the line of travel to be the most direct and economical in the direction. It is quite an expensive thing, you understand. But when this is fixed if it does not meet the convenience and economy the county chairman fully and readily understands that he can transpose that schedule to the way that will be the most convenient to land these speakers in the most acceptable place to spend the Sabbath day. Sometimes this may not be fully consummated. We are talking about conditions. There are times where away out eight or ten miles in a splendid farming location in Pennsylvania, where the farmers there are the salt of the earth; they have no trolley lines; they have no permanently constructed roads; they have none of these conditions; but they have good farms; they are good farmers, and they are entitled to the very best we have got, if it comes on Saturday night, and occasionally we are landed right out there. I stand up here and affirm to these speakers that it is their duty to these farmers and to this Department to endure the hardships like good soldiers and give to the farmers out there the best that is in them. There is one thing these good farmers have to be excused for. You are the most sociable people in the world and when you get these men there and you entertain them and you know you have good company, and you only once a year have the opportunity to get some knowledge and you want to get it and sometimes you talk them to death. They will have to put up with that. I am going to talk pretty plain with these leaders of sections. I know it is a splendid thing and I appreciate it, to get a good warm bath once or twice and really I believe a man ought to have a bath once a month whether he needs it or not. But look here: I never went to a farmhouse in my life that they did not either have a good pump or spring of good flowing water and they had a wash basin and tub and a lot of towels and a lot of soap. Ask for the towel and you will have the soap, and rub yourself off until the blood courses through your veins and gives a vigor like it does to everybody on the farm. That is my view of this matter.

I stand here and pledge you that so far as we are concerned we stand ready and willing to fix the schedule of these lines of travel to the very greatest conveniences of these lecturers who are under heavy pressure. We know that and we say to you farmers that you on your part will study their highest comfort and convenience. I

know you do that. You have shown your appreciation of this great work in that way, but never yield the point that because your farm is ten miles from the railroad station that you are not entitled to the best that the State can give you in this case. It is not necessary to continue this discussion on this line further. There is just one question I shall dwell upon. I am not a stickler for the Saturday night session. I never have been. Gentlemen of the county, you have fullest charge of that matter. It is in your hands. If you believe the best instruction, the best interests of the institutes in your county will dispense with that session, act upon it but take a little care. Better study that matter over carefully. Do you know that sometimes it is not always just exactly the old farmer that may not go out on Saturday night. It may not be him; but his daughters and his sons, and some of the young people that will be on these farms a little later will be there and take up the home questions, educational questions and social questions and present them to these young people in the manner that will lighten up home and farm life. We are in this business for work, good effective work that will lift the standard of agriculture and hold it up before the world. Thank you.

MR. PEACHEY: I am not here to retract anything that I have said, but I am glad for this one thing if nothing more, and that is that I have gotten you stirred up to think with me along the line that concerns the farmers' institute lecturer, and I believe he has a perfect right in this meeting, as in all other meetings, to stand up for what he believes is right and if he don't care for that personal property no one else is going to and that personal property is himself. No reflections whatever. I only stated the case as I found it, honestly and conscientiously, and if good can grow out of this matter I am satisfied. I know it is the unpopular side, but I want to say to you this, that it has not always been the man on the popular side that was on the right side. There may be exceptions and, of course, we have the rule and you have the exceptions, but whenever the exceptions become more than the rule, greater than the rule, then the exceptions become the rule, and so I hope sometime you will agree with me and will do just like is being done in other states, that Saturday night is left to the speaker and he can either go home or go to the hotel and do the best thing he can, and goes to work again on Monday morning. I have talked with some men from other states and they say this: "Peachey, I am surprised that you people work all winter and are compelled to work Saturday night and travel on Sunday." And one man said this: "That is the only thing that is not a credit to your Pennsylvania institute work." Now I hope I am not reflecting upon any of my friends, and Brother Kerrick, I did not mean him any more than anybody else. I stopped twenty-nine days in Bradford county, that county of magnificent distances. They travel from Dan to Beersheba to get to the institute. I travelled twenty-seven miles—they claimed it was thirty but it was about twenty-seven miles, to get from a farmers' institute and one of the fellows said it almost froze the marrow in his bones. So I only speak of these things. If I said anything that will add to the betterment of the farmers' institute why I am glad for it even though I have taken that unpopular side, and somebody you know must occasionally get on that side that stirs them out and possibly that stirred them up.

THE POULTRY INDUSTRY

By PROF. JAMES E. RICE, *in Charge Poultry Husbandry, Cornell University, Ithaca, N. Y.*

Mr. Chairman, Ladies and Gentlemen: I do not know how many people in this audience are interested in poultry. I have been trying to find out. As near as I can learn most of you are delegates who are interested in everything else but poultry. I hope that there are a few here that are thinking seriously of paying more attention to poultry than they have already done and with this object in view I have selected slides that will represent some of the recent results of the experimental work, with a practical bearing. Each one of the experiments that I shall deal with have been carried out with the idea of saving money, of making more money out of our hens.

Until very recent years poultry husbandry has been looked upon as a side issue on most farms. It has been looked upon as a business primarily for women and children and men who, having failed in some other line or broken in health, think that they can retire to a little patch of land and keep a few thousand hens and, because it is easy to make a dollar or so per hen, they figure out with a lead pencil that they can make several thousand dollars by keeping several thousand hens; hence many people have gone blindly into the chicken business only to discover that they know nothing about it. And secondly, poultry husbandry as a profession has been looked upon as a great risk, as a hazard, a business for example, which the banks could not loan money on; not a safe, conservative, sane business investment. This viewpoint is rapidly changing, poultry husbandry is just now coming into its own. It is becoming a perfectly safe and a very profitable business when it is carried on in the line of our best knowledge.

The difficulty with poultry husbandry is that we are dealing with so many little individuals; that there is too much detail to look after, and consequently the amount of business that any one person can do is exceedingly limited. But in recent years we have discovered methods of hatching extensively and successfully, brooding in large flocks and very successfully, and the keeping of hens in large numbers for egg production and keeping them by easier, safer methods, and housing them in the large open air houses, and giving them free range instead of the little close "bare yard" conditions; and marketing their eggs as they should be marketed, carefully grading them as fruit people are supposed to grade their fruit, and the hens bred as scientifically as men have been breeding their horses and cattle; and as a result, to-day we have all over the country men who are keeping from 1,000 to 10,000 or more hens and keeping them more successfully than before, with greater profit than we could have expected from 500 to 1,000 hens five or six years ago. These changes have come about by virtue of the careful work by men who have studied and experimented for themselves and by the colleges and experiment stations that have been investigating some of these problems, and I think that as I show

you some of the slides to-night you will readily agree that the State cannot make a better investment than in giving money for educational or experimental purposes for agriculture, and to no other branch of agriculture more wisely than to poultry husbandry, because in all these years since the Land Grant Colleges have been in operation nothing has been done for poultry husbandry until very recently. In all this time the dairyman, the fruit grower, the vegetable grower and, in fact, the man on every other important branch of farming has had his problems investigated and they have been getting the benefit of the help. The farmer's boys and girls have been taught these better methods of farming, whereas very little, if anything, of this kind has been done in regard to poultry. So we are just now coming into our own, and poultry husbandry is becoming a business in which you and I can engage with perfect certainty of succeeding and of making as much money for our efforts and for our capital as we could with any other branch of agriculture.

With this brief introduction we will have the slides thrown on the screen.

The first set of slides will deal with the problem of the breeding and selecting of hens for constitutional vigor. In othe words, we are coming to recognize the fact that there are strong fowls and weak fowls, just as there are strong human beings and weak human beings; either born so or having acquired their strength or weakness through their environmental conditions. The pictures that I shall show here will indicate types which I think will be perfectly clear to you, representing the contrast of high and low vitality. For example here (Fig. 1), we have two barred rocks, one a male full sized, vigorous and active one of the finest specimens of the breed. And here you have one of the same breed that has been unsexed. He shows weakness. He is a lifeless sort of a type. You will notice the contrast. The strong male has a large round head, with the heavy curved beak, with large bright, full eye, red comb and bright plumage, in contrast to this capon with small darkened comb, long thin feet, shrunken eye and rather dull plumage. The capon runs because it lacks courage. The other one follows him very quickly if he gets a chance and is afraid of nothing.

In the second slide, (Fig. 2), we have breeds of four different varieties, all pure bred varieties; one strong and one weak in each of these four sets. This shows a strong buff plymouth Rock; here is a weak brother. You will notice that the very action indicates weakness; notice the drooping tail. Here in the strong one we have a deep body, heavy shank, and short thick neck. In the case of the Barred Rock you will find the same traits, deep heavy body with the rest of the body in proper proportions. Here you have an individual that is built on stilts, as it were; a long, lean, lank, narrow spindling type. This chicken weighs at least two pounds more than this one and this is a brother. One is constitutionally strong; the other is constitutionally weak. Here you find the same traits in the Rhode Island Red and in the Leghorn. You will notice in this instance the male with the big flowing tail, with fine large comb, heavy wattles, with splendid plumage, heavy shanks, in violent contrast to his brother here with dropping tail and with the other characteristics as I have indicated. The same contrast will be true of females as males; but this will suffice.

Here (Fig. 3) we have pictures of an experiment in which we undertook to find out what it would mean to the farmer if he would select rigidly in the fall of the year pullets that were of strong heavy body, robust constitution, as compared to some that were more of a delicate type as you see them here. (Fig. 4). Here (Fig. 3) is a pen of 25 pullets of strong vitality and here (Fig. 4) are 25 of weak vitality, and yet there is not a sick chicken in the bunch. No chicken was kept in this experiment that a farmer would not expect to keep. We kept records of these flocks for the year, counting the cost of food, eggs laid, and results of hatching the eggs and rearing the chickens and we did the same thing with the other experiments and compared the results for two years since with the succeeding generations. I will give you briefly the net results. These pullets of strong vitality, (Fig. 3) in their first year of laying gave us a profit of 40c apiece more than the flock here, (Fig. 4). They laid 11½ eggs apiece more. The eggs were more fertile; they had strength and hatched better; the chickens lived better, and in the fall of the year when we brought them up at about six months of age and weighed the pullets and photographed them we found that the pullets (Fig. 5 A) that we hatched from the eggs laid by hens of higher vitality weighed one-half a pound apiece on the average more than these pullets (Fig. 5 B) of the same age, hatched the same, in the same incubator and brooder, hatched from eggs laid by the hens of low vitality. It was purely a question of inheritance of high vitality and low vitality and made a great difference in the results in dollars and cents.

Here (Fig. 6) we have something that will illustrate the points better than I have explained them. These verticle lines mark off the different months of the years into 13 periods of 4 weeks each. These lines here mark off the distance, the percentage of egg production by the different flocks, and you will see that the solid line is above the dotted line, the heavy one being for the high vitality and the dotted one for the eggs of low vitality, indicating a marked contrast in production between the two. Notice the difference in weight. The hens of high vitality average higher. Also you will notice that they made a better use of the feed that they consumed for the eggs that they produced. And the same thing is true of pullets that were hatched from the hens of high vitality. You will see the same increases in the second generation as you found in the first in the matter of egg production; the same general difference of weight of the second generation as there was in the first, and the same proportionate gain in favor of the more economical use of the feed; showing that the hens in good health made better use of their food than the others did.

We go now to the other end of the cycle of life, beginning with the difference in characters that would indicate high and low vigor of the breeding stock. Now let us examine the eggs and we will find that we can actually tell the high vitality chicken before it ever gets out of the shell. For example, we took some trap-nested eggs from one of the flocks and incubated them, a certain number from each hen, and separated them out, the high vitality and the low vitality germs on the seventh day of incubation when the little embyro chicks were of the size of a little red spot in the egg; nevertheless the size indicated that there was a difference in vitality at that early stage. These eggs were marked and then incubated and the last few days of incubation were separated. This picture (Fig. 7) represents what we found. Of

the eggs that were selected for high vitality at seven days' incubation, 70 per cent. hatched; whereas of those that were selected for low vitality only 32 per cent. hatched; and here (Fig. 7 A) are the strong chickens from the strong vitality eggs and here (Fig. 7 B) the weak chickens from the weak vitality eggs, and above here are the eggs that remain unhatched from those of low vitality and the few of the high vitality; showing again that it pays to make a good selection of eggs having strong germs.

The question getting profit out of hens rests primarily on two factors, the inherited tendency to lay and to live and their power to digest food; and with all due respect to pure breds I want to say right here I would rather have the commonest mongrel fowls if they had constitutional vitality and ability to digest food than the best pure breds in existence that did not have good health or good constitution.

We should make the first selection with the eggs; the second when the chickens hatch. Here (Fig. 8) are a bunch of chickens just dried off, about 36 hours old, and there is one of high vitality; here (A) is another; here (A) is another. You can see by the plumpness of their bodies, the round full eye and the well shaped head and the heavy fat legs that they are well born. You can tell at a glance that these chickens are of high vitality; while this little chicken (B) and this here one (B) are manifestly of low vitality. There is no use keeping that sort of individuals. They will never amount to anything.

Notice (Fig. 9) the same types of chickens that we have here two weeks old. Here (A) you have a large chicken, with strong body, bright eye, the body thick and shanks full; whereas here (B) you get the little puny spindly type of individual that never will amount to anything. Here (Fig. 10) you get a contrast of chickens of the same age, hatched alike, all hatched from the same hen. There is one (A) born constitutionally strong; a violent contrast with this chicken (B) of the same age and reared in the same brooder at the same time. Here is one only partly strong (A). Here is one a little better (A). That over there is an individual growng very much faster than any other chicken in the pen. Whenever a chicken shows low vitality either kill it or, if it appears to be worth anything at all to grow for market, mark it with paint so that by no chance will it get mixed with the others; feed it on sour milk and a finely ground fattening feed until it weighs three-quarters of a pound and sell it alive. Do not let that kind of a chicken live on the farm.

In Fig. 11 you see the most violent contrast imaginable of low vitality. There is a long thin "crow head," shrunken eyes, long thin shanks, long thin nose; a good for nothing individual, born so and cannot help it. You naturally ask why that chicken lacked constitutional vigor. If we stop to ask what the little hen is doing each year I think we will find an answer. The wild jungle fowl lays about nine eggs at a litter and only one or two litters a year. The modern hen is expected to lay 130 to 150 eggs and frequently lays 175 to 200 or more eggs a year. A hen laying about 200 eggs lays five times her own weight in a year; and the laying of the egg is different from the ordinary secretion, such as the secretion of milk. It is reproduction which is vastly more exhaustive process. Dr. Jordan, of the Geneva, N. Y. Experiment Station, has calculated that the hen weighing three and one-half pounds that lays 200 eggs a year, compared with a Jersey

cow that gives 7,000 pounds of milk having 4 per cent. butter fat, that little Leghorn hen is consuming two and one-half times more dry matter in a year per pound of live weight than is the Jersey cow. So you see why with the quick growing, heavy powers of digestion, rapid assimilation and reproduction of the domestic fowl that they live short, rapid lives and must have a good constitution to stand up under the strain.

One of the causes of low vitality is want of proper housing. Fowls must be kept in the fresh air. In Fig. 12 is a simple little house for protecting 35 hens, where the chickens live in fresh air practically all the time. Some glass is provided to give protection in cold weather, but the object is to open the cloth window except in storm weather.

Fig. 13 shows a broody coop, a desirable fixture in a hen house. Back of the perch platform is the only portion of the house that is double boarded. The house has a concrete floor and a shed roof.

Fig. 14 shows a covered dust wallow. Here the hens will not be likely to soil or throw out the dust as where it is exposed.

Fig. 15 is an end view of the house, showing the construction of the walls. The principle is to avoid a dead air space. We simply let the air circulate through these spaces in the wall between the studding and rafters. The double boarding is open at the bottom and top so that the air can pass up around the space and by so doing prevent this inside boarding from becoming cold and preventing moisture at this point, and the hens are warmer than they would otherwise be. The door on the back and front side of each pen is especially desirable because of the fact that the hens need to keep cool in summer as much as they need to be protected in winter. These doors are kept closed in the winter and when open in the summer allow the air to pass up through and out the front of the house, making this building much cooler in the warm weather than it otherwise would be.

There is one way in which we lose vitality and never suspect it. In fact, I know of no one way in which more trouble is likely to occur and not be suspected than this. In experiments conducted a few years ago at Cornell a bunch of 50 eggs were kept in a living room for 14 days; another bunch of 50 were kept in a cold storage dairy room and another in a room with a furnace. The average temperature in the first instance was 65 degrees; that is, only living room temperature. The other averaged 50 degrees, a temperature that was so cold that when the eggs were placed there we thought it might kill every germ in them. The furnace room was about 80 degrees. They were kept for 14 days and then all put into the incubator, and at the end of 7 days 53 per cent. of those kept in the living room were fertile, 90 per cent. of those kept in cold storage, and only 24 per cent. of those kept in the warm room. The hatching results showed 52 per cent. from those kept in the living room, 76 per cent. from the eggs kept in the dairy room, and no chicks hatched from those kept in the furnace room, indicating that the germ had died because kept in too warm a place.

Following that experiment, here is another one in which all the eggs were kept in the living room at 65 degrees and kept there for various lengths of time, from 1 day to 7, 14, 21, 28 and 35 days, and then all were put into the incubator at the same time with the following results: Those kept 35 days, 8 per cent. fertile; those kept 28 days, 9 per cent. fertile; from 1 to 14 days, 78 per cent.; 1 day, 86 per cent.; and

the hatching results were in essentially the same ratio; that is to say, pretty good percentage of hatching from the eggs kept only a few days, while almost no results for those kept a considerable length of time.

A common notion is that we get vitality by crossing our fowls. We wanted to find out whether this is true or not, therefore we instituted an experiment in which we crossed barred rock males with white leghorns hen and with leghorn males on barred rock hens and compared them with the pure bred rocks and leghorns. The results I can only briefly give to you. They are, that after three years' test in comparing the first crosses and the second crosses with the pure breds of similar ages we find that they have gained absolutely nothing in egg production by either of the crosses over the pure bred leghorn. We have gained nothing in size, and meat qualities of our cross bred chickens over the pure bred rock; but we have lost something by each of the crosses. We have lost because we have neither one nor the other. We have simply undone, by mating these fowls together, what it took some skillful breeders fifty years to accomplish, and we have not increased the vigor or health of the chickens as compared with the pure breds. The pure bred white leghorns of the third generation laid us last year 182 eggs apiece, an average for every pullet in the pen. The barred rocks averaged 129; the crosses averaged just about 133 to 150 apiece. We did get chickens in each of the crosses a little larger than the leghorn by means of the barred rock infusion of blood, but that is all we accomplished and that was not worth while because we had a better individual for meat purposes in the barred rock. Our experience for these pure breds at least, is to not cross them, but to keep the bred pure and get new life and vitality by getting new blood from somebody that has something better than we have ourselves, of the same variety.

One of the ways in which we can economize in the handling of poultry is in rearing the chickens in large numbers. I have here a slide (Fig. 16) that shows the nursery where the chickens are started. This is an excellent colony house 8 feet square. There is a big hover inside the house that will cover 250 to 300 chickens in a single flock. These houses are kept close together early in the spring and after the houses are all filled with the young chickens three or four weeks old, then the houses, chickens and all are moved out on the farm into the corn field or on the meadows where they can have free range. By this method we can reduce at least three-fourths of the labor of rearing chickens in large numbers.

Fig. 17 shows four methods by which these houses are moved. If we want to move the house only a few rods in the same field we just hitch the team to it and draw it along. If we are going to move it across the fields we run it upon a skid. If however the houses must be moved on the highway a mile or two, as we are obliged to do every year with the 25 houses because we have not enough money to build a double equipment on each farm, these houses are put upon wagons and moved out to the farm. It costs about $1.50 apiece for moving the houses so far. The reason why it is necessary to move these houses back and forth to the farm is largely because we use the houses all winter for laying hens. These houses are big enough to hold 12 to 15 hens all winter. We find we can carry over 350 hens each winter more

than we otherwise could because we use our brooding system the year round, brooding chickens in the spring and keeping laying hens all the winter.

Fig. 18 shows a closer view of the house. This is a later pattern.

Fig. 19 shows filling a tank with gasoline with a 5 gallon can. The burner under the house burns with a blue flame, and the heater box is made of galvanized iron and is fire proof. The heat pours down on the chickens and the fresh air comes in and spreads out over the chickens.

In Fig. 20 we see several thousand chickens on the range where they are reared. Last year with 4,000 chickens one man did all the work of brooding and handling these chickens. The only time he had help was occasionally for cleaning, once a week when the chickens were young. After that he did not have any help, and the latter part of the year he had time to do other things besides. This is because much of the work is done by horse power and because the chickens are kept in large flocks. The houses are 100 to 50 feet apart, and the chickens running together and not fenced to separate except where they are of different ages. The illustration shows how these houses are scattered over 5 to 10 acres of land.

A simple device for connecting up several of the houses for winter use is shown in Fig. 21. You may notice that little galvanized collar at this point. It connects up three houses. The houses in this division have been removed to get photographs. The house in the centre of the group is where all the chickens roost, 45 of them; and this house to the right is where they go to eat, 45 of them; and the house to the left is the house where they go to lay, 45 of them; and then all run back and forward and go visiting when they please. Instead of having to take care of each house with 15 chickens, we take care of and clean only one house, gather the eggs in one and feed in one, a saving of 66 and two-thirds per cent. of the work in caring for the colony of 45 chickens as compared to keeping 15 in each house.

A corn field in which the chickens are running in the rape where the houses are so that the chickens will not destroy the corn as it comes up is shown in Fig. 22. The surplus chickens are removed when about 8 to 10 weeks old. We have about 200 or more chickens in each house when they get old enough to separate the sexes, which makes it desirable to prevent overcrowding.

Four different types of feeding troughs are shown in Fig. 23; one by which the very young chickens are fed; later a higher one; then a higher one still; and then later they are fed in this large one only once a day, and after eight weeks old they are fed in these out door hoppers you see here. After eight weeks old they are all fed by the hoppers by the man driving around and filling them once a week. It becomes an economical method.

Here is a sanitary water fountain (Fig. 24) by which chickens cannot soil their water. It is turned down side up to take the water out and wash it.

Fig. 25 is a catching box that ought to be on every chicken farm. You can drive the chickens in from this end and shut it up; and one man on each side of the box can carry a lot of chickens without danger of their smothering or having frightened them. It is a great labor saver to do this instead of frightening and running the chickens.

The low down wagon used to carry the water barrels is shown in Fig. 26. This is the wagon used to carry the feed, water, milk, &c and make the rounds in caring for the large flocks. To clean out the houses it is arranged as shown in Fig. 27. Two boys can go a mile and do all the work of feeding and watering 2,000 to 3,000 chickens in less than an hour.

In our experiment where we tried seven methods of feeding chickens we found a great difference in growth. You can get the details by sending for our bulletin No. 282. In Fig. 28 you will see the contrast in the size of the chickens and what it will mean if the feeding of chickens is properly done. We fed seven different kinds of rations. At nine weeks we killed all of the chickens that weighed one and one-fourth to one and one-half pounds as broilers and this is the result. You will notice on three rations there were a large number of chickens ready for killing at nine weeks; whereas, on other rations there were only six or seven, and on this ration where they had practically all dry mash only a few more were ready; and where only cracked grain was fed only a few more. Later, at the time of killing, at ten weeks old you will notice these rations have the same proportion of chickens; and then at the final killing, eleven weeks old, almost no chickens were left to be killed from this flock and almost all the chickens or a very large proportion of them remained over to be killed at the end of the experiment. It was a very marked contrast due to the methods of feeding, and all the feeding was done by the same person.

Did you ever see chickens look like those in Fig. 29? Thousands and millions of chickens have been dying of the disease know as the white diarrhea. These chickens are suffering from that disease. Dr. Retgar, of the New Haven, Conn. Experiment Station, has found that this bacillary white diarrhea is a bacterial disease that is carried from one generation to the other through the ovary of the hen and the bacteria is left in the yoke of the egg so that the chicken is doomed to have the disease before hatched. If the chicken survives because it has a weak form of the disease it gives it to the next generation and so carries it on. It has been found also that the little chickens if they are not born with the disease in them may catch it up to the time they are four or five days old from other chickens that had it, but if not so doomed they will get through without trouble.

Fig. 30 shows what must be done as a means of prevention and that is thorough disinfection with 5 per cent. carbolic acid and 5 per cent. sulphuric acid and water 90 per cent. in order to be sure of killing the disease germs existing, and selecting the hens rigidly to find out that we do not have the disease on the place, and generally by keeping the chickens or hens away from where white diarrhea exists.

In Fig. 31 is shown a correllation between the number of eggs a hen will lay, the weight of the hen and amount of food that hen will consume. You will notice as these curves of food consumption drop the weight has gone down and the egg production down. As the feed consumed goes up, the weight goes up and egg production goes up; when the food consumption declines the egg production declines. These curves illustrate the most fundamental thing we know about feeding hens. It is this: that hens to lay well must have all they can eat of the right kind of food; and second, they must have that feed before they begin to lay. I met a man this winter who said his hens were not laying and he was not going to give them anything more to

Fig. 1.

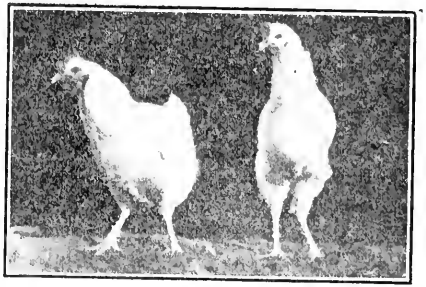


Fig. 2 A.

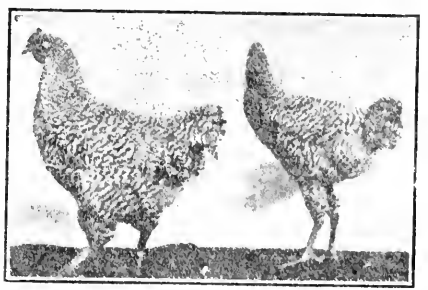


Fig. 3 A.

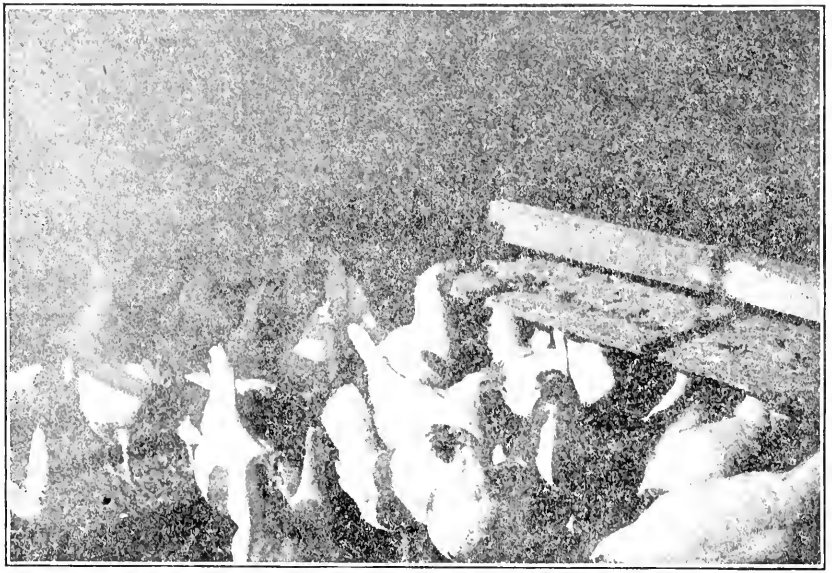


Fig. 3.

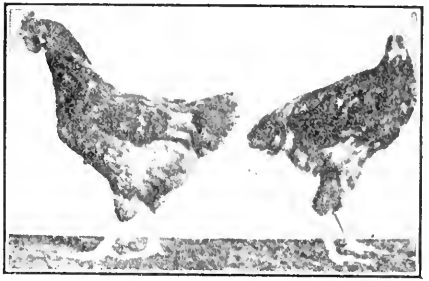


Fig. 2 B.

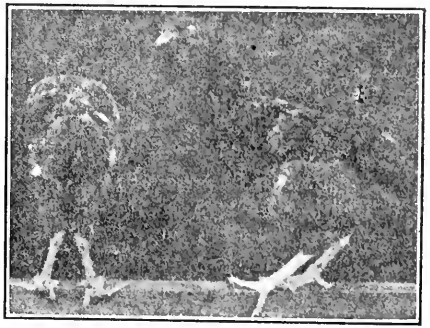


Fig. 3 B.

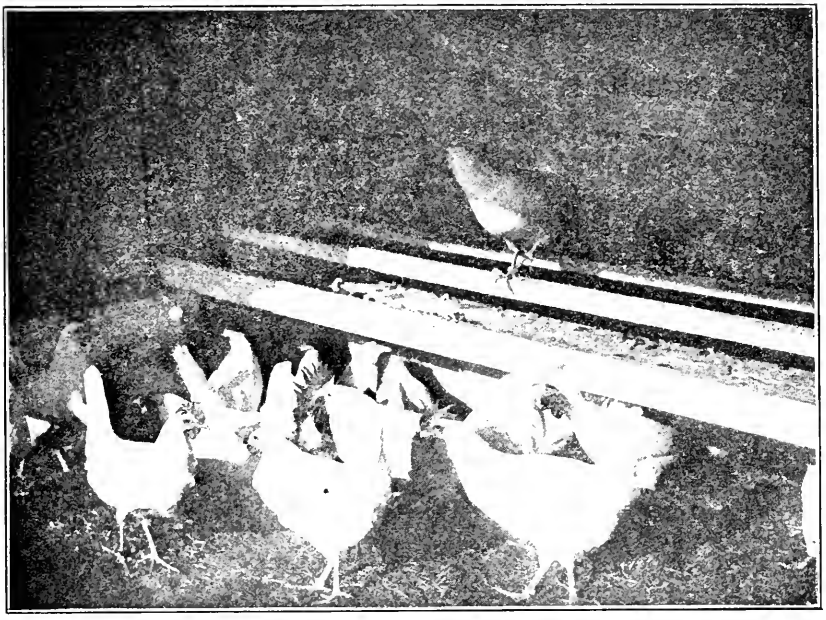


Fig. 4.

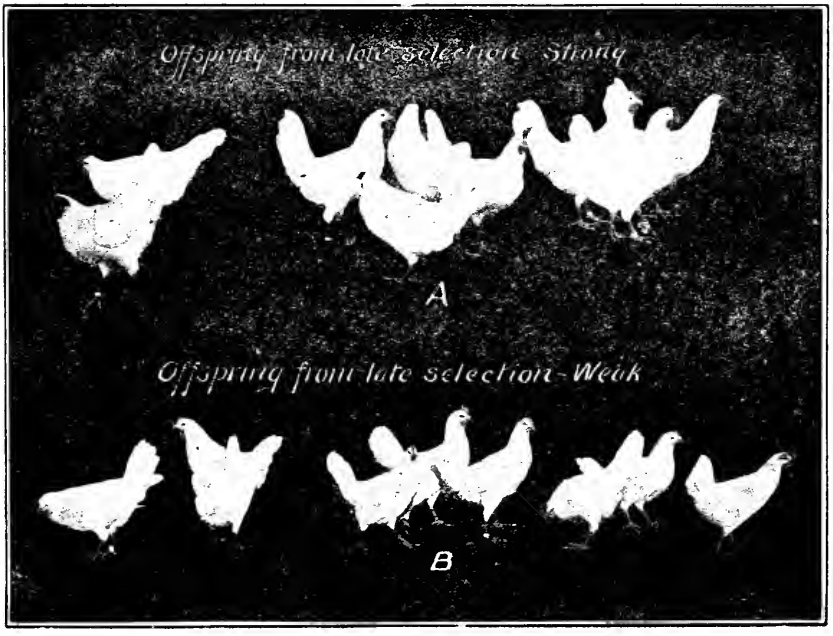

Offspring from late selection Strong
A
Offspring from late selection-Weak
B

Fig. 5.

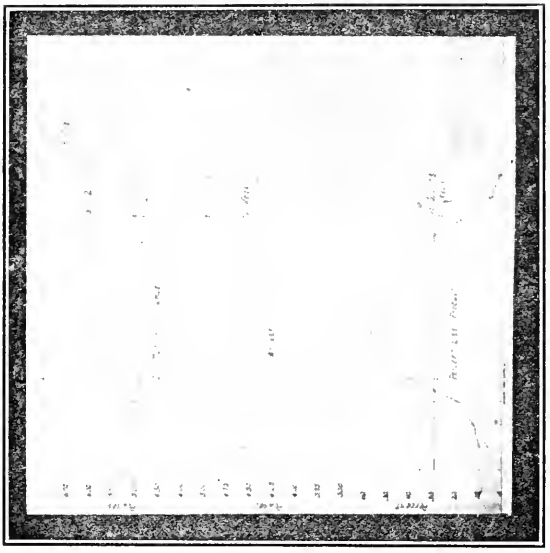


Fig. 6.

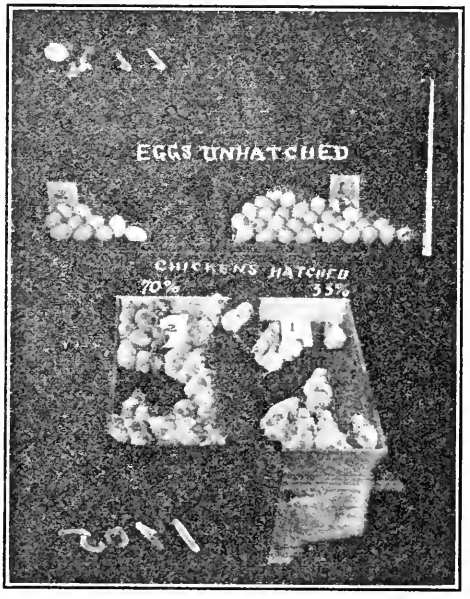


Fig. 7.

Fig. 8.

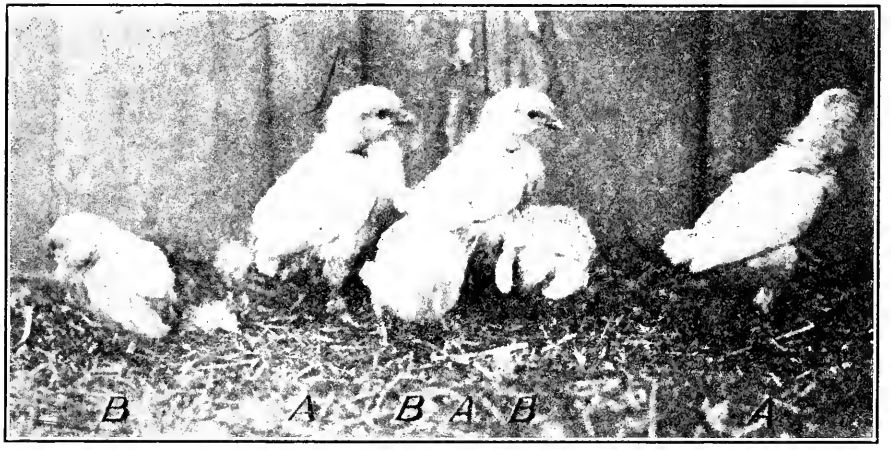


Fig. 9.

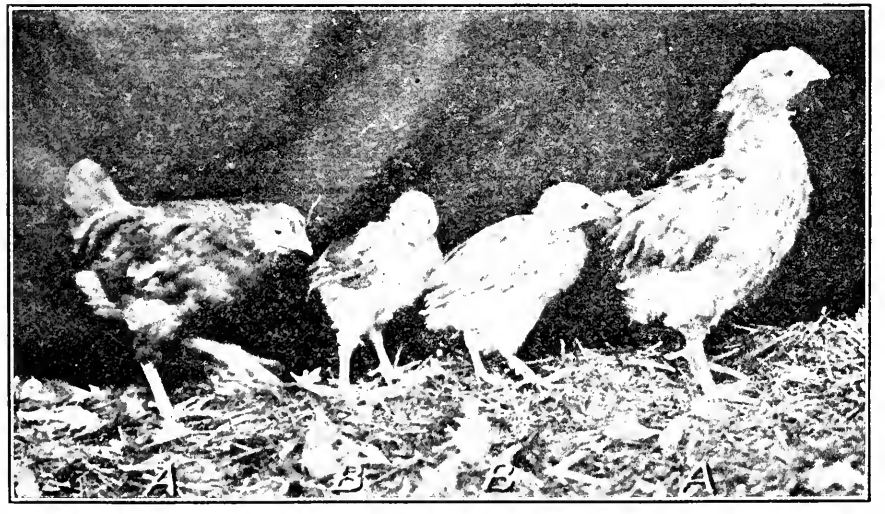


Fig. 10.

Fig. 11.

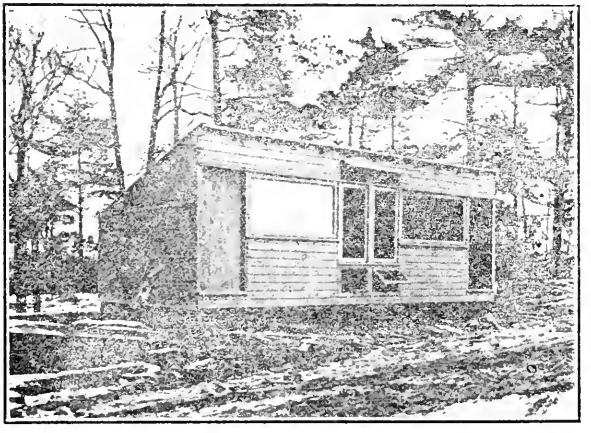


Fig. 12.

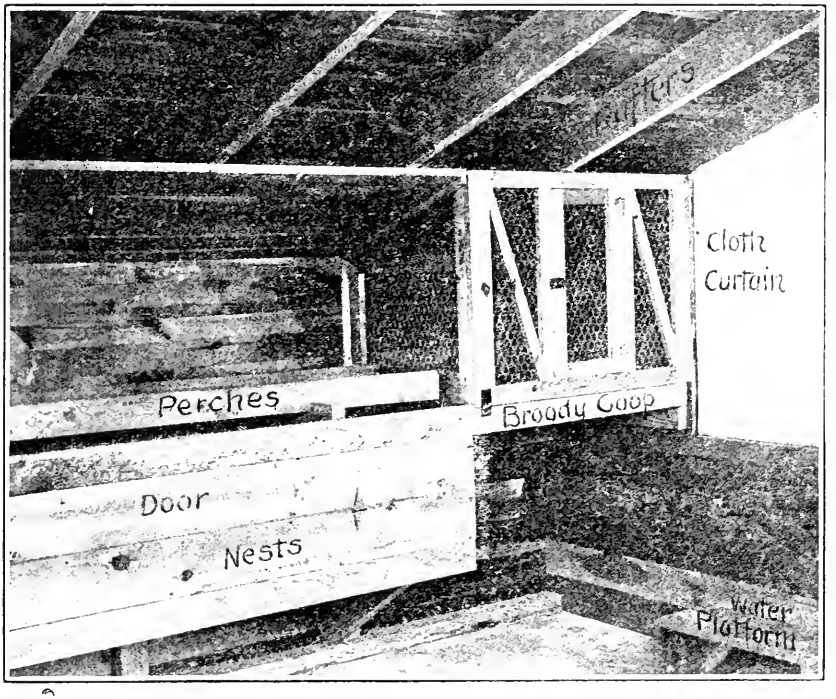

Rafters
Cloth
Curtain
Perches
Brooder Coop
Door
Nests
Water
Platform

Fig. 13.

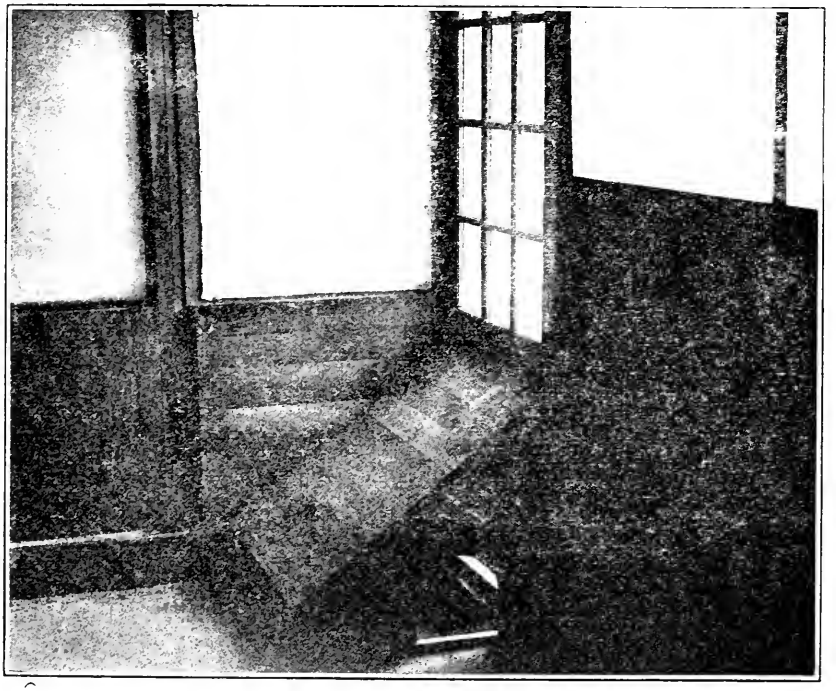


Fig. 14.

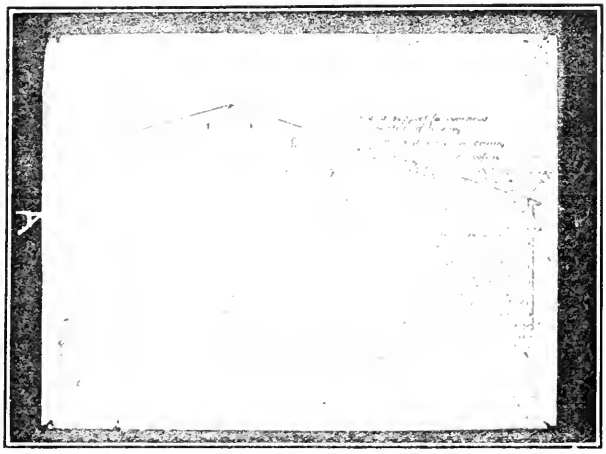


Fig. 15.

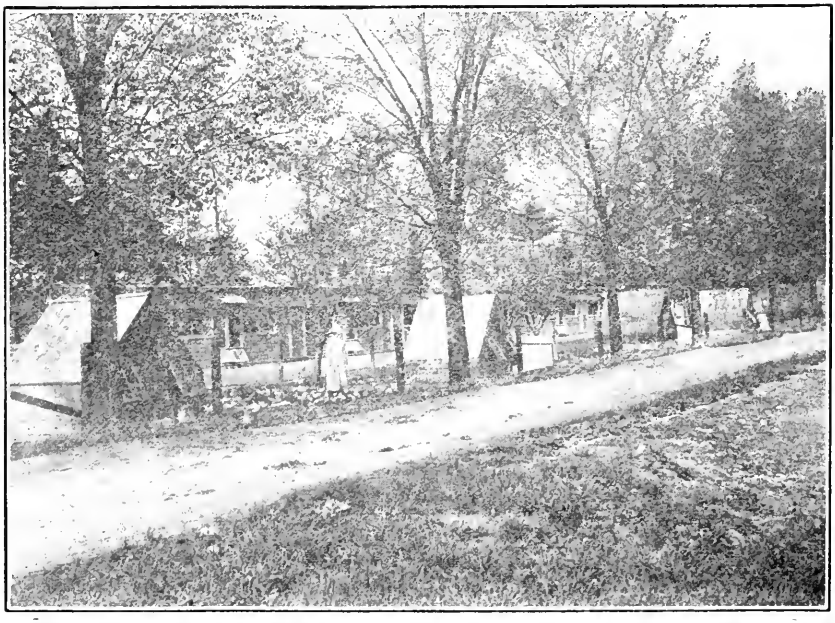


Fig. 16.

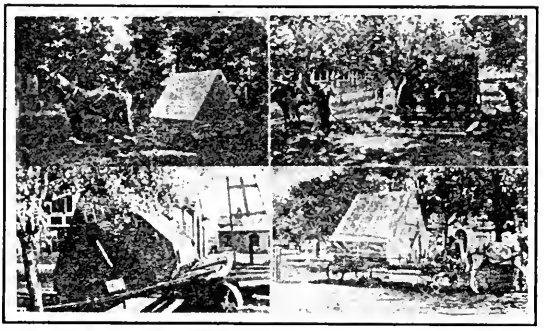


Fig. 17.

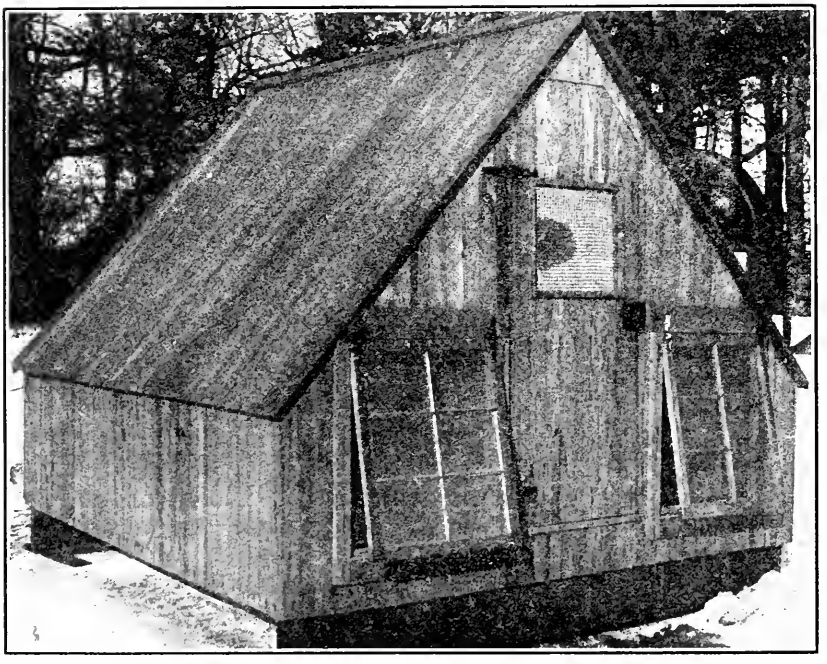


Fig. 18.

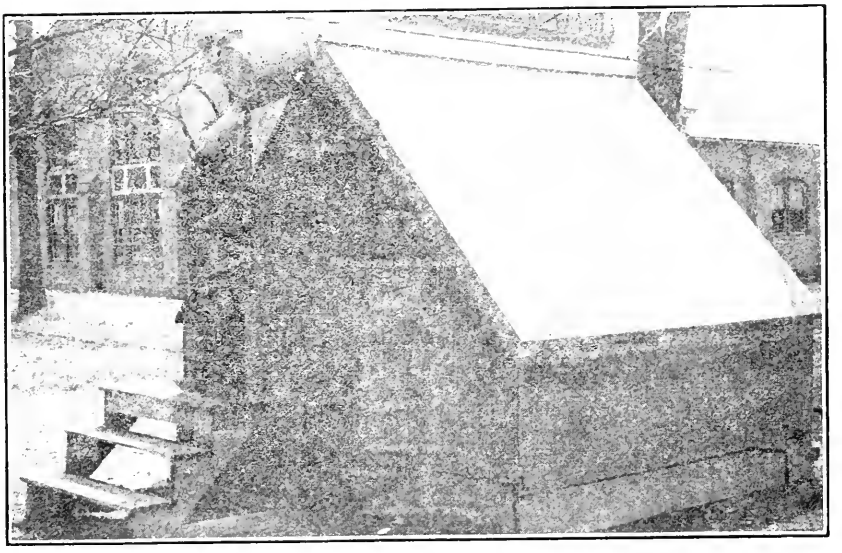


Fig. 19.

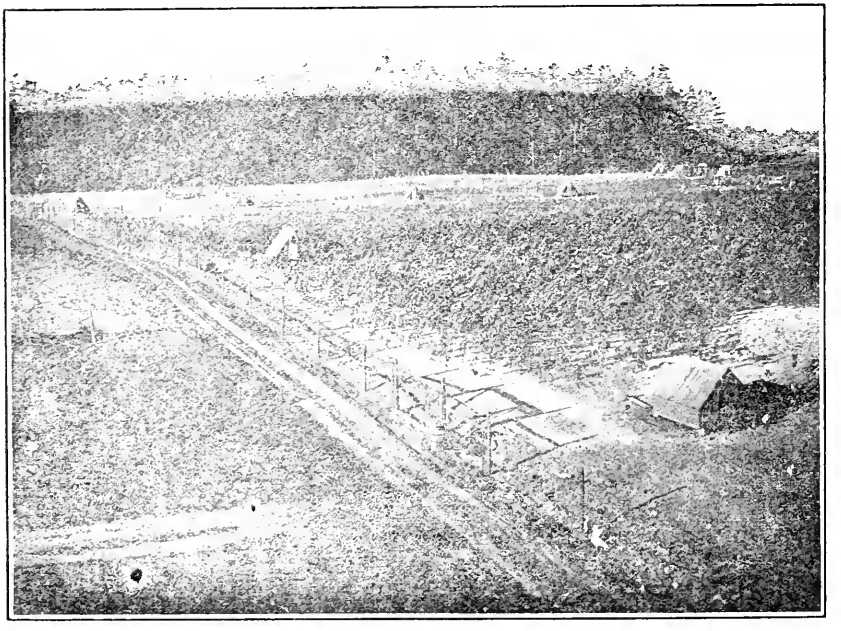


Fig. 20.

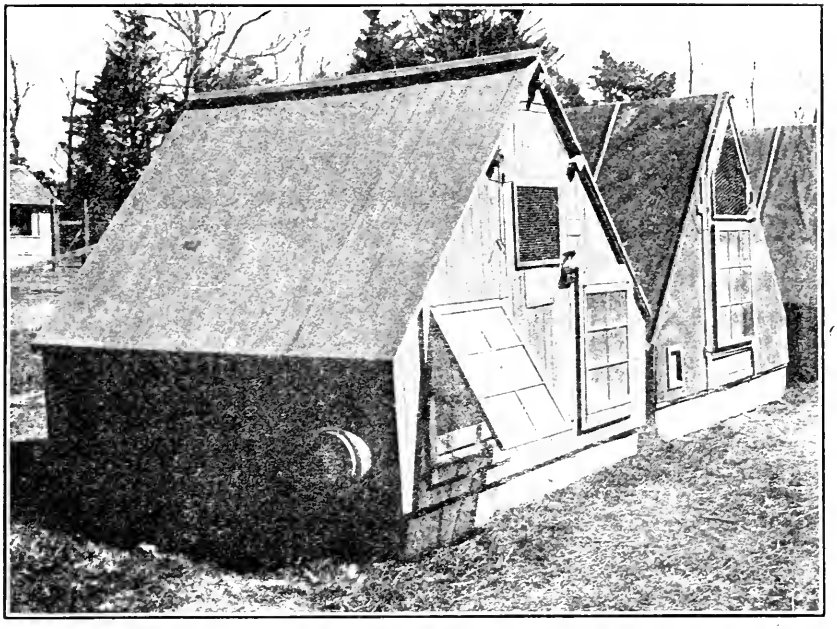


Fig. 21.

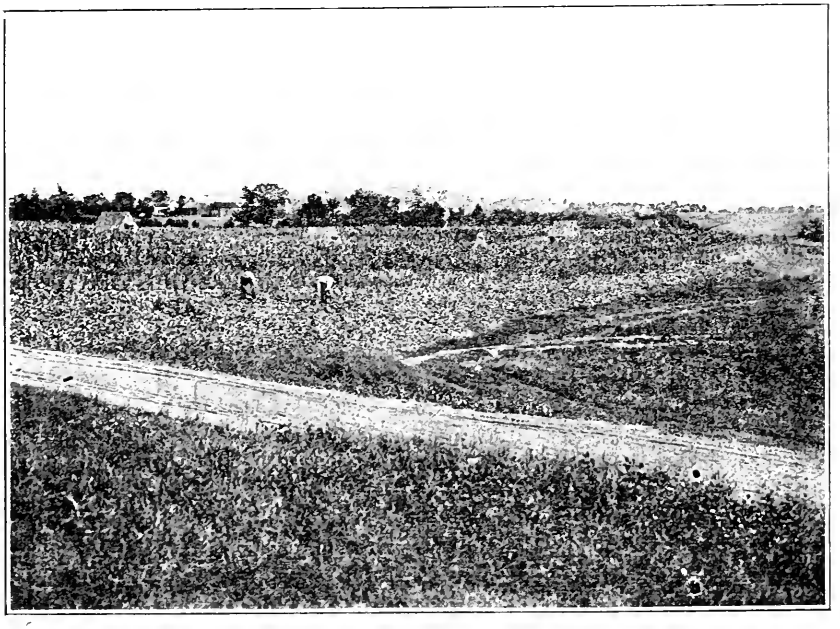


Fig. 22.

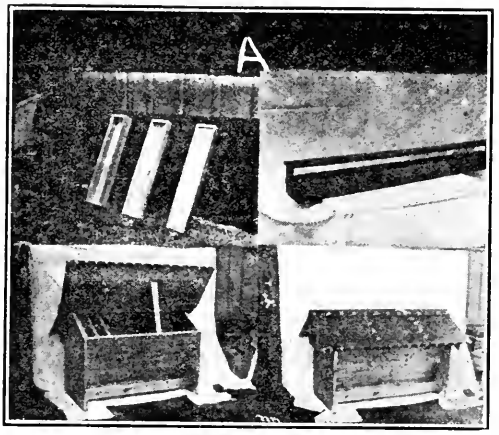


Fig. 23.

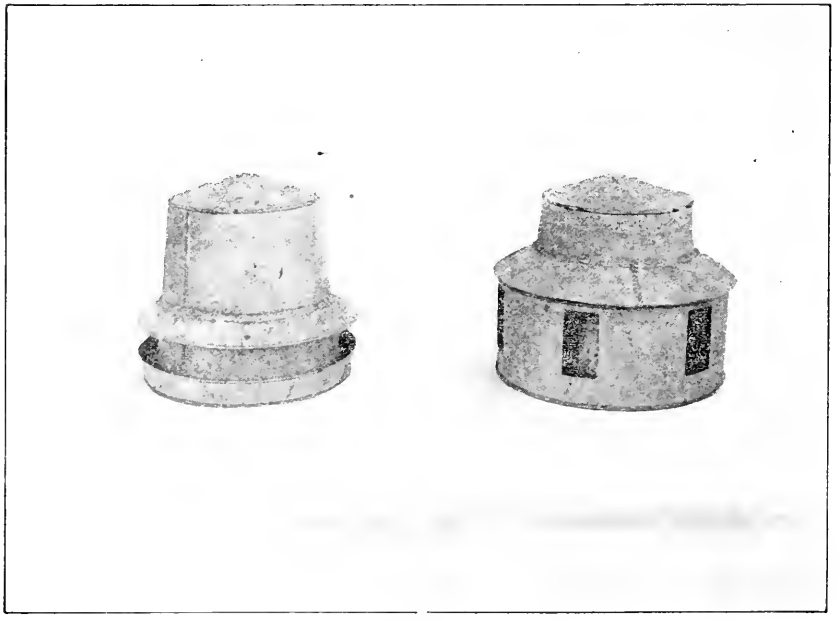


Fig. 24.

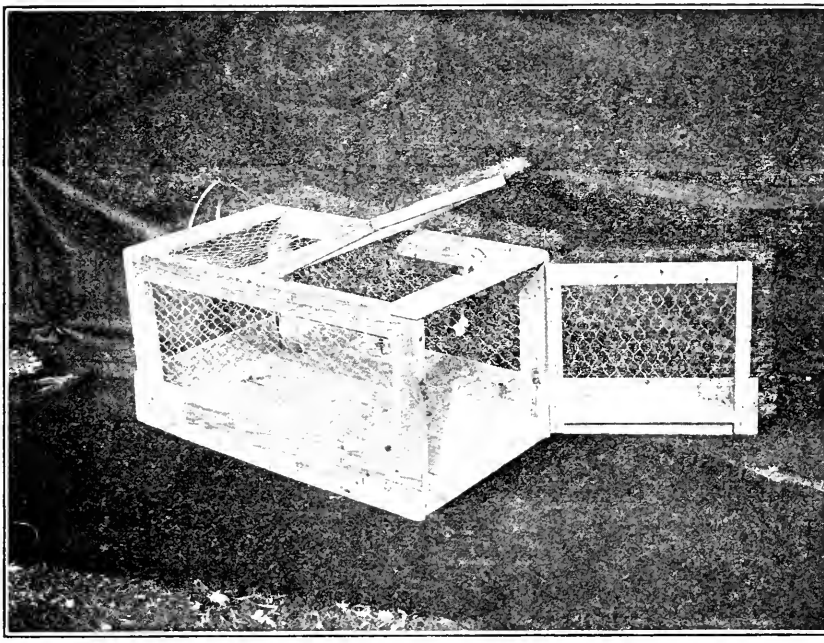
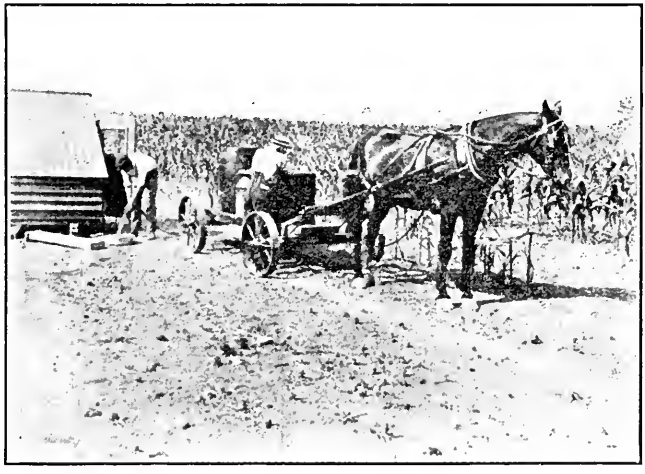


Fig. 25.



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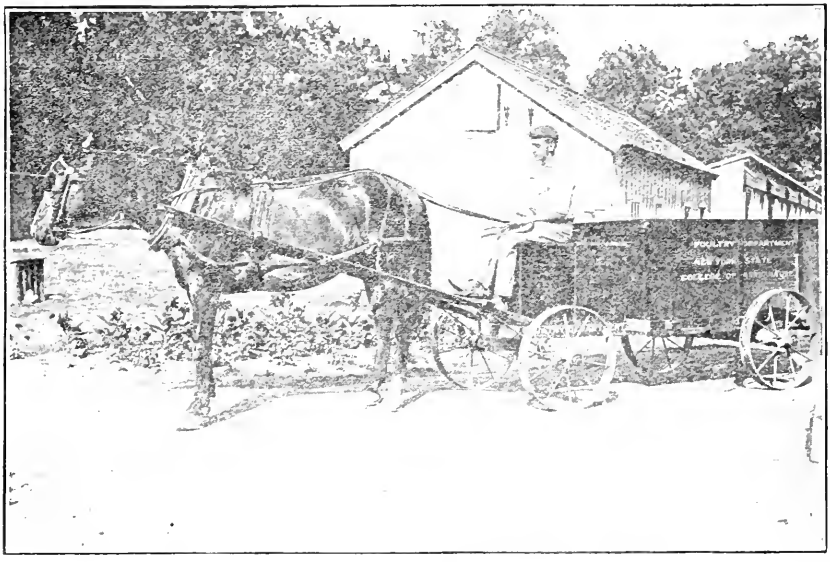

Fig. 27.

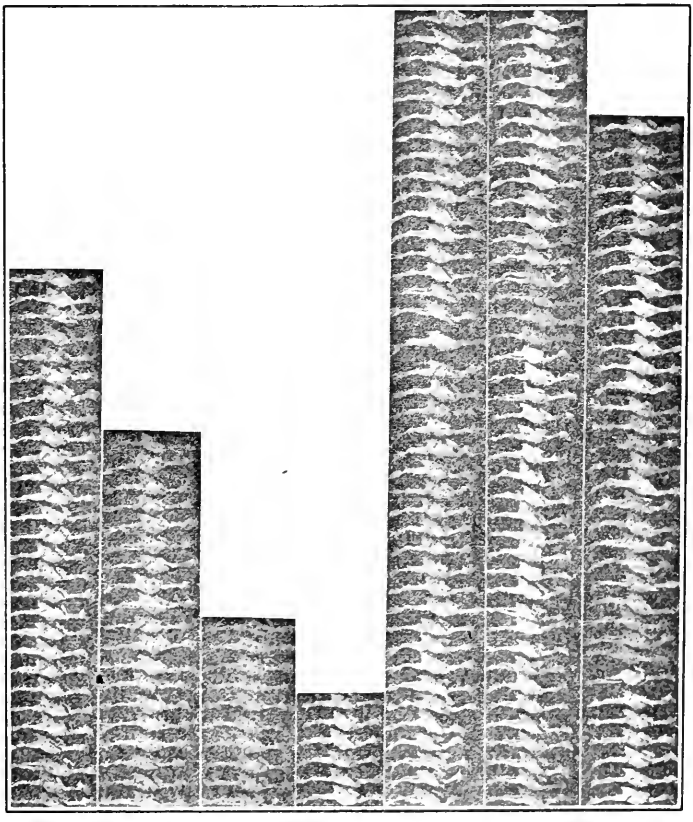

Fig. 28.

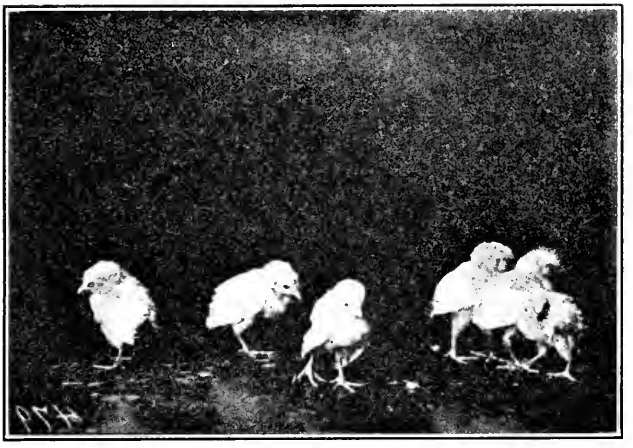

Fig. 29.

Fig. 30.

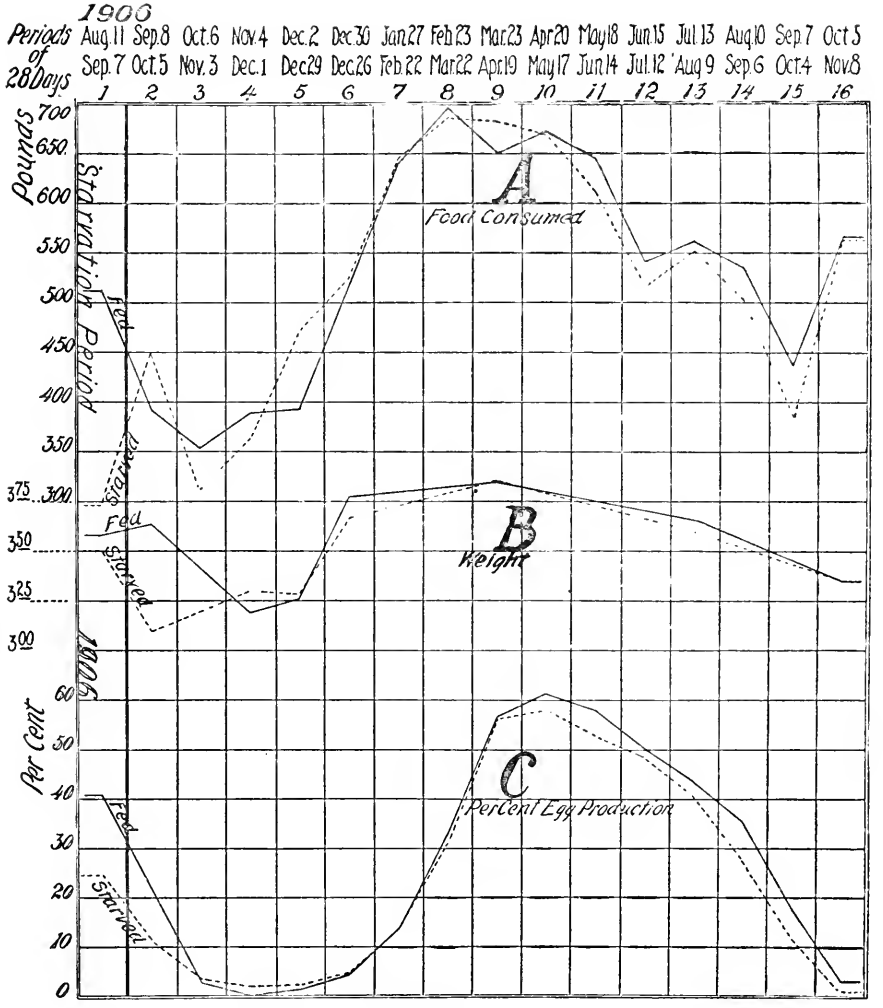
1906
Periods of 28 Days
Aug. 11 Sep. 8 Oct. 6 Nov. 4 Dec. 2 Dec. 30 Jan. 27 Feb. 23 Mar. 23 Apr. 20 May 18 Jun. 15 Jul. 13 Aug. 10 Sep. 7 Oct. 5
Sep. 7 Oct. 5 Nov. 3 Dec. 1 Dec. 29 Dec. 26 Feb. 22 Mar. 22 Apr. 19 May 17 Jun. 14 Jul. 12 Aug. 9 Sep. 6 Oct. 4 Nov. 8
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Pounds
700
650
600
550
500
450
400
350
375 300
350
325
300
Per Cent
60
50
40
30
20
10
0
Starvation Period
Fed
Starved
A
Food Consumed
B
Weight
C
Per Cent Egg Production

Fig. 31.

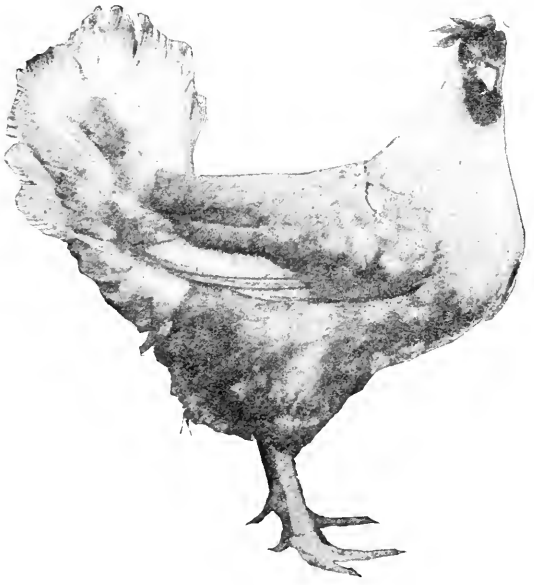

Fig. 32.

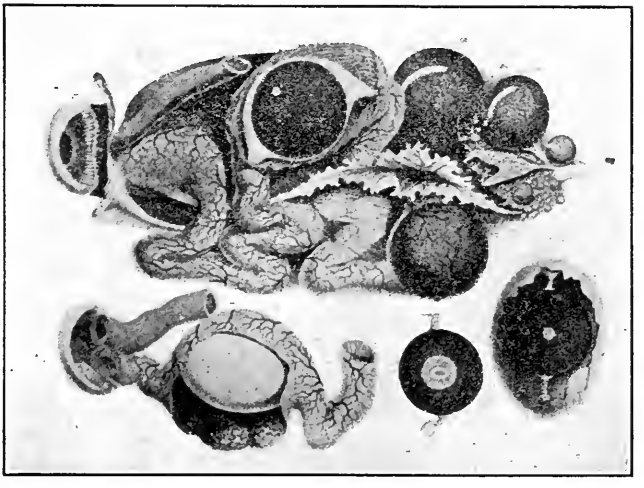

Fig. 33.

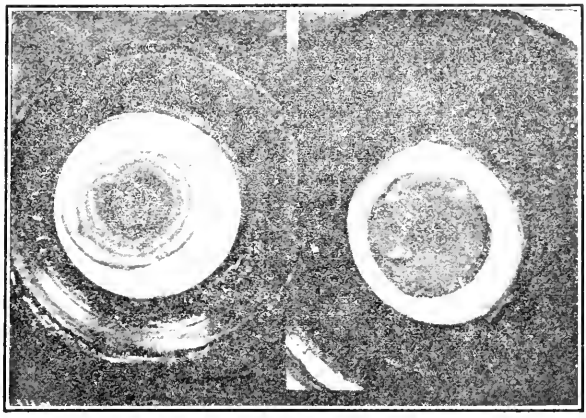

Fig. 34.

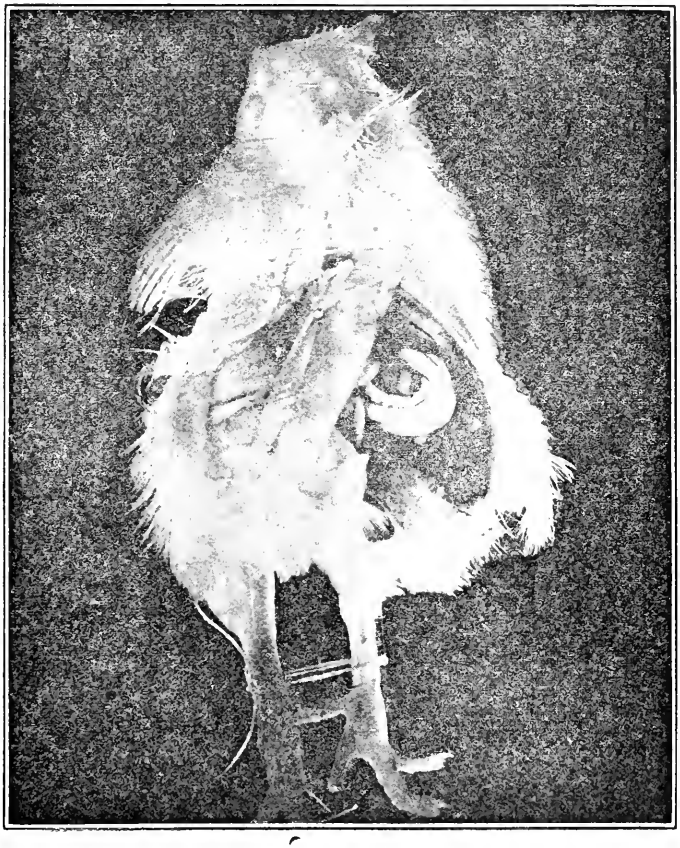

Fig. 35.

Ways in which the Department of Poultry Husbandry is endeavoring to assist the Poultrymen of the State.

1. By conducting Experiments with Poultry.
Ask for the Poultry Bulletins.

2. By Correspondence.
Write to us.

3. By special instruction in regular and winter courses.
Send for announcement and take a course.

4. By showing visitors the Poultry Department.
Come see us.

5. By personal assistance in selecting breeding pens.
Perhaps we can help you.

The Department of Poultry Husbandry in Co-operation with the Extension Department.

6. By Poultry reading course lessons.
Send for them.

7. By Educational exhibits at the Fairs and Poultry Shows
Go look at one.

8. By Lectures and Demonstrations at Poultry Association meetings and Poultry Shows.
Arrange for a meeting.

9. By Lessons in Poultry Husbandry for Rural Schools.
Ask for Rural School Leaflets.

10. By co-operative experiments with poultry.
Try one.

Fig. 36.

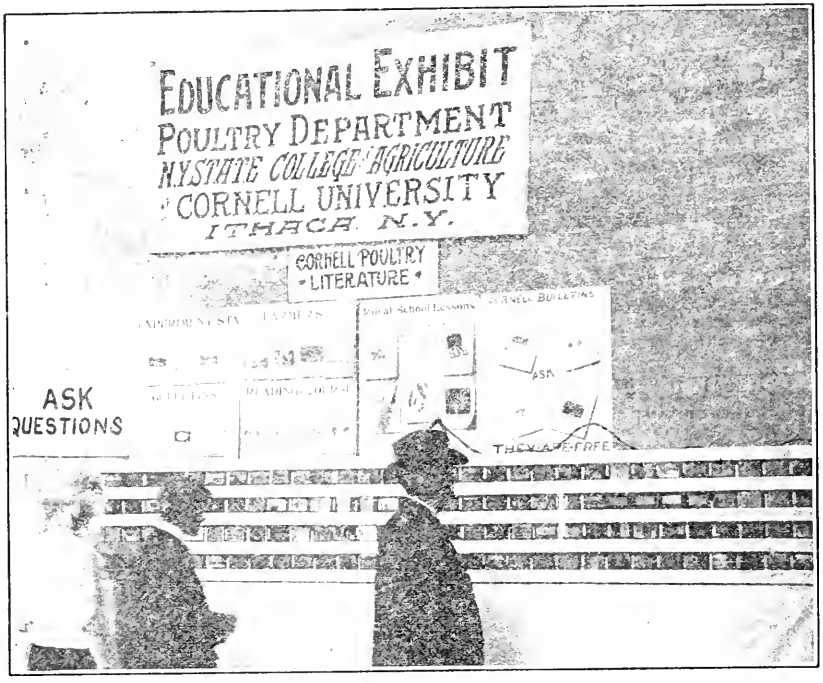
EDUCATIONAL EXHIBIT
POULTRY DEPARTMENT
N.Y. STATE COLLEGE AGRICULTURE
CORNELL UNIVERSITY
ITHACA, N.Y.
CORNELL POULTRY
LITERATURE
ASK
QUESTIONS

Fig. 37.

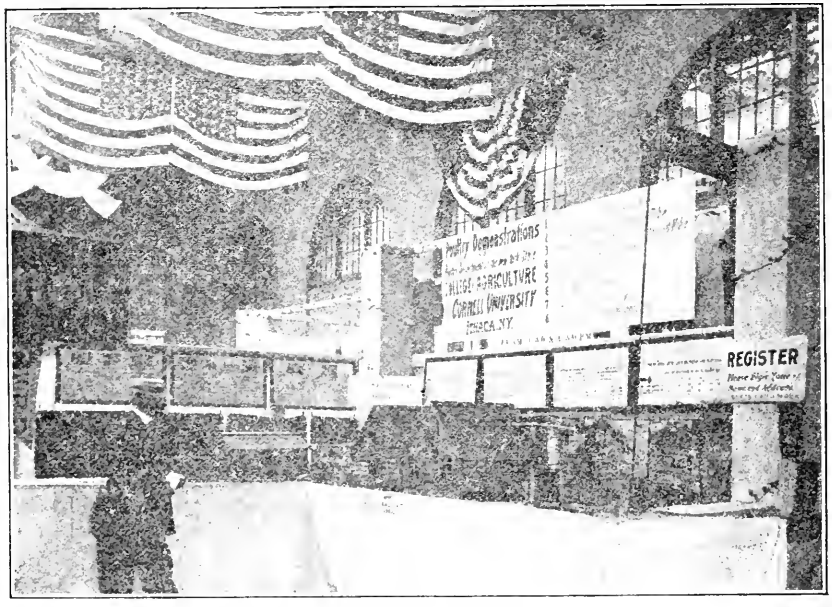
Poultry Demonstrations
REGISTER

Fig. 38.

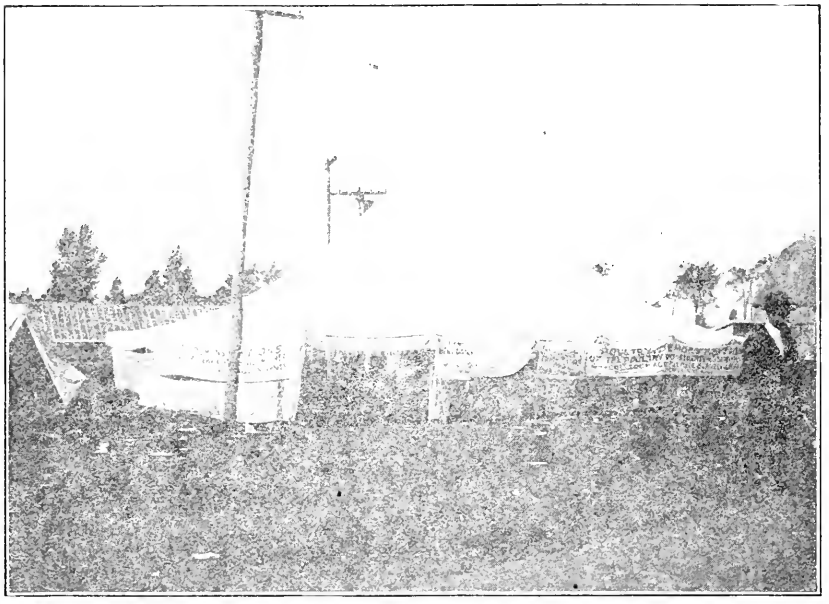

Fig. 39.

Fig. 40.

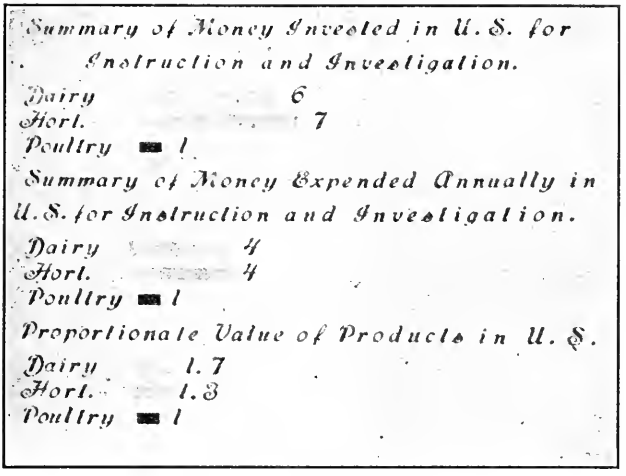
Summary of Money Invested in U. S. for Instruction and Investigation.
Dairy 6
Hort. 7
Poultry 1
Summary of Money Expended Annually in U. S. for Instruction and Investigation.
Dairy 4
Hort. 4
Poultry 1
Proportionate Value of Products in U. S.
Dairy 1.7
Hort. 1.3
Poultry 1

Fig. 41.

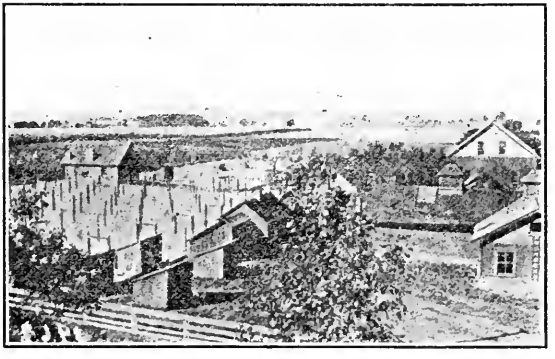

Fig. 42.

eat until they did. Any poultryman knows, who watches his hens, that they will begin to eat more for two or three weeks before they begin to lay because it takes that long for the eggs to develop; and this proves it. We have examined hundreds of hens and we find the rule holds good, that the hen will first begin increasing in the consumption of food, then increasing in her weight and then she will increase in egg production. The best condition for egg production is when a hen has surplus fat on the body. A poor hen cannot lay. They must have some surplus fat with which to make the first.

The hen shown in Fig. 32 is a good one. We discovered her in a moulting experiment. This hen was the last one of them to moult. She moulted on the 28th of November. She had laid 213 eggs in ten months and was the last hen to moult in a flock of over 200 and the best hen we had. In looking up the egg records of other hens we find that almost invariably the best laying hens we had are the ones that moult last, and the poorest layers we had were the ones that moulted first. And here all these years you and I have been killing off every fall the best hens because we have picked out the early moulters because we thought by virtue of early moulting that they would be the best early winter layers. We have found also that not only do the last moulting hens lay most but they also take a shorter time to moult than the hens that moult early.

Fig. 33 is a picture showing the development of the egg, the ovary and oviduct. Right here in the ovary is where the disease of white diarrhea occurs. When the yolk breaks from the follicle and falls into the ovasack and comes down here and passes along where the albumen is deposited, the shell of the egg is laid on. A moment ago I stated the fact that the hen must have surplus fat in her body in order to lay well. This is the proof. The first part of the egg developed is this little yolk in the follicle, and there are many hundreds, 1,500 or more of these contained in the ovary along the spine. 64 per cent. and more of the dry matter in these yolks is fat and unless the hen has surplus fat in her body to develop the ovum, then she cannot lay, so that if we are going to get eggs we must give the hen an abundance of food so that she has the available nutrients to develop the ovum. We must have the right kind of material to manufacture the egg.

In Fig. 34 is shown one of the results of our experiment in which we undertook to find out what place inside of a hen. Governor Hoard says the darkest place in the world is the inside of a cow. I beg to differ with the Governor because just as dark a place is inside the hen.

A red dye due known as Soudan II was mixed with the food and absorbed into the body and in that way the dye affected the egg and here we can count up the red rings on the yolk and tell how many days it took to develop. We find it took ten days to fourteen days to develop from that small ovum up to the full size yolk of the egg. We found that another dye, Rhodamme red, does not affect the color of the fat of the egg but does color the white of the egg; hence we can tell what takes place in both the white and the yolk of the egg. When the egg is incubated and the chicken hatched we find this interesting thing takes place. In Fig. 35 is a picture of a little chicken hatched from an egg where the mother had been fed on Soudan III and you will notice that the chicken has manufactured the fat of the yoke of the egg over into the fat of its own body. That fat is ordinarily found on the inside of the chicken.

The next slide, Fig. 36, shows what can be done by the poultry departments of the agricultural colleges. It shows ten ways of helping the poultrymen of the State by conducting experiments with poultry, through correspondence, by showing the poultry department, by a poultry reading course, by educational exhibits, lectures, &c., at fairs, and by lectures and demonstrations at poultry shows, by poultry lessons for rural schools. These and many other things a poultry department in the State Agricultural College can do.

A few slides more, because the time is nearly up, I will throw on the screen to show the way in which this matter can be brought to the attention of the people. Fig. 37 is the lantern slide exhibit holding about 150 lantern slides which we used at the New York State Fair, where the people can stand and look at the slides with the illuminated back and read the inscription under them.

Fig. 38 shows another portion of the same educational exhibit in the same building, in which there are models of poultry houses and appliances and photographs showing the results of experiments with poultry.

Fig. 39 shows a new departure. Swarms of people passed through the exhibit in a large tent at the State Fair. This was to find out whether or not the people were interested enough in poultry to witness the demonstrations when there was horse racing and balloon ascensions and all sorts of other things going on around. And yet those who were there certified to the fact that every one of the four demonstrations held each day the seats were almost always occupied and many times the attendance filled the tent standing room. So that it was a pronounced success and shows that the people of the country are hungry and thirsty for knowledge regarding the methods of handling poultry.

Fig. 40 gives a view inside the tent showing the assistant giving a demonstration how to kill and pick poultry.

There was also shown an egg grading device by which eggs can be graded and which also shows what the value of these eggs are if they are produced of the right quality. There are 30 dozen eggs there to be put into nine grades, large, medium and small, and each of these groups divided into three grades as to color, white, brown and mixed. The average prices given by the best dealers in New York for each grade of eggs, and the value of the eggs according to the grades is shown. We can tell exactly and quickly what any case of eggs is worth. We find a difference in the New York City market usually of five to twelve cents a dozen between the pure white eggs and the mixed colored eggs of the same weight, and sometimes a difference of twenty cents or more between eggs of the fancy large white and the common or small eggs. It pays to produce the right kind of eggs. I am certain that we know how to produce eggs of better quality and also how to breed hens to produce more eggs. There are a few things we can do in selecting hens to produce more eggs. There a few things we can do in selecting hens for breeders to increase egg production. (1) Select our hens for constitutional vigor. (2) Take hens that moult late because they are the ones that are generally the heaviest producers. (3) Watch the pullets of the same age and see which ones begin to lay first and they usually are found to be the hens that in the long run will lay the largest number of eggs. (4) The color of a fowl's shanks may indicate her laying capacity. The hens in the fall of the

year just before they begin to moult that have pale shanks are likely to be heavy layers. We find that it is almost invariably the case with the yellow shank breeds that if you find a fowl with good color in the shanks she is not a good layer. (5) In addition to that we may consider the body of the fowl as indicating prolificacy. There is such a thing as the egg type when you once come to know it, but it is not a certain indication.

Before closing this lecture I ought to bring to your attention the fact that the amount of money that is being spent by the agricultural colleges for dairying and horticulture, and other branches of agriculture, is entirely out of proportion to the amount of money given to poultry. This chart (Fig. 41) shows the result of a census taken by the American Poultry Association to learn the amount of money spent for dairying, horticulture and poultry in the agricultural colleges and experiment stations in Canada and the United States. You will notice that for every dollar spent for instruction and investigation and permanent investment in poultry husbandry in the United States and Canada there are six dollars spent for dairying and seven dollars spent for horticulture; and of all this amount of money that is expended annually for every one dollar for poultry there are four dollars for dairying and four dollars for horticulture. However, when you come to get the actual proportionate value of the products produced by poultry, by horticulture and dairying, and by horticulture, according to the census of ten years ago, we find that for every one dollar in value of poultry products produced there are only one and three-tenths dollars in horticulture and one and seven-tenths of a dollar in dairying.

The last slide (Fig. 42) shows a picture in your own State. There is a picture of the poultry department of your own State College of Agriculture, a department where under Prof. Homer Jackson good work is being done with facilities that are wholly inadequate to the poultry interests of this great State. Dean Hunt, I know personally, is thoroughly interested in the development of that department. When I was there a number of years ago he said: "Whenever we can get the appropriation to build the buildings and find the man"—he did not have Jackson then—"to take care of this department as it ought to be, there are twenty acres of as nice land as can be found in the State of Pennsylvania that will be turned over to the use of the poultry department."

The slides show views of the boys in the winter courses making chicken coops, building colony houses, judging poultry and other pictures to show the dozens of ways in which they are trying to teach the latest and best methods that will help the poultry of the State.

I feel that in this great State of Pennsylvania, which is one of the richest and one of the best agricultural States in the Union, and in which poultry husbandry is one of the chief agricultural resources, with the ability and the courage and the loyalty of the poultrymen of the State and the efforts of your poultry association through the able leadership of the President, Mr. W. Theodore Wittman, who is chairman of this meeting, with the assistance of the State Board of Agriculture and Farmers' Institutes and all these other educational agencies, that the State of Pennsylvania is not going to take a position in the rear rank, but is going to measure up to the responsibility and take the position and place it should occupy in the front rank of the states. (Applause).

FARM MANAGEMENT

By J. A. BILLINGS, *U. S. Department of Agriculture, Washington, D. C.*

The work of the Office of Farm Management of the U. S. Department of Agriculture, embraces a study of the underlying principles which affect the profits of the farm. In this work very little attention is given to the carrying on of experiments, in fact, the object is to apply the results obtained by State Experiment Stations to use the methods employed by the most successful farmers in different sections, and outline the system of management best adapted for each particular section, after taking into consideration the local conditions, such as character of soils, location in regard to markets, and climatic or other changes which may affect the types of farming and cropping systems.

Farm Management differs from experiment station work in that it makes a study of the farm as a whole, that is, the organization of the farm in reference to the arrangement of fields, the location of buildings, the cropping system and rotation best suited for the maintenance of soil fertility, the distribution of labor on the farm, the amount of equipment necessary to operate the farm, and the proper system of keeping records and accounts in order to know what crops are the most profitable to grow, or what system of farming is best adapted under existing conditions. The agronomist tells us *how* to grow any particular crop, the preparation and cultivation of the soil, the use of manures and fertilizers to furnish plant food and maintain profitable yields of crops. The animal husbandman tells us *how* to feed and care for animals, the dairyman tells us *how* to handle the dairy products, but the farm management man first of all studies the question *what* is the best type of farming which is best adapted for his particular farm. After deciding what crops to grow and the acreage of each; what arrangement of the fields for the most economical handling of labor and equipment; what cropping system which will be the most profitable for the type of farming to be followed; what kind of animals and the number of each; what kind and amount of farm equipment which is best adapted for the particular kind of farming which is to be followed, and this takes into consideration the buildings which are best adapted for this purpose, the kind and number of farm implements, machinery, stock, etc.; what amount and the best distribution of labor and what cost of production for the different farm crops or products and the probable net income which will be derived from the farm. In other words, farm management answers the question *what* or *whether*, while agronomy, animal industry, etc., usually answers the question *how*, as applied to the farm.

The work of farm management is to make a study of the conditions of every particular locality in order to study the problems in that region, and where necessary, co-operative work is arranged, in order to carry out this investigation.

The arrangement of this discourse will be taken up in the same logical order as we make a study of any particular farm with reference to establishing a better system of farming for more profitable returns. This is given to you as a guide to enable each farmer to make a study of his own farm in the same way and to think out solutions for the many problems which every farmer has to meet. In order to do this, therefore, the first question to decide is the best type of farming which can be followed with profit, whether a livestock, grass or grain, fruit, market gardening type of farming, or any combination of each. After deciding this question, it is necessary to satisfy conditions. This question will cover the number of work stock, such as horses and mules, and the number of cattle.

THE FARM PLAN.

If livestock or dairy farming is to be followed, then it is particularly necessary to estimate the number of dairy cows which can be kept with profit on the farm. In order to do this, each farmer must figure out the amount of forage crops or grain necessary to feed each animal, and first of all one must decide on the ration for each kind of animal. For example,—suppose we have a problem to work out the best plan for a dairy farm. There are several feeding systems which can be followed, such as pasture in summer with no silage, pasture with silage, soiling crops without silage, soiling crops with silage, or silage for twelve months. These feeding systems may be more or less combined. It will first be necessary to find out the number of days or periods as for example, the number of days that silage is fed or the period of pasture, estimating the pounds of each material given during this period, for adult animals, for yearlings, for calves and for work stock. Then calculate the total amount of the different feeds necessary for the entire year. It will also be necessary to estimate the proportion of yearlings and calves to adult animals. As a general thing, we find that the average farmer will keep about one-half as many young stock, both yearlings and calves, as adult animals. In other words, in order to maintain the herd, we assume that there will be one-fourth as many yearlings as there are cows and one-fourth as many calves as cows, and in estimating the feed for each cow and corresponding young stock, calculate the amount of feed, both forage and grain, for one cow for the entire year and add to that one-fourth of the amount of feed necessary to support one yearling and one-fourth of the amount of feed necessary to support one calf.

After finding out the tons of feed of the different food materials necessary for one cow and corresponding young, find the acreage or the fraction of an acre necessary. Assume the average yield of farm crops, then divide the amount of each feed found for one cow and corresponding young stock by the yield per acre, which will give the acreage necessary. After determining the acreage of available land which can be used for farm crops or pasture, subtract from this acreage the acreage necessary for the work stock, and divide the remainder by the acreage necessary for one cow and corresponding young, which will give you the number of cows which can be kept upon the farm if the whole area is devoted for growing forage for the stock, if grain or other money crops not used for feed are grown, then the acreage of these crops must be deducted with the acreage for the work stock before we can determine the number of dairy cows which can be profitably kept.

In order to illustrate the establishment of a cropping system, an 80 acre farm is assumed of which 72 acres is available for crops or for pasture. We will suppose that 72 acres can be divided into six fields of 12 acres each for convenience of rotation. We will assume that the yield of farm crops per acre is as follows:

Yield of Farm Crops per Acre

Corn,	60 bu.	Clover or mixed hay,	2 tons.
Oats,	40 bu.	Soiling corn,	10 tons.
Wheat,	30 bu.	Silage corn,	13 tons.
Potatoes,	180 bu.	Alfalfa (3 cuttings),	4 tons.
Soy beans,	20 bu.	Canada peas and oats, (hay)	2 tons.
		Cowpea hay,	1½ tons.

Several rotations may be established on such a farm in order to satisfy conditions, but some of them, however, will be of greater advantage in maintaining the fertility and keeping up the humus contents of the soil. An outline of some of these rotations, with the approximate number of work stock, dairy cows and young stock, is as follows:

Rotation I. 1. Corn. 2. Corn, 6 a. Oats, 6 a. 3. Wheat. 4. Clover and timothy. 5. Timothy and pasture. 6. Pasture.	Pasture: No Silage. Animals Kept: 3 horses. 1 bull. 10 cows. 2 yearlings. 3 calves.
Rotation I. 1. Corn. Oats, 4 a. 2. Silage corn, 4 a. Corn for ears, 4 a. 3. Wheat. 4. Clover. 5. Timothy. 6. Pasture.	Pasture: Silage. Animals Kept: 3 horses. 1 bull. 10 cows. 2 yearlings. 3 calves.

Rotation I.	Soiling: No Silage.		When Fed.
	Soiling Crops.	Acres.	
1. Corn.			
2. Corn.			
3. Soiling crops, 6½ a.	Rye,	1½	
Oats, 5½ a.	Wheat, vetch & crimson clover,	1	May 13 to 24.
4. Wheat.	Red clover,	1	May 25 to June 5.
5. Clover.	Peas and oats,	2	June 6 to 31.
6. Timothy.	Early corn,	2	July 1 to 21.
Animals Kept:	Cowpeas & Kaffir corn or sorghum,	1½	July 22 to August 11.
4 horses.	Late corn,	1	August 11 to September 4.
1 bull.	Cowpeas,	2	September 5 to October 1.
16 cows.			
4 yearlings.			
4 calves.			

Rotation I.	Soiling: Silage. Animals Kept: 4 horses. 1 bull. 18 cows. 4 yearlings. 5 calves.
1. Corn. 2. Silage corn, 5 acres. Corn for grain, 7 acres. 3. Soiling crops, 6½ acres. Oats, 5½ acres. 4. Wheat. 5. Clover. 6. Timothy.	

Rotation I.	Silage 12 Months: No Pasture. Animals Kept: 4 horses. 1 bull. 14 cows. 3 yearlings. 4 calves.
1. Corn. 2. Corn for grain, 6 a. Corn for silage, 6 a. 3. Oats. 4. Wheat. 5. Clover. 6. Timothy.	

Rotation II.	Rotation III.
1. Corn. 2. Soybeans for seed. Cowpeas for hay. 3. Wheat. 4. Hay. 5. Hay. 6. Pasture.	1. Corn. 2. Soybeans for seed. Cowpeas for hay. 3. Potatoes. 4. Hay. 5. Hay. 6. Pasture.

Rotation IV.	Silage for 12 Months. No Grain Purchased: Animals Kept: 4 horses. 1 bull. 18 cows. 9 young cattle. Grain Purchased: Animals Kept: 4 horses. 2 bulls. 42 cows. 21 young cattle.
1. Corn. 2. Silage corn, 9 a. Corn (grain). 3. Potatoes. 4. Alfalfa. 5. Alfalfa. 6. Alfalfa.	

Rotation V.
A three year rotation, 72 acres divided into 24-acre fields.

1. Corn.	2. Corn, oats or soiling crops.	3. Clover.

Pasture; No Silage:
Corn for grain, 24 acres; oats, 24 acres; clover hay, 12 acres; and clover pasture, 12 acres.
Pasture; Soiling:
Corn for grain, 24 acres; oats, 18 acres; soiling crops, 6 acres; and clover hay, 24 acres.
Silage 12 Months:
Corn for grain, 24 acres; corn for silage, 10 acres; oats, 14 acres; and clover hay, 24 acres.

Rotation VI.

Six Year Period—36 Acres.	Three Year Rotation—36 Acres.		
Alfalfa continuously for five years. The fifth year put 12 acres to corn. The sixth year, 24 acres to corn. The seventh year, the three year rotation established.	1st. Corn	Corn	Clover
	2nd. Corn	Clover	Corn
	3rd. Clover	Corn	Corn
	4th. Corn	Corn	Canada peas & oats
	5th. Corn	Peas & oats	Alfalfa
	6th. Peas & oats	Alfalfa	Alfalfa
	7th. Alfalfa	Alfalfa	Alfalfa

Rotation VII.

1	2	3	4	5	6
Alfalfa*	Corn	Corn	Wheat	Clover	Timothy
Alfalfa	Corn	Wheat	Clover	Timothy	Corn
Alfalfa	Wheat	Clover	Timothy	Corn	Corn
Alfalfa	Clover	Timothy	Corn	Corn	Wheat
Alfalfa	(Timothy, peas & oats, potatoes).	Corn	Corn	Wheat	Clover
Corn	Alfalfa	Corn	Wheat	Clover	Timothy

*The alfalfa field may be permanent as long as profitable then brought into the regular rotation and a new field devoted to this crop.

Some other Rotations Followed:

1. Corn.	1. Potatoes.	1. Wheat.
2. Wheat.	2. Corn.	2. Corn.
3. Clover.	3. Potatoes.	3. Canada peas and oats or potatoes.
4. Wheat.	4. Wheat.	4. Clover.
5. Clover.	5. Clover.	5. Timothy.
	6. Timothy.	6. Timothy.

Cover Crops for Green Manure:

Rotation I.

At last cultivation of corn.

Rotation II.

At last cultivation of corn.
After each crop of potatoes.

Rotation III.

At last cultivation of corn.

In *Rotation I*, where the pasture system is followed, the number of animals which can be kept profitably on the farm will be governed by the acreage available for pasture, and in this case I have assumed that there is no permanent pasture, except a small paddock near the buildings, but that the pasture will come into rotation. There will also be sold wheat, hay, or other crops in some cases over and above what is

necessary for feed for the animals. The grass incomes from this 80-acre farm for the different feeding systems under this rotation vary but little, at the average farm prices, and will be approximately from $1,900 to $2,500. From this must be deducted the expense for labor, farm equipment, interest and depreciation, fertilizers, etc., although for a live stock type of farming very little fertilizer will be necessary if the rotation is arranged as suggested.

In *Rotation II* soy beans and cowpeas have been introduced as a crop to follow corn, the object being chiefly to introduce a leguminous crop to improve the soil texture preceding the wheat and to much better maintain the fertility of the soil. Soy beans may be introduced as a profitable crop in Pennsylvania, either for hay or for seed. The latter can be ground and fed to the farm animals or may be sold in market, as there is demand for soy bean seed. Cowpeas may also be grown for hay in the more southern parts of the State, but this crop is not as profitable a seed crop as the soy beans. The feeding value of soy bean meal may be shown by the chemical analysis and digestibility experiments which give the total digestible protein in soy bean meal about that of linseed meal. In many parts of the State of Pennsylvania this crop may profitably be substituted for oats in the farm rotation.

Rotation III varies from Rotation II only in the substitution of potatoes in place of wheat. This is applicable only on those soils which are better suited for growing potatoes. The total income from Rotation III will be somewhat greater, varying from $2,500 to $3,100 annually, but on the other hand, there will be a greater expense for labor in growing the potato crop and probably an additional expense of $175 to $200 for commercial fertilizers.

Rotation IV introduces alfalfa, a very profitable crop for the dairy farmer, and this crop can be profitably grown in a great many parts of the State. Alfalfa may be grown permanently for five or more years, before reseeding or rotating, or alfalfa may be placed in a rotation for three to five years, as suggested. The great advantage of this rotation is its influence in improving the soil, as alfalfa is a soil builder, while the grasses and cereals are soil exhausters.

Rotation IV, in which potatoes enter, gives a very desirable crop preceding alfalfa, but in order to seed to alfalfa after potatoes, it will be necessary to grow early potatoes, which can be marketed about August 1 and which will enable the alfalfa to be sown before September 1. If potatoes are not profitable, in any section, Canada peas and oats may be substituted, mowed for hay the latter part of June or early in July, and the field quickly plowed, or perhaps simply disked and allowed to lie fallow with weekly cultivations until the latter part of August, when alfalfa may be sown. Under some conditions, such as on limestone soils that have considerable clay, it may be necessary to fallow the land from early spring until July, then seed to alfalfa.

Alfalfa is a profitable crop for feeding livestock or for market. At present the price for alfalfa hay is fully as high or higher than for good timothy hay and as a rule, under favorable climatic conditions, we can depend upon at least four tons of marketable alfalfa hay per acre. Furthermore, this hay has a much greater feeding value as far as protein is concerned, than grasses or even clover and nearly equals the feeding value of wheat bran.

The gross income from this rotation, basing alfalfa at market price, is greater than for any other rotation which can be followed on the farm, and varies from $4,000 to $5,700, depending on the number of animals which are kept and the amount of grain which is purchased. An interesting fact is that 42 cows can be kept when the necessary grain feed is purchased, but the net income, after deducting the cost of grain and labor, from 42 cows is but little greater than where 18 cows are kept and all the feed is grown on the farm.

Rotation V, which is a three year rotation, gives clover once in three years and is therefore a good cropping system for maintaining the humus of the soil. The income, however, from this rotation is slightly different from Rotation I.

In *Rotation VI* it is assumed that the 72 acres is divided into two fields and that 36 acres of alfalfa may be grown continuously for five years, while the other half of the farm is devoted to a three year rotation. The advantage of this system is that where alfalfa can be grown successfully it may be far more profitable to let this field stand permanently as long as possible before reseeding, and when it is necessary to change, the half of the farm devoted to rotation can gradually be seeded to alfalfa and rotation established on the alfalfa area.

Rotation VII is best suited to a farmer who desires to keep permanently as long as possible only a small field of alfalfa. When it is advisable to change, any other field may be seeded to alfalfa, as suggested in the outline, and the area devoted to alfalfa be placed in the regular rotation.

With all of these rotations it is very desirable to grow cover crops, which can be used for plowing down in the spring as green manure, seeded at the last cultivation of corn or after potatoes, when potatoes is to be followed by some crop which will be planted the following spring. For this purpose, we suggest the planting of hairy vetch, especially on soils of sandy nature, but it is more advisable to sow with the vetch some rye, wheat, crimson clover, or a combination of each, which will give a support to the vetch and more vegetable matter to turn under. We suggest where rye and vetch or wheat and vetch are sowed to use a half bushel to three pecks of rye or wheat with 18 to 25 pounds of vetch. Several successful farmers are using 25 pounds of vetch with five to six pounds of crimson clover per acre, and some are planting vetch alone at the rate of 40 pounds per acre. One-half bushel of rye or wheat with 18 to 20 pounds of vetch and 5 to 6 pounds of crimson clover, in the regions where crimson clover can be grown, is a very desirable mixture.

FARM EQUIPMENT

The kind, amount and efficiency of farm equipment is a matter which is receiving considerable study by our office. Very little attention has been given hitherto to the study of farm equipment, especially in regard to the requirements on farms of different areas and different types of farming. Dairy buildings, and especially the stables for dairy cows, has received considerable attention in the last few years and the Dairy Division of this Department is recommending plans for sanitary stables. However, my observation of many dairy buildings shows that on many farms which are producing high grade milk, a great many of the stables are very expensively equipped, whereas on

other farms equally good milk is being produced from more simple construction of stables. I have in mind a farm in Susquehanna county which is sending to New York milk which receives nearly as high a score in cleanliness as any other milk shipped to the city, yet the buildings are very simple. The production of clean milk perhaps depends largely upon the individuality of the man as upon the equipment. Clean milk may be produced under very simple though sanitary conditions, if great care is used in the care and handling of the product from the time the milk is drawn until it reaches the consumer.

The style of farm buildings and stables in different regions varies widely. Pennsylvania has a peculiar type of structure of barn which is seldom found in other states. These barns have the stables in the basements, which are usually dark, poorly ventilated, and unsanitary. Such stables, however, can be easily modified, giving more healthful conditions for animals, by building a one-story ell with concrete floors and very simple sanitary interior fittings. Such a stable has recently been erected by the U. S. Indian School at Carlisle, Pennsylvania, from plans by this Department.

Another style of barn, very applicable to regions where considerable grain is grown, is a covered yard type of stable with storage above, and an arrangement for stanchioning cows at the time of feeding. This covered yard may be entirely enclosed, with side windows, and a sanitary milking stable addition adjoining this building in which the milk may be produced as cleanly as from any other system. A stable of this kind was built a few years ago near Columbus, Ohio. It was large enough to accommodate 60 cows my dividing the covered yard into two yards holding thirty cows each. The silage and all roughage is fed in this covered yard and the grain feed may be fed here or may be fed in the milking stable during the time of milking. The advantage of this system is that it enables the farmer to utilize a great deal of the straw, and overcomes the necessity of cleaning stables daily. Where plenty of bedding is used, the cows are usually as clean as ordinarily found in the other type of stable, even where considerable care is given to grooming and cleanliness. In such a system it is necessary to give 80 to 100 square feet of space per animal. If the storage above the covered yard is arranged for hay in the center and straw in the wings, then the amount of labor in caring for the animals can be reduced to a minimum. This system ought to appeal to farmers in parts of Pennsylvania, especially in Lancaster county, where the rotations call for considerable acreage of wheat and where, as a usual thing, a great many steers are fattened for market.

In making a study of the equipment on the farm, each owner must carefully consider principally the type of farming and the simplest requirements for the storage and handling of his crops. A truck or fruit farmer may not require near as much expenditure in buildings as a hay, grain, or dairy farmer. The problems of working out standards for equipment for all different types of farming is receiving special attention in this office.

Another problem which each farmer should carefully consider is the amount of equipment in farm implements and machinery. As stated for farm buildings, many farms are over-equipped in this respect, while many others do not have the amount of equipment necessary to handle the farm economically. The question of the most

efficient tillage implements is also of vital importance, and a knowledge of the best methods in preparing land and cultivation of crops is very essential, in order to plan on the amount of farm equipment necessary. The farm roller is an implement which probably is necessary on every farm, but very little attention has been given to what kind of a roller is most efficient. The efficiency of an implement to compact the soil was brought to my attention the past year, in those regions which suffer the most from drought. In New Jersey it is customary to seed down to clover and timothy or alfalfa the latter part of August, after harvesting a potato crop or some early crop, which allows the field to be cleared in August. Many fields of clover and timothy and some plantings of alfalfa this past year were not a success, due probably to the inefficient work of the ordinary farm roller, and under such conditions it may be necessary to have an implement with a corrugated surface or with a series of convex disks set closely together in order to compact the subsurface of the soil. On several fields where potatoes had been harvested and the vines had been raked off with the ordinary horse rake, even where this failed was rolled after preparing by a disk harrow, the seed failed to germinate, which shows where the wheels of the horse rake compacted the soil, which shows conclusively that under dry conditions the ordinary plain roller superficially compacts the surface. There are several implements being placed upon the market, which compact the subsurface and which should receive the attention of farmers.

Many implements for cultivation are now placed upon the market which are equipped with blades or knives for cutting the surface without going very deeply into the soil. Such implements are very efficient for the later cultivations of crops in that they simply loosen the top soil, prevent the cutting off of feeding roots, prevent the evaporation of soil moisture from a lower depth and provides a dust mulch to conserve the moisture.

The Office of Farm Management also makes a study of the efficiency of farm implements, with a view to economy of labor. It is often an important question to what extent a farmer may employ larger implements which require a greater number of horses and thereby decreasing the amount of man labor. In many sections of the East it may be entirely practical to use large power machinery, especially the traction plow, and the traction engine for other farm operations. The traction plow is already in operation in New Jersey and Pennsylvania, and where the fields are comparatively large and level, especially where the fields are rectangular, with a long course before is is necessary to turn, such expenditure may be economy. There are many farms which could be arranged for the practical use of a traction plow by rearranging the fields.

The problem of farm equipment I consider has not been solved as yet, by any means, and the farmers should assist the Department in giving their inventories of farm tools, in order that this office may secure data enough to establish some standard for farms of different areas and types of farming.

RECORDS AND ACCOUNTS

One of the most important farm management problems is the establishment of some simple system of records and accounts, which will enable the farmer to know more definitely the cost of production

of farm products, and the distribution of labor on the farm, as influenced by his farm conditions. One of the important questions of the day among business men is the establishment of scientific management, which will give greater efficiency. The study of efficiency in operating large plants has been perfected in many places so that the manufacturer is realizing greater profits. The efficiency and distribution of farm labor is a problem also which is one of the most important on the farm. The farmer should know the cost of feeding and caring for the different animals; he should know the cost of labor, both horse and man labor for the different crops; he should know the production and cost of production of dairy products, in order to have an accurate knowledge of the profits and losses on the farm. Many farmers are beginning to realize the necessity of keeping careful records and are establishing systems which will give them this data. In most cases, however, this is done on large farm propositions where the records and accounts are kept by a bookkeeper hired for that purpose. The small farmer, however, needs this information just as much, and a simple system of keeping his accounts may be devised, which, while not absolutely accurate, will give enough of this information to determine what profits are being made on the farm.

The Office of Farm Management has for some time been keeping records on a number of farms, doing the tabulation in the office, by a system of daily record blanks, especially designed fo getting the information which this office needs. The summaries of the yearly records on many of these farms are extremely interesting and suggest many things of importance in their business management.

In order to show the importance of this work and what a careful keeping of farm records actually means, the following tabulations of the cost of growing corn, the maintenance of an ochard and handling the apple crop, is given.

TABLE I.

Compiled by Office of Farm Management, U. S. Department of Agriculture. Wisconsin Farm.

1909. Crop Corn—Ensilage. 15.38. A. Field "a-1."

	Dates.	Total.			Per Acre.			Remarks.
		Man hours.	Horse hours.	Cost.	Man hours.	Horse hours.	Cost.	
Care seed corn,	4/21-6/19,	49¼		$6.56	3.20		.427	
Plowing, 5 inches deep,	6/ 1-10,	88¼	264¾	38.25	5.74	17.22	2.487	John Deere.
Dragging,	6/ 7-14,	20½	45¾	7.30	1.33	2.97	.475	Spike tooth.
Discing,	6/11-14,	14⅜	44¼	6.41	.96	2.88	.417	John Deere 12 Discs.
Planking,	6/12-15,	10½	22	3.60	.68	1.43	.234	3 planks 12 feet.
Planting,	6/12-16,	25½	37½	7.15	1.66	2.44	.465	John D. Check Row.
Dragging,	6/16-19,	20¼	44	7.10	1.32	2.86	.462	Spike tooth.
Replanting,	6/24-26,	10¾		1.43	.70		.093	Hand planter.
Cultivating:								
1st time E&W,	6/26-7/7,	22⅜	45½	7.58	1.48	2.96	.493	Sulky 2 h riding.
2nd time N&S,	6/29-7/17,	47¾	59½	12.31	3.11	3.87	.801	1 & 2 horse cult.
3rd time E&W,	7/10-21,	27½	55	9.17	1.79	3.58	.596	Sulky 2 horse.
4th time N&S,	7/21-27,	44	79¾	13.84	2.86	5.19	.900	1 & 2 horse cult.
5th time E&W,	7/28-31,	34½	58	10.40	2.24	3.77	.676	1 & 2 horse cult.
Hoeing,	7/ 1-9/8,	592¾		79.03	38.55		5.139	
Cutting,	10/ 6-23,	119½		15.94	7.77		1.036	
Hauling and siloing,	10/ 6-19,	427	383	95.23	27.76	24.90	6.192	
Total labor cost,		1,555½	1,139	$321.30	101.15	74.07	$20.893	
Seed—Silver King,				10.70			.696	214 lbs. @ 5c. lb.
Equipment,				26.89			1.748	
Taxes,				7.69			.500	
Interest,				76.90			5.000	
Total cost,				$443.48			$28.837	

YIELDS.

192 loads silage @ $3.00,	=	$576.00
32 shocks fodder corn @ 75 c.,	=	24.00
3½ bu. seed corn @ $3.00,	=	10.00
Total,		$610.50

SUMMARY.

	Total.	Per Acre.
Income,	$610.50	$39.70
Cost,	443.48	28.84
Profit,	$167.02	$10.86

Rates per hour: Man hours, 13 1-3 c.; horse hours, 10 c.

TABLE II.

Compiled by Office of Farm Management, U. S. Department of Agriculture.. N. Y. Farm.

1910. Crop: Orchard, 4½ Acres. Field "H."

	Dates.	Total.			Per Acre.			
		Man hours.	Horse hours.	Cost.	Man hours.	Horse hours.	Cost.	
Scraping trees,	3/ 1-28,	25		$5.00	5.56		$1.112	
Pruning trees,	3/28-4/2,	100		20.00	22.22		4.444	
Spraying,	4/4-9,	28¾	28¾	8.63	6.39	6.39	1.919	Lime sulphur.
Piling and drawing brush,	4/16-20,	16	7	3.90	3.55	1.56	.867	
Plowing,	4/22-23,	27	54	10.80	6.00	12.00	2.400	
Spraying,	5/ 2-6,	13	8½	3.45	2.89	1.89	.767	Bordeaux.
Harrowing,	5/ 9,	4	8	1.60	.89	1.78	.356	
Harrowing,	5/16-17,	4	8	1.60	.89	1.78	.356	
Spraying,	5/24-26,	27½	34	8.90	6.11	7.56	1.978	Bordeaux.
Harrowing,	5/26-6/8,	4½	9	1.80	1.00	2.00	.400	
Spraying,	5/31-6/4,	20½	11	5.20	4.56	2.44	1.156	Bordeaux.
Cultivating,	6/ 7,	3	6	1.20	.67	1.33	.267	
Spraying,	6/18-20,	13	13	3.90	2.89	2.89	.867	Tobocco Ext.
Cultivating,	6/24-7/13,	13	26	5.20	2.89	5.78	1.156	
Sow clover,	7/13,	1		.20	.22		.044	
Dragging clover,	7/13,	1½	3	.60	.33	.67	.133	
Rolling clover,	7/13,	2	4	.80	.44	.89	.178	
Thinning apples,	8/13,	10		2.00	2.22		.444	
Picking apples,	10/ 3-17,	299½		59.90	66.55		13.320	
Picking up and drying apples,	10/ 4-17,	55	22	13.20	12.23	4.89	2.933	
Drawing apples,	10/ 3-18,	27½	61¾	11.67	6.11	13.73	2.594	
Total labor cost,		695¾	304	$169.55	154.63	67.52	$37.691	
Manure charge (50 per cent. of 1910 charge),				20.71			4.602	
Spraying materials plus hauling,				15.80			3.511	
Clover seed—½ bu. @ $9.00,				4.50			1.000	

Barrels—488 @ 35c. each,			170.80			37.955
Equipment charge,			28.79			6.395
Taxes,			3.15			.700
Interest,			31.50			7.000
Total cost,			$444.80			$98.854

YIELD.

488 bbls. apples @ $2.50,	=	$1,220.00	108.4 bbls. per acre.
Drying apples,		100.00	
Total,		$1,320.00	

SUMMARY.

	Total.	Per Acre.	Per Bbl.
Income,	$1,320.00	$293.330	$2.71
Cost,	444.80	98.854	.91
Profit,	$875.20	$194.476	$1.60

Assumed rates per hour: Man hours, 20 c.; horse hours, 10 c.

Some figures on the cost of feeding dairy cows for the production of milk are very interesting. The average cost of feeding and caring for an animal from its birth until it became an adult, which was about two years, secured by keeping accurate record of a dairy herd in Wisconsin, shows that under a very simple system of management the cost of feed and labor amounted to $50.08. The cost of feed during this period was $42.01. The cost of labor was $8.07. The feed was charged at market prices, man labor at 12 cents per hour and horse labor at 10 cents per hour. The young stock were pastured for about three months during the summer, for which there was no labor charged. An interesting fact in connection with this is that for the first two months the cost of both feed and labor was the greatest of any part of this period. During the winter months it remained fairly uniform and was the lowest during the summer.

Another line of work which has received considerable attention in our office it what might be called conducting an agricultural survey. This is a canvass of all the farmers in a township and securing complete data on the incomes and expenses of the farm. In this work, attention was given to the early training and preparations for farm life and one of the most interesting deductions from farm surveys in New Hampshire is that the average net income from farmers which received a high school training was considerable above the income from farmers who only attended the district school.

THE NEEDS OF OUR RURAL SCHOOLS

By MISS SARA C. LOVEJOY, *State College, Pa.*

The needs of our rural schools are fundamentally the same as those of all schools, based on the common object of all education. Every one who aspires to the name, "Educator," and even those of us who can claim no higher title than "teacher" are thinking some pet theory as to what education really is, but from the many definitions, as numerous as are the definers, we may select as one of the best that of a leading college president: "The object of all education," he says, "is to train men and women for intelligent citizenship." The schools of our rural communities should, therefore, fit the boys and girls for their duties as men and women. Are they doing this?

Before we can answer this question we must consider what these duties are for which training is needed. First for the home, the one institution of our land in which all the people share, and in the building of which every one has a part. We have long recognized that boys who were to become physicians, ministers, or engineers must be especially trained for their professions. It is time that people admitted that home-building is no less a profession than are these others and that they who are to administer the work of the household should be definitely trained.

In our rural districts, however, as in our cities, we do something besides live in homes. Their material needs must be supplied and that necessitates a directly lucrative occupation. Now the one business upon which all people, whether dwellers in the open country or in crowded cities depend is that carried on in our rural communities,—agriculture. Stop that, and how would the people of this land live? Financially, it is worth more in this State than are all the other occupations combined, including mining and the oil industry. Is it not a business, therefore, for which there should be definite preparation in the schools where the future farmers and farmers' wives are being trained for intelligent citizenship. How can agriculture develop, how can it keep the place it should hold, that of our foremost industry, unless the people who engage in it are as well-trained as are the people engaged in other occupations?

The reason, then, for the study of Home Economics and Agriculture in our rural schools is to increase the power of the rural districts by giving to the boys and girls such a thorough mastery of their business that they will realize its importance and will more readily remain on the farms. It must be recognized that one reason why young people are flocking to cities is that they feel that farming and housekeeping are drudgery and that there is no chance to "rise." There is always a chance to rise when one is studying his work and making it progressively better.

In addition to introducing these technical branches, our rural schools should also better relate their present courses of study to the facts and interests of daily life, so that education may not lead away from the home, but toward it. A problem in arithmetic is of as great educational value when it deals with the division of the income of a family in such a way as to allow the proper proportion for food, for clothing and for housing, as when it deals with the proportionate amount of capital invested by the several partners of a business firm. Attention can be called to matters pertinent to the welfare of family and of livestock if other problems set the children to figuring the required amount of nitrogenous food in a balanced ration either for man or for beast. A geography lesson can be made interesting in itself and may be related to matters of daily life if, instead of being required to learn mere lists of exports, imports and agricultural products of China, Japan and other distant lands, the children are at the same time, given instruction as to the uses of some of these exports in our own households, for instance tea, coffee, rice and sugar; or if they taught something of the agricultural methods employed in other countries. This suggests that in raising the standard of our rural schools, we are not asked to put out of the curriculum the common branches which all recognize as necessary, in order to teach some subjects which many people feel are distinctly "new fangled" and unnecessary. On the contrary, the aim should be to co-ordinate all the work so that it shall be of the greatest practical value.

This is not the time or place to take up in further detail the courses of study. We can merely indicate in general the chief needs of our schools. Later speakers will present methods for instruction in agriculture. All that I can hope to do is to urge you most strongly to introduce into every school, courses in Domestic Science and kindred subjects. The first objection to this is that matters pertaining to the

home can best be learned there. If cooking were all that is included in Home Economics, doubtless most mothers would claim the ability to teach their daughters, although many an experienced housekeeper is often forced to admit that luck rather than science guides her own cooking processes. Much more, however, is included and should be understood by every woman who has the responsibility of directing a household. She should know not merely how to cook, but how to combine foods into a properly balanced ration. This implies a knowledge of the needs of the body, and of the foods supplying these. The soil and the cattle on our farms require nitrogen and lime—so do human beings, but the amount needed by the latter is less generally understood. Moreover, a lack of any of the necessary food elements means a form of starvation, which cannot be prevented by an increased amount of another food element. Since a knowledge of these principles is essential to the complete well-being of our families, this should, very evidently be taught in our public schools if they are to train for intelligent citizenship.

The principles of hygiene and sanitation also belong in the curricula of our rural schools. We have a State law requiring that temperance be taught in all public schools. This is a wise step in freeing the country from a great evil. But one-half the cases of intemperance are caused by improper food. When the body is not properly nourished, a craving for some stimulant is created. Moreover, intemperance is not confined to excess in drink, indiscretion in eating cause many bodily ills. The pupils in our schools should, therefore, be taught the laws of health in regard to eating as well as to drinking.

A well organized crusade against tuberculosis is attracting the attention of people everywhere, and we welcome every effort put forth to stamp out this plague. Preventative work, however, is better than curative, and here again the school is the place for instruction. When school houses are properly built and cared for in regard to ventilation and sanitation, when the common drinking cup is banished, and the pupils are taught why clean houses, fresh air, pure water and clean bodies are necessary to good health then there will be less tuberculosis to fight. If only once a week definite instruction were given concerning the dangers lurking in the dust that clings to our clothing and furniture; in the air of a close room; in the cup passed from student to student; in the touch of a fly flitting from the filth of improperly cared for barns to the food on our tables, and in other matters vital to health, we could soon see a distinct rise in the standard of public health. It ought not to be necessary to emphasize the importance of these matters in rural communities where pure air, good water and proper sanitary conditions are so easily provided, but repeated experience proves that we who live in the country often disregard the laws of health more than do people in cities.

One reason why many people fail in agriculture is because they do not put it on a business basis. They do not know their exact capital invested, or the income derived therefrom, and cannot tell whether they are making money or losing, until too late they find out to their sorrow. For this reason every rural school should include in its instruction a business training, not the stenography and banking which are usualy associated with that term, but a study of the finances of the farm and the farm home. If the merchant must know the propor-

tion of his income which he should invest in advertising in new equipment or in enlarging his business, the farmer, no less, should know his financial status, and the farmers' wife should realize her responsibility since the expenditures for the home are largely under her direction. As has been said before, much of this may be introduced with the usual arithmetic and book-keeping taught in most schools. It is not a new subject, but a practical application of an accepted branch of common education.

So much can be done, then, by the progressive teacher whose desire is not so much to follow well-worn educational paths, as to adapt her instruction to the needs of present day life. This, however, is not enough. As we have seen, some definite technical work is needed for the future home-maker, and the problem of introducing the subject into rural schools becomes difficult. It seems to require special teachers and special equipment, impossibilities in communities where school taxes scarcely provide for the present inadequate facilities.

This condition of affairs emphasizes the need of consolidated rural schools. Why is it that Pennsylvania is so far behind other states in this matter? We look in vain through the pages of the report on Consolidated Rural Schools issued by the office of Experiment Stations and the Bureau of Statistics, for any mention of Pennsylvania. On the contrary, the shabby, isolated school buildings which we all know are a disgrace to this, one of the richest states of the Union. Better buildings, better school grounds, more adequately paid teachers, and then we shall have wider courses of study and a rising generation of more efficiently trained citizens. Concentration of capital, whether in trusts, or in school management brings higher returns, and in the case of schools, the general public receives the benefit of these returns—it may not be out of place to quote from the report already referred to :—"The fusion of a number of small districts into a larger administrative unit furnishes a stable and extensive basis for financing the school and thereby makes for higher efficiency. An incentive is given to make permanent improvements to beautify the school grounds, secure modern sanitation, and provide ample school room equipment. Studies can be introduced which require specially trained teachers, such as agriculture, home economics, manual training, music, advantages almost unattainable in small district schools. These centrally located country-life schools, too, form convenient social centers for communities; local interests and activities affiliate with the schools, so that public use is frequently made of their commodious class rooms or auditoriums."

Pennsylvania should follow the example of her neighbor, Ohio, and of many western and southern states in this respect, but until she does, we must find a way of meeting existing conditions. The problem has been solved in Maryland and elsewhere by means of a special teacher of Home Economics, hired jointly by the several schools of one township or of adjoining townships. With a convenient traveling equipment she is able to go about spending one day, or part of a day, each week in a school. The equipment may include a denatured alcohol stove, if possible one supplied with a portable oven, a home-made fireless cooker, a small supply of cooking utensils; sauce-pans, measuring cups, mixing bowls, spoons, knives, baking pans, and other most necessary articles. This can be packed in a trunk or box and

taken from place to place. The pupils in each school are instructed what supplies to provide for each lesson, and if the whole is arranged systematically, the work is most successful.

Better still is it to have a packing box equipment in each school house. The boys can be pressed into service to construct cupboards from packing boxes easily obtained, and the necessary utensils can be packed conveniently away between lessons. If the building is so arranged that a separate room can be provided, so much the better, but if not, a table at one end of the regular room must do. If a permanent one is not possible, one constructed by means of boards placed on wooden trestles, or on the desk tops will serve the purpose. Often the stove used for heating the room may be utilized for cooking.

The question naturally arises as to whether such work will not interfere with other classes in the same room. It need not, if discipline is properly maintained. Another question is regarding the cost of such an equipment. It can be provided according to its completeness, at from $10 to $100; I have seen a satisfactory one for less than $30. If there is sufficient interest in the matter, donations of utensils and supplies by the people of the community often reduce the cost of equipment and maintenance.

The object of such a course in cooking and a study of food principles, as of all else included in the broad term Home Economics, is two-fold; to train efficient home-makers, and to raise the standard in the home, so that the dignity and importance of household tasks may be better appreciated. We have false standards when we feel that person who works in a kitchen is performing service less worthy than the girl who manipulates a type-writer in an office.

A direct result of this course may be the solution of one of the serious problems of school life—the noon lunch. We nearly all recognize as injurious the cold luncheon, consisting often of a combination of indigestible food, served in an unappetizing manner. Nevertheless, it has seemed impossible to avoid this entirely. Even though we may chose more nutritious articles and see that they are packed so carefully as to be palatable when lunch time comes, still a cold mid-day meal is poor sustenance for growing children. With the introduction of cooking into our schools we may hope to improve conditions very materially. Each day the lunch brought from home may be augmented by some one hot, nutritious article served at a trifling cost. The planning may be done by the teacher, the work by the pupils, those only being allowed to help whose lessons are prepared. The ever useful fireless cooker is of assistance here as a means of cooking and keeping hot, cocoa, meat stew, beans, maccaroni and cheese or other wholesome articles. Another bad feature of the usual school lunch, aside from its effect on health, is carelessness regarding table manners, and a general disregard of order. This also may, to a large extent be welcome if a more regular noon meal, served neatly indoors, takes the place of the contents of a lunch pail hastily devoured on the school house steps.

Some of you are ready to object that the school program is already over-crowded and that the introduction of subjects hitherto considered a part of home training will over-work both teachers and pupils. When a special teacher can be hired by several schools, no additional work need be put upon the regular teacher, and even if this is not possible, most teachers who have undertaken the work have found that the children enter into it with such zest, and return to their other studies

with so much more enthusiasm that the strain of teaching seems less severe. Others will object that Home Economics is merely a fad. Is any subject a fad which helps people to live according to higher standards, by teaching them how to observe better the laws of health, how to be prudent in the use of time, strength and money, and by making a study of the home of supreme importance? You say that there is nothing to be learned in school about house-keeping and home-making, we immediately put these occupations upon a lower plane than others, since we admit that twentieth century methods are better than nineteenth for most things. Scientific methods are accepted in the business world, why not in the home?

If we are to have Home Economics permanently in our schools, we must of necessity have properly trained teachers, and here a more serious difficulty presents itself. However, with the required introduction of this work into Normal Schools, and with the course already established at the Pennsylvania State College, opportunities are being offered for their preparation. For these teachers in schools where no facilities for work are provided by the board of education, and where no regular courses can be taught, a beginning may be made through the noon lunch, which may develop later into a complete course. The summer course for teachers at the Pennsylvania State College, while it cannot give in six weeks a complete professional training in Home Economics, offers much that is valuable to those who wish to know how to start work through the lunch or in some other small way.

Let it not be thought that all the needs of our rural schools will be supplied by the introduction of Home Economics into the curriculum. We need, as has already been stated before, a more liberal appropriation for school work making possible better buildings, more attrac tive grounds, more adequately paid and, consequently, better teachers and a closer co-operation between school and home. However, one very definite step toward some of these needed improvements will be taken when Home Economics and Agriculture are introduced into every rural school.

COUNTRY SCHOOLS FOR FARM LIFE

By PROF. THOS. I. MAIRS, *State College, Pa.*

It is acknowledged by nearly all that the country schools are not serving their purpose so well as they once did. The object of all education is to adapt the pupil to his environment. As the environment changes the schools must change to meet it, if they are to do the work for which they are intended. If our schools had been less efficient in the past there would be less difficulty to-day in adapting them to present needs. Some one has said "Man must be fluid, must be able to change, institutions are not fluid, they never change until forced to do so and then they fight to the death to maintain their

dogmas." While this is to some extent true this very conservation is one of the strong points of the public schools. It is well that they are not carried away by every dreamer with a freak educational system. Nevertheless certain changes, not reforms, are needed if the country schools are to adapt their pupils to farm life. By country schools we mean not only the one room country schools but the township high schools as well.

That it is the function of these schools to adapt their pupils for farm life should not be questioned. Practically all their pupils come from the farm and most of them will continue on the farm. Very few of them will attend any other school and must therefor get whatever education schools can give them in these schools. It should be the function of the schools to train the pupils for the conditions of tomorrow so far as they can be foreseen, but since the morrow cannot be seen let us train them for to-day rather than for yesterday.

The specific adverse criticisms made of the country schools are that they do not touch the heart of the community, that they are modeled too much after city schools, that they do not give enough useful knowledge, and that they are inclined to place the fitting of students to meet college entrance requirements ahead of training for life, that is they are inclined to sacrifice the interests of the majority for the benefit of the few. The reasons of these tendencies are far to seek but the remedy is not always so easy to apply. The leaders in education have not been workers in the rural schools and there has been a constant drainage of the best teachers from the country to the city schools and the professions on account of the better salaries. The country teachers have in general recognized the superiority of the city school and in seeking for improvement have naturally been led to copy. A great deal more thought has been given to the improvement of city schools for city environment because of the better organization and higher salaried men.

The public gives the teacher of the township schools more credit for fitting one student for college than for what he does for all the rest of the school. It is natural therefore that the teacher should give special attention to this one again. The teacher is perhaps a college graduate and would of course like to furnish a new student to his *alma mater*.

In order that the school may touch the heart of the community it must become more of a social center. The games and amusements entered into by the pupils contribute more toward this end than any other one thing. Where you see a school that can get up a ball game you will see one that is getting next to the people.

If we admit that the rural schools are not meeting their possibilities and can point out their specific weaknesses we should then seek the remedies. Some of these have already been suggested, perhaps none of them are new to you. The two great opportunities for improvement are by centralization and consolidation and the introduction of vocational studies. Centralization and consolidation will mean fewer schools so that we can pay better salaries and have better teachers and more close supervision. It will make the school more of a social center, stimulate civic pride, increase attendance, and interest more people. Consolidation and centralization are placed first not because they are regarded as of more importance than vocational

studies but because logically they should come first although actually they will come last. It will be a long time before any large per cent. of our country schools will be centralized or consolidated.

Of the vocational studies domestic science is perhaps the most important because practically all girls will become housekeepers sooner or later, most of them sooner, but this is out of my line. The course of study should include domestic science for all the girls and manual training and agriculture for all the boys and some agriculture for the girls. The manual training should be agricultural in its tendency and all exercises should lead to the making of some useful object. The pupil should be able to see some utility in the work without exercising too much of the "substance of things hoped for, the evidence of things not seen." In manual training it may sometimes be necessary to restrain the pupil's ambition, to prevent him from undertaking to make articles too difficult or complicated. Accuracy is probably the most important element here.

Agriculture may be introduced either into the elementary schools, eighth grade and lower, or into the high school. It may be introduced into the elementary schools as a separate subject, in connection with nature study, as supplementary reading, or special phases may be developed by oral teaching object lessons and busy work. While some agricultural work in the elementary schools is desirable it is of less importance than its introduction into the rural high school.

The State of Pennsylvania puts the high school education within the reach of every person within the State who is interested enough to accept the provisions of this law and has the ability to go that far. Agriculture as a separate branch is more of a high school subject than an elementary subject. That is, it can be taught to better advantage in the high school than in the grades. There are many phases that may be taught in the grades but these are better probably taught somewhat after the manner of oral instruction object lessons, etc., rather than as a distinct subject. In the high school too there is more time for the introduction of vocational subjects, and teachers are better prepared to teach them. Further the high school course without agriculture tends to separate the pupil more and more from home interests. This is not so much the case with elementary schools. The object however is not primarily to keep boys on the farm but to broaden the pupil and put him into sympathetic and intelligent relations with his surroundings. If in doing this it makes farm life more pleasant and more profitable and thus induces a larger number of the bright boys to become farmers, it is well.

There are three ways in which agriculture may be introduced into the high school. The first is by the organization of distinct Agricultural High Schools whose primary function is to make farmers or in other words to teach agriculture as a specialty in an agricultural environment. The second is the introduction of an agricultural course into our existing high schools parallel with the other three years' or four years' coursed now being given. In these courses some agricultural subjects will be taught each term from the beginning to the end of the course. The third method is the introduction of the subject of agriculture as one of the sciences in the regular high school course, coordinate with botany, physics, and other sciences now taught.

We believe that the last named method is by far the most important and the most practicable one. We believe that the subject should be taught in the existing high schools rather than in special high schools for the reason that the State would hardly feel able to support two sets of high schools in the manner in which they should be supported to do the work well. Another reason is that these special high schools would necessarily be few in number and so far apart that they would be readily accessible to only a few of those which they would be intended to reach. A further reason is that special schools would foster the class feeling and tend to sharpen the line separating the rural from the urban classes, which is contrary to the spirit of American institutions. We believe that so far as practical the farmer should be educated along side of the lawyer, the merchant and the engineer; in the same classes as far as possible. A few special agricultural high schools would be a good thing but they should supplement rather than take the place in existing high schools.

We believe that it is more important that agriculture be taught as a branch coordinate with other sciences rather than that special agricultural courses be organized for the reason that a greater number of pupils would be reached as most of the rural high schools are not able to maintain more than one course of study. We believe that it should be required of all as its training value aside from its utility is fully as great as that of any other science. It requires as close observation and as accurate thinking as any of them. It may be the first science taught when it will serve as an introduction to the others, or it may come after physical geography and botany.

A few months ago we sent inquiries to all of the county superintendents in Pennsylvania asking for a list of the high schools of the first, second and third classes in each county teaching agriculture. Replies were received from 43 superintendents representing 85 high schools of the first class, 154 of the second class, 290 of the third, and 29 unclassified, or a total of 558 in all. These superintendents reported in the 43 counties there were 12 high schools of the first class, 36 of the second class and 107 of the third class making a total of 155 in which agriculture was being taught. Letters of inquiry were then sent to each of these 155 high schools asking the number of years in the course, the extent to which agriculture was taught, the text-book used, if any, and the proportion of time given to recitations and to practicum. Replies were received from 89 principals. Of these 53 reported that they were teaching agriculture, nine reported that it was being taught incidentally along with physical geography or some other branch, and three that it was optional in the course but was not being taken. Two schools reported separate agricultural courses. Most of them however seem to devote about one period per day for half a school year to the subject. A few teach it two or three times a week for half a year.

Twenty-six or exactly half of the schools were using a text-book which is not above the eighth grade. Nine more were using a book that is even more elementary. Both of these are attractive books and are put out by very aggressive publishing houses which accounts for their wide introduction. Six schools were using Warren's Elements of Agriculture which is probably the best book we have for the purpose at present. Two were using Wilkinson's "Practical Agriculture" which may be made of high school rank if the teacher so chooses.

Within the last month or two Halligan's "Fundamentals of Agriculture" has appeared which is also a high school book but better adapted to southern conditions and does not contain directions for laboratory and field work.

Most of the schools devote nearly all of their time to recitation giving very little to demonstrations, field or laboratory work. They give as the reason for this when asked that they do not have time for anything else. To my mind three recitations per week and two periods given to demonstrations or practicum work of some kind are desirable. It would be well to have double periods for practicum work, if possible, but even single periods would be better than giving all the time to recitations. The pupil must use his hands and eyes if he is to get the desired amount of training from the subject he cannot get it by using his memory alone. The pupil must be taught to see and do things. These inquiries show that agriculture is coming into the schools and it is our business now to see that it comes in the proper way. If we introduce merely a text-book in agriculture the result is apt to be disappointing and there is danger of a reaction. If we introduce work of too low a grade it will be disappointing. If the pupil sees in the work only things that he already knows, even if he sees them in a new light he is not getting all he is entitled to. Not only must we teach agriculture but we must teach it right, the pupil must feel that he is getting something worth while.

In teaching agriculture in the public schools we must seek to accomplish the following:

1. Give the pupil new knowledge.
2. Develop the view of the knowledge he already has.
3. Teach him to use his thinking faculities.
4. Teach him to do things.
5. Teach him to find out things for himself.
6. Correlate the school with the home life.
7. Not neglect the business side of agriculture.

While we realize that rural life problem is a large one and that the country schools are only part of it, we believe that the teaching of agriculture in these schools, as it is capable of being taught, will do more than any other one thing for the advancement of the rural community and the conservation of our natural resources.

THE PRESENT TREND OF AGRICULTURAL EDUCATION

By L. A. CLINTON, *Storrs, Conn.*

When I selected my subject for the address at this meeting I had no knowledge of what the other subjects were upon the program. The large number of addresses upon the subject of agricultural education simply shows the importance of that subject and the large place it is occupying in public education at the present time.

There seems to be a general interest in the welfare of the farmer, and the strange thing about it is that the least interest of his welfare is being shown by the farmer himself. City people, college professors, railroad presidents, boards of trade, have all become interested in the welfare of the poor farmer. Meanwhile the farmer pursues the even tenor of his way, plants his crops, fights the bugs, harvests crops, sells his products and gets about thirty-five cents of the consumer's dollar paid for the same.

In every age and in every generation there are those who are inclined to look with more or less sympathy, pity or scorn upon the customs of the previous generation or age, the belief apparently being that we in our wisdom have made great progress over those who immediately preceded us. On the other hand there will always be those who are constantly living in the past. It was the "good old times," whether in religious life, or educational affairs or business. In spite of all trusts and combinations in restraint of trade there are none of us who would go back to the time of the home industry, when everything necessary in the way of wearing apparel, food products and furnishings for the house was made on the farm. While we may lament the present disregard of the Sabbath, there are none who would wish for a revival of the old manner of Sunday observance.

Schools and educational methods have also changed, and while there are some who regret the passing of the classical scholar and recognize as an educated man only one who has been trained in the classics, yet the majority of people have come to recognize that the old system of education has had its day, and that what is needed at the present time is an education which will fit the boys and girls for the practical work of life. New schools and new methods have come to stay until they shall become antiquated, and possibly the future generation will think of our age with pity, possibly with scorn, that we so slightly grasped the problem. The methods of every age are an outgrowth or development from preceding ages. Some of the best from every age is preserved, modified and developed to meet changing needs and new conditions. In this forward march there must always be some back tracking, some mistaken notions as to what is best to preserve, but the general trend is forward in the solution of the problems of life.

One of the most remarkable trends at the present time is towards agricultural education, not only of the farmers but of the masses, city people as well as country, and this general interest has been largely created within the last few years. When the agricultural colleges were being established some fifty years ago there was no general agricultural awakening and no widespread interest in agriculture. The earliest attempts at agricultural schools were failures because the people were not especially interested. The masses of the people were producers and not consumers and the amount of product which was being produced each year was great enough to more than supply the demand for these products at reasonable prices. The importance of the federal law which resulted in establishing agricultural colleges in every state was not fully appreciated for about two generations after its enactment. At first there were but a few students and few teachers and but little to teach. There was no agricultural science, and while the men who were called to positions in agricultural colleges did noble missionary work yet their training

was almost entirely from the practical side. This was necessarily so because there was little or no agricultural literature; there was little in the way of definite facts relating to agriculture; there was no problem of food supply for the working masses. In most of the states the agricultural colleges were located as separate institutions and not combined with the state university. The reason for this was because it was feared that the students in agriculture would be looked down upon by the other students; that to be known as a student of agriculture in a great university would be rather a disgrace, and that those who might wish to take the agricultural work would become lonesome and shift over into the other courses of the university. But in a few of the states the agricultural college was combined with the state university, and in most cases where this was done the agricultural college has now become the big college of the institution and the students are proud to be known as students of agriculture. City men as well as farm boys are registering for the courses and agriculture is now the popular thing. When the agricultural colleges were established it was expected that they would have a marked effect upon the farming industry. They were to bring about an educated country population; they were to result in the conservation of our agricultural resources, and through them was an attractive country life to be made possible. These hopes were not realized, and it was soon found that if agricultural education was to be developed there must be some foundation of agriculture science. This resulted in the federal law establishing agricultural experiment stations in all of the states, and in those states where experiment stations had not already been established it was required that the experiment station should be established in connection with the agricultural college.

The work of these experiment stations has become the greatest factor in agricultural education in our day. They have made possible a science of agriculture; they have established the basis for work of our agricultural colleges. In many cases the man who is working quietly in his laboratory day after day, month after month, and year after year may be the man to whom we are indebted for the most important results in relation to agriculture. The man who attracts the attention may be the successful teacher or lecturer; he may be the man who can most successfully organize farmers' institute trade, in other words the most successful advertiser. If our work in agricultural education in this country is to be developed this will come about only through the increased support and development of our agricultural experiment stations; in careful scientific work of the investigator is necessary as a basis for instruction in the class-room. Therefore it is important that every state shall see that its agricultural experiment station is liberally supported; that the investigators are given unlimited opportunity for research work because much as we have accomplished we are just at the threshold of agricultural science.

While there is no question about the great value which resulted from the early work of the agricultural colleges yet the results were in a direction entirely unlooked for by those who were responsible for the colleges. The graduates of the college became teachers, experiment station workers, lecturers, scientific investigators in the U. S. Department of Agriculture; they even became lawyers, doctors,

and occasionally a preacher was developed, but not many of them became farmers. The reason for this was that the trained men, graduates of the agricultural colleges, could do better financially elsewhere than they could on the farm. Naturally, then, they drifted into other lines of work. Those who did return to the farm, however, showed the value of the training they had received, better methods of agriculture were put into practice; and their farming methods became models for the community. Almost until the present time the agricultural colleges have continued giving a thoroughly scientific education, and while this work must be continued yet there is another growing demand at the present time, and this demand is for the popularizing of agriculture education. I would not in any way under-estimate the importance of the work which has been done by our agricultural colleges because their graduates have become leaders in every walk of life, and it was owing to the great demand for men in agricultural experiment station work and in scientific investigation of every kind that these graduates did not go back to the farm, but their work has been of direct value in promoting the interests of farm life through their application of scientific principles to the problems of the farm. There was no popular demand for the agricultural colleges to in any way change their courses of instruction or to render their work more popular. In fact the masses of people cared very little what the agricultural colleges were doing anyway, but when the price of food products began to soar beyond reach of the average consumer, and the wages received by the workmen at the end of the week were barely sufficient to pay the bills for food products which had accumulated during that week—then came the demand for a more general dissemination of agricultural information for the teaching of agriculture in the public schools. Then our great railroad corporations became interested in better farming trains, in model farms, in all that would in any way develop farm life without interfering with the price they received for the transportation of farm products. The settlement of all our arable lands, leaving no further room for expansion westward has brought about a demand for more intensive tillage of the lands which are now under cultivation. Higher production per acre must come at once if relief is to be found for the high cost of farm products. The partial depopulation of many of our rural communities has been brought about not because of unfertile soil but simply because better opportunities have been offered elsewhere, and the farming population, like people in every walk of life, have accepted the opportunity offered them even though it necessitated leaving the farm.

The most constant and ever present demand of the human race is for food. So long as the supply is plentiful no one pays any special attention to the source from which it comes or the conditions under which it is produced so long as the product itself is in fair condition. The trouble with agricultural science and its relation to the farmer has been that there has practically been no relationship between the two. The colleges and experiment stations have gone forward with their work. A comparatively few well trained men have been developed and these men have gone into various lines of work, and the individual farmer working back over the hills has for the most part been left to work out his problems as best he might. The other day in

looking out of my office window, I saw Copeland driving his ox team, walking along before them, swinging his ox whip and calling to them. He was expecting them to follow. At one time he walked so far ahead of them, expecting they were close at his heels that they apparently lost sight of his leadership and began to graze by the roadside. After walking on for some distance he swung his ox whip over his shoulder and called to them to come on, and upon looking around was surprised to see that they were far in the rear and paying no attention to his directions. This, to me, illustrates fairly well what has happened in the agricultural world. The colleges and experiment stations have gone forward with their work, expecting the farmer to follow, but he has been left far behind until he has really lost sight of the work which has been done for his benefit. While I know there are exceptional cases, and a large number of exceptions of individual farmers who have made progress and who are applying to their work the very latest and best methods known, yet farmers as a class have failed to apply the latest principles which have been worked out by our investigators. We must go back to them and keep our leadership closer to the individual farmer. We have learned that the agricultural science will not feed the hungry people of our land unless it is actually and practically applied to the production of food crops on the farm. The educational pendulum is now swinging rapidly towards the other extreme. The demand is being made that agriculture shall be taught everywhere and by everybody.

Vocational training is demanded as a part of our regular school system and in separate schools of agriculture and agricultural high schools. Agricultural education is now being given to the masses through farmers' institutes; through better farm trains; by the "schooner" wagons which go out across the country, carrying charts and illustrative material to the individual farm; by the introduction of agricultural courses in the public school; by the agricultural high schools as separate institutions; by the agricultural colleges, not only through their regular four year courses, which lead to a degree, but by their schools of agriculture; their special courses and by extension work and demonstration experiments; by experiment station bulletins; the agricultural press; by the popular monthly and weekly magazine; through the daily newspapers, and even from the pulpit of our churches as well as by the organized bureaus of the state and national government. This all means that the effort is being made at the present time to reach the individual farmer. We have been considering farmers in the mass; we must now pay more attention to him as an individual and there must be a constantly increasing effort to reach the individual farmer and help him to solve his problems.

The difficulties which are being met with in this popularizing of agricultural education are the facts that agriculture is a peculiarly technical study, and that it requires trained teachers in order to properly give the instruction, and these trained teachers are difficult to find for the money which is available as salaries. This teaching requires not a mere statement of facts which relate to farm life, but a thorough discussion of the principles which underly these facts. Conditions may change, but where the principles are thoroughly understood the farmer should be able to apply them. This work requires time, industry and patience and while our short courses in

agriculture, and the various other methods which have been adopted for the dissemination of agricultural information are doing a splendid work and will result in great improvement in farm life, yet the problem is only partially solved through these means. Thorough mental training is required for the successful pursuit of farming as an industry just as well as in any other walk of life. There is no occupation in which more problems are arising every day which must be solved upon the spot, and upon the correct solution of which depends success or failure, than in farm life.

There is no country which has a more highly developed agriculture than Denmark, and centered all over that country, within easy reach of the farm boy, is the rural high school. The boys who go to these schools are given not short courses in agriculture, but general training courses; work which is designed to develop their reasoning powers. These boys go back to the farms, better able to continue their work successfully, not because they have learned a mass of facts, which sometimes apply and sometimes do not, but because they have learned to think and to reason, and in thus learning they are better able to solve the problems of the farm than they were before.

The strenuous demand which has been made for purely informational courses has forced somewhat the hands of our agricultural colleges, and yet the real leaders in agriculture are going to be found among the best trained men who have taken the longest and most thorough courses offered in college training. Just what should be the relationship of our public school system to agriculture is a much debated question at the present time. There are some enthusiasts who would have the immediate introduction of agriculture in all the public schools; who would have the teachers without any special training or preparation begin giving instruction in agriculture. This in my opinion would be a great mistake. To properly teach any subject requires a pretty definite knowledge of that subject on the part of the teacher. This knowledge of agriculture is not possessed at the present time by any considerable number of teachers in our public schools, and it cannot be acquired upon short notice. I believe the time is not far distant when agriculture will be made a part of the instruction in all of our public schools, city as well as country, but the work will be given by teachers who have been especially trained in agriculture science. This work will not be given because of vocational value, but because agriculture possesses peculiar value as a training subject. It is just as important that agriculture should be taught in our city schools as in our country schools. It is important that the consumer shall know something of the conditions under which farm products are produced. Many of our city people do not know what good milk is when they get it, neither do they know how to care for this milk until it is consumed. More knowledge on the part of the city people with reference to the difficulties in the production of the food products would create a broader sympathy and a more general interest in farming conditions and would result in great benefit to the farmer. This work in agriculture should be given in the higher grades and opportunities should be given to those who wish to specialize along agricultural lines, to take advanced work in that subject.

The highest degree of success in any farm community will not come through a knowledge of agriculture alone. This knowledge may result in the making of money, and when the money has been made the farmer moves to the city and a tenant comes upon the farm. The trouble here is that the social life of the community has not been developed and the farmer has not been trained so that he can see the beauty and opportunity and the advantages of the open country life. He looks upon the farm as a place to make money and so it is, but there should also be an opportunity for the enjoyment of that money to its fullest extent without moving from the farm.

One boy in my class in Rural Economics offered as an objection to farm life the fact that the best girls do not wish to marry a fellow who is going to live on a farm. Of course, the other fellows of the class immediately asked him how he knew. But if that objection is really true then the subject is worthy of the most careful investigation to find out why it is true. I believe if the young man who is living on the farm possesses that degree of culture, of training and of mastery of his business which is possessed by the most successful man in other walks of life that the best girls will not object to life on the farm. If on the other hand the farmer is lacking in training and in general culture and he sees in his farm and in farm life only an opportunity for making money, then who would blame the best girls for objecting to marrying a farmer. Improvement in the farm life in any community must come from sources acting within that community and not from without. These centers of crystallization from which will radiate the elevating influence will be the farms of those who have received the most thorough training in our schools or colleges of agriculture.

Much valuable printer's ink has been used in recent times in discussing methods for the uplifting of the farmer. In my section of New England we have a native dweller upon the soil by the name of "Harvey." In our local discussions with reference to methods of improving farm life one of my colleagues has always replied to my propositions, "Go try it on Harvey." If you can uplift him then there is some value in your proposition," It seems to me the problem of country life in every section is how we are going to reach the "Harveys." In the first place they do not care to be reached; in the second place we have no point of contact with them. The one way that I can see to reach them is through the location in every community of men whose farms will become model farms; who will take an active interest in the improvement of church, schools and roads and all of the social conditions which make for the advancement of that community. Just as in city life the community settlement has been found to be one of the most potent factors towards improving conditions so the community settlement in country life will be found one of the most powerful factors towards improving local conditions.

The farm boys and girls are entitled to an opportunity for securing just as good an education as is within reach of the city boy or girl. At the present time this opportunity is not available. There will be no satisfactory solution of the country life problem until this condition is remedied. Twenty years ago if anyone had said that the farmer in nearly every section of our country would have his mail deliv-

ered at his door at least once every day he would have been called a dreamer, and yet at the present time the arrival of the morning paper and of the daily mail has become one of the mixed features of farm life. The next great step forward will be the organization of the township rural high school, as thoroughly graded and as thoroughly equipped as is the city high school;—the development and the training of the country boys and girls in the country, not necessarily in agriculture, but under their natural surroundings in which they will be taught to see something of the beauty of country life; something of the possibilities of the farm. Through this will come the development of our rural life.; the improvements of social conditions and the establishment of better relations, and more thorough understanding between our country and city population.

SOME LESSONS WE SHOULD TEACH

By R. P. KESTER, *Grampian, Pa.*

I do not expect to present anything new this morning, anything that has not been advocated by at least some of our institute speakers in the past, but realizing that some men think the only legitimate field of the institute worker is to teach how to increase production—how to make more money, I wish to call our attention to some other phases of the farmer's life that needs his increased attention and activities quite as much as that.

There is no question but what first and foremost of the practical questions is how to naturally and most cheaply maintain and increase the fertility of the land. Need of this knowledge is evident from the fact that the average farm produces little, if any, more than it did in the days of our grand-fathers. For many years much has been said and written on the subject and many bulletins published by our experiment stations giving the results of their findings, and all of this has been said and written on the subject and many bulletins published by our experiment stations giving the results of their findings, and all of this has been suggestive and useful, yet a great deal of it seems to be in the nature of temporary expedients and have not solved the problem of building up permanently and economically a productive soil. Instead of figuring so much about pounds and percentages of potash, phosphoric acid and nitrogen as purchased in the fertilizer sack, for which so great a part of the crop's value is paid, the general farmer demands and needs to know of natural methods by which he can maintain and increase his fertility and have profit at the end of the year. A few families have been doing this for years, many of them in this beautiful county of Lancaster, and in almost all the instances I have examined, the four C's—corn, cattle, clover and cultivation—have been the four corner-stones of success. These four agencies, intelligently handled, will bring success to any general farmer.

I do not wish to belittle outside agencies, but I do want to protest, to those who attempt to teach lessons on fertility, against unduly emphasizing the necessity of hauling material from the ends of the earth to put on the land, but to teach such methods and practices as will enable the general farmer to regain, maintain and increase the productive power of his land.

Another important lesson in need of emphasis by teachers is that the farmer must specialize more than he has in the past. In the olden days when every farm was a little kingdom, independent within itself, when practically all that the farmer and his family used was produced and manufactured on the farm, the crops and rotation of that day were suited to the needs. But farmers no longer make their tools, harness, boots and shoes, soap and candles; the whir of the spinning wheel and the pounding of the loom are no longer heard in the farm home, but instead all these things are purchased necessitating the expenditure of money, the equivalent of labor or its products and the farmer who has no speciality has little to exchange for the necessities he does not produce. Farmers have been slow to adapt themselves to the changed conditions; slow to realize that he can't live the individualistic life of his grandfathers, but that he is part of a larger and more complex life where he must exchange the value of the products he has for those he does not have. He too often sticks to the crops and rotation of a former day, raising a little of everything, just enough for home use, and does not have a money crop—does not have a specialty that he may exchange for the thousand and one things required in the modern home. So we need to teach the necessity of a specialty on every farm, one suited to the man, the soil and the market. And this not as an individual, but as a community. Every community of farmers would be benefited by meeting and planning together as though their farms were one big farm and they were joint owners. In the future, crops will be raised and sold co-operatively. You say this is visionary? Maybe it is but it is in line with modern business methods. It is one of the necessities in bringing closer together the producer and the consumer, one of the most important questions confronting us. Buyers are attracted to a community where there is produced an abundance of fine fruit, or a good breed of cattle. A community noted for its good butter or its fine poultry can sell to a better advantage. In all such cases, sales are more easily made and better prices are obtained. A study of the soil, climate, water and markets should be made and the specialty selected which is best adapted to them. Farmers would find as much opportunity for applying the much-talked-of methods of "scientific management" as do the captains of other industries.

These things emphasize another important question, the need of organization among farmers. Neither the individual life nor the community life is as useful or as strong when the individual stands alone as when all are working intelligently and harmoniously together. Farmers and their families need meet together, to talk together; to discuss social, economic and political questions effecting them to the end that they may intelligently and concertedly meet the duties of citizenship resting upon them. In this way he loses the fear to think and act independently. The events of the past few months have shown the intelligent farmer that there is no such thing any more as a "stand-patter." Even the professional politicians, re-

gardless of party, have joined hands to further legislation which we believe to be detrimental to the best interests of American agriculture. Only the organized farmers are effective in the fight for fair treatment and a square deal.

There is a growing dissatisfaction amongst country people with the curriculum and the product of the country school. With all the clash and jangle over the new school code, little or nothing has been done to meet the needs of the rural schools. Nearly all the attention both of the commission and the legislators has been directed to the cities. This is partly due to the fact that no concerted, popular demand was made by rural people. We have not agreed as to what we want and brought it forcibly to the attention of the authorities. It is time we stop pretending that we believe a proper school course is one scheduled to begin with the primary school and ending with a college degree. However desirable it might be, we find it to be impracticable. An investigation conducted by the Sage Foundation recently, shows that out of 18 children in the First Grade Grammar school, only five reach the eighth grade and only one the High School. In the rural districts alone the proportion is much less. With all our anxiety about the young people leaving the farm, fully 90 per cent. of them remain in the country, and all the education they ever get is in the inefficient country school. Like all other questions of rural uplift and rural progress, improvement of the rural schools must originate in and be made by the rural people themselves. So it is the duty of competent teachers and speakers to lead in the demand and recommendations of such changes as will bring to the country child advantages for an education that will fit him for his life's work and make of him a contented and efficient man. For fear that we might "consign him to the farm" by giving him an education suited to his needs, our leaders have, in the past, by an unfitted school curriculum, consigned him to a life of inefficiency and poverty. An education no longer means an equipment enabling one to live without work at the expense of the ignorant, but a real education today means that training of the head and hand and will which fits the student for the fullest and most efficient life. Why then should not rural schools fit rural people for rural life? The necessary increased production of the American farm must come, not from extended acres, for there are few more, but it must come from the present farms more intelligently farmed. The future farmer must know how? and when? and why? better than his father does.

One valuable result of the Institute work, together with other agencies, is that the farmer's respect for his own business has been increased. There are fewer discouraged, complaining pessimists than there were a few years ago. This is mainly due to the fact that his greater knowledge of his business makes him feel more fully that he is, in a measure, master of the situation. As he realizes his blessings and his possibilities, he envies less his city brother; that although his cash receipts may be smaller, he enjoys a thousand things for which his city brother must pay cash.

So this is a lesson we may well continue to teach. The Institute speaker who, while showing up errors and fallacies, fails to leave a message of hope and cheer, who leaves his audience in the gloom and despondency of pessimism, does more harm than good, though he may have the wisdom of a sage on technical agriculture. On the other

hand he or she who leaves to a community a renewed faith in itself and its calling, leaves the most helpful lesson that can be taught. President Roberts of McDonald College said in speaking of industrial training, "It is not primarily intended to enable one to raise a bigger steer or bigger ear of corn, but by doing so he may make a better home for a better child." Fellow lecturers, let us think on these things. Man's education is not necessarily completed who knows how to grow big crops and make big profits, but when he knows how to expend these in improving himself, his family, his home and his community. Then only is a man in the fullest sense an ideal farmer. This nation will remain great and increase its greatness only as the innumerable country homes continue to be owned by individual farmers. No lesson we can teach is of greater importance than that of showing the young man the great importance of his getting hold of a piece of land. If that day ever comes in which the agricultural land of this nation is owned by concentrated capital and worked by peasant farmers, as other natural sources have been secured and are worked by wage workers, that day will see the decadence of this nation as a republic and the end of democracy will be at hand.

Let me urge you to leave this injunction with every man. "With all thy getting, get understanding." Men should continually strive to understand. The eternal question "why?" is as important as the question "how?" By this, man learns his relationship to his fellow-man and to the great out-of-doors. It enables him to see and to appreciate the wonder and power of the great forces with which he co-operates, and to "Look through Nature up to Nature's God."

COMMON DISEASES OF LIVESTOCK

By DR. C. J. MARSHALL, *State Veterinarian, Harrisburg, Pa.*

At the present time most diseases affecting domestic animals are fairly well understood. Many of them may be prevented if proper measures are adopted. The knowledge possessed in reference to prevention and cure of diseases is not as well applied as it should be. It is estimated that $5,000,000 worth of livestock is lost annually in this Commonwealth from diseases that might be prevented if the known, necessary measures were adopted to control them. This is a heavy tax and it should be our duty to prevent the loss of such extravagant sums in every possible way.

In 1792 an appropriation of $250,000 was made by the National government of France to found the first Veterinary School in the world at Lyons. This was deemed necessary in order to devise means for preventing or controling the extensive losses in livestock from diseases that were at that time not well understood. There were no qualified veterinarians. Veterinary medicine was practiced by quacks, charletans and misfits from the medical profession. Millions of dollars worth of livestock were lost annually in all European countries from such diseases. The worst losses were due to such diseases as anthrax, contagious pleuro-pneumonia in cattle, foot-and-

mouth disease and rinderpest. Many of you can remember when contagious pleuro-pneumonia in cattle occurred in our own country. It cost our Government $1,500,000 and took but five years to exterminate it. The last case of this disease seen in the United States was in New Jersey early in the spring of 1892. In some countries it is still prevalent. The recent outbreak of foot-and-mouth disease is familiar to all. These two diseases were exterminated quickly in this country because their great dangers were realized and proper measures were adopted for their suppression.

We have occasional losses every year in Pennsylvania from anthrax, yet it has never proved the pest here that it has and does in other countries. It is usually a fatal disease in most all of our domestic animals as well as in man. While we know no treatment to cure the disease, we do know how to prevent it and protect susceptible animals from its ravages. Rinderpest is one of the worst animal plagues known in cattle. It has probably caused more extensive losses to agriculture than any other one disease. Fortunately we have never had an outbreak of rinderpest in America yet the disease is to be feared. It does occur in other countries, is contagious, the contagion can be carried long distances in food, clothing, hair, hides, etc. It is extremely necessary that our country should have men trained in the mysteries of this and similar uncommon disease, at all times in order that they might be recognized at once if they should appear and the necessary measures adopted for their eradication.

The National and State Government prescribe methods for handling the most important contagious diseases. By enforcing measures for suppressing such dangerous diseases as foot-and-mouth disease, contagious pleuro-pneumonia, rabies, glanders, etc., owners are frequently put to great inconvenience, and in some cases hardships are imposed that are hard to bear. It seems best in such cases that the few should suffer for the protection of the many.

To the uninformed it may appear extravagant or unreasonable for the State and National Government to spend money for Veterinary education and sanitary police measures. When it is realized what vast sums of money are invested in livestock and to what extent our people are dependent upon this industry it will be seen that very little is spent comparatively speaking to protect them from the extensive losses that are entirely possible. Our State spends about $1,000,000 annually for the maintenance of the National Guard and for police protection. The dangers to our livestock industry from animal plagues, contagious and infectious diseases are much greater than the possibilities of war. The nine hundred members of the veterinary profession should be looked upon as so many members of our National Guard. It is the duty of each Commonwealth to see that ample facilities are afforded to educate men for this service. It is very inexpensive when compared with other forms of protection that is afforded our citizens and the monetary value represented. Veterinarians and agriculturalists in general should know the great dangers that exist in this line and be prepared at a moment's warning to meet dangerous contagions or infectious diseases and know how to exterminate them.

The great mysteries surrounding the causes of many infectious diseases have been cleared up in the past fifty years. The true cause of anthrax, which perplexed nations for centuries, was one of the

first to be discovered. It is caused by a small organism that belongs to the vegetable kingdom and it is so small that it can be seen only with the microscope. Its life history now is well known. How it is transmitted to animals and from them is no longer a mystery. When a district becomes infected with this organism it may remain and is a source of danger for years.

Among the diseases, the causes of which have been discovered since that of anthrax, might be mentioned tuberculosis, glanders, hog cholera, tetanus or lock jaw, black leg, lumpy jaw in cattle, strangles or colt distemper in horses, fowl cholera, nodular disease in sheep, Texas fever, contagious abortion in cattle, etc. These diseases cannot spring up spontaneously. The specific organisms that produces them is invariably the cause. In most cases no curative measures have been discovered for these diseases and we are nearly as helpless in treating animals so afflicted as we were before Veterinary Schools were organized. We should not be discouraged, however, for much valuable information has been obtained in reference to them. When any such disease occurs we now have means for making a positive diagnosis. This is especially important. One of our states spent thousands of dollars a few years since fighting an outbreak of foot-and-mouth disease and later found that the disease was caused by eating smut on grain and was of very little importance.

Aside from our ability to diagnose or recognize the above named diseases, many other points of importance have been determined in reference to them. In some cases vaccination may be used to prevent them. We also know how to destroy the germs outside of the animal body or how to prevent such disease from spreading from infected areas to animals and man.

Among these diseases against which a satisfactory vaccination has been discovered might be mentioned tetanus or lock jaw, anthrax, blackleg, hog cholera, Texas fever and rabies or hydrophobia. It is hoped that similar measures of prevention may soon be discovered for other incurable diseases.

A large number of the above named diseases is more or less prevalent in our own State. Among them might be mentioned tuberculosis, hog cholera, contagious abortion, rabies, mange in horses, glanders, blackleg and anthrax. Any or all such diseases might be better controlled and some of them exterminated if the knowledge available in reference to them was disseminated among those interested. The sensible, practical solution for the extermination of all such diseases may not be entirely settled; but the State Livestock Sanitary Board stands ready to assist those who apply for assistance and it is earnestly hoped that effectual service may be rendered in all such cases.

The fact that tuberculosis can be eliminated from dairy herds has been demonstrated beyond a doubt. You may consider the present method extravagant, yet there is a question whether it may not be advisable to adopt the apparent extravagant measure and rid your herds of this pest.

The measures for controlling glanders, contagious dysentery in young animals, blackleg, contagious abortion and mange are less expensive and more easily applied. By rigidly enforcing the principles of our present knowledge the losses from such diseases should be very small.

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There is another class of common diseases of livestock which causes extensive losses and over which the State has no jurisdiction. The most conspicuous diseases of this class are such familiar conditions as blood poisoning, colic, founder, heat stroke, influenza, pneumonia, bloat in cattle, garget or inflamation of the udder and among parasitic diseases might be mentioned nodular diseases in sheep, tape worm in sheep, lice, hoose or worm bronchitis in calves, gapes in chickens and many other familiar diseases too numerous to mention.

Many such diseases might be prevented if proper attention was given to animals in the way of care, feeding, exercise, rest and sanitary measures in general. They are curable in most cases if the proper form of treatment is adopted before the symptoms have progressed too far.

In some cases the disease is not recognized and proper measures for its cure are not adopted till the patient is past all hope. Too much time is wasted in either waiting for the animals to recover without treatment or some patent medicine, home remedy or that suggested by those not competent to prescribe is given a trial. The time to begin treating sick animals that are in need of treatment is in the beginning and then no medicine should be used unless it is prescribed by one who knows what is wrong with the animal in question and also the dose and effect to be expected from its administration. In most cases the handy dose of medicine does more harm than good. You may say that you have cured many cases of colic in this way. It is a well known fact that many cases of colic will recover if no medicine is given. Colic frequently kills quickly and in spite of the most approved system of treatment. It is, therefore, advisable to look upon colic as a dangerous disease and treat it accordingly.

Cases of blood poisoning usually develop as a result of wound infection. Serious and dangerous forms may develop from apparently insignificant wounds. Nail wounds and wounds from fork tines are especially dangerous and the danger is increased by applying poultices to them. We frequently find such wounds dressed with poultices made of cow manure, flaxseed, wheat bran, etc., and the case in the last stages of lockjaw which may have existed for days but had not been recognized. Lockjaw can be caused in no other way than by the specific germ that is known to produce it, gaining admission in some way to the animals body. It may gain such admission through small wounds from which air is excluded. The animal may be vaccinated any time in a week after such a wound and the disease will not occur. After the disease has developed treatment is nearly hopeless yet occasionally the patient will recover either with or without treatment. It is always advisable to vaccinate animals to prevent this disease when a suspicious wound has been received. The wound should also receive antiseptic treatment.

Horses are often foundered by suddenly checking a perspiration as by giving too much cold water soon after a drive or allowing the horse to stand in a draft when sweating. The disease occurs in a few hours ofter such exposure and if recognized promptly and the proper treatment applied soon enough the case should make a complete recovery in a few days. When such cases are not recognized, are neglected or not properly treated for three or four days or more there is great danger of bad results and the animal may die or is

left a cripple for the balance of its life. The best medical attention, if begun late in this disease, will seldom restore such animals to usefulness. All prepared medicines are worthless in treating founder. The best medical attendance should be obtained for such cases and as soon as possible.

The value of a good cow is often materially reduced by a slight case of garget. This disease is usually recognized soon enough but proper treatment is frequently neglected until it is too late. The disease will seldom recover without treatment. It is advisable in most cases where a valuable cow develops this condition to provide a nurse as well as a veterinarian. The case may be cured in the first two or three days if properly treated. After a case has been neglected or improperly treated for a few days the hopes of a cure are slim even though the best form of treatment may be used.

Influenza in horses is not a dangerous disease. Most cases will recover even if no medical attention is given. The greatest danger is due to the fact that it sometimes develops into pneumonia, pleurisy, or some other dangerous complication. These diseases should be recognized early and treatment begun promptly. The average layman can seldom recognize pneumonia or pleurisy even in any stage. Proper treatment begun in the first twenty-four hours after pneumonia develops is of more value in restoring the animal to health than any that might be given for the next week or ten days. There is no specific form of treatment for pneumonia yet if properly treated very few cases should die.

Heavy losses are sustained each year from parasitic disease. Lice are often due to neglect on the part of the attendant yet they are not seldom found on animals that receive the best of attention. The methods for exterminating them are well known and stock owners should not underestimate the damage that is caused by parasites. Whitewash should be freely used in stables, poultry pens, etc., that are infected, manure and filth should be frequently removed. Any of the coal tar preparations may be effectively used. They should not be applied on an animal's skin without being properly reduced. Many animals have been severely burned or even killed by applying such remedies either full strength or too strong.

Gapes occur in young chickens and turkeys. The cause is a small worm that may be found in the throat. Infection takes place by eating or drinking food or water that contains the eggs of the parasite. It can usually be prevented by keeping such young birds on clean board floors till they are a few weeks old. Such floors should be scalded or washed with creolin solution every few days to destroy the parasites, their eggs or larvae.

Sheep suffer most of any of our domestic animals with diseases caused by parasites. Tape worms, stomach worms and nodular disease are very common and when any or all such diseases occur in a flock of sheep the industry of sheep raising cannot be carried on profitably so long as any parasites are present. Such parasites are propagated by eggs. Infection takes place through food and drink. Wet pastures, stagnant pools of water or swamp land is much more dangerous because the eggs and larvae find, in such places, conditions favorable to them. It is well known that sheep do better on high dry land. These diseases are easily recognized because the parasite or its

eggs can be found on post mortem. Satisfactory and economical measures are known for ridding a flock of such diseases. In some cases it is advisable to abandon sheep raising for a time and allow such infection to die out naturally. A period of one year is often sufficient.

Much more attention is given to the subject of common diseases of livestock in European countries than in our own. American people are considered more extravagant in many ways than our foreign friends. Money is easier to get and is consequently more willingly spent. In some cases the owner may feel that a diseased or injured animal is a matter of small consequence and allow it to die or become worthless rather than to be bothered with treating it. In most cases it is best from a financial, as well as from a humanitarian standpoint, to provide the proper treatment for all suffering animals. This should be done in the way of careful nursing as well as in capable medical attention.

CULTIVATION AND HARVESTING OF TOBACCO

By E. K. HIBSHMAN, *Ephrata, Pa.*

Mr. Chairman, Ladies and Gentlemen: In this talk on tobacco, I propose to tell you the practical side of it; that is, the way the farmers grow it here and the method in which they handle it. But before I start to tell you that, for the benefit of those who do not live in this county and are not acquainted with conditions I better explain our system here. Nature has provided Lancaster county with a very deep, rich limestone soil over the greater part of it. Some parts of the county, the northern part and central part, do not have the limestone soil. Through the central part we have a type of soil that is known as Hagerstown loam; but it is on this limestone soil that the greater part or portion of the tobacco is grown, and we do grow quite a good deal here, two-thirds or three-fourths of all the tobacco grown in Pennsylvania.

When tobacco was first grown in this country, and we follow the history of the different tobacco sections, principally those of the South, we find that they grew tobacco year after year on the same soil and the result of this was that the soils gave out; they farmed out all the humus. But here in Pennsylvania our conditions were different. The first men that began growing tobacco here began growing it in rotation with their crops and that is the way we are growing it today. The rotation here in Lancaster county differs very little from that generally followed over Pennsylvania; that is, the four year rotation, wheat, grass, corn and oats, only instead of oats we grow tobacco and so our rotation here is wheat, corn and

tobacco. Now, there may be some exceptions to that, where the man instead of plowing corn stubble for tobacco is plowing under sod; but in general that is our rotation. Aside from that we do something else in Lancaster county that a good many do not do, and that is we feed a great deal of stock. In Lancaster county alone there is fed annually over 40,000 head of steers. Instead of selling our corn, selling our hay and our straw the farmer goes to our stockyard—Lancaster has a very good stock market—and buys a stable full of cattle. He buys from September to November and takes them home and stables them and feeds the corn and hay and beds the straw. In the spring the fat cattle are ready for the block. Instead of getting cash, however, for his straw and hay and corn he has a large heap of manure which he puts back on the land and in that way he is keeping on the farm almost everything that he grows. Practically the only two things he sells are his wheat and tobacco. He follows that system in order to get plenty of manure, and instead of our soil getting poorer year after year here, as it did in other tobacco sections of the country, it is getting better because the humus supply is not going down.

Tobacco grown in different sections of the United States is used for different purposes and classified according to the purposes for which used; as, for instance, where they are growing a very fine leaf that is adapted for cigar wrappers, they grow what is called wrapper tobacco; another place plug tobacco and cigarette and pipe tobacco. Here in Pennsylvania we grow what is used for cigar filler, and there is an established market and demand for Pennsylvania tobacco. It is called cigar filler tobacco and whenever the name Pennsylvania is applied to tobacco you can be sure that means cigar filler tobacco.

The crop is started about the first week in April. The farmer makes a seed bed about six feet wide and as long as necessary, according to how many acres he is going to set out, and about the first week in April he sows his seed. One peculiar thing about the tobacco crop is the fact that the seed is very cheap. For fifty cents you can buy enough to grow $700 or $800 worth of tobacco. The proportion of the cost of seed to the value of the crop is quite different from that of most crops. I have here a vial of seed (showing) and you san see how very fine it is. There is enough seed there to plant 20 acres and yet that seed came from one stalk. Right along this line I want to mention where they are doing a little improvement work along the line of seed and seed cleaning. The farmers clean their seed wheat, but many of them don't stop to think about cleaning tobacco seed and in this way there is a lot of light chaff seed gotten which will give poor plants with little vitality. Now the United States government has devised a machine by which it can blow out the light chaff seed. They have a machine or glass tube about five feet long with fine wire gauze on the bottom and pour the seed in and force air through and it takes the chaff out and leaves the heavy seed in there. It makes the seed very nice and clean, and it will germinate more uniformly in the seedbed and give more uniformity of plants. He sows the seed on top of the soil, usually mixing about a tablespoonful of seed into a two gallon sprinkling can full of water and then sprinkling the water evenly upon the bed. An even tablespoonful will sow about 1 square rod. Over

the top of the frame he will stretch a cloth several inches from the surface of the seed bed. This is called tobacco muslin. It is a little heavier than cheese cloth, but not as heavy as regular muslin By this time of the year they are ready to begin to plant. I happen to have several plants here about the size for transplanting. The plants are drawn from the seed bed, the bed being first well watered to let as much of the roots and ground on as you can to set in the field. In plowing we endeavor to plow as deep as you well can because the tobacco is a comparatively deep rooted crop and so one thing essential is deep plowing. The next thing to get is a fine preparation of the soil so that when you set out a plant there will be fine soil particles to put around it and not let the sun dry up the roots, and good preparation of the field is essential. There is some commercial fertilizer used in this county, but not as much as in other sections because we make so much manure it is not necessary to spend money for commercial fertilizers. It may be that like clover and potatoes it wants potash. It needs potash to give it that green color and good quality, but in using potash we must not use muriate or chloride of potash. In Pennsylvania tobacco it is essential that our tobacco burns, because, no matter what the flavor, if it would not burn it would not be any good for cigar purposes. It is essential that it burn and in buying fertilizer for tobacco we want the sulphate of potash. We find cottonseed meal for nitrogen is very well adapted for growing tobacco, because in cotton seed meal the nitrogen is available gradually. This must rot in the soil and decaying gradually give off the nitrogen. If the nitrogen is given off too rapidly in the soil it will grow too rapidly and too much of the strength of the plant goes to the frame work of the leaf and you get a heavier weight feaf but not as valuable as a plant that grows more steadily. So cotton give a good source of nitrogen because it is gradually available.

Just about this time I saw from the trolley window this morning several places where they set a few plants and our planting season is about beginning. They set these plants out with a machine called the transplanting machine, built especially for it and brought here from Wisconsin. The machine requires three men to operate it, two men to set the plants and one man to drive. On this machine is a barrel of water which waters the plant as it is set. There are cogs on the wheel from 18 to 20, 24, or 30 inches apart, depending what distance you plant, and there is a spike which these engage and runs out about half a pint of water, and every time the water is left out you set your plant and that is the way the distance is regulated. Then there is a "V" shaped plow drawn through the ground and makes a little furrow, then after this plow there are blades or paddles which draw the ground together. Between the blades and and this "V" shaped plow there is an opening in which you set your plants. The men sit on the planter with a number of plants in their laps and they set the plants with one hand, the men on the left sets with the right hand and the man on the right with the left hand and each man setting the alternate plants. He takes the plant like this and sets it in the hole where the water has been dropped and the paddles of the machine pack the ground around it and the plant sets up like that. The same machine would set cabbage plants provided your machine is built so as you could get your rows close enough.

Our tobacco is planted in rows about three and one half feet apart. We don't get much closer than three feet with the planter as it is built, but I have no doubt that a machine could be built to set cabbage plants that you could get closer. Generally the Pennsylvania broad leaf tobacco which we grow is placed from twenty-four to thirty inches in the row with the rows about three and one half feet apart.

The first trouble after planting is the cut worm. Very often a few days or even the first night after the tobacco plants are set out this worm will eat off a great many. Various remedies have been tried and the one most successful and practical on the experiment plot was in making a mixture of about a bushel of bran, a pound of Paris green and a quart of molasses and put enough water to it to get a crumbly mass and mix all into a candy bucket and take a small bucket and drop a pinch at each plant. The molasses will draw the cut worm and he will eat that before the plant. Last year in planting an acre, planting by hand on account of the large number of small plots, we turned up many cut worms with the trowel, and in planting that acre. There must have been a great many that we did not turn up. I put on that mixture of bran, Paris green and molasses and not more than six plants on the acre were missing. We think that an effective method.

After your field is set out the cultivation is almost the same as that for corn. The first cultivation we do not work too close to the plant. The roots of the plant must be established before we start thorough cultivation; then cultivate deeply for a while and gradually right up towards the plant. As these leaves develop it will lay down and spread out and by ridging up we can keep it thrown up and make it easier to get through the rows.

I have here a number of stalks of tobacco. While the crop is growing other insects attack it. There is one worm known as the tobacco worm that causes a lot of damage. A moth comes flying over the fields in the evening, and lays its eggs on the under side of the leaves. These eggs hatch out into a small green worm. The worm grown rapidly and in three weeks it gets about three inches long. It shears off the leaves and eats everything but the mid rib. Then it creeps into the ground and changes into another pupae and later comes out as a moth and lays another set of eggs. There are two broods in a year. Another insect is the grasshopper. This jumps and will eat a hole in a leaf and then jump over to another leaf and eat a hole there. Sometimes there is a little black insect called the flea beetle comes along and eats a small hole, a shot hole. These are not so injurious to cigar filler tobacco but yet damage it quite a bit. One of the worst things is a hail storm. A hail storm will ruin the entire crop. If a hail stone goes through a leaf you can always tell the mark on the leaf.

Now I have here a cured stalk of tobacco just as taken out of the curing shed during the winter. Now the purpose of the tobacco plant, of course, will be to produce seed. Along towards fall, about the last of July, there appears on the top of the plant here a bud which will be a seed head. If you leave that bud develop and the flowers come out and seed develop, it is going to change the type of the plant. The upper leaves will be small, hard and woody, and the plant will not ripen up and the quality of the tobacco be poor. So

we go along and break out that seed head as high as you want your plant to be and with as many leaves on as you want to it. That is called topping. Sometimes some of the sections will top ten leaves, some twelve leaves some more. As soon as the plant is topped it developes what is called suckers. In the axil of each leaf there developes a branch same as that developed, first above. This appears first at the top leaves and then on down the stalk. If you leave these grow they will grow up and develop seed and the branch growing up in the axil of the leaf would naturally take the strength away from the leaf, so the grower keeps that broken out. After the upper four are broken out about four more come in and that way on to the bottom of the stalk. By keeping these broken out you drive all the strength of the plant into the leaves and get a larger, finer, softer leaf. If you leave the suckers grow it will be the same as not topping the plant, because the strength of the plant will go into the suckers and the leaf will suffer and get hard and woody. Oftimes the weather has a great deal to do with the time the plants seed. If we have a spell of dry weather then the plants go to seed a good deal sooner. It is natural they should, too. You qut a good plant under adverse conditions and it will try to develop seed and reproduce itself before the strength is gone.

The better the grower cultivates the soil the better he conserves the moisture and the better the growing conditions are for the plants. During the seasons of 1908 and 1909 I saw a great deal of difference on different farms here in the county. One farmer when the dry weather set in stops cultivating. Another grower kept on cultivating. The man that stopped was losing moisture because the ground became hard and baked. And the man who kept on cultivating kept a mulch on top and prevented the sun from evaporating the moisture. The season has a great deal to do with the size and body of the leaf. During a very dry season your leaf will be shorter and a great deal heavier. During a wet season it grows more rapidly and grows finer. The quicker the plant grows the better the leaf. In Connecticut and Florida they use a great deal of commercial fertilizer and grow more rapidly in order to get a thin leaf. If a get dry weather it makes a heavy leaf. We don't want too thin a leaf, though it not advisable to get too heavy. We want a medium weight leaf and good size.

During all this time or almost any stage of tobacco there is a disease that is liable to set in and, by the way, there is no section of the country in this world that does not have this disease. It is a disease called Calico, or technically known as mosaic. If it attacks the plants when young the plants become rusty and go to pieces. When it attacks the plant almost grown the upper leaves get it, but the lower leaves do not develop it and the upper leaves show very little sign of it after cured. It does not do much damage after the plant is grown up, but when it attacks the young plants it will do damage. Just what the cause of this disease is we do not know, but it compares very favorably with the "yellows" in peaches.

About the last of August or first of September the tobacco begins to ripen. Then it is ready to put away. When it stops in its growth it is said to be ripe and there are several simple tests which will tell when this stage is. The leaf as it stands on the plant stands this way. When the leaf begins to ripen, around the edges here you will

notice sort of a mottled appearance. You will see a green little spot with more green. It gets a mottled appearance and if you take hold of it, it feels like leather, and then your tobacco is ripe and ready to cut. At the same time when the leaf is ripe and you turn it over between the finger and thumb it will crack, and you can be sure that your crop is ripe. It has come to the stage where it is going to cure up with better coloring and weight.

Before we come to the harvesting I better mention a little about the selection of the seed plants. There is one mistake that the farmers have made in this section as well as in other sections, and that is the careless, haphazzard way in which they select the seed plants. Usually they let a half dozen stalks stand for seed. They don't appreciate they should have the best stalks in the field for next year's crop. The proper thing to do would be when topping to pick out the seed stalks and look for certain qualities—I am not going into breeding work—but one of them is the number of leaves on the plant. Many of our farmers have strains that will produce twelve or even fourteen leaves. By counting the leaves they will be surprised to find the difference. Here is a plant that has fourteen leaves and here is one that has sixteen leaves. If this plant here has enough vitality to develop sixteen leaves next year where this has fourteen, it will mean two leaves more on each plant. That will mean quite a few pounds more in the aggregate. This type here has eighteen leaves. This is, however, a good strain or type, but it was not taken right out of the field, commercially grown. It is out of an experimental crop. But the point I want to make is that the farmer should pay more more attention to the selection of the seed than he does. He thinks that is an easy matter and pays no attention to it.

After the crop has become ripe they begin to harvest. The stalk it cut off at the ground with a pair of long handled shears. After it is cut off it is allowed to lie on the ground for an hour or more to become wilted. It is then picked up and speared upon lath. Tobacco lath are four feet in length and a little heavier than the sort used for building. On the end of the lath we put an iron spear. The iron point is forced through here. About five or six of these stalks are strung upon the lath and then it is taken to the curing barn. The curing process takes eight to ten weeks in our climate on this kind of tobacco. There is a thinner tobacco that cures more rapidly. When this plant is cut it is very heavy. A lath with six stalks like that on is as much as one man can handle, and work all day handling. Now then practically all that moisture must go out of the stalk by evaporation in the curing barn. The curing barn must be well supplied with ventilators in order to keep the air moving and carry out tons of water held in there in that green crop. Curing is not simply the drying out of all moisture. It is the general impression that curing is simply a drying process. It is not. When this plant is cut off at the ground the supply of nourishment is cut off and that plant starves to death. Now if that tobacco lays in the sun too long and becomes scorched or sunburnt it will not cure up, but always stay green in color. Rapid chemical changes take place in the leaf in curing. The last of the crop is harvested just before frost. Sometimes we get caught with the frost. Frost will ruin a crop of tobacco. It is another thing that the growers must watch out for. There is perhaps a worse thing that the

grower must watch out for. When the moisture is evaporating out of these leaves in the shed and warm, dark, cloudy weather comes, he is likely to have his tobacco pole-burn, and after pole-burn once gets started it is hard to check, and in the course of four or five hours it will ruin a crop of tobacco. Pole-burn is a fungus disease that attacks the surface of the leaves and decomposition sets up, and it will become black as if it were rotting and the next day the leaves fall to the ground. This makes the crop practically worthless because you cannot touch the leaf without your fingers going through it. And it is damp, foggy weather that brings about this disease. So that when the grower sees that he is going to experience that kind of weather he closes the ventilators in the shed. So he must have the shed shut up. Then at other times he must open up the shed and let the fresh air in and the shed must be fixed to open up and close up. If hung too close the air cannot circulate through it.

A Member: How close on the racks do you hang it?

MR. HIBSHMAN: It depends on the size of the tobacco. Some years it grows very stiff that the leaves stand out, but generally you leave a margin of seven and one-half to eight inches. I know men who hang closer. After it is hung for several days, then many hang it closer. It is just when the leaf is changing color—it is green when it comes into the shed and the first change is to yellow and from yellow to brown—and it is just while the leaf is changing to yellow that the moisture is going off most rapidly and the greater the danger from pole-burn. There are several other diseases that come in through the winter, but they are not nearly so dangerous. After the tobacco is cured the leaves are so brittle you cannot touch it, so the grower must wait until damp weather comes on. As soon as that comes and it gets moisture and becomes soft so he can handle it without breaking it he takes it down from his shed and puts it into a damping cellar. Under one of the sheds he has a large cellar divided into two parts, the stripping room and the damping cellar. The damping cellar has an earth floor and a very little light. It is hung in there and gets damp, and when it gets so damp that he can take it up without breaking, it is then taken to the stripping room and then the stalks are stripped from the leaves. This is what is called stripping tobacco. The term "stripping tobacco" as used means different things. With the grower it means taking the leaves from the stalk and sorting and tying up in hanks. With the manufacturer it means taking the mid rib out of the leaf. The term "stripping" does apply to both operations. He takes them in the cellar and strips the leaves, and that stem is valuable as a fertilizer. It contains a great deal of potash and I have no doubt about the nitrogen. The farmers apply them to the corn ground.

A Member: Does he apply them in that condition?

MR. HIBSHMAN: Usually in this condition and they are put on in the manure spreader.

Now then he has his leaves stripped from his stalk, but these leaves are not all alike. There are some poor ones in there. The lower leaves of the plant as it grew in the field came in contact with

the soil and they got dirt on them. These are called ground or sand leaves. They are not as valuable as the other leaves and consequently he makes two grades and in one he puts the ground or sand leaves and all torn, broken or worm eaten leaves, and in the other grade he puts the best leaves. So he takes the tobacco from the stripping table and sorts out all the bad leaves. Usually there is about a proportion of one to six or one to eight of second grade or ground leaves leaves to the best leaves in the crop. Then his next concern is to sort these different grades out according to the length of leaves. That would not show any good sorting (illustrating). But where he has a large bulk usually one man strips off and another sorts and several lay out. He will lay the longest back here, the medium in the middle and the shortest one in front, graded up that way, and then reaching at one side he gets a handful, as much as I have here, and he ties them up with another leaf, usually taking a leaf out of the second grade, taking about a dozen leaves and making the ends nice and even. There is a difference. Some growers do it up more carefully than others because in tying up not many growers will make the butts as even as that. You have three to four inches difference in the butt end of the leaves. It shows poor sorting. I think it would pay the growers to tie it up neater. He takes it up and ties it with another leaf. That is known as a hank. Some places a hank is called a hand of tobacco. His whole crop is put up that way. Of course, the leaves are uniform in length, maybe a half inch or so variation. In this condition the grower sells it and after it is done up this way he usually bales it up in bales of 50 pounds and covers the bales with paper. This is the paper used in baling them. They have baling boxes made especially for certain sizes, about 34 inches by 18 inches each way. The paper is wrapped around these bales and they are tied with three wraps. Then it is in that condition that the grower sells it to what is called the packer. Remember this tobacco is what we call green. It would not be fit to smoke. It has the gum on. It has not the color or texture, not at all like the tobacco you find in the cigar shop. It must have good fermentation and sweat in which it will lose twenty per cent. weight going through the sweating and it takes the gum off. This tobacco is sticky. It has the gummy excretion of the leaf which in fermenting is broken up and dispersed. There are not many growers that sweat the tobacco. They sell to the middleman, who does the fermenting and sweating and sells to the manufacturer. And it is done up in hanks like this and tied up in the bales that the grower sells to the packer. Now in Pennsylvania the packer goes from farm to farm and buys the crop. Each farmer is his own salesman. There are some sections where they sell on what is called the block. A farmer may have a large crop and may want to sell at once, and he makes known that Mr. Black will have a public auction. The buyers come there and bid against each other. I believe there they get a more fair price for tobacco than in Pennsylvania, because the packer goes to farmer after farmer and says: "Sell me your tobacco at ten and three. That is all we are bidding and we want your whole crop." "Well, I think I will have to sell for that," the farmer says. And that is the way a great deal of tobacco is sold. It is not bought on its merits as much as it should be in Pennsylvania. That is only the objections in selling. I believe if the grower would do the crop up better he could get better prices for it than he does.

MARKET GARDENING

By M. H. McCALLUM, *Wernersville, Pa.*

Mr. Chairman, Ladies and Gentlemen, and Fellow Institute Workers: It gives me an exceptional pleasure this afternoon to speak upon the subject that has been assigned me, namely, market gardening. While I cannot upon this subject give vent to my greatest enthusiasm along agricultural lines, yet I have always had a great interest in the growing of vegetables, and a good reason, no doubt, is the fact that I was born in the vegetable garden, brought up there, and have ever lived there, and the end seems not yet. The subject is an immense field and I shall consider briefly only some of the outcroppings with an eye single to the interest of the market gardener.

If the man who believes that in agriculture the best opening lies along the line of market gardening he should recognize early the importance of adding to what he already knows, whatever scientific knowledge and training he may be able to secure. It is hardly necessary to say that the chief object of every gardener is to make money. But in gardening as in every other business the most successful are those usually who have best knowledge of their undertaking. The more advanced and complete are his ideas the more successful will be his work. The more he knows the more he can do. We need forethought in all lines of agriculture, but when we are wanting in this respect in the market garden we fail most wretchedly, for the market gardener must show more knowledge, care and attention than does the general farmer who raises only the staple crops. The most successful market gardeners are men of high and definite purposes and are never satisfied with ordinary results. They are men who read and they are men who think. Market gardening can be made a very delightful, profitable, and all desirable vocation, but on the other hand it can be made and is made by many these days a slavish life of drudgery—men and women eking out a wretched existence, simply, either because they are not putting brains into what they are doing, or by force of habit have no desire for recreation or self-preservation. It has been said by a successful tiller of the soil that a man should be so resourceful as to be able to spend one day of the week sitting on the fence and watching his crops grow, and by another who adds that that day should not only be Sunday either, but a week day as well, and perhaps they are right. Anyway, I believe a great need of the average gradener today is more and better knowledge of the principles underlying successful gardening, the use of scientific facts and the result of the experience and investigation of other gardeners and experiment stations.

One of the simple things in the practice of the gardener that is invaluable is the keeping of a diary, and from this diary kept from year to year formulate a calendar or record of time of planting and seeding the various crops. The farmer has but a few crops to plant

and so has the dates well fixed, but with the trucker it is quite different, there are very many plantings to be made and each as important in point of time and season as any farm crop dare be. And there are the various successions that have to be noted. All this is confusing unless there is something to guide. There is a season when a gardener can think and plan at leisure. He should then make definite record of plans and purposes. This with the time of seeding and the various successions should be conveniently displayed; giving valuable assistance at a time when time itself is at a premium.

Every gardener before he can hope to make a success must be thoroughly alive to the best methods of production. The soil in the first place is no small factor. The gardener should know his soil; its likes and dislikes. He is very likely, in the early spring, through enthusiasm and over-anxiousness to have an early start, to be unwilling to await proper soil conditions. The working of soil at such time is harmful and cannot be remedied the entire season. He should direct every effort to securing the best kind of a seed bed. The great importance of good tilth has always been appreciated by practical men, and experience has abundantly taught us that care should be exercised in bringing the seed into perfect tilth before receiving seeds or plants. Seed placed into mellow soil will allow the roots to grow unhindered in any and every direction in search of moisture and plant food, and it is this intimate and close contact of the absorbing surfaces of the fibrous roots with soil particle that nourishes and sustains the plant. Again, the fact remains, that unless there exist proper soil condition he may lavish upon the garden spot all the plant food he pleases and there will not be the results desired. Soil for the garden should not bake and crack, or run together and puddle after rains. But how are we to secure the proper physical condition? The crying need of our Pennsylvania farms and gardens to-day is more humus. We are preaching it and yet it is being used twice as fast as supplied. Gardeners living near the cities can often supply this cheaply in the form of stable manure, while it remains for the other fellow to resort to green manuring. However, he has not need of being discouraged. Green manuring is a well know fact, but its importance is by no means appreciated. Every inch of the garden should be wintered with some cover crop to furnish organic matter, and to save from leaching the available plant food, and also in case of a legume to furnish nitrogen. Crimson clover and cow-peas may be grown to advantage in some parts of the State. Rye and hairy vetch are more appropriate because they can be sown later. Then rye may be sown as the last resort; say 3 to 4 bushels per acre.

However, in this connection it might be well to say a word about lime. In turning down these green crops he should not overlook the use of this important element to correct acidity. It seems we use too little lime in our market gardens anyway. Manuring heavily from year to year necessitates liming as well to keep the soil in good sanitary condition. In visiting market gardeners through Philadelphia county last summer I was very much impressed with what benefit a little lime would be upon some of those garden spots. While being shown over one of these large plantations I was told of a

certain field that was not doing its duty, and as we approached and noticed conditions I could not help but feel that a little lime would do it good and so suggested, and the point was well taken.

In further consideration of the soil as a factor in successful production we must not overlook the act of cultivation. This is an all important operation and must be done at the proper time if the crop is to be kept free from weeds and in a good growing condition at the least cost. It is important to keep the soil well stirred both to conserve moisture and dew-elppe plant food. There are times through the growing season that if this is neglected only for a few days it will result in considerable loss.

Every crop from seeding and planting time until harvesting must be watched with an eagle eye. The method employed in producing certain crops successfully last season may have to be modified in growing the same crops this season. Insects, pests and fungus diseases require no little vigilance, and we must know how to meet them and be ready to meet them. Rotation should be carefully observed. Aside from many other benefits it means renovation. This fact was forcibly brought home to me several years ago in taking hold of a large garden where rotation was regarded of little consequence. And of all the diseases, insect pests, maggots and what not, made me almost feel like giving up in despair. But the following year we sought refuge in another location, practiced rotation and eliminated many former troubles.

It goes without saying that to produce bountiful crops and crops of quality and appearance we have to fertilize heavily, and stable manure is the truckers great stand-by. And yet as cheaply as this may be placed upon our gardens, I believe that an intelligent use of commercial fertilizer is profitable. And the gardener should be his own mixer. He should experiment with the plant food elements singly and in combination upon the crops that are his money makers. It may be a little easily available nitrogen will do wonders, especially in the early spring when nitrification is not active. Taking the average of 18 or 20 of the main garden vegetables, and we find that manure as it comes from the stable is practically a balanced ration for them. And yet experience teaches us that an application of phosphoric acid in connection with the manure is greatly beneficial. We may find too that potash will be helpful upon some soils and upon certain crops. And so for the man who uses commercial fertilizer, there is no reason why he should go it blindly. Let him ask intelligently of the soil and it will respond through the various crops with all the apititude of nature.

Another factor that is altogether vital in the market garden is the seed proposition. Its importance cannot be too strongly emphasized. Men of experience can trace many a crop failure to the purchasing of bad seed. There are many discouragements to encounter in the market garden, but not a few are offset by taking the proper precaution at this point. The mere fact that seeds germinate does not tell the whole story. I know a gardener who set two acres in cabbage and at harvest time there were good cabbages, brussel sprouts, cauliflower, and everything between. Whatever seeds have to be bought should be bought early. Have nothing but high grade and be willing to pay well for them. Most growers have a few kinds in which they are especially interested, and are selected

with more than ordinary care. It is desirable to obtain from such a source all seeds of crops in which we specialize. However, it seems to me the gardener should practice the selection of seeds more than he does from his own plantation. Some few seeds such as cauliflower are best purchased from a reliable source. He cannot produce such seed profitably. But with such crops as sweet corn, cabbage, onions and tomatoes, etc., there is a vast opportunity for improvement. It is right here where the gardener with a little skill and care can raise a peg or two by selecting choice seeds and improving the strain from year to year. He should have his ideal and select upon merit. Close attention along this line will be amply rewarded, and give satisfaction.

Again to be successful the market gardener must be thoroughly alive to the best methods of selling and distribution. For it is at the market end that skill counts for most in securing maximum profits. And he who is wise in producing and likewise apt in disposing of his product we will term a successful gardener, for these are two qualities not always found in the same person. To produce is one thing, and to sell another. Many succeed admirably in the production of vegetables, but fail at the profit end because of inability to market. They fail to see the force of appearance and condition, and attractive recepticles. Their grading may be defective. First class goods may not be strictly first class. Size, shape, color and soundness are not properly regarded. Attractive appearance catches the eye and goes a great way in clinching a bargain. Then there is the other fellow who can usually sell to advantage whenever he has anything, but they are often such that like to sit on the fence and not alone watch the crops grow. The vegetable garden is not the place for a world of ease, by any means. It is no business for the careless, the lazy or the stupid. Its occupant must be ambitious and not afraid of hard work. He should never know where to place that which he grows, and grow that which he is possible to place. We must cater to the wants of the public, and yet be original enough to create a market where this is possible. Start in moderately to fill a want existing. Try to have your vegetables upon the market a few days before your competitor, keep your goods from the consumer's eyes. Study the market, the demands of certain articles. Educating the peoples' tastes for certain goods is a slow process. Quality may sometimes have to be sacrificed for outside attractiveness. Aim at uniformity of bunch or package, and cleanliness. Endeavor to establish a reputation by inspiring confidence and reliance in all you say and do. Retailers like to deal with growers whose word is as good as gold. Abide by that trite saying "You see top you see all." My experience has seldom gone so far as the middleman, and yet as dealing directly with the consumer the best policy always is honesty. In gardening as in every vocation in life there are many uncertainties, but one of the sure things is that your sins will find you out.

GLEANINGS FROM OTHER COUNTRIES

By MISS SARA PHILLIPS THOMAS, *Philadelphia, Pa.*

Mr. Chairman, Ladies and Gentlemen. To-night I wish I had been asked to speak on "What is the Matter with the Men of Pennsylvania," because this thought has been going through my mind very much for the last few days and weeks, and when I realize that we have 600,000 men members of the great churches in this State is it any wonder that we are really trying to do something for the childhood of our State to stimulate a better manhood and womanhood. I ask why you men of Pennsylvania put such a low valuation on the expression of your citizenship; why you do not send men to Harrisburg, when you have it in your power to control the balance of power in the Senate and House of Representatives, men that are men, that are stalwart men, that will not only make us good laws but stand for the upbuilding of the State and the protection of the home; and I appeal to you to use your votes in this way, to use your influence over the other Christian men of this State.

And now to-night we are to realize that there are many ways in which we get our education even after we leave the scholastic halls of learning, and I think you will agree with me that as long the earth exists that we must go on in seeking knowledge and enlarging our sphere, and one of the pleasantest ways by which we can do this is by means of travel and if we are fortunate enough to get into the old countries beyond the seas we find a splendid opportunity to study life, art and history, as well as to enjoy the natural scenery everywhere around us; and I am going to ask you, in the limited time I have to-night, to take a rambling trip with me and I will start with you in that magnificent harbor of Queenstown, and I ask you to picture that old town on the height above the harbor with a perpendicular wall of about 80 feet rising from the water's edge and high above that you find terrace after terrace planted with beautiful shrubbery and flowers. We landed in this town about 2.30 o'clock in the morning and at 4.00 o'clock the day had dawned and so it occurred to me that we might profitably use our time by taking a jaunting car ride and for some of you who are not familiar with a jaunting car I will describe it. It is a vehicle that carries properly four people and the driver, but the great advantage is that you can pile in any number and use but one horse to it. It has seats that run lengthwise over the wheels and the reply that the driver made to me when I asked him about the ride, he said: "Oh, yes, miss; it is a fine thing to do. It will shake your breakfast down and shake your liver up." And so it will if the jaunting car is not properly balanced because it is one of the roughest vehicles if you do not have your load properly balanced. We rode around the streets of Queenstown and felt transported into fairy land as we looked upon the liburnum, which as many of you know belongs to the locust family, with long festoons of yellow plume and as we looked up into it was one mass of golden beauty; and then

aside from the liburnum the rhododendrons in the very prime of their beauty and the pink and white hawthorn hedging the fields, and then, too, the native goose or wind which is found in England and Scotland and covered all the hillsides and meadow lands, and as we left Queenstown and hurried on to breakfast in Cork we enjoyed the magnificent beauty of this mass of yellow bloom as we looked from our car windows. In Ireland in striking contrast to all this natural beauty—but in contrast to all this you find the most abject poverty that I have ever seen and you find dunning behind your vehicle the little urchins begging as long as their breath holds out and you hear them saying: "Copper, sir; copper, sir;" until they can barely lisp it.

I am not going to ask you to stay in Ireland more than just to take a peep into the country fair and realize the way they handle their stock in the markets. Once a month the country folk come in with their cows and pigs and their children, which of course they do not sell, but the livestock are brought for sale and they congregate in the commons and opens and have a good social day of it as well as a profitable market auction.

Then I am going to ask you to leave Ireland and travel across Scotland and up on the highlands and view the historic parts of Scotland. Let us just pause at the Island of Ionia that Robert Louis Stevenson has made so famous and as we visit the battle fields remember the stirring incidents of their time and all through we find an association of history that gives a keener appreciation of the natural beauty of the places. It may be interesting to tell you that while I was in Scotland I met there in Edinboro during the World's Missionary Congress our great American orator, William Jennings Bryan, who was the great orator of that occasion. I was also fortunate enough to be a fellow passenger on the steamer with him in crossing the occean. The morning after Mr. Bryan spoke in Edinburgh the thing that interested me very much was the way the British papers spoke in regard to it. Something like this appeared in the morning papers. As you probably know, there was a limit of seven minutes to each speaker. Even to those men who had spent ten years in gathering information to present to that great congress was allotted only seven minutes to give the results of their investigation. And the papers said that in the seven minutes at the beginning the Britisher would begin by apologizing for the very little that they can say in seven minutes while at the end he would be found apologizing for the small amount he would say in seven minutes. While the American would begin by saying, "I want to tell you such and such a thing," and by the time he had reached the middle he had covered half of his subject and when he had finished there was nothing left to say upon the subject. So I think it is remarkable that the Britishers who have a good opinion of their own people and their own oratory should pay the Americans such a compliment as that in their local papers.

The country I want you to travel longest in to-night is Norway. We find a country not as much travelled as some others and so very different from our own in appearance, in agricultural points and contrasting effects that it brings particular interest to the American tourist. In the southern section of Norway we find mountains and waterways and as we travel on the little boats and look up at the mountains we have a feeling that there is nothing beyond the horizon

line, that the world stops with the mountain top and if we were to reach that particular mountain top I am sure we would have the same feeling that there was nothing beyond the horizon line of the next mountain, so closely are they hemmed in together. So you can realize that there is little tillable ground in the southern section of Norway. The farms or Sagties as they call them are principally on top of the mountains. In the early spring they send the cattle up there to pasture and they send with them their saaler women or girls and leave them up there the whole summer long and you can imagine it is a desolate sort of existence. They have a trolley wire that comes from the mountain top to the base upon which they send the milk down from the mountain to be taken to market and also send up stores and provisions for the women who live up there through the summer. They have small farms scattered along through what we might call their valleys and they get the grass off the hillsides. We could hardly recognize it as hay because largely made up of weeds and ferns with possibly a spear or two of grass. They cure their hay in a manner entirely different from anything we see in this country unless we happen to go in sections where Norwegians have settled. They call this method of curing hay "haas." It seems as they took bean poles and planted them two feet apart and connected them with light lumber and put their hay up over this rack until cured, and you can imagine as you pass over the country that these racks present a very curious appearance. They do this partly on account of the small amount of grass in one place but more because of the heavy rains they have and the dews so that the ground is not dry enough most of the season to be able to cure the hay on it. The sun is hot and the hay will cure in a few hours when prepared in the manner described. It is of interest to you to realize that there are 30,000 more Norwegians in the United States than in Norway and because of this fact we find people speaking English through a great many sections of Norway. We often find that the girls have gone over to the United States and then gone back into some of these inland sections and opened a hotel for their fathers on the American plan. We find sometimes the American ways being introduced but not in very many sections and some of the men who drove us spoke of the fact that it was very hard to get a Norwegian to adopt a different system of work from that which they had and if I recollect rightly they told me they began to work at seven o'clock in the morning and then worked for an hour and then left off for an hour and again began at nine o'clock and worked until twelve and then rested for two hours until two o'clock and then worked until five and then stopped until seven and then, as I remember, worked until nine. Maybe that don't count up quite right. They fix the hours to suit themselves. That gives you an idea of the way they perform their day's work instead of going at it and getting through with it as our American man does. The method of transportation is interesting. When I tell you that during the month I was in Norway I was but three times on a steam railway you can realize that we did not travel in a hurry. Most of the travelling is by the stulkjaare. The stulkjaare is a two wheeled cart with a seat in front for two people and behind a seat for one on which the driver sits. They drive in this the little horses which are native to Norway and weigh from 700 to 800 pounds. They cost in our money about $125.00. The stulkjaare

you can purchase from $35 to $40. This is really the earning capacity of the farmer or the implements that he has to use to make his living with.

These little farms that you find through the country sections possibly you could get two and maybe four of them in this room so little are they. You can realize from such a small plot of ground that the farmer cannot make very much to keep his family on; so with his horse and stulkjaare he has something that he can earn a living for his family with and it has been a Godsend to the Norwegian that the tourist has taken to travel in his country more and they do not hesitate to say that their country is much better financially than before the tourist came there in numbers and so it is fair to say that one of the chief industries is catering to tourists and he does this largely with the stulkjaare. He gets about $3 a day for travelling with his horse and for his own wages. The country is subdivided into two sections and each section has its own station where there are a certain number of horses required to be in order to accommodate tourists and I suppose you have already grasped the idea that everything in this section is of the most primitive kind. The farm houses of the Norwegians are nothing but huts with turf roofs on which is placed the turf and you see the grass growing on these turf roofs from eight to ten inches high which presents a rather picturesque appearance. In contrast to this primitiveness we are rather surprised to find that they have a systematized travelling scheme and each farmer is required to send his horse into the various travelling stations so that there shall be a sufficient number to accommodate the tourists as the demand increases. They have this system so well regulated that each man knows exactly over what territory he can drive, the number of miles or killometers he can drive so that one does not interfere and get into the territory of the other, so that there is a perfectly amiable arrangement. We find the country subdivided into sections very much as our states are subdivided into counties and each section has its own customs and costumes. The people in the various sections wear one particular costume, and this makes me think of one of the institute workers who tells a story of how the farmer's wife is abused by having to send to the neighboring town to buy a spring bonnet. The horse was so slow that by the time she got back the styles had changed. This does not effect the Norwegian woman, because the styles never change. They wear the same style of dress in all its details from generation to generation. I have here, which possibly you can see, the dress of the Norwegian girl and the young women and I have also the dress of the man and the boy in the Hardangar section of Norway. I would like to say that the men from the old countries do much more to contribute to the picturesqueness of the country than do our American men by wearing these attractive costumes. We find the young girls wearing a knitted zeyplucoil which goes over the hair; and then we find the next older girls wearing a cap like this and this corresponds with the same costume that I have shown you on this little girl and they wear a red jacket such as I have here. Then when the woman marries she wears a head arrangement something like that and when she becomes an older married woman she wears a black one. I think you American men would be glad if there was some way you could tell the ages of the American women

as quickly and nearly as they can in Norway. The bride wears a crown of metal. She wears it of silver or brass if she is fortunate enough to have enough of worldly goods to own such a one; if not, she wears a material that looks something like brass and is interwoven with bright colored strands and this is handed down from generation to generation. She wears such a streamer hanging down from her waist and then when married she wears two. We go into another section of Norway and we find a costume like this. We find this in the Hollingdel section. It is the most beautiful costume to see. The cap I will put on so that you may have a realization of the way they wear them, because the Norwegians seem to understand the ways of coquettishness. We find in Norway most of their implements are wooden and a great many of them are artistic. We find some of their utensils are carved most attractively and one of the wooden things I have here in my hand that represents an old time custom of the Norwegians is a bridal spoon. This is carved out of one solid piece of wood symbolic of the union of the man and woman and at the breakfast feast the groom eats out of the one and the bridge out of the other and it is very beautifully carved out. We find as we go up to the central part of Norway that we come into a more fertile section and we sometimes see agricultural work done in a way that reminds us of what we do in America. We see them gather the hay in much the same way as we do. And farther north we find still a more fertile country. In the northern section we find a great many Laplanders. There are about 30,000 Laps in Norway. About 3,000 of these are sea Laps who are better off financially than are the field Laps. When we went on north and landed at one of their northern towns called Tromsoe we were greeted by a curious lot of people, a dirty set of people and one feels the people should be fumigated or you keep your distance. The women carry their babies much as the Indian does the papoose and they make caps and dolls for sale. The men carve many things out of bone, pipes and knives, paper knives and spoons, and it is a matter of interest that one of the chief industries of the Laplanders is raising and killing reindeer. The meat is really quite palatable and we had the pleasure of eating it but once at it was out of season, therefore tasteless. One of the men said he was going to begin hunting but would not have reindeer meat by the time he got home and I said: "Why not?" and he said: "Because it costs so much that I will sell it before I get home." I have in my hand a spoon. In this spoon are five little rings. Each ring represents 100 reindeer that this man has killed; so for every 100 reindeer he kills he puts one ring in his spoon. I wish I could convey to you some idea of the beauty of the lights of the midnight sun. It is almost impossible to give you any idea of the wonderful lights and colors that the sun produces in that northern section where they have their days lasting two and one-half months and their nights of corresponding length; and in all that twenty-four hours there is no suggestion of darkness. One does not know by the light when it is time to sleep or when it is time to be awake and surely the tourist seems to be infected, as the native seems to be, by spending most of the twenty-four hours where he can see the beauties of nature round about him. The first night that we had on the North Cape summit made almost the greatest impression of any upon my

mind, though that was not the grandest exhibition of lights and colors. At 11.30 the sun set and at 12.30 it rose and we saw the lights of the sun set and sun rise side by side in the cycle and it seemed to give me a greater realization of what it meant to realize that the sun did not set in the sections when we got a little farther north. I am going to take the trouble to read a little extract from my diary that may give you a little idea better than I can give it to you now because I wrote this when the freshness of the impression was upon my mind of the lights and colors as they presented themselves to us in that northern section.

I have but ten minutes time longer to speak to you and I am going to leave you with this picture if I have been able to bring one of you to the land of the midnight sun and I just want to tell you before we leave that when we are on the North Cape we started out at 10.30 and we desired to reach the top of the North Cape which was about 100 feet above the mountain so as to see the sun burst, the flash of glory from the top, but we were unfortunate enough to get into a heavy fog just as we reached the top, but sometimes I think that was a blessing that we could see such a wonderful sight as we did from the top of the Cape even if we did not enjoy the glory of the sun. In just about a minute the fog rose just as if a magic hand had drawn the curtain and there below was the land and the islands and our little boat moving around in the sea and beyond and up above was the line of the sun and then just as it lasted a minute it seemed someone gradually pulled the curtain over and there was nothing beneath us at all.

Now let us go quickly into that vast territory of Russia, one of the largest countries in the world and one of the countries in which you find the greatest accummulation of wealth, the wealth of all the churches and palaces and in everything that pertains to the government, but nothing spent upon the common people; nothing even spent in the way of sanitation and no country needs it more than Russia. We cannot help but be impressed with the strange contrast between the luxury provided for royalty and absolutely nothing for the large mass of the common people. I went through their palaces and we saw doors lined with solid gold; we saw hundreds of plates that were worth from $30,000 to $40,000. They had been presented to the Czar by different people, gracious municipalities and various sections of the country and there were numbers and numbers of these in many of the palaces all through Russia. And one thing that seemed to be different or made more impression on my mind was that they took large numbers of peasants through these palaces and these plates I speak of were always placed in large panels and had a red curtain covering them and likewise their gold doors were covered and when the peasants went through they were exceedingly careful that they did not get a glimpse of this wealth that they were glad to show to the tourist. We had the opportunity of seeing the people congregate at the church festival and if I were to describe a Russian costume it would be a conglamoration of color something like this: a green skirt, a yellow apron, a red shirt waist and a pink kerchief. So you can imagine the combination that you see there. They don't seem to appreciate harmony of colors. It is the common people that I am speaking about. The peasant people

are the ones that contribute the interest to the tourist, because in the cities we see people just as we are accustomed to see and dressed much as we are accustomed to seeing. We found one thing in the churches, the Greek Church of Russia, which interested us very much and that is their "ipons" which are similar to the painted images we find in the Roman Catholic Church. They are made of gold and silver and inlaid with diamonds and precious stones. We found a great immense amount of wealth put into some of these single ipons and in a procession we were able to see we counted somewhere upwards of 100 ipons carried through the streets, and in Moscow in one of their oldest chapels, the Iberian Chapel, you find an ipon brought many centuries ago from Iberia, which is taken out when sickness or any occasion calls for it and placed on wagons drawn by six horses and taken through the streets to the house where it is desired to come to and in the meantime, of course, a painted copy is put in the chapel and this is supposed to take away the disease or whatever it is that the particular people in the house are afflicted with. It is a matter of interest that this particular ipon is the one that the Czar, who is the head of the Greek Church, and all the dukes and various prominent members of the royal family come first to worship. We find great quantities of the most beautiful, marvelous and precious stones in Russia and we had the privilege of visiting the royal granite works and I have never seen such stones in such quantities as we saw there and the most wonderful carving in stones possible to imagine. In my hand I hold one of the choicest of the Russian Marbles and the tomb of Alexander II, the liberator of Russia, is made of that marble. You will recall that this particular ruler was assassinated in 1888 and you will remember that it was a girl that by throwing a handkerchief to the street gave the signal to the student who threw the bomb and that Alexander was not injured in the throwing of this bomb and he got out of the carriage to see what assistance could be rendered to the injured and the second boom was thrown which fatally injured Alexander, and this is one of the reasons why the Russian common people are held under suppression because of the dreadful assassination of this particular ruler who was doing everything in his power for the people of Russia. And on the spot where Alexander fell they built a memorial chapel and it is one of the most magnificent chapels that it is possible to imagine. This chapel has some of the most expensive ipons in it.

I want to say that in Russia one finds better sleeping car arrangements than we do find in America. While we find some things most primitive in contrast to that, we find everything that caters to wealth there and in the five nights that we rode in the sleeper in Russia we were much better accommodated than if we had been in American sleepers.

The Russian language is a most difficult one to understand. They have so many letters in their words that people cannot understand what they do with them. I hold in my hands the Lord's prayer written in Russian on this and if you would write the Lord's prayer in English in corresponding sized script I think you would find that it would not cover half this space. There is not a word here that bears any resemblance to my Lord's prayer. And when you travel on the streets I want to say that the droskimen and their droski wagons

are features that contribute much to the interest of the tourist. These wagons are drawn by horses wearing large wooden collars over their necks from shaft to shaft.—But the Chairman says I cannot take you any further in Russia to-night. (Applause).

FARM SANITATION

By MRS. GEO. E. MONROE, *Dryden, N. Y.*

For many years the Institute effort has been directed toward the care and feeding of the farm animals. Dairymen and poultry men have really succeeded in bringing about great improvements. Recently it has occurred to us that what was good for the animals in the barns, might with profit be applied to the persons living in the farm homes.

The death rate from serious contagious diseases like typhoid fever, tuberculosis and many others, is as high in the country as in the city. This ought not to be.

There are three things necessary to good health. 1st: Fresh air and sunshine; 2nd: pure water; and 3rd:—and this largely depending upon the first two,—keeping the seeds of disease out of our bodies.

Consumption, which causes the death of more persons than does any other disease, needs only for its cure and prevention—pure air and sunshine, with nourishing food; while the dreaded typhoid fever is a water borne disease. During the day more or less fresh air is admitted to our homes from opening doors, but during the night it is too often carefully excluded. Since we spend one-third of our lives in bed, we might with profit increase our contact with fresh air and improve our health without interfering with our comfort. No one enjoys having the wind blow on them through an open window. But by covering the outside of the window with muslin, or covering a wooden frame which fits under the lower sash of the window, one can enjoy fresh air without any discomfort. Ventilation is fresh air without drafts. Try this method of obtaining it. The muslin should be a trifle heavier than cheese cloth. It will not lower the temperature of the room more than two or three degrees. Besides pure air heats easier and pure air remains warm longer than bad air. If the muslin is unbleached it will not wet through. In regard to the water we use for dometic purposes, it is not enough that water should be odorless, colorless and tasteless. It must prove to be pure under the chemists test. Our bodies need large quantities of water inside and out. The body is truly a system of canals, and should be flushed daily. Five pints of water is none too much to drink daily. It is better than pills. Try it.

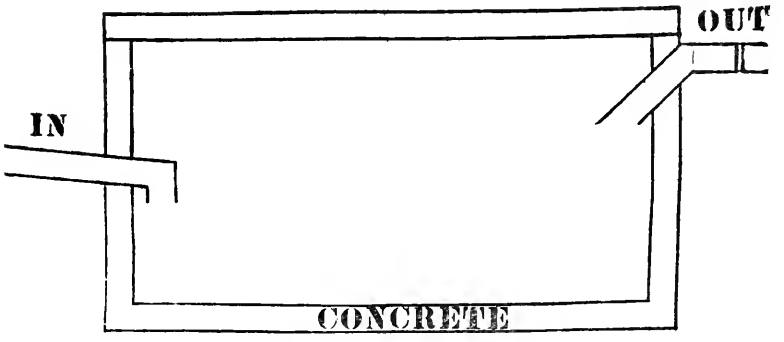
Time was when our country was new, that water from any stream flowing through the farm was safely used for domestic purposes. Now some streams are so foul that fishes cannot live in them. Now the unfortunate dwellers in cities are often obliged to use such water but we on the farms should not do so. A spring in a virgin forest may be pure, but any spring is only as pure as its surroundings. It should be built up with cement at least a foot above the surface of the ground to keep out the surface drainage water. At present the all but universal source of our water supply is some form of well. The dug well, is dug just deep enough to get water, laid up with loose stones or bricks, and covered over with planks which dry and warp in the sun and rain, leaving cracks which admit to the well, surface water, dust and filth which may be near. A dug well should be cemented up inside 6 or 8 feet from the top and a cement cover and curb built to protect it. Probably the safest source of water on the farm is a driven well, deep and well cased to protect it. If there is within 100 feet of any source of filth is contamination there is danger to the water. Slop holes, manure piles, and outside open vaults are a menace if near the water supply.

While seeds of disease are carried into the body by air and water they are also carried by the common house fly. He is called the filthy fly, the typhoid fly. Certain it is he is the most dangerous animal on earth. The more one knows about his habits, the less one likes to speak about him in polite society. He breeds in filth; he lives in filth, and, unfortunately, he eats the same kind of food that we do—but we eat at the second table. He flies back and forth from the slop holes, the manure piles, the outside open closet, into our homes where he alights upon the fruit and food prepared for the farmer's family. He is responsible for the spread of many diseases, consumption, typhoid, bowel diseases of children, and the list is long. Fortunately he never goes very far from the place where he is born, so if we remove all filth from around our homes we will do away with the pest of the house fly.

On many farms it is common to find the water supply for the barns either pumped by windmill or engine or piped from distant springs, but no provision is made to supply the house with water, for bath, toilet or kitchen sink. The farmer is willing but he says, and truly, that there is no sewage system in the country, and he can not dispose of his waste water, and what is the use of putting water in the house if he can not take the sewage out beyond the cellar walls. The old style cesspool, made by digging a pit in the ground and stoning it up without cement, is a menace to health and life, and poisons the soil for long distances. If the water supply comes from a well, it may poison that, the leakage from the ill-smelling, disease harboring outside closet may reach the well water. Even if the surface of the ground slopes right, that is no reason why under ground the water runs right. So you see our homes must be provided with water supply and not depend upon wells. It will cost $100 more or less to put in a system of plumbing, including hot and cold water in the kitchen sink, the permanent bath and the inside closet. The cost depending upon the size of the house and how much help can be given the plumber.

Now the waste waters could be easiest disposed of by turning it into a stream. There is a slight objection to this. It is against the law, and is not allowed unless the State gives permission, this is usually denied. If one small home could and did turn the sewage into a stream others would want to. If the stream is used for domestic purposes further down, the sewage might cause an epidemic of disease. One house might cause 5,000 cases of typhoid. We are too civilized to do this, then what shall we do? We will build a cesspool that will hold all the sewage until it is purified. It should be built in porous soil near the surface of the ground, so the outlet will pass through the first foot of soil, the upper layer of soil being more open and contains more bacteria. The garden is a good place to run the outlet pipe but right under the sod of the lawn is the very best place.

FARM CESS POOL.



6X3X3 FT.

This cesspool will cost about $5 if the farmer can build it himself, and will require 1 load of farm stones, not too large; one load of gravel, not too coarse; and 5 sacks of cement. This builds a cesspool 6 x 3 x 3 feet, and large enough for a family of five or six persons. The cover should be tight, a slab of stone or of cement with seven to nine inches of soil on top, and should not have any ventilating pipe, as the bacteria that work in it are the kind that work without air only. This tank is in effect a settling tank, and can be built of any size, shape or material so long as it is large enough to hold one day's sewage of the family, and so long as the sewage comes in so slowly that the solids have time to settle to the bottom of the tank, it will do all that is expected of it. The tank should be connected to the house by a four inch tile drain, every joint cemented and rubbed smooth on the inside. This should be 24 feet long and have a tilt of one-half inch per foot. It enters half way up the side of the tank. The outlet is at the top of the tank and should be of four inch tile laid with open joints, so the clear water that passes out can pass into the soil at each point. This drain should be from 40 to 80 feet long, depending on soil, laid on a tilt of one thirty-second

of an inch per foot. The slanting elbow, on the inside of the tank connected with the outlet, is to keep the scum that forms, in the tank, as in the scum a form of bacteria is working to purify the sewage. The only solid left in this tank is the mineral part, this amounts to very little in a year. It will not freeze so long as the house is occupied. There are two reasons for this: 1st, the character of the water entering the tank; and 2nd, because bacteria in working produce heat. The sewage should not stand in the tank. If the expected flow is cut down, dilute it with water. The water flowing from the outlet is a clear liquid, and is harmless.

A THREE COURSE DINNER

By MRS. ANNA B. SCOTT, *Domestic Science Bureau, Philadelphia, Pa.*

Just a few words about the dinner we are going to cook at a cost of less than 60 cents, for four adults. I hope that every person here will come forward at the close of the demonstration and see the dinner. I only wish that there was enough for all, but I will leave it to a committee to taste, and say whether there is enough for four hungry people.

Yes, housekeeper, we are planning a dinner of well blended and well selected foods; for we want the meal, first, to be satisfying, nutritious and palatable. Second, we want to serve it in the best way to promote the health and pleasure of our family; no haphazard way for us. Just a few touches of refinement at the table mean so much to all. Yes, there are some who think only of filling up, and getting through with the meal; that will do. They are satisfied, and the hunger is appeased. But housekeeper, let us make the dinner table the place that we meet at least once a day, and have a social time.

Following is the menu for the dinner.

Sago Soup;

German Stew with Vegetables and Dumplings;

Creamed Spinach or Cabbage;

Peaches a la Conde.

Sago Soup.

6 cups stock;
½ cup sago;
1 tablespoon finely cut onion;
1 tablespoon finely chopped parsley;
1 teaspoon salt;
Dash white pepper.

We can use rice, barley, or farino in the same way that we are using the sago. Our main thought in having the light soup is to prepare the stomach for the hearty dinner that is to follow.

Remove 6 cups of the stock from the meat that is stewing, add the onion and the sago that has been well washed; boil 30 minutes; then add the salt, pepper, and parsley.

Cost:—Sago, 2c; seasonings, 1c. Total, 3c.

German Stew with Vegetables and Dumplings.

1½ pounds stewing beef;
1 quart potatoes;
1 cup cut carrot;
1½ cup cut onion;
1 tablespoon salt;
Dash white pepper;
1 tablespoon caramel;
1 tablespoon chopped parsley.

Wash or wipe the meat; put on to boil in 2 quarts boiling water; boil slowly 1 hour; remove 6 cups stock for soup; then add to the meat the potatoes, onion, carrot, salt and pepper. Boil 45 minutes or until all is tender, being sure that there is 2 cups stock; if there is not, add boiling water as it is needed. Add the dumplings; boil 10 minutes, without removing the lid. Place the dumplings around the edge of the platter; put the meat and vegetables in the center; add to the gravey the flour which has been mixed with a little cold water, and the caramel. Boil 2 minutes; pour over the meat and dumplings, and sprinkle the chopped parsley over the top.

Dumplings.

1 cup flour;
1 teaspoon baking powder;
1½ teaspoon salt;
1 teaspoon lard.

Sift the flour, salt and baking powder into a bowl; rub in the lard lightly with the tips of the fingers; add just enough cold water to hold the dough together. Take one teaspoonful at a time and roll in floured hands; lay on floured board until all are ready, then put in the meat.

Cost:—Meat, 21c; potatoes, 4c; dumplings, 3½c; seasonings, 1c. Total, 29½c.

Creamed Spinach, or Creamed Cabbage.

I had planned, this morning, to have creamed spinach, but as I went to several places and could not get real nice spinach we are going to have creamed cabbage. If I had been here yesterday I know that I should have been able to get nice spinach as Lancaster has good markets. But this same thing might happen to any housekeeper; after planning to have spinach, she finds that spinach is not to be had, so she gets the next best thing, that does not cost more than spinach. I looked around and all that I could see was a small head of cabbage. Of course you can substitute anything. There are nice string beans, news peas, and nice asparagus. But my thought is to bring you something that you can have 9 months in the year at small cost.

1 small head cabbage;
1 tablespoon butter;
1 tablespoon flour;
1 cup milk;
1 teaspoon salt;
Dash white pepper;
½ teaspoon onion juice or ¼ teaspoon mace.

Cut the cabbage into small pieces; set aside in cold water 30 minutes; drain, put over fire with boiling water enough to cover. Boil 30 minutes without a cover, or until the cabbage is tender. That all depends on the age of the cabbage. Drain, add the sauce and boil 2 minutes.

Cream Sauce.

Put the butter into a sauce pan; when melted add the flour, then the cold milk slowly; stir until smooth and creamy; add the salt, pepper and onion juice or mace. Boil 2 minutes.

Cost:—Cabbage, 5c; butter, 3c; milk, 2c. Total, 10c.

Peaches a la Conde.

1 cup rice;
½ cup sugar;
2 cups peaches, cherries, strawberries, (either fresh or canned; fresh are best);
½ teaspoon salt;
1 teaspoon butter.

Wash the rice through several waters; put on with 4 quarts boiling water. Boil 25 minutes; strain; drain; blanch with boiling water; sprinkle with salt and spread on a platter or bake dish which has been brushed with melted butter; spread the fruit over the rice; sprinkle the sugar over the fruit and place in hot oven 10 minutes. This is served with a sauce made as follows, or you can serve it with fruit juice, or with cream.

Sauce.

1 cup water;
1 cup peach juice;
2 tablespoons sugar;
1 tablespoon cornstarch;
1 tablespoon lemon juice.

As soon as the water comes to a boil add the cornstarch which has been mixed with a little cold water; boil 2 minutes then add the sugar, peach juice, and lemon juice.

Cost:—Rice, 4c; peaches, 10c; other ingredients, 1½c. Total, 15c. Total cost of dinner:

Soup,	$ .03
Meat,	.29½
Cabbage,	.10
Dessert,	.15½
	$ .58

ABSTRACT OF PROCEEDINGS OF THE SEVENTH ANNUAL CONVENTION OF THE FRUIT GROWERS' ASSOCIATION OF ADAMS COUNTY, HELD DECEMBER 13, 14 AND 15, 1911.

OFFICERS

President,	Robert M. Eldon,	Aspers
1st Vice President,	C. J. Tyson,	Floradale
2nd Vice President,	C. A. Griest,	Guernsey
3rd Vice President,	C. E. Raffensperger,	Arendtsville
4th Vice President,	E. P. Garrettson,	Biglerville
5th Vice President,	J. G. Stover, M. D.,	Bendersville
Recording-Secretary,	Josiah W. Prickett,	Biglerville
Corresponding Secrtary,	Edwin C. Tyson,	Floradale
Treasurer,	Wm. S. Adams,	Aspers

EXECUTIVE COMMITTEE

Robert M. Eldon,	Aspers
C. J. Tyson,	Floradale
C. A. Griest,	Guernsey
C. E. Raffensperger,	Arendtsville
E. P. Garrettson,	Biglerville
J. G. Stover, M. D.,	Bendersville
Josiah W. Prickett,	Biglerville
Edwin C. Tyson,	Floradale
Wm. S. Adams,	Aspers

PRESIDENT'S ADDRESS

By ROBT. M. ELDON, *Aspers*

We are glad to welcome members of the Fruit Growers' Association, visitors, lecturers and patrons to the seventh convention. We are in practically new quarters. By the offer of increased rentals, the fruit growers organization so encouraged the owners of the old hall that they were moved to add much thereto, which I am sure you will appreciate during the days of this week. The growth of the organization from less than forty at the first meeting in 1903 to more than two hundred sixty in 1911 is most gratifying. Sometimes there is a failure to renew for a year, but mostly the man or woman once a member, comes promptly forward with a renewal. Not all of our membership own orchards or fruit trees, but join

because since the coming of the fruit growers' association, they find that they can get better and cheaper fruit, or because as business men, professional men or laborers, they know that the fruit-growing industry has greatly increased the amount of money returned to the county, a part, and a very large part of the gross returns is certain to come to them in the usual course.

A number have joined, if for no other reason, because they say that to sit and see and hear at convention time is worth the price. I can see several of these now, and there are others also filled with the good American desire to help a good thing along. Join the Fruit Growers' Association and become part owner of a large amount of good-fellowship. You will later get a copy of the proceedings which will be of value to you. It is a text-book on Horticulture; not theory, but the boiled down experience of practical men.

More than the usual care has been exercised during the past year in spraying for scale insects and for the codling moth and its co-laborer, the curculio. It is impossible to expect that any of the trio named or of many other pests attacking tree, foliage or fruit will ever become exterminated, but we believe that all may be held in check by careful and timely work.

Several of our members have noticed the same fault in spraying operations, namely, that the nozzle man kept too close to the tree so that some of the branch tips at about the level of the operator's face were entirely missed. I have called the attention of my helpers to this at least a score of times during the past season, and we found at picking time that the few scale present were on the fruit from these branches. By the use of bends for the rods or angle nozzles, the old fault of poorly sprayed lower branches has been cured.

To do a good spraying job, high pressure and large air-chamber space are of the first importance. A good pump and a willing pump-man are good, but the compressed-air sprayer is the coming sprayer. Either a central plant where an engine and compressor can charge the power tank of the sprayer while the spray liquid tank is being filled, or the portable engine and compressor outfit fills the bill as no direct pumping outfit can possible fill it. The first of these two types is the lighter while the second is perhaps the safer and more efficient. This second type can reach full spraying pressure while the operator is straightening out the hose and rod, and it has a constantly increasing air-chamber space at maximum pressure.

The occurrence of Cedar Rust has been much less prevalent during 1911 than during 1910, but there is apparently no way of determining whether this is due to climatic conditions or to the general cutting away of the cedar trees. If the scientists are correct in their statement that the cedar trees and the apple trees are alternate hosts for the fungus, it would be sound argument to say that the cutting of the cedar trees is the chief factor in the lessened amount of the fungus injury.

Many trees in the neighborhood suffered severely from fire blight, which is certainly the most distressing of the apple orchardist's troubles, requiring a cure that is no cure, but a partial or entire destruction of the tree.

The apples seem to have had a poor blooming season, yet set a heavy crop as did also cherries. Peaches bloomed freely but fell off, probably due to overbearing in 1910 and lack of other care. Small fruits were generally disappointing.

The apple crop was the largest in the history of the country, but at the present time figures are not available. Its quality was good. Perhaps a part larger than usual went to the cannery and evaporator, on account of the general large crop throughout the country. While we desire first of all to grow apples for the box trade and the high class barrel trade, there will always be a quantity larger or smaller moving toward the cannery and dryhouse, and surely in the future when the Adams county full crop year coincides with the outside full crop, a great mass of fruit will be directed to them. We have but one cannery and two evaporators under one management within a radius of several miles. There should be others so that we might profit by reasonable competition. I should like to see a co-operative canning and evaporating plant owned and operated by the members of this organization. I am not alone in thinking that the price of drops and culls is too low. New York growers get much better prices. Evaporators are much more plentiful there or growers dry their own fruit.

Let us make a concerted effort to have the Adams County Exhibit better than any previous Adams County Exhibit, and better than any other county exhibit. Partly because we want to keep the cup offered as a prize for best exhibits, but principally because the habit of winning is a good habit to cultivate, when the accomplishment of the object striven for, does not injure the other fellow in the race. Our sister counties have good individual growers who are certain to have good fruit on exhibition, but not having been organized so long as have the Adams county growers, they do not pull together as perhaps we do. It takes not only care in growing fine fruit but continued effort in following it through all the stages of its course from picking to judging. Ever since our organization began to compete as a county exhibitor it has always had a number of its members on hand to take advantage of the choice of space, and to see that the fruit is properly selected and displayed.

The practice of making an exhibit at our own convention is the best kind of training in preparation for the second and more elaborate display at the State meeting.

Join the State Society and attend its sessions. Help to make it the best in the country. It should have two thousand members and two hundred or more of them should come from the first fruit producing county.

Join the Adams County Association and persuade others to do the same thing. Attendance at its sessions will help you to understand your troubles which is half way to mastery over them. You cannot expect to remember all that you hear here. Join and get the record, the proceedings.

APPLE DISEASE

By PROF. H. R. FULTON, *State College, Pa.*

I have been asked to speak on the subject of apple diseases. Fully twenty of these, affecting all parts of the apple tree, have come to my notice in Pennsylvania. Fortunately the majority are only slightly injurious; several that are very serious in other sections of the country occur very infrequently with us. We can consider only the most important apple diseases to-day.

These diseases, for our purpose, may be classified as fungus and bacterial diseases, and physiological diseases, remembering that bacteria are, after all, merely a special kind of fungi. Those of the first class are caused by living plant organisms of very small size, that may spread from plant to plant; and these diseases are infectious or contagious in character. However, climatic and local weather conditions, as well as other conditions of environment, may favor or check epidemics of such diseases, either directly by influencing the spread and development of the organisms, or indirectly by placing the host plant in a condition of greater or less susceptibility. But always the causative organism must be present, and control measures must usually be aimed directly at it.

Occasionally, as in the case of the Powdery Mildew on leaves and young shoots of apple, the fungus may be killed after gaining foothold by applications of a fungicide. In most cases the aim must be to prevent the first infection; because, as a rule, when the organism has become established, there is no hope of eradicating it from invaded parts.

For infection to occur, three conditions must hold: There must be a source of contagion, there must be a susceptible host plant, and the general environmental conditions must favor the infection. To prevent infection, we must take these things into account, and the special measures will vary for each disease according to its peculiarities with reference to these three conditions. For illustration, think of a well known treatment for apple scab, which calls for three applications of a proper fungicide, just before the buds open, just after the petals fall, and a third two weeks later. The coating of fungicide on fruit and leaves makes an unfavorable environment for the development of the scab fungus there. This is made when the parts in question are young and in their most susceptible condition. And it so happens that the source of early contagion for scab it the so-called winter-spores that form slowly during winter on fallen apple leaves infected the previous year with scab, and reach maturity, are scattered, and retain their vitality for three or four weeks only, about the apple blossoming time. I know of cases where elimination of the fallen leaves, by plowing them under before the time indicated, or by burning them, has given successful control; but such measures do not commend themselves on the score

of general practicability. Varietal susceptibility influences very much scab infection, and should influence our treatment of it. Baldwin, York Imperial, Ben Davis and Jonathan are affected little or not at all, while Stayman Winesap, McIntosh, Spitzenburg, and Northern Spy are quite susceptible. Discrimination in the treatment of varieties varying in susceptibility will promote efficiency and economy not only for scab, but for other troubles. A wet, cool spring favors scab. Our climatic conditions, fortunately, are less conducive to scab development than those farther north; and we can for this reason safely omit, in the average season and on the average variety, the early application, just before the blossoms open.

In the case of Cedar or Orange Rust, unprotected young leaves and fruit of certain varieties are the endangered parts; the infective material in this case comes from red cedars that may harbor the fungus in the familiar "cedar-apples;" and infection is favored by periods of continuous wet weather for two or three days. When these conditions occur together, which is only occasionally, we have an outbreak of Cedar Rust. For this disease the removal of endangering red cedars from the vicinity of orchards has proved more constantly effective than spraying.

We were speaking of the spray applications, for us usually two in number, made when the petals fall and two weeks later, that are timed particularly for scab control. These, let us remember, will also be more or less effective for Cedar or Orange Rust on leaves and fruit, for blotch on leaves and fruit, for Sooty Mold on fruit, and for Black Rot Spot (Sphaeropsis) and Frog Eye Spot (Illosporium) on leaves. The diluted lime-sulphur material seems to be satisfactorily effective against these troubles, and is preferred to Bordeaux mixture. Where blotch and Black Rot prevail, care should be taken to cover twigs and limbs at one of the sprayings; and as thorough as possible pruning out of affected woody parts should be practiced.

Sometimes, when cool, moist weather prevails, there may be a midsummer outbreak of scab; and usually the leaf spotting fungi and Sooty Mold and blotch of the fruit continue to cause infection until late in the season. Furthermore, Bitter Rot and Fruit Spot usually begin their attacks after the fruit is half grown; and such ripe rots as Black Rot, Brown Rot, and Volutella Rot come on in the latter part of the year. More efficient protection is afforded against all of these if a fungicidal application is made in July, at the time when spraying is done for the second codling moth brood. Where blotch and Bitter Rot prevail, Bordeaux mixture must be used in midsummer and the application made two or three times at intervals of two weeks on varieties susceptible to these destructive diseases.

A word further about blotch and Bitter Rot may not be out of place. Both of these diseases are among the most serious affecting apples in the South. They occur in Pennsylvania to a small degree only, but we must be on the alert lest they gain a greater foothold.

Bitter Rot spots are brown and circular, and the rot extends inward in a cone-shaped area quite rapidly, so that it may reach the core by the time the surface area is the size of a half dollar.

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The surface is dotted with spore pustules which emit minute flesh-colored, waxy masses of spores rather early in the development of the rot. The fungus lives over winter in mummied apples on the trees, but not in those that rot on the ground; and in the limb cankers, when these are formed. Of our commercial varieties Jonathan is likely to suffer most.

Blotch affects the surface of the fruit, without directly causing rot. The skin is discolored, and sometimes thickened so that small raised areas are apparent. These are covered with minute black dots in which the spores are formed. When attacked early the fruit is dwarfed and deformed. The fungus attacks leaves and twigs, surviving the winter in the latter. Ben Davis is the most susceptible of our commercial apples.

The Fruit Spot that can be controlled by July spraying is characterized by numerous small spots, about 1-16 of an inch across, that are at first deeper green or red than the surrounding color; and soon becomes dead, and brown or black. The flesh is not affected deeply. They are more numerous towards the apex of the fruit, and frequently occur at lenticels. The cause of this fruit spot is the fungus Cylindrosporium pomi, which infects the fruit during July as a rule, and can be readily prevented by one or two applications of almost any fungicide during the first half of July. We must not confuse this disease with that known as Fruit Pit which seems not to be due to fungus attack, and can not be controlled by spraying.

Let us remember that the requirement for summer spraying, as for any spraying, and the returns to be obtained from it, depend on the presence of certain fungi that develop then, the growing of varieties susceptible to their attack, and the occurrence of weather conditions that would favor their development; and that the most satisfactory results will be obtained when judicious spraying is an adjunct to the use of good methods of culture and sanitation. Spraying is, after all, an expedient to catch, as it were, the thief after he is in the house. Let us see to it that we do not allow ways to multiply by which he may enter.

There are certain transmissible diseases that can not be satisfactorily controlled by spraying, such as Twig Blight, and the cankers produced by the Black Rot and Bitter Rot fungi, and the several wood rots and root rots. Our only means of holding these in check is to discover the trouble at an early period in its development, and thoroughly remove all affected tissue.

Twig Blight, sometimes known as Fire Blight, attacks young shoots, the bark of older limbs, and sometimes the blossoms or young fruit. As soon as blighted twigs are noticed, they should be cut off well below the affected part and the cut surface, however small, touched with a swab wet with a disinfectant, such as 1 to 1,000 bichloride of mercury; tools also should be wiped with such a solution at frequent intervals. Cankers can ferquently be cut out; but often the affected part must be sacrificed. Large cuts should be painted over as well as disinfected.

Collar Rot as we find it causing the death of the bark at the base of the trunk of apple trees, is a perplexing condition. I am not satisfied as to its causation in every case. Perhaps we ought to bear in mind that this part of the tree is the one where general decay is most likely to occur because moisture from the soil and

a good oxygen supply favor general decay organisms. We know that a fence post will usually rot because of the same conditions, more rapidly near the surface of the ground than above or below. I am sure that in some cases winter injury is primarily responsible for the trouble with the apple trees. In a few instances I have found the blight bacterium present as the cause of the extensive death of the bark; and I have also found other organisms associated with the trouble, such as the fungus of Black Rot, the wood rotting Schizophyllum, and the root rotting Armillaria. In the Far West, some hold that arsenic injury to bark is responsible for a somewhat similar, although apparently not identical condition. And there are cases where improper painting of trunks has caused trouble. But when all these things are considered, I am not satisfied in my own mind that I can satisfactorily account for half of the so-called Collar Rot that I have seen.

Though we can not yet speak certainly about its causation, we ought to take precautions against its possible spread. In hunting borers in orchards affected with collar rot, free use should be made of disinfecting solution on all wounds and tools. Close watch should be kept for the first signs of the trouble, and the affected area cut out as thoroughly as may be, leaving the live bark with a smooth edge for healing. The cut surface should be washed with bichloride of mercury or strong lime-sulphur as a disinfectant, and the surface painted with pure lead and oil paint or tar. When the exposed surface is large, and above ground, a coating of grafting wax will prevent drying out, and promote healing. Diseased trees should be prevented from carrying a full crop of fruit, and attention should be paid to securing proper soil moisture and aeration and fertilization. Judicious reduction of foliage by summer pruning would doubtless be helpful.

We come next to those constitutional disorders that we call physiological diseases. They are not caused by organisms of any sort; they result from derangements of the normal physiological functions of the plant parts, usually due to unfavorable environmental conditions. Our knowledge of them at present is meagre; and from their nature control measures are unfortunately of limited applicability. Such troubles are Fruit Pit (perhaps more usually known as Baldwin Spot, although this term is also sometimes confusingly applied to Fruit Spot mentioned above), Watery Core, Watery Apex, Sun Scald, Sticky Skin, and probably Jonathan Spot.

Fruit Pit shows rather large, vaguely outlined, slightly depressed spots, that suggest finger print bruises. Under these the flesh is dead for some distance, and later the surface becomes dead and brown. Frequently affected areas can be found in the interior of the flesh. The cause is supposed to be lack of sufficient moisture at certain periods in fruit development, especially sudden changes from wet to very dry conditions. It may be that tillage methods can be so developed as to equalize the soil water supply sufficiently to reduce this trouble to a minimum.

Watery Core and Watery Apex seem to be different forms of the same trouble. Continued deficiency of water may cause the cell sap to reach such high concentration as to kill the living substance, and there is a consequent diffusion of sap into the small spaces

in the apple tissue, giving the watery, instead of the whitish, opaque appearance; or a sudden access of water after the cell sap has become highly concentrated, may result similarly.

Sun Scald is injury to the cells from intense heat. It is accompanied by abnormal ripening of tissues in the vicinity. It may be aggravated by liquid on the surface of the exposed fruit and is frequently seen on fruit suddenly exposed to the sun's rays after being shaded.

I do not know of any explanation for the condition known as Sticky Skin or Dead Skin. Microscopically the tissues in such cases seem fairly normal.

The Jonathan Spot is also hard to explain in the light of our present knowledge. It seems not to be due to any organism. Whether or not it is related to the physiological Fruit Pit is an open question. Perhaps we will find eventually that it is a trouble distinct from others enumerated. It has been suspected to be a form of arsenic injury, but tests made in 1911 by the U. S. Department of Agriculture indicate that heavy applications of arsenic do not increase the amount of spotting. It develops much more on apples in ordinary storage than on those in cold storage and attention to this point is advised when apples give indication of developing this trouble.

PEACH CULTURE

By JOHN F. BOYER, *Middleburg, Snyder County, Pa.*

Peach culture is very different to-day from what it was 25 years ago, and in many localities the cultivation of this delicious fruit has been entirely abandoned. It is, however, a fruit so well known in Pennsylvania that a description is not necessary. Years ago a peach tree would live to bear almost like an apple tree, especially the seedling, which to-day is harder in bud than budded trees, but the tree itself seems to have lost the vitality it once had and is no more a longer lived tree than trees from the nursery. What brought about these changes?

I believe that Providence had a great deal to do with production. It seems to me that a man is limited in all lines of production. In my opinion, surely, the man who bites off more than he can chew will make a flat failure in peach culture.

It is not extensive but intensive peach culture that pays. The man who can do the proper thing at the proper time is always the man who offers the choicest fruits on our markets and that is the only fruit that pays the producer.

Common and poor fruit was never very renumerative with me. The subject of peach culture seemed to me like a funnel, looking into it at the small end, the farther you see into it, the wider the subject gets. I always feel my inability to do justice to this subject. The novice then would ask what the the requirements to be a suc-

cessful peach grower. My anwer would be, the *Man,* the *Location,* and the *Soil,* would be the chief requirements; and the most important of the three is the Man himself because he may cause failure where the most favorable conditions exist.

He must take a liking to the business. Having such a man, next in importance is the *soil.* I do not expect to find it disputed when I say God made the soil complete—by which I mean that virgin soil contains all the required elements to produce both the tree and the fruit. Where shall this soil be located? By all means on the hills, where there is an air drainage, get above the frost line, do not make the mistake of putting your orchard in a ravine where it is thought by many the cold winds cannot strike them. We have all learned and often heard the remark on a cool evening—If the wind's calm, we will have a frost. What does this mean? It means as long as the wind blows, moisture will not settle, and as long as moisture does not settle, frost cannot form; but just as soon as the motion of the air ceases then moisture will gather and freeze. In many so-called sheltered places where not sufficient air can get in, moisture will settle and cause the loss of a crop of fruit.

Having the location, next in order would be the *trees.* I never expected the nurseryman to grow these for me. All I want from the nurseryman is the starter. I never wanted the heavy first class trees, neither would I recommend a very small tree. For, should a dry season follow, heavy loss would be the result, as the tree which should be planted in early spring has no way of taking nourishment until fibers form, and in a dry season, would die or dry up, if too light before fibers form. If too heavy not enough rootlets come with the tree from the nursery, and this goes to the other extreme. Having trees to caliber one-half inch planted a little deeper than they stood in the nursery, in ground plowed deep, and prepared as for a crop of corn is about right. After the trees are set fifteen feet apart each way, then comes the work of the pruning knife, here again the medium sized tree has the preference. Any one familiar with the peach tree from the nursery knows full well that a tree has a set of branches, then buds, then another set of branches, then buds again. In heavy trees the tree has to be cut either right above the collar which is too low; or at the second set of buds which is too high; giving the tree too much leverage when planted in the full sway of the wind. Potatoes or any cultivated crop may be grown for two years, after which time the entire ground should be given to the tree, and thoroughly cultivated. The leaders should be cut back for three years, that is the time required to grow peach trees of bearing size. The peach tree is unlike the apple. The apple has fruit spurs while the peach bears its first on the previous year's growth of wood.

Consequently we must have a succession of new growth of wood. By thorough cultivation and proper pruning and not allowing the trees to overbear, the desired new-growth can be controlled, and fair crops can be produced; unless the winter season becomes too severe. Properly ripened peach buds will stand a temperature of 15 degrees below. A man has far more control than is generally believed by not allowing the tree to overbear. This is the whole secret of getting the buds in proper shape. Otherwise the tree has

no time to mature the crop and prepare the buds for the following year. Thinning the fruit should be done after the June drop.

The peach *borer* can easily be controlled by removing the soil from around the trunk, and extract the borers with pocket-knife or some pointed iron. The peach borer does not cut wood like the apple, but feeds on the Cambium layer, and if taken before he gets down in the roots, can be easily destroyed.

Spraying for scale and fungus diseases must be carefully and thoroughly done in early spring, before the blossoms open. Lime and sulphur is the most satisfactory material, known at the present time, for both the scale and fungi.

In my 28 years' experience as a peach grower I have yet to learn what crop to grow in a bearing peach orchard that is not grown at the expense of the peach crop. Frequently I am asked what crop can be grown in a peach orchard, when bearing; and my answer is always a peach crop. The disease known as "Yellows," among peach trees is first noticed in the premature ripening of the fruit.

Then follows the wiry growth on branches generally in clusters, with very narrow foliage. The word "Yellows" does not indicate that a tree with yellow leaves has taken this disease, as a tree may not have proper nourishment or may be attacked by borers which cause the foliage to turn yellow; and such trees will respond very readily if proper treatment is given.

And again, a tree with the most vigorous foliage, dark green, may premature its fruit and fully develope the disease. The only way I know to hold this disease in check is to remove the tree and burn on the spot.

It was frequently stated a few years ago that the peach business would fall in the hands of specialists, and I really believed it myself, but I have changed my mind. Since the San José scale has made its appearance in sufficient numbers to destroy those orchards planted by the negligent fellows, they are not in business. Only the stand-pat fellows are in the peach business to-day, and they are here to stay. The syndicate or incorporated orchard companies must learn that they are carrying on their business with disinterested help, and to have thousands of acres of orchards will necessitate them spreading labor over too large an acreage and the result is slighted work going on all the time.

The fruit business is different from factory work—where one foreman can stand over hundreds of hands and control them sucessfully. The biggest mistake I ever made was when I increased my peach business until at one time I had between 43 and 44 thousand trees in cultivation and it was impossible for me to have the fruit picked and packed in proper shape; and I found that I had to reduce my acreage in order to have the fruit right for the consumers.

You see, someone had told me to be sure that I was right and then go ahead; well, I started to grow more peaches to get more money to buy more land to plant more trees to get more money to buy more land to grow more peaches; and that is the way I got into the business so extensively. My neighbors who had only small orchards had finer fruit than mine. You see, I wanted to be one of those specialists, but I soon discovered that the old saying that

the big fish eat the little was not true. In fact, I believe the time will soon be here that the little fish will eat the big. At least, I do not fear the competition of large orchard companies, but I do fear the competition of the fellow who has only as many acres in cultivation as he can look after himself.

To summarize—would say, the right man—the right location—the right soil—with all requirements strictly carried out, from the planting of the tree to the marketing of the fruit, will find peach culture as profitable as the culture of any other fruit.

THE INFLUENCE OF FERTILIZATION AND OTHER FACTORS UPON YIELD, COLOR, SIZE AND GROWTH IN APPLES

By DR. J. P. STEWART, *Experimental Pomologist, State College, Pa.*

The Pennsylvania Experiment Station has been conducting experiments bearing upon the above subject during the past five years. Altogether it has now in operation 18 such experiments, involving 11 soil types and 3,660 trees. In many respects, this series of experiments is by far the most comprehensive of any similar series thus far reported in America. In number of soil types; in the number of treatments and checks; in number, variety and range of age of the trees; in duplications of the experiments of a given type; in the amounts of fruit involved; and in the fact that the experiments are distributed over the State and located as a rule in regions generally recognized as being well adapted to apple production—in all these respects we believe that the Pennsylvania orchard experiments enjoy distinct advantages over most previous efforts to answer the questions involved.

The results considered in the present paper are chiefly from 10 experiments, containing 2,219 bearing trees and involving 10 different soil types. Some of the general features of these experiments are given in Table I:

TABLE I. LOCATION, SOIL TYPES, VARIETIES AND TREES IN EXPERIMENTS AWAY FROM THE COLLEGE

Expt. No.	County.	Soil.	Varieties.	Age 1911.	No. of trees.
215	Adams,	Porters loam,	York and Stayman,	12 yr.	160
216	Franklin,	Montalto fine sandy loam.	York and Jonathan,	12	160
230	Bedford,	DeKalb stony loam,	York and Baldwin,	13 & 23	160
217	Franklin,	Montalto loam,	York and Gano,	18	358
218	Franklin,	Hagerstown clay loam,	York and Albemarle,	12 & 16	400
219	Bedford,	Frankstown stony loam.	York, Jonathan, Ben Davis and Gano.	9	320
221	Wyoming,	Shenango fine sandy loam.	Spy and Baldwin,	39	115
336	Chester,	Chester loam,	Grimes, Smokehouse and Stayman.	9 to 11	120 & 105
337	Mercer,	Volusia silt loam,	Spy, Baldwin and Rome,	4	180 & 180
338	Lawrence,	Volusia silt loam,	Baldwin,	23	80 & 105
339	Bradford,	Lackawanna silt loam,	Baldwin and Fallawater,	17	120 & 16

It will be noted that the soil types range from heavy clay loams in experiment 218, through silt and plain loams to light sandy and stony loams, in experiments 216 and 219.

The first three experiments deal with the influence of fertilizers, and involve 10 treatments and 6 checks in each case. The next four experiments deal with cultural methods and involve 12 treatments in each case, except the last, which has six. The last four experiments are a combination of portions of the first two types and deal with both fertilizers and cultural methods. As shown in the table, the trees are of 10 varieties, though with one exception there are two or more varieties in each experiment. In age at the present time, the bearing trees range from 9 to 39 years; and since the work started they have produced over 1,315,000 pounds of fruit.

In this one item of fruit, we may call attention to the facts that, so far as American experiments are concerned, this amount is more than treble that reported in any other single experiment, and very distinctly more than the total fruit reported from all other similar experiments combined. This does not mean that the importance of the experiments elsewhere is to be minimized in the least, but it should help to emphasize the fact that, in those cases where conclusions or attitudes are in conflict, very careful attention should be given to the actual and relative amounts of evidence upon which the differing attitudes are based. In fact, within our own experiments we can find the counterparts of practically all those reported elsewhere. If we had fewer experiments—for example, only one on fertilization and another on cultural methods,—our conclusions could be much more easily formulated, and we might readily become ardent partisans on either side of the questions, the side depending merely upon which of the present locations our experiments chanced to have. In other words, if we attempted to base our conclusions upon any one or two of our present experiments, those conclusions would be very different from any we would now formulate, on the basis of all the results. There can be no doubt that when the whole truth is known, we shall be able to account for *all* of the facts, and this is what we are undertaking to do.

THE INFLUENCE OF FERTILIZATION

The first factor to which we shall give attention is that of fertilization. Can the yield, color, size and wood-growth of apples be influenced by fertilization, and, of so, how and under what conditions? This has always been an important question, and five years ago, when we were starting our experiments, we could find no data upon which to base a definite, well-founded answer. We do not say that we can fully answer it yet, but such progress as we have made may be partially seen in Table II and III:

TABLE II. INFLUENCE OF FERTILIZERS ON YIELD. *(Johnston Orchard, Experiment 338.)*

(Total yields of fruit on each plot and annual yield per acre.)

Plot. Year.	1 Check.	2 N.P.	3 N.K.	4 Check.	5 P.K.	6 N.P.K.	7 Check.	8 Manure.	9 Lime.	10 Check.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1908,	90	528	237	446	57	759	211	278	558	106
1909,	675	6,018	5,257	1,932	3,089	6,621	2,008	3,531	1,216	1,266
1910,	2,575	3,265	1,822	3,108	3,552	2,108	1,629	6,149	3,185	3,505
1911,	283	7,563	7,816	617	1,227	8,209	1,362	4,874	388	106
3-year totals,	3,533	16,846	14,895	5,717	7,868	16,938	4,999	14,554	4,789	4,877
Bushels per acre,	141.3	673.8	595.8	228.6	314.7	677.5	200	582.1	191.5	195

TABLE III. EFFECT OF FERTILIZERS ON YIELD. *(Johnston Orchard).*

(Average returns from certain treatments during past three years.)

Treatment.	Checks. (Av.1,4,7,10)	Manure. (Plot 8)	N-Fertilizer. (Av.2,3,6)	P.K.-Fertilizer. (Plot 5)
Totals 3-yr.,	4,781 lb.	14,554 lb.	16,226 lb.	7,868 lb.
Ratios,	100	304.4	339.4	164.5
	---	100	111.5	-----
Average annual yield per acre,	191.2 bu.	582 bu.	649 bu.	314.7 bu.
Average gain per acre,	-----	390 bu.	457 bu.	123 bu.

These tables are from one of our "combination" experiments, involving both fertilization and cultural methods,and started in 1908 The fertilizers have therefore had a chance to affect the crop only during the past three years, and it is for that period that the totals and annual yields per acre are computed.

Even a glance at these tables can leave no doubt as to the postive and profound effect of *proper* fertilization on the yield of apples. It will be noted that the checks run fairly uniform, averaging a little over 190 bushels per acre annually. Lime applications (at the annual rate of 1,000 pounds per acre) have given almost exactly the same returns as the average check. The phosphate and potash combination has affected yield in this case rather decidedly, having raised it by 123 bushels per acre. This may be partly due to a slight superiority in location, as indicated by the fact that its adjacent check is the highest in yield and is within 86 bushels of the phosphate-potash treatment. While this increase in yield is fairly satisfactory, there is nothing in the growth or appearance of the trees of plot 5 that would lead one to believe that their treatment is appreciably superior to that of the checks. In other words, the trees of plot 5 still look starved and indicate that there is something else lacking, although it will be noted that this is the fertilization ordinarily recommended for orchards.

This lack is very decidedly met by the manure treatment of plot 8. In this plot, the trees are making a luxuriant growth, both in wood and foliage, and the yields have been increased by 390 bushels per acre annually,—a very satisfactory exchange for 12 tons of stable manure. Even this increase in yield, however, is considerably less than those obtained on the plots receiving a nitrogen-carrying fertilizer. Under the latter treatment on three plots, the *average annual yield* has been increased from 191 bushels on the checks to 649 bushels on the fertilized plots, or an annual *increase* of 457 bushels of apples per acre. This resulted from fertilizer applications that actually cost less than $17, and the essentials of which can be bought at retail for about $10 per acre. During the past year,—the fourth year of the experiment,—as shown in Table II, the yield on plots 2 and 3, compared with that of their adjacent checks, was at the rate of 17 to 1, the yield on the checks being at the rate of 54 bushels per acre, while that on the intervening nitrogen plots was 922 bushels. Surely it is not necessary to further defend the thesis that *proper* fertilizatition may very profoundly affect the yield of apples.

There is no reasonable possibility of these results being due to any other agent than the fertilizers. The trees are all of the same variety and same age. They receive the same spraying, pruning, soil handling and other care. The soil is practically level and very uniform. The treatments are abundantly checked. In fruit, foliage, growth and general health of trees, the benefits stop abruptly where the fertilizers stop, and similar results are being obtained by the owner in other parts of the orchard, on the same and other varieties, with the combinations of fertilizers found effective in the experiment.

In regard to the relative values of the different fertilizer elements, it will be seen in Table II, that nitrogen is evidently the first limiter. Thus, the phosphate and potash combination in plot 5 has given an increase of 123 bushels per acre, while by the addition of nitrogen to this combination, in the adjacent plot 6, we get an increase of 486 bushels. In other words, the addition of nitrogen to the treatment ordinarily advised for orchards, resulted here in nearly quadrupling the benefit. In plot 3, where the phosphates are omitted, it will also be noted that there is an annual deficit which amounts to nearly 80 bushels per acre. This doubtless indicates that phosphorus is the second limiter and that the yield in plot 3 is being reduced by lack of this element. Potash applications, on the other hand, have been practically of no avail in this experiment. This may be seen by comparing plots 2 and 6. The annual addition of 150 pounds of actual K_2O in the latter treatment has resulted in a gain of only 3.7 bushels of apples.

The above results were obtained without any aid from tillage or cover-crops, the fertilizers being merely sowed over the surface of untilled soil, on which there was a light sod composed chiefly of mixed grasses. Here the question may be raised as to whether equal or superior benefits may not have been obtainable with some form of cultural methods. This question is answered in Table IV:

TABLE IV. CULTURAL METHODS AND FERTILIZERS ON YIELDS.
(Johnston Orchard).

Plot.	XIII	XII	XI	(Av. 2 & 6)
Treatment.	Sod.	Sod-mulch.	Tillage and cover crop.	N-P-fertilizer.
	lb.	lb.	lb.	lb.
1908,	1,170	2,265	2,843	2,813
1909,	17,982	7,455	10,702	27,649
1910,	2,940	16,789	17,254	11,752
1911,	3,550	2,629	7,500	34,502
Totals last 3 years,	24,472	26,873	35,456	73,903
Ratios,	100	109.8	144.8	303
Ratios,		100	131.9	275
Ratios,			100	208.4
Average annual yield per acre, 3 years,	223.7 bu.	245.7 bu.	324.1 bu	675.7 bu.
Average gain per acre,	---	22 bu.	100 bu.	452 bu.

In this portion of the experiment, which is devoted to cultural methods, the plots are larger and contain 35 trees in each. The yields of plots 2 and 6, from the fertilizer portion, therefore, are raised to their corresponding values for plots of equivalent size. No fertilizers were used on the cultural methods plots, until the season just past. They were used then uniformly on all treatments, primarily because the sod plot had gone two years with very little fruit, though all the trees of these plots were plainly in need of something additional.

In Table IV the sod plot shows a little higher annual yield than the average of the checks in the fertilizer portion, this being due to an exceptional crop that occurred on this plot in 1909, and from which the plot has not yet recovered. In the next plot, we see the effect of adding a mulch to the sod treatment. In this case, although all the herbage that grows is left in the orchard, and a further application of 3 tons of straw per acre is added to the plot, the average annual gain is only 22 bushels per acre. In the next plot, we find that tillage and leguminous cover crops have given a fair increase, amounting to 100 bushels per acre on the average. This, however, is hardly to be compared with the 452 bushel increase shown in the next case, which is obtained without tillage of any kind, merely by the addition of a fertilizer that carries the elements that are evidently lacking.

In some quarters one would gather the impression that apples can scarcely be grown without tillage. While we have nothing against proper tillage as an orchard treatment, yet this and other

results from our experiments show that it is by no means indispensible in the production of first grade apples and that it can be readily over-emphasized like anything else. There are many situations that are otherwise very well suited for apples, where tillage is decidedly inadvisable, and where, with proper management, the trees would get along very much better without it. In such situations it is undoubtedly preferable to sow the orchard down to some leguminous crop as a permanent cover and follow the mulch system, properly supplementing it with fertilization. For this purpose, hairy vetch is doubtless preferable, on account of its relatively low moisture draft, and its usually excellent staying powers when once well seeded down. Whenever it is crowded out by the grasses, the orchard may be re-plowed and again sowed to vetch, if the trees seem to require it.

DATA ON FERTILIZERS FROM OTHER EXPERIMENTS

Thus far we have confined our attention to a single experiment, primarily because the contrasts in it are so great that both the existence and nature of the effects could scarcely fail to be recognized. To go through each experiment in this way would be impossible in our present space, hence we have condensed into the next two tables a statement derived from the results of six experiments, including the one just discussed. These tables show the average effects of the different fertilizer elements, obtained in six experiments, during periods covering from three to five years as indicated. The effects are calculated as closely as possible and are expressed in terms of per cents. of benefit based on the normal performance of the treated plots. The methods followed in making the calculations are described briefly in our Bulletin 100 from the Pennsylvania Station, and described in full in our Annual Report for 1910-11.

TABLE V. EFFECT OF FERTILIZER ELEMENTS ON YIELD, COLOR, SIZE AND GROWTH

(Calculated Percents of Benefit,)

Experiments 336, 338 and 339.	Yield.		Color.	Size.	Growth.
	1908–11.	1911.	1909–11.	1909–11.	1908–11.
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
Nitrates in combination,	94.05	103.1	—13.3	—4.81	24.11
Phosphates in combination,	36.65	35.8	—.95	4.04	—3.97
Potash in combination,	—4.65	—6.42	—.1	13.2	4.17
Complete fertilizer,	122.5	106.4	—16.0	5.93	27.50
Manure,	144.1	109.8	—14.3	30.8	37.49
Lime alone,	19.5	—3.07	—2.9	19.4	8.04

TABLE VI. FERTILIZER ELEMENTS ON YIELD, COLOR, SIZE AND GROWTH

(Calculated Percents of Benefit,)

Experiments 215, 216 and 220.	Yield.		Color.	Size.	Growth.
	1908-11.	1911.	1908-11.	1908-11.	1907-11.
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
Nitrates in combination,	41.7	18.05	—12.35	—1.67	14.83
Nitrates alone,	30.0	39.10	—16.00	—6.23	18.33
Phosphates in combination,	15.4	9.35	—1.55	.925	.62
Phosphates alone,	—7.4	—7.37	2.80	—1.21	.52
"Floats" alone,	—18.8	6.4	7.70	—1.92	—6.00
Potash in combination,	15.2	12.80	6.55	5.67	2.71
Complete fertilizer,	68.8	65.7	—16.00	4.30	19.10
Manure,	101.—	221.90	—9.90	4.73	24.70
Lime alone,	—12.0	15.1—	.8	—1.05	3.1

In general, these tables corroborate and extend the deductions obtained from those already considered. The addition of the results from the other experiments have reduced the apparent benefits somewhat and the relative values of certain materials are also slightly changed. We have included the results of the first year in the yields of Table V, which also reduces the apparent benefits, since the fertilizers had not yet had time to operate. Even at that, however, we see that the yields during the 4-year period have been nearly doubled by the addition of nitrates, in experiments 336, 338 and 339 and with the same material they have been increased by 41 per cent. in the younger experiments of Table VI.

Phosphates, when used in combination with nitrogen or in a complete fertilizer, maintain their position as the next limiter after nitrogen, though they are closely pressed by potash in Table VI. On the other hand, neither acid phosphates nor "floats" nor lime, when used alone, have shown any consistent benefits on yield thus far. Their apparently *negative* influences on yield may be smoothed out in time, as indicated by some of the results of the past year. There is some evidence, however, that certain of these negatives really indicate a toxic action that is manifested only under certain conditions, but we have not yet carried this far enough for definite statements.

The important advantage shown by manure, especially in Table VI, is doubtless largely due to the very full crops on the manure plots of those experiments during the past year, which was rather of an off year for the similar plots receiving complete fertilizer. The better moisture-conservation under the manure and the larger amounts of plant food carried in it also probably account for a part of the superiority. In general, however, we do not find any important superiority in manure over a proper commercial fertilizer, neither in actual nor net increases. Manure is undoubtedly a safe and valuable material to apply in orchards, when it can be satisfactorily obtained in sufficient amounts. But with very few exceptions, thus far in our experiments as a whole, wherever manure has given important increases, these increases have been approached or surpassed by a proper commercial fertilizer.

CORRELATION BETWEEN YIELD AND GROWTH

In regard to growth, it will be observed that, in general the improvements in it have accompanied those in yield. The same materials that have improved the one have generally improved the other. In other words, as a rule, our best growing plots have been our best fruiting plots. Contrary to a prevalent notion, therefore, we may say that growth and fruiting are not necessarily antagonistic, but rather are associated, unless either should occur in abnormal amount.

DATA AND DEDUCTIONS ON COLOR

In regard to color, it will be observed in Tables V and VI that none of the applications have given any important increases, and most of them have given decreases. Similar results have also been uniformly obtained elsewhere, so far as we have received the reports. The same is essentially true of applications of iron salts. From these and other considerations, therefore, we believe that color in apples cannot be materially *improved* by soil applications, and that it is *primarily dependent on maturity and sunlight.*

This refers only to the red colors in apples. The yellow colors can probably not be affected by any external agency. Physiologically, the yellow color is connected with certain bodies located in the superficial layers of cells in the apple skin. It develops independent of light, and its intensity depends merely upon the degree of maturity or ripeness. The red color, on the other hand, is a constituent of the cell sap; it is capable of being influenced by a number of agencies; and its intensity is dependent primarily upon the amount of light received during the latter stages of maturity. In other words, we get back to its dependence upon maturity and sunlight. Conditions increasing one or both of these factors, such as late picking, light soils, open pruning, and sod culture will increase color. Opposite conditions decrease it.

From this viewpoint, the reduction in color caused by the nitrates and the manure is easily explained. It is evidently due to delayed maturity. That such is the case was shown the past season, especially in the Johnston orchard, where the fruit of the nitrogen plots was left on the trees until it reached approximately the same stage of maturity as that on the checks when they had been picked. The difference in the dates of picking, which correspond closely with the delay in maturity, was exactly three weeks,—from September 28th to October 19th. And when the final picking was done, the amount and brightness of the color on the nitrate plots was actually greater than it had been on the checks. The average increase in color on the treated plots, 2, 3 and 6, over the checks, 1, 4 and 7, was actually as great as 10.3 per cent. The great importance of maturity on the trees in increasing color is thus clearly shown.

The importance of sunlight, we had already determined in an earlier experiment. In it, we found that after the apples were picked, exposure to sunlight increased their redness by 35 per cent., while the checks in the dark and those exposed to electric light showed no definite increase.

We may also mention the facts that color may be materially affected by certain kinds of spraying and by internal variations such

as appear in the solid-colored variants from the Gravenstein and 20-Ounce. These points also are discussed in our Annual Report for 1910-11, but space is too limited for further consideration here.

RELATION OF FERTILIZER TO SIZE

Again referring to Tables V and VI, we see that nitrates have apparently reduced the average size of the fruit. Phosphates have given only a slight benefit, if any; while potash and manure have given quite important increases. This apparent benefit from potash is interesting, and it may indicate an actual fact, since size depends so much upon moisture and potash has been credited physiologically with the ability of increasing the osmotic power of plant cells.

All these apparent influences on fruit-size, however, must be considered in their relation to the size of the crop on the trees. A year ago, we plotted a number of curves from data given in connection with a fertilizer experiment at the New Jersey Station, in order to determine definitely, if possible, whether any relation existed between these two factors—fruit-size and size of the crop on the tree. We found that no correlation exists below what we may call a certain critical point, and that, under the New Jersey conditions, the number of fruits on even moderate-sized trees had to exceed about 1,400 per tree before any perceptible correlation appeared. *Above this critical point*, however, it is probable that *crop-size is the dormant influence on the size of the fruit*, though the exact position of the critical point may doubtless be raised or lowered somewhat by local conditions of moisture, plant food, etc.

In our judgment, this has a bearing upon the fact that nitrogen has apparently failed to increase the size of the fruit in our experiments. The crop-size was raised so much that full size of the fruit was not obtainable.

It also has an important bearing upon thinning. It means, in general, that if one thins an apple tree of even moderate size before the number of fruits has reached a critical point, which may be 1,400 or more, he can hardly expect to modify the size of the remaining fruit, and the most effect of the thinning will be an actual reduction in total weight of apples at least for that year. Exceptions to this may appear in varieties of extra large sizes, or in seasons or locations that are exceptionally dry.

It also means that, below the critical or the thinning point, there is opportunity for the other factors to exert their influence. It is here that such factors as fertilizers, cultural methods, moisture-supply, and heredity show their effects, and they may co-operate in such a way as to materially raise the critical point. This assumes that the variety is properly located in respect to temperature and length of growing season, both of which are factors that may have an influence on fruit-size. We also may mention here the factors of pollination and number of seeds per fruit, which have been found to affect fruit-sized by Frost and Muller-Thurgau in Germany.

A SUGGESTION FERTILIZER FORMULA, WITH CONDITIONS AND TIME FOR APPLICATION

Having thus seen something of the possibilities of fertilizers in orchards, it remains to point out some of the practical applications. In general, we may say that where there is probability that plant

food is needed, a good fertilizer is one carrying about 30 pounds actual nitrogen, 50 pound actual P2O5, and 25 to 50 pound K2O per acre. In many cases, the smaller amounts of K2O will doubtless give better net returns than the larger, though there are some soils where this is apparently not the case. In certain of our cultural methods experiments, a fertilizer similar to this has very good results, especially in connection with tillage. In some cases in connection with sod or mulch treatments, however, it has seemed probable that the nitrogen was hardly sufficient in the above formula, though this is a point that will have to be determined more or less by local trial. The nitrogen can, of course, be furnished by manure or leguminous plants to a greater or less extent, if this is found desirable.

In a few of our orchards, moreover, no form of fertilization has as yet produced a material response. This we consider due to the presence of other limiters, of which *improper* moisture supply is frequently important: though there are many other possible limiters.

The existence of such orchards emphasizes the need of local tests before making large and regular expenditures for fertilizers. These tests can be readily made by treating one part of the orchard and leaving the remainder unfertilized. In the case of most young orchards, or in any orchard that is doing well in growth and fruiting and retains a thrifty foliage well through late August and September, it is doubtless *safest* to fertilize only a small portion of the orchard for two or three years and leave the larger part unfertilized. The fact that the trees are well loaded in a given year, however, is no sufficient reason for omitting the fertilizer that year. In fact, that is one of the best reasons and times for applying a proper fertilizer rather liberally, in order to prevent the total absence of a crop the following year, and in the long run to tend to steady the annual production.

In case of the reverse conditions,—old orchards or those not retaining a thrifty look throughout the season or not growing and bearing satisfactorily,—it is best to reverse the procedure, and fertilize the larger portion, leaving only a small block to test the value of the treatment. In all cases, however, we strongly advise the use of a check until the real value of the treatment is well established. It is neither desirable to throw away money by too much liberality in the treatment of crop, nor to fail to realize its possibilities by too niggardly a treatment. Either course is an economic blunder, and the latter is especially deplorable because its effects is to decrease the productivity of the whole nation.

The time of application also we consider important, especially in the case of the nitrates. While our evidence is by no means complete on this point, yet we believe that it is quite possible to make the applications either too early or too late for satisfactory results. In fact, we have some evidence, from the work of certain orchardists, that leads us to believe that very distinct harm may be done by applying nitrogen too near to the fruit-setting time, especially in the case of peaches. Other evidence indicates that nitrates applied too early in the season may be wholly lost to the trees.

So that all things considered, we feel that nitrates should be applied not earlier than petal-fall in apples and probably not later

than the 1st of July, though some of our best results have come from applications as late as July 8th. Most any time during the period indicated will probably get the most out of the nitrate applications.

With the other less soluble and slower acting materials, the time of application is much less important. We know some careful observers, who even advocate the application of phosphate and potash in the fall on peaches, and claim that they get the best results in that way. Our own feeling on this is that the time of application for the mineral fertilizers is of relatively little importance. In any event, they are rather quickly fixed in the soil and they do not leach readily. Hence, we apply them along with the nitrogen, letting the time of application for the latter, which we do consider important, govern for all.

SIZE, COLOR AND QUALITY IN FRUITS

DR. U. P. HEDRICK, *Horticulturist, New York Agricultural Experimental Station, Geneva, N. Y.*

It is a genuine pleasure for me to meet the Adams County Fruit Growers' Association to-day. My acquaintances and colleagues in New York, who have been here, have brought home glowing tales of the wonderful fruit region you have in Adams county, of the hospitality of the people, and the good meetings you have in this Association, and have had here for years. It is all the more pleasure because I feel that the two states, the one bounding the other, ought to be in closer contact in matters pertaining to fruit growing than they are. My subject to-day is "Size, Color and Quality in Fruits." I want to discuss the relative values of these three principal characters in fruit in particular, in regard to their great importance to this State.

You are all aware that there is a discrimination against some of the fruits of the East. Side by side fruit from the Far West is preferred in the markets of the country. None of us like the sound of this but it is well to face positive facts no matter how disagreeable. This discrimination is unjust for when the same market grades of most eastern and western fruits are compared, connoisseurs find the eastern the better. Unfortunately, public opinion does not always march with the opinion of the connoisseurs. The difference between professional and popular judgment in this matter comes about because of the general misconception of the relative value of size, color and quality in fruit. It is to a consideration of the values of these attributes that I ask your attention for a short time with the hope of suggesting something to stem the present comparative unpopularity of the products of eastern orchards.

Appreciation of fruits comes through three of the five senses—taste, sight and smell, though the last is of little importance, being

so intimately connected with taste as to almost be a part of it. The senses of taste and sight remain. We grow fruit to eat and it would, therefore, seem that taste should set the seal and symbol on a good fruit. But somehow a great number of people imagine that size and color are of more importance than quality and judge fruit by the eye rather than by the mouth. A misunderstanding, it might be said a quarrel, has thus arisen between the advocates of taste and sight. Extremeness of view, misapprehension of purpose, and not a little intolerance, is shown on both sides. Let us discuss fairly and without prejudice the properties of fruits which give them value.

When the nurseryman sets his net, in shape of an illustrated catalogue, for the fruit grower, he baits it with gorgeous illustrations showing fruits of heroic proportions. The most frequent descriptive phrase accompanying this alluring bait is, "of largest size." In his turn the fruit-grower usually makes an exhibit, or a sale, or a present of his wares, with the apologetic yarn that he kept the largest for his own use, or he had larger last year; or, if you catch him in his orchard he lets you know that he could grow larger fruits if he were only so disposed. All this shows a craving after size—a craving that has been bred and is now stimulated by competitive exhibitions in which size is usually given first place. This has gone on for so long that now in the eyes of the "average person," personification of what we call the public, size is esteemed about the highest quality a fruit may possess. This feeling finds expression many times at every fruit exhibit when onlookers remark in a deprecatory tone, "I've seen lots of apples larger than those." What are the true merits of size in fruit? The question need careful consideration. We cannot make advance in horticulture until we know what we want.

In tree fruits for the kitchen, fair or large size is distinctly meritorious, saving waste in paring and coring or pitting though even here there are exceptions for one does not want a huge baked apple, a mammoth peach for canning, nor large plums for preserving. But for all dessert purposes the medium sized fruit should be preferred and the Fameuse or a little Lady apple, a Seckel or Doyenne pear, a Crawford peach and a Green Gage or Jefferson plum are, or should be, as acceptable as any varieties of their kinds. Certainly no one wants to make two bites at a cherry, strawberry, or any of the small fruits. Size in fruit is often poor economy whether on the fruit stand, in the hotel or for the home, for a small or medium fruit frequently answers the same purpose that a larger one would. It is true that some of the varieties of our tree-fruits might be increased in size to advantage and the value of many grapes and small fruits would be enhanced by greater size.

Not always, but often, undue size in any variety is accompanied by inferior quality. This is especially true if size has been brought about by irrigation on rich land in which case the fruit may actually be said to be "bloated." The water and food are not properly assimilated, and the highly flavored solids of the normally grown fruit are diluted or adulterated with water. This is the condition of much of the western fruit which, because of size and color, is elbowing the less showy and less bulky eastern product to the rear. So

too, extra large specimens of tree or small fruits in this region in which size is attained by high feeding or by such abnormal practices as ringing, usually lack in quality. From all this we must conclude that mere size is about the least needed quality for a good fruit.

The dispute as to whether color is more desirable than quality is just as warm as the one over size and quality. Each has stout advocates and while both are necessary in a first-class market fruit, why there should be any question about the supremacy of quality over color, is unanswerable. We grow fruit to eat. What a paradox to grow that which is unfit to eat provided only that it have high color. Here again western fruit has a decided advantage over that from the East, for the question of color is largely one of climate. The fruit from the Rocky Mountains and the Pacific Coast is certainly more highly colored than that grown east of the Mississippi. The sunlit West must ever produce fruits of brilliant hues for, like the complexion of Shakespeare's dusky Moor, the color of fruits "is but the burnished rays of the burnisher sun." Yet we of the East make a fetish of color and often times laud it as being quite equal or even more desirable than quality in a first-class variety, not only a mistake in judgment, but an advertisement for the fruit of our western competitors.

Just now the fashion is for red apples and pears though red is not necessarily handsomer than any other color and certainly does not make the fruit taste better. But fashions in colors of fruits change in markets and countries just as fashions in colors of dresses or coats or hats or ties change. At one time russet apples or pears were in great demand. In some markets Yellow Newtowns, or Bellflowers, or Rhode Island Greenings are still preferred. Some markets like white fleshed peaches; others, the yellow fleshed. The value of a black or a red or a yellow skin on a sweet cherry depends upon the market to which it is sent. Color is for most part quite aside from the intrinsic value of any of these fruits else we should not have differences and changes in fashion. A hungry man should be as truly thankful and should say grace with just as much unction over a Yellow Newtown as over a Jonathan or a Spitzenburg.

Is high quality associated with intensity of color? A popular fallacy associates quality with color. Some say high quality is correlated with low color, hence the oft repeated phrase, "handsome but poor"; others say high quality goes with high color. Baldwin apples grown in sod are most brilliantly colored. Nine out of ten people will choose the highly colored fruit as the best flavored, but it needs only a taste to convince to the contrary. The tilled fruit is crisper, juicier and richer, a fact attested to by all who have had to do with experiments in which the fruit is grown under the two methods of culture. In this case the low colored fruit is normal while the high color is the hectic flush of disease. So in every instance, a seeming parallelism between color and quality may be explained. Individual instances seem to show correlations, but a general survey of all instances shows that there are no correlations either between kinds of color or intensity of color and quality.

I quite realize that it is necessary for a variety to have a vogue, because of some character or characters to create or satisfy a special demand, in order to "catch" the market. But need its reputation

necessarily be made by its size or its color? If so, our western friends in all probabilities have us beaten. But when it comes to making a reputation for high quality, for choicely good apples, highly flavored pears, unimpeachably good peaches, and honeyed plums, the products of the Middle and Far West are only tolerable in comparison. Why do not we in the East make the most of the conditions that have been given us and grow fruits of quality and stake our reputation on it? Let the westerners continue to grow their huge, highly colored fruits. In time the public will distinguish between "quality fruits" and those recommended by their bulk and the color of their hide.

We come now to a discussion of quality, a word rolled under the tongue by fruit-growers and consumers alike but which like "good cheer" in the fable is fish to one, flesh to another, and fowl to a third. We need, therefore, to define the term. In brief, quality is that combination of flavor, aroma, juiciness and tender flesh which make fruits fit for the palate. But this is not all. The thing that gives charm to the attractions of the world, whether books or pictures, or music, or people, or fruits, is that subtle undefinable thing called personality. A Northern Spy, a McIntosh, a Seckel pear, a Green Gage plum, an Iona grape, for examples, all have distinct and charming personalities which contribute no small part to the high quality of these fruits. But many fruits have it not and the sorts named lose it when grown under some conditions. This personality may be quite aside from any tangible quality. It is akin to the charm of a woman of which Maggie says, in the current play, *What Every Woman Knows,* "If a woman has it she needs nothing else in the world, and if she has it not, nothing else in the world is of any use." A high quality fruit should have some such personality. Is charm marketable? It is in marriage markets. It ought always to be in fruit markets.

High quality does not have the commercial value that it should but it is coming to be worth more and more. There are two kinds of taste, natural taste and acquired taste. Only savages have a natural taste; to them crude, unrefined tasteless foods answer all purposes. But civilized man has an acquired taste and with each succeeding stage of civilization it becomes more delicate and more refined. Once they but know where it can be obtained, people will buy and pay for fruits of high quality—fruits with delicate and refined flavors and aromas and juicy tender flesh. Such fruits should be the food of the great mass of the American people while coarse, turnipy fruits should go only to those who cannot tell the difference between a Jonathan and a Ben Davis, a Barlett and a Kieffer. People need only to be educated as to what fruits are of high quality and a profitable demand will be created.

It may be asked why the fruits of the Atlantic are of higher quality than those of the Pacific sea-board! It is largely a matter, as I have said before, of food and water. But what combination of these essentials produces it is still another matter and one that we know nothing about. There are poor fruits grown in the East as well as in the West. Paul plants and Apollos waters, but God gives quality. In His distribution of favors He has seen fit to characterize the fruits of this region by their quality and those of

western regions by their size and color. We who have quality, have been talking most about color and size which we have not. Sober second thought should show us that we should make most of that which we have—quality.

There is of course a great difference of opinion as to which the high quality varieties are of the several fruits. This is as it should be for if all mankind liked the same varieties we should have but one sort each of the several fruits. Fruit-growing would thereby be greatly lessened, and what in Heaven's name would all the nurserymen do! It is well that there are many varieties, the number is a measure of the merit, and to pick out those of high quality each man must choose for himself, wading through the dismal swamp of varieties until he finds what pleases him. The difficulty is to bring the good varieties before the public.

In what has been said I have sought to establish two facts; namely, that high quality is the chief of all the attributes of fruit; and that the fruits of the East have it in greater degree than do some of their competitors. I have presumed to say, too, that eastern fruit-growers take small account of quality which should be their chief asset; rather do they magnify the importance of size and color, that which they have not, nor cannot have as some of their competitors do have. But there is little use in this discussion if one cannot be somewhat precise in telling how the condition that prevails can be bettered. To this end I have a few suggestions to offer —specific suggestions for individulas and general ones for the Society, for this is a case where concerted action between individuals and societies is necessary. Speaking to individuals:

First. The individual fruit-grower of this region must come to realize in growing fruits for color or size they are beaten by the West and that their long suit is to grow for quality. This is true now but it will grow more and more so as the years go by. A man should grow sorts for the market that he is willing to eat himself. If individuals will make a reputation for the high quality of their fruits, a reputation will soon be established for the region.

Second. Let every man deprecate above all things the oft made assertion that the public wants trashy stuff—cares only for appearance and not for quality. It is the fashion of the times to decry the public. Certain papers say the public wants only yellow journalism; some writers hold that the people will read only light or vulgar fiction; rag-time music is supposed to suit the public; theatres will present only sensational plays; following the fashion some fruit-growers hold that the public has the tooth of a gorilla, the taste of a buzzard, the stomach of an ostrich, and by choice fills its maw on Ben Davis apples and Kieffer pears. It is not true that the public likes poor fruit, the better the fruit the more of it will be eaten. The public is slow moving but once it learns true worth in fruit its appetite will be for the good varieties. It will not be content with poor or mediocre sorts. If it must wipe the tongue around the mouth and titillate the palate in order to find the flavor of apples and pears, it will take to oranges, bananas, grape-fruits and pineapples.

Third. It is a good policy in this world not to break rudely with the old but to run smoothly into the new. It would hardly

be wise for any man to cut down or graft over certain apples, or pears or plums, or pull out certain grapes because they are of poor quality. But in the planting of new orchards a man should look well to the quality of the varieties he selects. Speaking broadly, and noting the Kieffer pear as the most marked exception, fruits of fine flavor can be grown as easily as grosser tasting ones. Here we have a seeming paradox for the best things in life most often come only by the greatest care and extreme labor of mind or body. In planting for the future, then, plant for quality.

Fourth. Never in the history of the world have there been so many men directing their efforts towards the improvements of plants. With the recent discoveries in plant breeding and the accumulated knowledge of centuries the efforts that are being put forth are bound to result in many new introductions within the next few years. A man may be pardoned if he clings to some of the mediocre varieties we now have for these are the elder-born to whom we have become attached in tenderly carrying them through a helpless infancy, but as the physicians and midwives of horticulture bring in the new born let us be chary of a blessing until their character for high quality is established. Let them be "born to blush unseen" and if christened let them remain in the limbo of the nurseryman's catalogue, if high quality be not among their accomplishments. Let us raise the standard of excellence and accept only new fruits which are superior in quality to their predecessors.

Fifth. The nurserymen can do much to encourage the growing of good fruit and to secure the appropriate recognition of high quality. The country is filled with men and women from city, town and country who want to grow fruit for pleasure and profit. When these embryonic fruit-growers pick the shell and get ready to plant, they go to a nurseryman for trees. Now if the nurseryman will sell all unfledged fruit-growers (the old hands should be able to take care of themselves) varieties of quality rather than what they can spare, fruit-growing and in the long run, the nursery trade, will have been helped. Some nurserymen hold it to be their inalienable right to substitute when varieties run short. If all such will only slip in a choicely good variety instead of an odd or an end, there will be less poor fruit. Nurserymen say they grow the varieties that fruit-growers want. In reality, however, they very largely force planters to take sorts that grow readily and make good looking trees in the nursery. Thus Canada Red, Winter Nellis, cherries on Mazzard, plums on St. Julian, cannot be had in the average nursery. Trees for the orchard must be grown in the nursery; trees grown in the nursery must be sold to the fruit-grower; the weal or the woe of the fruit-grower is the weal or the woe of the nurseryman. If tree-growers would push the sale of varieties and trees that are truly most useful to the tree-planter, nurserymen, fruit-growers and the public all will be gainers thereby.

Leaving now the individual, there are some things that horticultural organizations can do to forward the interest of high quality fruit and hence the interests of all eastern fruit-growers.

It should be the business of eastern horticultural societies, one and all, to make the public familiar with the names and the qualities of fruits. With this knowledge fruit-buyers would pay the dif-

ference between good and poor quality varieties just as they pay the difference between a porterhouse and a pot stew. Why should they not? There are several ways of reaching the public in this matter. Fruit-growers and their customers may both gain knowledge of what are the best fruits, and which of them may be grown, by a full and frank discussion of the whole matter at horticultural meetings. County and state fruit organizations ought to do more in the way of making instructive exhibits both at their meetings and at the fairs. In these exhibits much more attention ought to be paid to fancy fruit—high quality fruit. Indeed, it seems to me that higher premiums ought always to be offered for choicely good fruits in plates or in boxes or barrels than for the varieties of poorer quality. Sometime, and it ought not be long delayed, the fruit-growers of the East ought to get together, through their horticultural organizations, and hold a monster fruit show in one of our great cities as the fruit growers of the Middle West and the Northwest are now doing yearly. These great fairs are likely to be held yearly in the West. Is the East to be behind in this matter? If such a fair is ever held we must advertise in no uncertain way the high quality of eastern fruit. This is a matter in which the East has been altogether too modest. The world thinks the western fruit is best; teach them otherwise. A rhyme of the trade once before quoted in this connection is worth repeating:—

"He who whispers down the well,
About the goods he has to sell,
Does not reap shining, golden dollars,
Like he who climbs a tree and hollers."

In conclusion: Why do I discuss this matter? Is it to encourage fruit-growing only for a select few who have the cultivated taste? Not by any means. The common taste which falls to with a vigorous appetite upon any fruit presented is now, and must ever be, the chief customer of the fruit-grower. But taste of the multitude should be educated by all possible means for better and better fruits. Why? Because in the long run it means the consumption of a great deal more fruit the country over; and for the selfish reason that the eastern states can grow fruit of exceptionally high quality but cannot compete with other regions in size and color of fruit. Do I hold that it is reprehensible to grow fruits of poor quality? Possibly not, but it would seem in the course of time the wiping out, root and branch, of the apple and pear industry of the East if all fruit-growers grew poor varieties; besides it would present the vile and sordid spectacle of people deliberately devoting themselves to growing poor fruit when they might as well grow good fruit. Do I say that high quality is the only requisite of a good variety? No indeed. There are a score of requisites of fruit and tree that go to make a good variety but among these quality is not now receiving appropriate recognition and it is for such recognition that I am pleading. Is this a matter of sentiment or of business? Both. I am not adverse to putting some sentiment in fruit-growing but I hope I have not been arguing before a packed jury in trying to convince this society that it is business as well as sentiment to grow good fruit. Is this not an affair to be dealt with by fruit-growers? Yes, but in most well regulated enterprises some-

one must have the thankless task of blowing a whistle to wake people up or to tell them that it is time to get to work. I have been tooting the whistle and if I have tooted a little long and a trifle loud it is because of some anxiety lest the fruit growers of the East should fall behind or possibly get locked out.

THE MAKING OF CONCENTRATED LIME-SULPHUR AND ITS USE ON APPLES AND PEACHES

DR. J. P. STEWART, *Experimental Pomologist, State College, Pa.*

Historical sketch of lime-sulphur, and advantages in home preparation:

Ingredients: Need for high purity in lime,—should be 90 per cent. CaO or better and preferably with less than 3 per cent. HgO. All present commercial sulphurs are pure enough; fineness important. Powdered commercial sulphur is preferred because of low cost.

Formula: 1-2-1, or 1-2-1-2, is best. Simple and effective. One pound of good lime enough for 2 pounds sulphur; excess of lime favors crystallization, increases sediment and fails to increase scale-killing powers. Clear solutions without extra lime here during past two summers have completely eradicated scale on apple trees, with three sprayings at summer strength.

One gallon of final product is about right for carrying 1 pound lime and 2 pounds of sulphur in home preparation. Gives a density of about 1.24 or 28½° Be'. Smaller volumes give greater densities but poor utilization of materials. Much larger volumes are uneconomical in cooking and in storing. Variations in formula for special uses and conditions.

The volume should not be permitted to run materially below desired final volume at any time during the cooking as this increases the sediment.

Utensils: Cooker, measuring stick, hydrometer and strainer. Desirable forms of each. Upward straining type of strainer is best. Cheap unstandardized hydrometers to be avoided, and they are intended to test concentrate, not to use as a float in diluting tank as an indicator of when the proper amount of water has been added.

Cooking Time: Until the sulphur is evidently dissolved, usually 40 to 50 minutes; either too much or too little boiling objectionable. Color not a safe guide. Keep pellets and lumps of sulphur broken during the cooking.

Storage: Avoid acids, CO2, and unnecessary contact with air. Use oil films or tight, well-filled containers. Three-year old sample at the college unchanged. Crusts formed in storage may be redissolved, diluting as usual according to density.

Dilution: (a) *Process with specific gravity hydrometer.*

Rule: Decimal of concentrate divided by decimal of desired spray equals total dilution.

Examples:—

$$\frac{.24}{.03} = 8 \text{ or } \frac{.24}{.01} = 24 \text{ or } \frac{.27}{.007} = 38 \text{ 4-7 or } \frac{.27}{.003} = 90$$

This means that a concentrate testing 1.24 is to diluted to 1 to 8 (total) to get a winter spray for scale, which should test 1.03, etc.

(b) *Other methods:* Dilution tables and floating hydrometer in diluting vessel. Latter is unreliable as an indicator of proper water addition, diffusion too slow. (For further discussion of these and other matters pertaining to lime-sulphur, see our Bulletin 115.)

DENSITIES AND APPLICATION TIMES FOR DIFFERENT PURPOSES

San José scale, 1.03, trees dormant; or 1.01 in summer at "hatching" time, followed by 1 or 2 later applications at ten-day intervals or as young reappear. *Other scales,* same.

Blister mite, 1.025, just as buds begin opening.

Peach leaf curl, 1.02, just before the buds open.

Apple and *Pear scab* and apple worm. About 1.007 with lead arsenate if three applications are given; 1.01 alone, or with the arsenate if only one application is given. Applications: (1) When blossoms are beginning to show pink; (2) May begin when petals are two-thirds off and finish within ten days thereafter; (3) About two weeks after second application.

Brown Rot, Curculio and *Scab* of stone fruits. (1) Lead arsenate, lime and water (2-2-50), when calyces or "shucks" the shedding. (2) Self-boiled lime-sulphur, 8-8-50, and 2 pounds lead arsenate, about a month later. (3) Clear lime-sulphur solution. 1.003, or self-boiled lime-sulphur, without any arsenical, about 3 or 4 weeks before fruit ripens. The former alternative in (3) avoids staining of fruit, is cheaper and handier and has been satisfactorily safe in our tests the past two seasons. It should not be used extensively, however, without preliminary trials in the locality and on the particular varieties to be sprayed. Peach spraying not yet as unqualified a success as apple spraying.

SPRAY INJURY

Sometimes very important. When the sulphur solution is used at proper densities, the injury may follow excessive applications (see our Bul. 106), or be due to reactions between the lime-sulphur solution and the arsenical, making the latter soluble. Lime sulphur solutions containing any material quantities of soda or potash are especially dangerous in the latter respect. (See our article on Peach Spraying in 1911 Report of State Hort. Assoc.).

We have wholly prevented the latter action on peaches during the past summer, either by using lead ortho-arsenate, Pb3 (AsO4) 2, with the lime-sulphur solutions, or by precipitating the sulphur from solution with iron sulphate before adding the ordinary arsenicals.

The former method is preferable, which indicates the desirability of manufacturing the ortho-arsenate here in the East as well as in California.

It also is probable that the ordinary mixed lead arsenates can be safely used with lime-sulphur solution by adding to them some free lead, preferably in the form of lead acetate or "sugar of lead," before combining them with the solution. The amount of the latter actually required depends on the percentage of soluble arsenic and of acid arsenates present in the commercial lead-arsenate sample and also on the amount of free lead already present. In general, however, one-fourth to one-third of a pound of "sugar of lead" should be sufficient to render safe the two pounds of ordinary lead-arsenate paste.

EDUCATING AN ORCHARD

By CLARK ALLIS, *President New York State Fruit Growers' Association, Medina, N. Y.*

I had supposed that the Garden of Eden was in Orleans county but it seems that this must be the site because this is Adams county. In our county the chief commercial apple is the Baldwin. Baldwins and Greenings are in the lead, and will continue to lead for a long time.

Like a child, the education of an orchard should begin before it is born. When possible, buy trees of a firm who gets its buds or scions for one of your southern nursery firms, we did not cut any difference in apples. We have in one orchard what is known as "Gray Baldwins" and under no conditions are they as good as our red Baldwins. Two years ago, in cutting over $500.00 worth of scions for one of your southern nursery firms, we did not cut any from the Gray Baldwins. I want a tree to be thrifty, large and fairly straight with three or more good branches low down. I do not cut back the roots or top unless broken.

One of the first things I remember was "apple sprouts" and those "remembers" were very painful, at home or in school, and I objected to the trimming of apple trees or boys. My father was an orchard fiend, takes after me, and all his trees were cut back to the main stalk—he had five boys. When I began to set trees for myself, I followed the same bad plan until I was convinced that "beheading" young trees was not the way to make the best orchard and most money. Two farms near me were bought by city men, one man a slipshod lumber dealer who made a failure at the lumber business and the other a Polander who did not know a tree from a boot jack; both set out young trees without any trimming at all, both set their trees next the road where I could see them at any and all times. Of course I broke that good old Bible saying "Fret not thy gizzard out" and proceeded to "fret," but it did no good. Those fool trees grew better than any I had ever set out and it made me disgusted. I found the same conditions in a western orchard I visited. I also

saw the experimental trees in which Mr. Foster Udell, "the Baldwin king" of Brockport, N. Y., proved out his belief that trimming of young trees was a mistake. His untrimmed trees were away ahead of his trimmed trees and still continue to lead. My first planting of untrimmed trees was in 1908: I set 2,000 and all started to grow but one, and but six died later. Several Baldwins at three years of age bore 40 or more large apples. This orchard at three years had many apples and next year, as a four year old, we hope for a good crop.

Orchard men tell me that I am making a mistake to let the trees bear so young, but I don't agree with them, and will not take off any apples except to thin and encourage the trees to be annual bearers. This orchard has the largest trees for its age of any orchard I have seen. Bearing apples will not hurt vigorous trees like these in the least. All the trimming this orchard has received is to cut out branches that cross; these are cut in summer. Every tree set since 1908 on our farms goes in without trimming. The past season trees set without trimming have endured the worst drought known to Western New York better than trimmed trees. I think our station at Geneva carried on experiments on this line this year, which are favorable to the untrimmed trees.

I like a low headed tree for my experience shows that trees headed low keep their large limbs farther from the ground than high headed ones. We are setting our permanent trees 42 to 45 feet apart with three fillers to each permanent tree. The trees are dipped in commercial lime-sulphur, 34° Beaume test 1 to 9. We do not dip the roots except as an experiment and have never seen any bad results from dipping the roots. The practice of dipping trees before setting is one that cannot be too highly recommended, for the dipping is so much more thoroughly done, is a great saving in time and does not require nearly as much liquid as in spraying. We spray young trees the same as the old ones.

The year before the orchard is set, I prefer to have some cultivated crop on the ground. The ground is staked out so a dead furrow comes for every row, a common or subsoil plow being used to loosen up the ground to a good depth. In planting we give the roots plenty of room, putting in fine top soil, well shaken into all cavities, firmly packed with the feet, except the last few inches which are left loose as a mulch. The trees are set deeper than they are grown in the nursery. In filling the holes, we either bank up well with loose dirt which we cultivate down to a level through the season or leave the hole below the level and throw up with the cultivator. The former way is preferable if the season is windy.

For the first few years some cultivated crop planted in hills to suit the width of the rows is advisable so the orchard can be cultivated both ways. Tomatoes or sweet corn, smaller stalks, the latter not planted too close to the trees, are good crops with some cover crop sown every year. Any of the legumes are good, but we usually sow a mixture of mammoth clover, vetch and cow horn turnips. Mr. Udell, the Baldwin grower, attributed his success to plowing his orchard using buckwheat for a cover crop. He said, "My father was the first one to use buckwheat in orchards in our section. He began its use about fifty years ago. His orchard has not failed to

produce a crop in over 40 years." To derive the most good from a cover crop it should be allowed to grow until May or June; but on level ground some of our best orchardists plow late in the fall to save time in the spring. Fall plowing should never be done in hilly ground for "Erosion" is a bad man to have on the farm or in the orchard.

Spraying is the most disagreeable and costly job ever invented and "Satan" never comes around the farm at that time for there are no "idle hands," everybody works, even father, he has to keep the steam pump running water into the large supply tank. We use gasoline rigs with tanks of 300 gallons capacity. One man on the tank to drive and spray the tops, one man on the ground with a 50-foot lead of hose to spray the lower limbs. The orchards are sprayed twice before blossoming and once after. The first spraying 1 to 9 or 10 lime-sulphur for scale and blister mites. The second spraying 1 to 20 with arsenate of lead, 4 pound to 6 pound to 50 gallons. As soon as the blossoming is nearly done the spraying begins on the Greenings as they are about the first to drop their petals, using 1 to 35 or 40 commercial lime-sulphur and arsenate of lead. We have not tried spraying in August, yet will this coming summer.

This past season has been so hot and dry fungous diseases have not bothered after apples were set. Unsprayed orchards this year were free as well as the sprayed ones, but unsprayed orchards did not set much fruit. Already some are saying, "well spraying hardly paid last year so I won't do much at it this coming year." The lack of spraying on buds never showed better than for the past two seasons. Last spring a young orchard adjoining my farm blossomed full. I would have given $1,500 for his crop and sprayed it. I offered $500 per acre for this orchard. The man did not spray or work his orchard, he had a failure. A friend bought a power sprayer, but he sprayed his neighbors orchard at the right time, leaving his own orchard for a later job. It rained so he could not do his own orchard when is should have been sprayed. But he won't do so again, for his neighbor had a fine crop, while he did not have any.

Fruit growing is one perpetual picnic. It is "up guards and at them" fifteen months out of twelve, although we do not have to fight borers in apple, but it is worth it for it pays in dollars as well as in the satisfaction there is in handling a crop of nice fruit.

Apple packing is the most serious question we have in the fruit business to-day and dealers are the worst sinners and are more to blame for the poor apples packed than the farmer. We are packing No. 1 "Fancy" 2 1-3 in. up and No. 2—2¼ to 2½, both grades faced with good apples of grade in the barrels with the rest of the apples, the same from face to the headed end, corrugated caps are used in both ends, a padded head is used to press the apples down first, then the head is put in. The best press we have seen is the Davis platform press with a large heavy iron ring nearly the size of the head to bring the pressure on the head where needed, instead of the center. This ring is an idea we have worked out ourselves and proves very satisfactory.

Up to the present time we have put our apples in storage as soon as they can be packed with the packers sorting as fast as picked. All the drops and culls are drawn to the evaporator, keeping the orchard cleaned up as we go.

At the evaporator apple prices are very satisfactory, 65 cents per 100 pounds for all that are on the ground and the culls. We expect to have a cold storage on our own farm and draw the apples to the storage, and if we are in a hurry the apples will not be sorted until they are all picked. The apples then will be cooled off and will stop ripening. Will not ripen a bit from the time they are picked until they get into storage.

TILLAGE VS. SOD-MULCH

By DR. U. P. HEDRICK, *Horticulturist, Geneva, New York.*

Commercial fruit growing is a comparatively new development in America. The first settlers of the new world brought seeds of fruits from the old world, for it was impossible, with their slow sailing vessels, to bring grafts or the trees themselves. All of the old orchards came from seeds. The first great impetus to American fruit growing came just after the Revolutionary War, when a great number of men in different parts of America became interested in introducing new fruits in America. They shipped to the old world the trees, flowers and plants that were found growing wild in this country, and brought back varieties of the different European fruits. Horticulture had its beginning at that time. Steam navigation gave another impetus. Before that time trees and fruits could be carried over the ocean only with the greatest difficulty. With the advent of steam navigation these difficulties were removed and many varieties were introduced into America. At the same time the codling moth, apple scab, wooly aphis and other pests which before that time could not be carried across the ocean, were introduced.

The third and chief impetus came after the Civil War. It came with the better transportation facilities whereby fruits could be transported from place to place. Until that time fruit had been carried from the producer to the consumer only by horses, but now railroads and steamboats came into use. Later developments have been the use of refrigerator cars, cold storage plants and means of evaporating and canning fruits.

In the old days the fruits were wholly an adjunct to the farm. The trees were planted near the house and along lanes and fences, and in sod, and the orchards were pastured. The trees received comparatively little care. There was but little money to be made from fruit growing, but with the development of commercial fruit interest it was found necessary to change, and men began to culti-

vate their orchards. It was found that the trees responded to good care. Fifteen or twenty years ago practically all the Experiment Stations were united in the belief that orchards were improved by cultivation and tillage. There were some exceptions where orchards were planted on hillsides or wet land. Some of these exceptions were so remarkable that much attention was called to them. One or two of our agricultural papers in particular, began to cite these exceptional cases as best for all. This led to a controversy as to the merits of soil and tillage. Our Experiment Station, at Geneva, N. Y., felt that it was necessary to try the two methods side by side. I want now to give you an account in some detail of one of these experiments.

My subject implies a controversy. This disputed question is, Will an apple orchard thrive and fruit better under tillage or in sod with the grass used as a mulch? The Geneva Experiment Station is conducting two experiments to settle this question. This paper is largely a report on one of these trials of the two methods of orchard management, the other not having been carried far enough to warrant a report. In a controversy of any kind terms must be defined, and to properly understand an expetiment the conditions under which it is undertaken must be considered and I hasten to these tasks.

Is it necessary to define tillage? The definition is short and clear. To till is to plow, cultivate or to hoe the soil. Tillage is an humble word with its flavor of soil and its suggestiveness of sweating toil but it is an old word and should be an honored one. It has rendered mankind untold and untellable service; it is practiced wherever there is agriculture in the world and nearly all of the plants which minister to the needs of human kind have been improved by tillage. To plow, cultivate, or hoe, to turn and stir the soil, and so improve the crop, or so improve the soil, these simple operations were the beginnings of agriculture and the beginnings of civilization and they have been the chief tasks of all civilized peoples. Tillage is so universal, and is so essential a part of agriculture that those who oppose it for any domesticated plant should look well to its origin, to its history and to its present place in agriculture before charging it with evil.

There are two words to define in the compound word sod-mulch. Sod is soil made compact and held together by the matted roots of living grass. A mulch is an organic material placed about trees to prevent evaporation and to furnish humus. The sod-mulch advocates divide into several sects in their manner of making use of sod and mulch. One sect keeps sheep on the sod, another pigs, and still another says the grass is not sufficient and must be supplemented with straw or manure.

We can understand the experiment to be discussed better if we take a glance at the philosophy of tillage and that of sod-mulch. The objects of tillage are so well set forth by one of the leading living authorities on the subject, Professor F. H. King, that I give them without a change of a single word:

"(1) To secure a thorough surface uniformity of the field, so that an equally vigorous growth may take place over the entire area.

"(2) To develop and maintain a large effective depth of soil, so that there shall be ample living room, an extensive feeding surface and large storage capacity for moisture and available plant-food materials.

"(3) To increase the humus of the soil through a deep and extensive incorporation of organic matter so that there may be a strong growth of soil micro-organisms and the maintenance of a high content of water-soluble plant-food materials.

"(4) To improve the tilth and maintain the best structural condition in the soil, so that the roots of the crop and the soil organism may spread readily and widely to place themselves in the closest contact with the largest amount of food materials.

"(5) To control the amount, to regulate the movement, and to determine the availability of soil-moisture, so that there shall never be an excess or deficiency of this indispensible carrier of food materials and through the plant.

"(6) To determine the amount, movement and availability of the water-soluble plant-food materials present in the soil, so that growth may be both rapid, normal and continuous to the end of the season.

"(7) To convert the entire root zone of the soil into a commodious, sanitary living and feeding place, perfectly adapted to the needs of the roots of the crop and to the soil organisms,—adequately drained, perfectly ventilated and sufficiently warm.

"(8) To reduce the waste of plant-food materials through the destruction of weeds and the prevention of their growth, through prevention of surface washing and drifting by winds."

It is impossible by any other means than tillage to obtain for the apple the conditions enumerated above; soil uniformity; soil depth or a commodious living room; an increase of humus; improved physical condition of the soil; conservation and regulation of moisture; greater availability of plant food; a sanitary living place, clean, drained, ventilated and sufficiently warm; and the destruction of weeds. Are not these objects worth striving for with any cultivated plant?

I am fortunate, too, in being able to give the philosophy of the sod-mulch and in the words of Mr. Grant Hitchings, who, as all know has been one of the chief advocates of it. Mr. Hitchings says:

"This system gives one practically the whole Spring and Summer to grow and market other crops, while the orchard is growing of its own accord a supply of vegetable matter for humus that all authorities agree is so necessary for proper soil maintenance. This means that you can do a good business without extra help, growing strawberries, green peas, early potatoes, etc., and have the money for the fruit in the fall to swell your bank account instead of paying it out for fertilizers and cultivation. Other advantages are that you can drive through your orchard to spray better on sod than on cultivated soil, as the latter sometimes gets muddy, and also washes badly on rolling ground. You can allow your apples to mature fully on the trees, for if they should fall on the grassy mulch nine-tenths of them would be marketable. By making repeated gather-

ings the yield will be largely increased and quality improved. With the mulch method you accumulate humus in your soil; with clean cultivation you burn it out or exhaust it."

We are now ready for direct evidence as to the relative values of tillage and sod-mulch for the apple. How do the systems of management pan out in a commercial orchard? The orchard in which the Geneva Station for five years tried the two methods in located on the farm of Mr. W. D. Auchter, at South Greece, New York. The orchard consists of ten acres of Baldwin trees thirty years old, five acres tilled, five acres in sod. The soil is a medium heavy clay loam, rich, and containing enough gravel to make it porous. It was selected as typical of the average orchard soil of Western New York. The experiment being carried on is a broader one than a simple trial of tillage and sod-mulch. The experimenters hope to add something to what is now known about the food and drink of trees—how trees take them in, make use of them, and with what effects; what influence soil temperature and soil ventilation have on the development and function of tree roots; and among still other problems, what the relationships between grass and the apple may be.

It should be said too, that the experiment is to run ten years at least and that the results now given cover but half the minimum period and are therefore in some respects inconclusive and superficial. For instance, the discussion now centers around the yield of fruit. While of course the crop is the ultimate criterion of orchard treatment yet the effect upon the trees as indicated by the leaf, wood and root development is quite as important an index of the value of tree treatment as the crop of fruit.

The care of the two plots in the Auchter orchard has been as follows: The tilled plot is plowed in the spring and cultivated from four to six times ending the cultivation about August first, at which time a cover crop of barley, oats or clover is sown. On the sod-mulch plots, the grass is cut once or twice during the season and allowed to lie where cut and decay into a mulch. The grass crop has usually been large, but last year it was enormous, thick and tall, standing to the top of the fore wheels of a buggy and no one could say that it was ever insufficient for a good mulch. In all other details of care the treatment has been the same in the two plots.

The ultimate criterion of the relative merits of the management to which an orchard is subjected is the crops of fruit obtained. It is important, however, that trees should grow well and for the measure of vigor there are several characters of the trees available; as the leaf area on the tree, the length of new wood formed; the number of new shoots and the color of leaf and wood. The properties of the fruit, as size, color, time of maturity, keeping qualities and flavor must be noted. We come now to a discussion of these criteria.

The effects of the two methods of management on yield of fruit are shown by the following figures:

	Bbls. sod.	Bbls. tillage.
1904,	615.1	591.9
1905,	233.	278.9
1906,	210.3	531.1
1907,	275.3	424.3
1908,	325.3	722.5

Average yield per acre on the plots for the five years: sod, 72.9 barrels; tillage, 109.2 barrels; difference in favor of tillage per acre, 36.3 barrels. These results scarcely need comment. For an average of five years the tilled plot shows an increase of a little over one-fourth above the sod-mulch plot. The figures first read show that each succeeding year the difference becomes greater, indicating a continuous loss of vigor in the sod-mulch trees.

One of the chief advantages of the sod-mulch method, as put forth by its promulgators is, that it is a much less expensive method of caring for an orchard. The average expense per acre of the two methods of management for five years was $17.92 for sod; and $24.47 for tillage, a difference of $6.55 in favor of the sod. It is true that the outgo has been greater for the tilled plot but the income has been greater. The cost of production has been materially less for the tilled trees and that is the main point in the whole discussion. A cheap and easy way of growing apples is not necessarily the most remunerative way.

Leaving the yield of fruit for a brief consideration of the effects of the two treatments on tree characters we can mention first the leaf area. Measurements of leaf area were not made but the merest glance through the orchard would show that there were more and larger leaves on the tilled plot than on the sod-mulch plot. The experienced orchardist knows that sparsity of foliage and smallness of leaf can indicate but one thing, ill-health.

So, too, there was something amiss with the color of the leaves. It did not need a trained eye to detect the difference in color of foliage in the two plots. The dark and rich green of the tilled trees could be noted a half mile from the orchard indicating an abundance of food and moisture and the heyday of health, while from the same distance it could be seen that the foliage of the sod-mulch trees was pale and sickly. Of all the signs of superiority of the tilled trees the color of the foliage spoke most eloquently and more than one man of the hundreds who visited the orchard was heard to say as his eyes lighted on the contrasting colors of the sick and of the well trees "that satisfies me." The absence in color in the leaves of the sod-mulch trees was due to a lack of chlorophyl or leaf-green. Chlorophyl is essential to the assimilation of plant-food and when it is lacking the trees become starved and stunted. The leaves on the sod-mulch trees assumed their autumnal tints a week or ten days earlier than those on the tilled trees and the foliage dropped that much earlier, thus seriously cutting short the growing season of the grassed trees and thereby impairing their future vitality.

The new wood produced by the grassed trees tells a similar tale of injury. It was not half that produced on the tilled trees; the twigs were not plump and well filled out; there were fewer new shoots; and the wood of the mulched trees lacked the clear, bright, rich brownish tint of health so that in mid-winter one could pick out mulched trees and tilled trees by the color of the wood.

As to color there is no question but that the fruit from the sod-mulch plot is much more highly colored than that from the tilled plot. This difference varies with the season. Mulched fruit ripens from a week to two weeks earlier than tilled fruit. If the variety and the season are such that the tilled fruit can remain on the trees

some days after the mulched fruit must be picked the difference in color is much less. The lighter color of the tilled fruit is readily and clearly explained. The coloring matter in the skin of the apple like that in the leaves, consists of chlorophyl or leaf-green. The coloring of ripening fruit is due to the changing of the chlorophyl of the skin into the colored substances of autumnal tints. Therefore since the sod fruit ripens earlier it colors earlier and in most seasons better.

The abnormally high color of the sod fruit in this orchard is one of the most marked signs of the deleterious effect of the sod on the trees. Every man of experience has observed that when a trees is starved, stunted, girdled, or injured, its foliage and its fruit take on high color. Radiant color in fruit or leaf is often the hectic flush of a diseased patient. The bright color of the fruit of the sod-mulched trees may be purchased at the expense of the vigor and the health of the tree.

The latter ripening period of the fruit on the tilled plot would be a defect with some varieties and in some localities but in general in New York late ripening is an advantage.

Fruit from both plots for the five years has been kept in cold storage to test the relative keeping qualities. This work has been in charge of Mr. G. H. Powell, the cold storage expert of the United States Department of Agriculture, who writes me in brief: "There appears to have been little practical difference in keeping quality between fruit from sod land and fruit picked a few days later from the tilled land."

There is but little difference in the quality of the fruit when specimens can be had at the same degree of maturity. But the tissues of the sod-mulch fruit begin to break down so quickly after harvesting that at any time after this period the tilled fruit is better in quality. This has been tree in all of the five seasons, a fact affirmed by repeated testing by those in charge of the experiment and attested by many who have seen the fruit at the Geneva Station, at horticultural meetings and at institutes. The more pleasing color of the sod-mulch fruit leads many to think it is of higher quality but it requires only a taste to convince to the contrary.

In considering the causes of the differences noted between the two systems of management we can do little more than state the hypotheses which seem to account for the results. The experiment is by no means concluded and definite reasons cannot be advanced until all the proof is in. Yet it seems to me I am warranted in offering the following hypotheses:

First. Plant food is more available in the tilled plot than in the sod plot. That there is an abundance of the plant food necessary for the welfare of the trees and the production of crops in both plots is certain. For the trees in the tilled plots showed in all respects, good feeding, and such trees in the sod-mulch plots as could get any considerable portion of their roots in soil where there were no grass roots, likewise seemed to be well fed. Moreover, two of the chief elements of plant food, potash and phosphoric acid, were added to a part of the trees in each plot for three successive seasons and without appreciable results in either case. It is evident

that there is plenty of food in the sod land but for some reason it is not available to the apple trees. The trees are starving in a land of plenty.

Second. The sod-mulch does not conserve moisture as well as tillage. The chief study in the Anchter orchard for the summer of 1907 was that of the water content of the soil in the two plots. One hundred twenty-eight samples of soil were taken at different times during the summer and under conditions safe-guarded in every way possible to determine accurately the amount of moisture in the soil. The analyses showed, approximately, that the water content in the tilled soil during the past summer, was twice as great as in the sod plot, thereby substantiating what has long been called that tillage is a better means of conserving moisture than mulching.

Trees must have water. If an apple tree bears ten barrels of fruit, there are about eight and one-half barrels of water in the tree's output. In a full grown apple tree it is estimated that the total leaf area is about 1,000,000 square inches. Mr. F. C. Stewart of the Geneva Station has counted the stomata or pores on a square inch of the apple leaf and finds that a fair average is about 150,000 per square inch. Or for the leaf area of the whole tree, 150,000,000,000 pores. Now to supply the demands of its ten barrels of apple children while these 150,000,000,000 pores are constantly giving moisture is enough to drive a tree to drink and the apple tree becomes a hard drinker. When in the heat and drought of summer, the apple tree is compelled to share its scant supply of water with the thirsty horde of hangers-on found in an orchard sod the trees must suffer. Still further, a diminished water supply entails a cutting off of the food supply. Plant food enters the tree as a solution and an apple tree suffering from lack of water as a necessary consequence suffers from a lack of food. A thirsty plant is a hungry plant.

Third. The sod-mulch soil is less well aerated. In the experiments we are carrying on I have not attempted to secure evidence on this point. It is obvious that sod interferes with the air supply in the ground beneath it and it is not hard to believe that such interference would hinder the proper development and prevent the proper work of roots. The muffler of mulch which forms a part of this system of orchard management would of course intensify the deleterious effects of the sod in the above respect.

Fourth. The soil temperature is lower in the sod-mulch plots than in the tilled plots. It is possible that the harmful action of grass on trees may be accounted for in part by the influence of the sod on the temperature of the soil. During the summer of 1907 the soil temperatures were taken in the tilled and mulched plots twice a day for 41 days at the depth of six and twelve inches and under as nearly comparable conditions as circumstances would permit. At both depths the difference was in favor of the tilled plot. At six inches the difference was slight, being only one-third of a degree but for the greater depth, twelve inches, the average in favor of the tilled plot was $1\frac{3}{4}$ degrees. It is not an assumption to say that the higher temperature is most favorable to the growth of the apple tree, for plant physiologists, soil physicists and bacter-

iologists agree that an increase in soil temperature is favorable to plant growth. As one of them puts it, "The soil is a great factory that has its production vastly increased as the temperature rises."

Fifth. There are probably differences in the biological or "germ life" activities taking place in the soil. This is a matter upon which I am not qualified to speak with certainty. But I know that the men who are studying soils find that there are various kinds of micro-organisms inhabiting the soil which have much to do with the proper functioning of the roots that grow therein. The soil is teeming with countless millions of living organisms which bring about necessary changes of one kind and another in that soil; without them higher vegetation would not grow. Now the activities of these beneficient organisms are dependent on soil conditions and King tells us, in the quotation given above, that tillage induces a strong growth of soil micro-organisms; that it improves tilth so that soil organisms may spread readily and widely; and that it converts the root zone into a commodious and sanitary living-place for the soil organisms."

Sixth. The grass may have a toxic or poisonous effect on apple trees. At the Fiftieth Annual Meeting of the Western New York Horticultural Society the speaker gave an account of a series of plot experiments which seemed to show that grass roots in some way poisoned peach trees growing. The United States Department of Agriculture has published a number of observations and experiments to show that different plants growing in the same soil may poison each other.

I am able to give also the results of a most excellent series of experiments planned and carried out on the Woburn Experimental Farm in England. These experiments were planned to show the effects of growing trees in grass, the latter to be used as a mulch. The following gives the list of the results of the experiments in question:

"As to the general effect produced by grass on young apple trees, the results of the last few years have brought forward nothing which can in any way modify our previous conclusions as to the intensely deleterious nature of this effect, and we can only repeat that no ordinary form of ill treatment—including even the cobination of bad planting, growth of weeds and total neglect—is so harmful to the trees as growing grass round them. * * * The evidence which we shall bring forward will, we believe, be sufficient to dispose of the views that the grass effect is due to the interference with either the food supply, the water supply or the air supply of the tree, and that it must in all probability be attributed to the action of some product, direct or indirect, of grass growth which exercises an actively poisonous effect on the roots of the tree." I do not put forth the statement that grass poisons the apple as one having been proved but I say that it may be so.

In conclusion, you are warned that particular cases do not warrant general conclusions. The Auchter experiment is in many respects a particular case and the apple grower must bear in mind that under other conditions, his own perhaps, the trees might have behaved very differently. The Auchter orchard was selected as being typical of Western New York conditions and the results obtained may therefore be regarded as especially applicable to this

region. But there are peculiarities of soil and location which might change them even in Western New York, and no doubt they would be more or less changed in Pennsylvania. It is a simple matter for an orchardist to plow up a part of a sodded orchard and cultivate it for a few years; or as easy for one who has a tilled orchard to lay a part of it down to grass, cutting the grass as a mulch, and in a few years he can see what happens. We want more experimenters among fruit growers and these are good experiments to try when a man becomes dissatisfied with the crops of apples he is getting.

The opportunity of giving another warning can not be lost. The sod-mulch method is heralded as the cheap-and-easy method. But some men can not stand cheap-and-easy methods. If they begin by applying it to tillage they are likely to look for a cheap-and-easy way of planting, the Stringfellow way for instance, a cheap-and-easy way of pruning and a cheap-and-easy way of spraying. Some will disembarass themselves with the necessity of taking care of their trees at all and in the end will wind up as ornery, no-account apple growers. I do not mean to say that all will but some of them will. You remember no doubt in Pilgrim's Progress how Bunyan's characters had their natural associates. Thus the young lady whose name was Dull chose as her companions, Simple, Sloth, Linger-after-Lust, Slow-pace, No-heart and Sleepy-head. Cheap-and-easy has his natural associates and they are a bad lot. Take care how you cultivate their acquaintance. Better keep them under a sod-mulch.

In chemistry, physics, astronomy and all of the exact sciences the workers constitute a jury of keen, trained men before which new doctrines can be tried. The jury is always sitting and false doctrine is quickly weeded out. Agriculture has no such jury. Its workers are scattered; many are apathetic; they differ in training and in degree of intelligence; and they speak many languages. There can, therefore, be no suitable jury to try new doctrine, and there are no recognized authorities to approve or disapprove of them. It comes about, therefore, that false and erroneous doctrines often grow unheeded and choke out the true and the useful. Agriculture needs now and ever to be defended against false doctrine. I am venturing to play the part of a defender to-day and if I have gone far in defense of tillage and in condemnation of sod-mulch it is because there is need.

COLD STORAGE A NECESSITY

By CLARK ALLIS, *Medina, N. Y., Commercial Orchardist (500 acres in apple), and President New York Fruit Growers' Association.*

The reason I have been studying lately on the storage problem is because the buyer seems to have a corner on the storage question, with us, and wants a large share of the profit. What I say may not be right or to the point, but it is as I have found it. I saw

a clipping in a paper this week in which the opportunity is so great that I am not sure but some of our fruit growers had not better go into this instead of fruit growing.

MILLIONS IN IT

A brilliant plan for getting rich is being worked out by an enthusiastic promoter. Only the chance to buy stock in it ("telegraph your order!") remains. The company is to operate a large cat ranch near Oakland, California. To start with, the promoter will collect about 1,000,000 cats. Each cat will average twelve kittens a year. The skins will run from 10 cents each for the white ones to 75 cents for the pure black. This will give 12,000,000 skins a year to sell at an average of 30 cents apiece, making a revenue of about $10,000 a day gross. A man can skin fifty cats per day for $2. It will take one hundred men to operate the ranch, and therefore the net profit will thus be $9,800 per day. The cats will feed on rats and a rat ranch will be started next door. The rats multiply four times as fast as cats. One million rats will give four rats per day for each cat. The rats will feed on the carcass of the cats from which the skins have been taken, given each rat a fourth of a cat. The business will be self-supporting and automatic. The cats will eat the rats and the rats will eat the cats, and the company will get the skins. Telegraph your order.

My county, "Little Orleans," is less than twenty by twenty-five miles in size, yet it produces more apples than any place the same size in the world, and has thousands of acres of young orchards not producing yet, "but soon." Five shipping points in western New York ship more apples than the entire states of Washington and Oregon.

Our county has seven cold or chemical storage houses with a capacity of 313,000 barrels, which did not begin to take the apples produced this year when a light crop. What will the fruit growers do with their apples when a full crop. This year many of the apples were sent out of the county to be stored, as long as storage could be obtained. When no more storage could be secured, apples were sold at a low price. Some storages that had promised to take growers' apples suddenly gave out the notice, "Storage all taken, no more room." One storage that gave out this report had an agreement with a western buyer not to raise the price of apples and they would both get apples cheap and the western buyer would store 20,000 barrels with this storage. This buyer takes annually from our town for a couple months work enough clear money to buy one of the best farms in the county. It is reported now that the storage was not filled. Many growers could get no storage, so sold out and when they finished drawing could have secured from 50 cents to 75 cents per barrel more for their apples than they sold for earlier. This was a clear loss and could have been saved if there had been storage room.

My storage bill this year is over $2,000 besides the extra cost of drawing apples to the storage and the loss of time waiting to unload when at the storage. During the busy time, an hour or more of waiting to unload is quite a frequent occurrence. Then again the loss on a crop stored in the ordinary storages from the practice of the storage men in always expecting to handle all the apples stored

with them. Besides the legitimate 40 cents storage charge, they always want to make a profit as big as possible and some years doubling their money. One time the storage men by accident froze the top three tiers of barrels over my entire block of apples. The damage was not discovered until I took an out-of-town dealer to look at the apples. The storage man said, "Well, I knew your apples were very badly covered with fungus, so I put the temperature down to keep the fungus from spreading." He stopped it. He bought the apples and when he took them out, said they were the best apples in the storage.

For some time, I have had an idea of a farmers' storage, but at the present time all the farmers, who were interested and ready to go in, have been bought off with promises or scared out by a misrepresentation of conditions. When I began to look up the storage proposition, I thought I knew a lot about storage, but it is like making books, "There is no end." In our section there are two kinds of chemical storages used and each advocate is sure his kind of chemical is the only one to use. The ammonia system most generally used has to be pumped at a pressure of 200 to 300 pounds to the square inch, and in case of a leak or break in the pipe has been disastrous to the workmen, and in some instances large damages have been obtained against the owners. The next chemical in popularity is carbonic acid gas CO_2, but it has the disadvantage of requiring a pressure of from 900 to 1,300 pounds per square inch. The users of each chemical tell of the dangers of the other kind and the benefits of their particular plants. With each one it requires a double set of machinery complete in every way to guard against a breakdown and heavy losses; for the storage company is liable for the loss by ever cooling or loss from lack of cooling, if you can make out a case, but they will always put up the cry of, "poor stuff" and try to prove that the reason why the fruit did not keep was entirely owing to poor quality.

The ammonia storage men claim for their system, that if any escapes by a leak or break, the odor is detected instantly and the defect attended to at once. They also claim a cheaper method than gas to start in with and should a gas system break or leak, there is no way to discover it as the gas is nearly or quite odorless.

Carbonic acid gas users claim there is less danger to workmen from the gas than from ammonia, and the gas, what little does escape acts as a preservative and keeps fruit much better than the ammonia system.

One of the large storages of 80,000 barrels capacity uses carbonic acid gas. This storage is a stock company and the company does nothing but straight storage business, never buying fruit. Their stock has averaged net 20 per cent. profits, besides a surplus since it was built, for a period of twelve years. One of the houses using ammonia have paid big dividends since they started, seven or eight years ago, and a retiring partner this year received 200 per cent. for his stock.

The third system of chemical storage for fruit that it adapted to the north, is what is known as the "Gravity Brine System." Mr. G. Harold Powell, formerly with the U. S. Department of Agriculture but now with the Citrus Union of California at a salary for the first year of $10,000, says where natural ice can be secured

cheaply, the "Gravity Brine System" is the best and by far the cheapest. Mr. Powell has spent much time studying and investigating cold storage problems for the U. S. Department and is one of the best informed men on that line in the country. Madison Cooper, of Calcium, N. Y., has erected nearly 150 storages of this kind in the United States and Canada. Canada is more kind to her fruit growers than Uncle Sam, and where storage buildings are needed pays 30 per cent. of the cost of new storages.

The "Gravity Brine System" is a chemical cold storage the same as the other two, but uses ice and salt with calcium carbide. Usually at the side of a brine storage house, is erected a room for ice well insulated, where ice is kept for use in the storage. No sawdust or other covering is used to keep the ice, depending entirely on the insulation. When operating the storage, ice is run through the ice breaker to an elevator which carries the broken ice to the tanks in the top of the building where it is mixed with salt. This mixture goes into the tanks which have pipes filled with calcium carbide and water. These pipes go through all the storage rooms thus cooling them to the required temperature. There is a complete system of ventilation for all the rooms drawing out the bad air, which contains carbonic acid gas that is thrown off by the fruit and replacing with fresh air. Pears going into storage hot in the summer weather throw off more carbonic acid gas than do the apples, which are put in in cooler weather, and replacing with fresh air. These fans are run on frosty nights in the fall and when cold weather comes can be used at any time, thus saving the cost of ice in operating and giving fresh air to the fruit.

M. Hartwell, who ran three cold storages at one time but who is now managing the 80,000 barrel ammonia plant at Brighton, N. Y., came to the conclusion that the old way of storing fruit with no ventilation was bad on the fruit, so at a big expense has put in a complete line of fans, piping, etc., that will change all the air in the rooms in a short time. Carbonic acid gas in any quantity through the lungs is a narcotic poison, while taken through the stomach does not act as a poison, but is refreshing. Mr. Coper and Mr. Hartwell both claim and seem to be able to prove that carbonic acid gas is detrimental to fruit and should be removed. This idea has not been absolutely settled, but in visiting the different houses, one cannot help but notice better air and freedom from fruit and other odors in rooms where fan circulation is used than in rooms where the same air is kept through the entire seasoon and from year to year. The air is damp and heavy with no life in it. One feels depressed in the room not ventilated besides the unpleasant odor from the damp barrels. Some kinds of wood give off a disagreeable odor and when barrels are made from these kinds of wood, the odor from them for the entire season is almost sickening.

The ammonia and carbonic acid gas systems of storage call for houses of 40,000 or more barrels capacity to keep the cost of operating down to a paying basis. Two complete duplicate systems of machinery must be always ready in case one should break down and two competent skilled engineers must always be on hand, one for day and one for the night shift, and in the Brighton, N. Y., storage three engineers working on an eight-hour shift at $25.00 each per

week, and these must be kept the year round for they cannot be picked up when wanted. They also employ two firemen. This makes the operating of storage plants very expensive where machinery is used. The cost, at the present time, of an up-to-date storage house is about $2.00 per barrel for the plants requiring duplicate machinery and about $1.50 per barrel for the "Gravity Brine" houses, thus giving the brine operated houses the advantage in building as well as in operating. Electric power, where a cheap rate can be secured, is the cheapest power, but the new internal combustion engine like the Deisel & Busch using crude petroleum is worth investigating as petroleum is a very cheap material to produce power. The ice and brine plant requires no high priced or expensive machinery in duplicate, but with its systems of fan circulation the outside cold air can be utilized, thus insuring good air and saving ice. The size of the plant does not enter into the problem as with the two first propositions, but natural ice at a low cost seems to the one necessary item. With the brine system, if one owns it himself, he can sell his fruit at any time and stop storage and insurance charges. If your apples were in some commercial storage, the fixed charges for the season must be paid, no matter when the fruit is disposed of.

I have been working on the storage deal this fall and have decided on a 10,000 barrel gravity brine plant for our own use. Will put the apples in barrels, heading them without pressing, putting them into storage as soon as picked without sorting. If help is scarce, sorting the fruit on rainy days or between kinds, or after the crop is entirely picked. If help is plenty will keep a sorting gang at the storage drawing all the apples there to sort. Should we leave our apples to sort until picking is done, it would benefit the evaporator man by allowing him to evaporate the drops before they decayed and holding the picked culls to the last.

We will have our storage house on our farm between the steam and trolley tracks, with siding from both. Will also have a large evaporator on same siding, thus insuring short hauls for picked and dropped apples.

Storage is absolutely necessary and notwithstanding so much rot published for the last few years in city papers about storages making living more expensive, it tends to equalize the cost of living. Without storage it would either be a feast or a famine, a glut in the market and produce of all kinds selling below cost of production and then a market bare of the same things that had been wasted for the lack of storage facilities. Cold storage is an infant, but a few years old, but he is growing. Mr. Case, of Sodus, one of the best growers in the state said that he lost a lot of apples this year at the last end, the apples just got ripe and dropped off. If he had had a storage to have drawn his unsorted apples, he could have saved his entire crop, sorting them after the apples were all picked.

BUSINESS METHODS IN MARKETING APPLES

By W. J. LEWIS, *Pittston, Commercial Orchardist, and President of the Fruit Growers' Association of Luzerne County, Pa.*

We, up in Luzerne, have for sometime recognized the fact that in the Adams county association you had one of the strongest societies in the East. One that was doing more for itself and its members, and one that had been and still is, an important factor in the development of the fruit industry in this section. For that reason I have looked forward with pleasure to the time when I could meet with you. That anticipation of pleasure is now more than fulfilled. I have assurance also that my being here at this time will be a pleasure to you. Lest you might take that feeling for one of conceit I will explain why I have it.

A few weeks ago at our Luzerne county meeting your Mr. C. J. Tyson was with us and gave us two very interesting and instructive addresses. While there he asked me to come to this meeting and address you on the subject which has been assigned to me. I tried to be excused with the plea that I had been so busy the last 15 years trying to learn how to grow and market fruit that I hadn't had time to learn how to tell about it in public, but he said "Oh, they are a good natured bunch down in Adams county and will put up with most anything." So I have risked your everlasting displeasure and will do the best I can.

When I get up to talk in public I am reminded of a story I read a few weeks ago. A young man was to address his first audience. After he had been duly introduced he forgot everything he had intended to say. His mind was entirely a blank. The only thing he could think of at all was a little story he had read in a paper a few days before, so he had to give them that. He said, "Friends great oratory is almost a thing of the past. The kind of oratory that sways men's minds and influences their whole life is almost gone. Caesar is dead, Abraham Lincoln is dead and I am not feeling very well myself."

I am just a little reluctant to bring up this subject in the presence of you people who have had considerable experience in the growing and marketing of fruit, many of you being much older and having had more experience than I have had, but we have all had different experiences and these things appeal to us in different ways. For this reason I shall hope to call your attention to a few things in marketing as I have seen them, with the hope that it may be of some little value to you. While my subject is the marketing of fruit, what I shall say along this line will apply equally as well to any or all other farm crops.

The advances that have been made along horticultural lines the past few years are simply wonderful. We naturally expect any new industry just starting up to make marked progress, but in

horticulture we have one of the oldest industries known, as we presume that ever since the apple was in the Garden of Eden more or less fruit has been produced. And now after these thousands of years to start up and make such progress is nothing less than marvelous. The sources from which we may learn how to grow crops are many. We have our United States Department of Agriculture, our several state departments, our agricultural schools, Farmers' Institutes, books, papers and last but not least these associations, but unfortunately, while these tell us how to grow crops, they don't give us much instruction on the marketing of them. Now, that seems to me one of the most important things we have to consider; it is the end of the business from which we get the price to buy the necessities, comforts or luxuries of life as the case may be.

Notwithstanding the wonderful progress that we have made along the line of crop production, we must admit that other industries have better systems of marketing their product than we have. And yet I do not recall the first practice followed in marketing other products that would not apply equally as well to ours.

I do not know of any better way that I can call your attention to a few things I wish to at this time than by a short study of the methods of those engaged in other lines and comparing their ways with ours. Just for the purpose of comparison I am going to try and call your attention to some of the ways and workings of the International Harvester Company. As you all know they are a large corporation with many factories turning out many different implements, and yet they make but one thing in each factory. This might suggest to use the advisability of being a specialist. I think the day of the specialist if not already here is coming very fast. Many arguments might be brought in support of this, but the one having to do with my subject is this: If we are growing but one crop we can produce that in sufficient quantity so that our influence is felt in any market that we care to enter, and to the extent we can make our influence felt, just to that extent can we control prices. This fact might dictate to us as to what market we should go. A market in proportion to the size of our supply.

Another point to which I wish to call your attention is the matter of cost. We, in order to market intelligently must know the exact cost of any product we put upon the market. From what I have seen since I have been in your county I believe you have a better development along horticultural lines than we have in Luzerne, yet if I should ask you how many of you knew the exact cost of any product you ever put upon the market I doubt if one of you could tell me. I hope for your sake that I am wrong about this. It is a principle as old as the hills that in order to trade (and that is what marketing is) intelligently you must know the value of what you are trading in. This matter of cost may look like a big job to you and I will admit that it does require some study and thought to work out a system to properly work out the cost of our different crops, but when you have such system once started it only requires a few minutes each day to keep it in shape. Bear in mind that the International Harvester Company have their own ore-mines and forests from which they take their raw material and their business requires a much more complicated system to know the cost of their product and yet they have it because it is absolutely necessary

that they should. I believe it is very possible for us to make a nice little profit on four or five acres of some crop and loose it on a pair of pigs or a dozen chickens or vice versa just because we don't know the cost.

Another thing this company does: At some certain time of the year they take a complete inventory, so that they can tell to the cent whether their operations for the year have been at a profit or loss. What would it be worth to us now as fruit growers if we had done this every year and should do this again on the first day of next January and then set down and figure out just what we had made or lost during the year that is past and then take our cost account and tell just what crops we grew at a profit and which ones at a loss. What a guide to us in our future work.

Another thing they do very extensively is advertising. It was said a year or two ago, in the sale of automobiles for instance, on a $2,000 machine, that absolutely $1,000 of that was spent for advertising and placing the machine on the market. Now I am not saying that it would pay fruit growers to spend so large an amount proportionately as this, but there are many little and cheap ways that we can use to call the attention of the public to the value of the apple as a food. Just last week in conversation with a western apple man he told me that it didn't make any difference where you went or for what purpose in Spokane you heard the apple talked about. Those western fellows are just filled up with it and we can see the result of that kind of advertising in our eastern markets. I heard another good authority say that if fruit growers would advertise and educate as extensively as the breakfast-food people did that there wasn't enough apples grown in the United States to supply the population of Pennsylvania. Bear in mind that their product has no value as a food in comparison with ours.

Another thing it doesn't make any difference whether a mowing machine is sold at home, in South America, Africa or Australia, the identity of the manufacturer and the place of manufacture is never lost sight of. The only place that this doesn't count in is the junk heap where the price has fallen from about $45.00 to $2.00. Friends, there is entirely too much of our product sold as junk. If you are turning out a product that you are ashamed of, let it go as junk, but if what you have for sale is as good as the average stamp your reputation on to it, show the consumer that you are not ashamed of it and you will be surprised what a lot of confidence you can inspire in him and what a price he will pay for it.

As illustrating that and another thought in advertising, we sell a good many of our apples in our local market, and two years ago we thought of putting a shipping tag on each of our baskets. It was not addressed, simply put on the basket. The merchant asked what we put those on for, and we said we wanted the basket back. He said he would keep the baskets for us, but some other fellow might find out where he was getting the apples and compete with him. I told him if I found our baskets sitting out without our tag on them we would quit him. That is advertising and identity.

Another thing that the International Harvester Company does when they have a machine ready to go out they never go out to a fence corner and pick up some old piece of wood to make a case

for it. If you wanted to buy that machine and it had an old case on it you would think it was an old machine. They use a nice, new, bright case. It pays them to do it.

I do not know how you people here market your fruit altogether, but in our county I have seen apples as good as the average of these exhibited going to market in boxes that hens had roosted in, in old weather-beaten boxes, and I have seen them in a dog-coop. I do not believe you do any of these things or I would not dare say so much. But to get back to the marketing end of it, we must put up our fruit in a package that is going to add to, rather than detract from its appearance.

Another thing that they do, they rake this country over with a fine-tooth comb, as it were, to get the very best man they can for a salesman. What constitutes a good salesman? In the first place, he should be good-looking; any of us can fill that. He ought to be reasonably well dressed; any of us can fill that. He must be a man of fairly even temperament. It does not make any difference what appears, he must not get angry. In other words, he must always be able to turn the bright side of the deal out for the inspection of the public.

For illustration I want to tell you of an incident. A farmer went into a grocery store to sell potatoes. He wanted 80 cents a bushel for them. The groceryman came out and shook hands with him and asked him how things were going out on the farm, and whether he had pretty good crops, and by that time they had reached the office.

The farmer sat down and poured a tale of woe into that man's ear that would have made even Job turn green with envy. The groceryman had troubles enough of his own. The groceryman despised him because he saw that that man despised his business. He did not care to do business with him. He said "I will give you 70 cents for your potatoes." The man would not take it.

The next day another man came in and shook hands with the groceryman, and by that time the groceryman had somewhat recovered from the host of the day before, and he asked him the same questions and treated him the same way. They had not been in the office fifteen minutes before the groceryman was ready to turn his business over to that farmer. This farmer had been prosperous the whole year. The fact was that the first man had been the most prosperous of the two but he did not know how to advertise. He sold all the potatoes for 85 cents. Never let the other fellow see how dark your side is; keep good natured and you can sell.

A salesman must have confidence in himself and faith in his product. That implies a whole lot. In the first place, to have confidence in himself he can make his way anywhere and go anywhere. If he thinks he is going to make a sale and get a good price, he is going to do it.

Now in conclusion, there are quite a good many little tricks in marketing that I might call your attention to. I mean there are little ways of keeping your customers good natured. I do not mean dishonestly. To sum up what I have said, we ought to get more actual business into our marketing. We have got the best business on earth. It is worth a good deal more consideration and attention than we give it. In proof of the fact hat we have the best

business on earth, I would challenge any one of you to name any other business that you are acquainted with that would stand the lack of attention that we give ours, and see if you can think of any business that would stand the methods we use. It may be that you people down here are very much more advanced along these lines than we are.

There has been quite a considerable controversy the last year or two in regard to the per cent. of the consumer's dollar that the fruit grower gets, and the "Rural New Yorker" has it figured down that we get only 35 cents, or less, of the consumer's dollar. I wonder how it would work if we would say that the consumer is paying $3.00 for one dollar's worth of goods. If the consumer was not responsible, it would be up to the growers to make the change. We have got a whole lot the best end of the string, it seems to me. I do feel sorry for the large bulk of consumers. If the conditions are as we see them, the next move is up to them, and any move that is made to remedy that condition must come from the consumer. That is about all I have to say on this subject, and I thank you.

THE EASTERN FRUIT GROWERS' ASSOCIATION, ITS PLANS AND PROSPECTS

By N. T. FRAME, *Secretary, Martinsburg, W. Va.*

Down in Berkeley county, West Virginia, we are accustomed ordinarily to say that there are two leading County Horticultural Societies in this part of the country; first the Berkeley County Horticultural Society and second the Adams County Horticultural Society. I shall go home from here and tell my people that we must immediately call a special meeting and start a fund to put up a building. I see that we are second to you in Adams county which we cannot afford to be. We are going to have a building.

Personally, I have for a long time wanted to get to Adams county. Now that I am here I assure you that I am very much gratified to see the audience that is here to discuss the subject of marketing. If there were no other impression or information that I could carry away from this meeting I should feel that I had been well repaid for coming over here simply to hear Mr. Lewis' practical talk on marketing problems. He told us a whole lot of things that will do us all good, and I particularly agree with him in commercial fruit growing even in Adams county and Berkeley county, we ought to have ripe, well developed apples to put on the market in the fall, whereas, at the present time, we are then putting on the markets cull apples that are not fit to eat. When you or I pick up a basket of grapes from a fruit stand and take them home they look fairly good, but when we taste of them find them green, we do not buy

any more grapes for some time. Now, the man or woman in New York, or Savannah or New Orleans who attempts eating York Imperial apples in the fall, does not buy any more apples until he or she is forced to do it. We want to have a ripe apple on the market in the fall season even if we sell that apple at cost. We shall be educating the people to use our later apples when they do become ripe.

But this has nothing definite to do with the Eastern Fruit Growers' Association. Two years ago a number of fruit growers from our section went to Washington and appeared before the Committee of Agriculture to further the passage by Congress of a bill giving the Secretary of Agriculture authority to quarantine against infested nursery seedlings. There seemed to be inadequate methods of detecting the imported brown-tail moths. We felt, in our section, that if a nest of brown-tail moth should get scattered we could not afford to spray against it.

When, however, we reached Washington, we found only a handful of fruit growers from two or three sections. We put up an argument before the Agricultural Committee which was admittedly strong, but we could claim before that Committee to represent only a handful from the fruit growing industry. We learned that a number of your people, I think several of you gentlemen from Adams county, had been down to Washington furthering the passage of the so-called Lafean Bill, standardizing packages. We were in favor of the Lafean bill. Your people went down to push the Lafean bill, we to push the Simmon bill. If we had all been there backing both bills, we might have got favorable reports. It, therefore, seemed advisable that some form of interstate organization be effected, and last year at the Hotel Raleigh, Washington, the Eastern Fruit Growers' Association was organized. Many of you have copies of the constitution with the minutes of that meeting last year. In concise terms, the idea of the Eastern Fruit Growers' Association is, that the organization is a legitimate lobby in the interest of fruit growing in Virginia, West Virginia, Maryland, Pennsylvania, Delaware and District of Columbia, and to further legislation which will help our fruit growers.

If any matters come up before the Agricultural Committee, the officers of the Eastern Fruit Growers' Association are expected to be advised of that fact and arrange for hearings at which all the fruit growers can be represented. There are certain interstate problems which affect this whole territory that neither your state society nor the Maryland State society, nor the Virginia State society, can alone successfully solve.

The second annual meeting has just been held this week in Washington, and in this connection I would like to beg the pardon of the Adams county society. When we arranged for the Washington meeting I told Mr. Lupton I thought there would be no conflicting dates this week. It was unfortunate that we should have picked out a date that made it impossible for any of our people to be in attendance.

At the meeting at Hotel Raleigh on Tuesday and Wednesday of this week, the matters discussed were as follows: It was decided that in the following line of work laid down we might more profitably confine the membership to the five states, Virginia, West Vir-

ginia, Maryland, Pennsylvania and Delaware, taking in, of course, any people from the District of Columbia. We did not feel that we necessarily would be antagonistic to New York or to Georgia and states farther south, although matters might come up where there would be a conflict of interest; but we felt that we could accomplish more by limiting the membership to these states. You will notice by the constitution, that the Eastern Fruit Growers' Association is open to membership to commercial fruit growers or men and women engaged in a scientific research work relating thereto in the five states mentioned. The membership fee is $1.00; for societies, $5.00. It is to be hoped that Adams county will join as a society and a number of you as individuals.

What shall the standard package law be? You people are backing a proposed Lafean Bill standardizing a 28½ inch barrel stave. We were fighting for just such a barrel. In Virginia the state law makes standard a barrel one inch shorter with a 27½ inch stave. If any effective legislation on standard packages is to be passed by Congress, the fruit growers who are vitally affected must go before Congress united and demand the same standard. If you people from Pennsylvania, and we from West Virginia and Maryland go down before the Agricultural Committee in favor of a 28½ inch barrel, but the strong Virginia Society sends a big delegation up there claiming that such a standard is unjust, and there should be a 27½ inch barrel, it is very likely that the bill will never come out of the Committee, which fact proves the necessity of an organization like the Eastern Fruit Growers' Association. The result of the discussion was that a committee of five, one from each of the five states, was appointed. This committee is expected to canvass the sentiment of their various states. I hope we can persuade the Virginia people that they are wrong. If we do persuade them then the fruit growers will go before congress united in effecting legislation along that line.

I have here a table of rates on which Hagerstown is taken as a basis for this section. On the shipments going to points like New Orleans or Jacksonville, the freight rates from all stations are just the same as the Hagerstown rates. Now the point is this: The price of apples through this whole York Imperial belt depends largely upon the lowest price in any one section. If the dealer can buy York Imperial apples in Winchester or Martinsburg for $2.50 he will not come here and buy yours at $2.75. This York Imperial belt is well defined, and my experience is that the lowest market price, packing and other things considered, governs the territory. The rate from Rochester to Memphis is thirty-five cents per hundred, and from Hagerstown to Memphis, thirty-five cents per hundred. Your York Imperial may not go so exclusively to the southern markets as ours do. A great many of your apples, nevertheless, go south. A buyer comes in here with the idea of buying 20,000 barrels of apples. He finds, however, upon investigation that he can buy 20,000 barrels of New York apples and get them into southern markets as cheap as or cheaper than he can get ours in. Now as a matter of justice, we believe we are entitled to a differential as we are several hundred miles nearer to this market. At this meeting in Washington on Wednesday, the members pledged a fund of $2,000.00

to hire an attorney to bring this matter before the Interstate Commerce Commission. We feel that you people will be willing to cooperate and bear your share of the burden.

Prof. Symons of the Maryland Agricultural College, read a report on Simmons Bill, which will have to be reintroduced this season giving the right to quarantine against infested nursery seedlings.

Prof. Waite, together with Dr. Haywood and Prof. Quaintance, all of whom are members of the Insecticide Board, explained something of the workings of that Board and the present law regarding spray materials. The law is broad enough so that any insecticide and fungicide which bears evidence of having been adulterated can be confiscated and the manufacturer prosecuted. But the evidence must be collected by the regular agent of the department. If any of you gentlemen suspicion that you have adulterated spray materials write to the Department at Washington telling why you think they are adulterated, and give the name of the brand and name of the manufacturer, which will give the Department a suggestion, and may be one of their inspectors will pick up samples of that particular brand in some other sections and if they are found to be adulterated the Department will have evidence on which to prosecute.

The Eastern Fruit Growers' Association felt that apple crop reports should be in terms of barrels rather than in percentages. No one seemed to know what would be a 100 per cent. crop. It is an abstract proposition. Our growers on the other hand are accustomed to estimate in terms of barrels when they place their order for empty barrels with their coopers. We think in terms of barrels and we sell on the basis of barrels. The Eastern Fruit Growers' Association, therefore, resolved unanimously to request the Department of Agriculture to work out a more satisfactory method of fruit crop reporting. A suggestion was made that just as the department at one time detailed Prof. Scott to work out the problem of spraying peaches with self boiled lime-sulphur and then send him to fruit growers meetings over the country to teach the growers the result of his experiences so now we would like to have a man detailed from the Bureau of Statistics to study with the owners and shippers and market men the subject of apple crop reporting and to formulate definite blanks and methods. If this specialist could then be sent to the horticultural society meetings so as to educate the growers in attendance upon a uniform method of reporting from all the different sections there would be in the course of a few years many thousands of trained crop reporters using the same standard. This we believe would be a great benefit to the growers.

STYLES IN FRUIT

In a recent issue of "Farm and Fireside" edited by our fellow orchardist, Mr. Herbert Quick, of Morgan county, West Virginia, appeared column after column of advertising matter addressed to the farmers and the farmers' wives to convince them of the necessity of dressing in an up-to-date style, filling their homes and barns with up-to-date equipment and going to town in an up-to-date automobile.

Mr. Quick's paper, as I understand, carries twice each month to some half million homes this appeal to country people to send

their money to the cities—to the so-called trade and manufacturing centers. Yet large as is the amount of such advertising carried by "Farm and Fireside" it is but a drop in the bucket compared to the whole volume of carefully prepared advertising matter going into the homes of the producers in this country with the purpose and intention of educating them up to the point of being up-to-date, of keeping in style.

This oft repeated and long continued appeal has produced a marked effect in the industrial life of this country. Countless cities profiting in the hundreds of channels of trade opened up by the advertising campaigns of the last twenty-five years have doubled and tripled in population; while the country districts offering only a passive resistance to their exploitation by the cities have in very many cases gone backward.

The cities with the aid of their advertising campaigns have been sending into country homes their patented luxuries and trade-mark necessities at fancy prices; while the country districts have blindly competed with each other in the open market to dispose of their foods, wools and cottons in bulk quantities with no thought to provide "styles" in raw materials and eatables so as to bring back from the cities at fancy prices some of the money sent there for the stylish but high-priced city products which the country people have been persuaded to believe form a necessary part of their every-day living.

As any man knows, who feels it necessary to buy a new derby hat this year, because his old one, perfectly good yet, is this year out of style, the styles in men's hats are controlled not by the consumers, but by the hat trade, from manufacturer to retailer, whose businesses would all be much restricted if the wearers were allowed to use their old hats until worn sufficiently to demand new ones.

Every woman who studies this year's fashion-plates and finds that she can hardly re-trim her old hat because of change in shapes, realizes that not she but the milliners control the styles in hats. They may like to make it appear that a demand for the change comes from the ultimate consumer but as yet 99 per cent. of the ultimate consumers do not know what the change will be until they see the "Ladies' Home Journal" or the "Woman's Home Companion" such a pretext is nonsense. The millinery trade controls the wires that re-create the fashions.

And so it is all down the line of city-made goods. If the country communities are to turn the trade balances back to a position favorable to them they must fight the advertisers with their own fire. A few country districts have already learned this. Hood River apples for instance sells at 25 cents apiece, not because of their superior quality but because of the organized advertising that has educated a certain class of consumers to demand such apples at any price. Such advertising has been supplemented with proper growing and packing and all the other details of successful marketing but exactly the same fruit without the advertising would never have made land worth several thousand dollars an acre in Hood River. Hood River has turned the trade balances in its favor because it has made it stylish to eat Hood River apples.

Why should'nt the fruit growers of West Virginia, Virginia, Maryland and Pennsylvania unite on an advertising campaign and make it stylish to have Grimes Golden apples at all times in the fruit dish and York Imperial apple pie with which to finish every meal?

The conditions in the apple trade appear to the writer very favorable for the taking up at this time such a campaign. Growers are gradually learning that they place themselves in a very weak position when they sit around and wait for the cash buyers to come to them to get their apples. With the apples ready to pick, no storage facilities provided and no means of getting in touch with consuming markets many growers this last year were forced at the last minute to take whatever they could get irrespective of what the market warranted.

Others growers, and wiser ones in my judgment, turned over to expert selling agencies the inspection and marketing of their crops on five year contracts. Such a contract enables them to concentrate their energy upon the successful production of their apples knowing that they will get for them the best that the market affords, and at the same time enables the commission man to begin a year ahead to help create the market for next year's crop knowing that he, and not someone else, will have that crop to handle.

The further development of this idea until the bulk of the apples of these four states would be put into the markets through well established and strong selling agencies would produce the machinery through which I believe we could control very largely the styles in apples as the hat trade does in men's derbies.

From correspondence and conversation with growers and commission men I am convinced that a considerable number of both would be mutually glad to enter into long term contracts if the matter were presented to them in such a way and under such auspices as to have their confidence. I suggest, therefore, that at the meetings held this winter of the state horticultural societies of West Virginia, Virginia, Maryland and Pennsylvania that committees already existing or new committees if necessary be instructed to confer with similar committees of the other three state societies to adopt a recommended form of selling contract between growers and selling agencies, to provide for securing funds for advertising appropriation and advertising agency to be recognized as an official agency of the four state societies to carry out such an advertising plan.

As details for consideration by these committees I suggest: First, that the form of contract recommended be for not less than five years duration; that it provide for high standards of pack and thorough supervision; that it require of the selling agency strict accountability but that it give him very free hand in meeting the market conditions and that it provide that 2 per cent. of the gross sales under such contract, one per cent. to come out of the grower and one per cent. out of the selling agency, be turned over to the officially designated advertising agency to finance an advertising campaign to make our apples stylish in the city markets.

To the advertising agency that may be selected this suggestion is offered: Already the York Imperial apple is favorably known in many southern markets, where the house-wives have learned to call for the big red lop-sided apple. This style in apple should be encouraged. If all of the house-wives can be persuaded to do the

same thing and taught also to send back other apples if the corner grocer is so unwise as to send a substitute around to her, the retailers and the wholesalers will eventually be forced to stock with York Imperial apples. To get the same they must come to some orchard in our section of the country beginning with Adams county, Pa., in the North and ending practically with Augusta county, Virginia, in the South, and only a few miles wide. Outside of this limited area there may be some York Imperials grown but not many. In other words there is this unique situation in a restricted area producing for some years a commercial crop of York Imperial apples cannot exceed a few hundred thousand barrels this must all come from comparatively small territory in the Shenandoah, Cumberland and Potomac valleys. This apple is already favorably known in certain markets so located geographically as to be most available from this section. It is an apple of such peculiar shape that any house-wife, however ignorant previously she may have been of apples, can be easily taught to identify it.

Prosperous cities have grown up around manufacturing plants producing patented articles with which other plants could not compete but almost without exception one of the most important departments of such a plant putting out a specialty has been its advertising department.

Why shouldn't we in this section so organize and so advertise that we can dictate the styles in apples in certain markets particularly with reference to the York Imperial. Every apple of this variety bears its own trade-mark, which we alone are producing in commercial quantities.

If the West Virginia, Virginia, Maryland and Pennsylvania State societies will appoint committees, who can get together and organize so as to devise and work a plan along this line which should be possible for this section to get back in extra profits from our apples some of the hard-earned money that we have sent to the cities for stylish and high-priced but not net needed derbies, hats, etc.

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OF THE

PENNSYLVANIA STATE BOARD OF AGRICULTURE,

FOR THE YEAR 1912

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R. I. Young, Middletown, Dauphin County, ...Term expires 1911
Gen. James A. Beaver, Bellefonte, Centre County, ...Term expires 1913
R. H. Thomas, Jr., Mechanicsburg, Cumberland County, ...Term expires 1915

APPOINTED BY THE STATE POULTRY ASSOCIATION

J. D. Nevius, ...Philadelphia,.....1910

APPOINTED BY THE PENNSYLVANIA BRANCH OF THE AMERICAN POULTRY ASSOCIATION

W. Theo. Wittman, ...Allentown,.....1913

APPOINTED BY THE PENNSYLVANIA BEE-KEEPERS ASSOCIATION

William A. Selser, ...Philadelphia,.....1915
C. S. Swanson (Alternate), ...Philadelphia,.....1912

ELECTED BY COUNTY AGRICULTURAL SOCIETIES

			Term expires.
Adams, ...	A. I. Weidner, ...	Arendtsville, ...	1915
Allegheny, ...	A. J. Purdy, ...	Imperial, R. F. D. No. 1, ...	1915
Armstrong, ...	S. S. Blyholder, ...	Kelly Station, ...	1914
Beaver, ...	A. L. McKibben, ...	New Sheffield, ...	1914

			Term expires.
Bedford,	Wm. F. Biddle,	Everett,	1915
Berks,	H. G. McGowan,	Geiger's Mills,	1913
Blair,	W. Frank Beck,	Altoona,	1914
Bradford,	F. D. Kerrick,	Towanda,	1913
Bucks,	B. Frank Wimbold,	Sellersville,	1914
Butler,	W. H. Millaren,	Euclid,	1914
Cambria,	Jas. Westrick,	Patton, R. F. D. No. 2,	1913
Cameron,			
Carbon,			
Centre,	John A. Woodward,	Howard,	1915
Chester,	M. E. Conard,	Westgrove,	1915
Clarion,	J. H. Wilson,	Clarion,	1913
Clearfield,	Peter Gearhart,	Clearfield,	1913
Clinton,	J. A. Herr,	Millhall, R. F. D.,	1914
Columbia,	A. P. Young,	Millville,	1912
Crawford,	J. S. Patton,	Hartstown,	1914
Cumberland,			
Dauphin,	Edward S. Keiper,	Middletown,	1914
Delaware,	E. J. Durnall,	Swarthmore,	1914
Elk,	John M. Wittman,	St. Mary's,	1915
Erie,			
Fayette,			
Forest,			
Franklin,	John P. Young,	Marion,	1914
Fulton,	J. L. Patterson,	McConnellsburg,	1913
Greene,	N. M. Biddle,	Carmichaels,	1913
Huntingdon,	Geo. G. Hutchison,	Warrior's Mark,	1915
Indiana,	S. C. George,	West Lebanon,	1913
Jefferson,	Peter B. Cowan,	Brookville,	1913
Juniata,	Matthew Rodgers,	Mexico,	1915
Lackawanna,	Horace Seamans,	Factoryville,	1913
Lancaster,	J. Aldus Herr,	Lancaster,	1914
Lawrence,	Sylvester Shaffer,	New Castle,	1913
Lebanon,	H. C. Snavely,	Cleona,	1913
Lehigh,	P. S. Fenstermaker,	Allentown,	1915
Luzerne,	J. E. Hildebrant,	Dallas,	1914
Lycoming,	A. J. Kahler,	Hughesville,	1915
McKean,	O. W. Abbey,	Turtle Point,	1913
Mercer,	W. C. Black,	Mercer,	1914
Mifflin,	M. M. Naginey,	Milroy,	1913
Monroe,	F. S. Brong,	Saylorsburg,	1913
Montgomery,	John H. Schultz,	Norristown,	1914
Montour,	J. Miles Derr,	Milton, R. F. D.,	1913
Northampton,	C. S. Messinger,	Tatamy,	1915
Northumberland,	I. A. Eschbach,	Milton, R. F. D.,	1914
Perry,	A. T. Holman,	Millerstown,	1913
Philadelphia,	David Rust,	Philadelphia,	1913
Pike,	B. F. Killam,	Paupack,	1915
Potter,			
Schuylkill,	John Shoener,	New Ringgold,	1913
Snyder,			
Somerset,	John C. Weller,	Rockwood,	1914
Sullivan,	J. G. Cott,	Forksville,	1915
Susquehanna,	Frank A. Davies,	Montrose,	1913
Tioga,	Calvin H. DeWitt,	Mansfield,	1914
Union,	J. Newton Glover,	Vicksburg,	1914
Venango,			
Warren,	R. J. Weld,	Sugargrove,	1914
Washington,	D. S. Taylor,	Burgettstown,	1914
Wayne,	Warren E. Perham,	Pleasant Mount,	1914
Westmoreland,	M. P. Shoemaker,	Greensburg,	1913
Wyoming,	D. A. Knuppenburg,	Lake Carey,	1913
York,	G. F. Barnes,	Rossville,	1914

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H. C. Snavely, ... Cleona
Dr. M. E. Conard, ... Westgrove
D. S. Taylor, ... Burgettstown
W. C. Black, ... Mercer
N. B. Critchfield, Secretary, ... Harrisburg

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Joel A. Herr, ... Millhall
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Pomologist, ...Chester J. Tyson, ... Floradale
Chemist, ...Dr. Wm. Frear, ... State College
Veterinary Surgeon, ...Dr. C. J. Marshall, ... Harrisburg
Sanitation and Health, ...Dr. W. Frank Beck, ... Altoona
Microscopist and Hygienist ...Prof. J. W. Kellogg, ... Harrisburg
Entomologist, ...Prof. Franklin Menges, ... York
Ornithologist, ...Prof. H. A. Surface, ... Harrisburg
Meteorologist, ...E. R. Demain, ... Harrisburg
Mineralogist, ...Dr. Isaac A. Harvey, ... Lock Haven
Apiarist, ...H. C. Klinger, ... Liverpool
Economic Geologist, ...Baird Halberstadt, ... Pottsville
Agricultural Geologist, ...W. H. Stout, ... Pinegrove
Forests and Forestry, ...Robert S. Conklin, ... Harrisburg
Feeding Stuffs, ...G. G. Hutchison, ... Warrior's Mark

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PAPERS READ AND ADDRESSES DELIVERED AT THE THIRTY-FIFTH ANNUAL MEETING OF THE PENNSYLVANIA STATE BOARD OF AGRICULTURE, HELD AT HARRISBURG, PA., JANUARY 24 AND 25, 1912.

REPORT OF THE COMMITTEE ON CEREALS AND CEREAL CROPS

By J. MILES DERR, *Chairman.*

Agriculture is really our most important industry because it furnishes so many raw materials for our manufacturers. Flour could not be made without wheat, nor cloth without cotton, wool or other fibre. Of all our farm products, the grains or "cereals," are the most valuable. They are the seeds of certain cultivated grasses, growing in all climates, from the Equator to the Arctic Circle.

In many respects, wheat may be considered the "King of the Cereals;" while as a wealth producer, "Corn is King," with a value more than twice that of the cotton crop this year, and but little less than the combined values of the cotton, wheat and oats crops. Corn is by far the leading crop of the United States as a wealth producer.

The estimate of 2,776,000,000 bushels indicates a production that has been exceeded only in two years. The farm price of corn is now high, and this establishes a total value for the crop that reaches $1,700,000,000 and breaks the record. According to this year's report, it has been proven that a large crop may be worth less to the producer than a small one and a small crop may be worth more than a large one.

The cotton crop of this year, commonly supposed to be the largest one ever grown, has reached a price of lint that is five cents a pound below that of last year, and for the same reason the price of seed has declined. Apparently, the value of fibre and seed of this year's crop is below the value of the last two years, although above the value of the five preceding years. There is no crop that this country produces that excites such world-wide interest as cotton, for the reason that the crop of the United States is about three-fourths of the world's production.

Barley is a crop this year deficient in production. The 146,000,000 bushels are 12 per cent. below the last five year average; but the total value of the crop is about $125,000,000, and much above the record value of 1907.

In this report I desire to confine my remarks to wheat, and try to give some reasons why we should produce better crops of this important cereal in our State.

WHEAT FALLING OFF

Wheat has fallen from second to fourth in order of value, and is worth $600,000,000. The estimate of the Department places the production this year at 656,000,000 bushels, an amount that would have been much exceeded had weather conditions been more favorable and less Hessian fly. This country produced one-fifth of the world's wheat crop during the last five years, and contributed about one-eighth of the world's exports. The world's wheat crop is about 3,162,000,000 bushels, and is about two bushels apiece for the world's people.

Wheat is one of the most important grains known to man. Although wheat was not known in this hemisphere before Columbus came, our continent now produces more wheat than any of the other grand divisions of the globe. We send millions of bushels of wheat annually across the Atlantic, and, with the exception of cotton, we get more for our wheat from foreign countries than for any other crop.

In Minnesota and the Dakotas there is a region known as the Red River Valley which might be called the "Bread Basket of North America." The wheat farms there are of vast extent and are managed on a grand scale.

Kansas has for several years held the honor of being the greatest wheat-producing state in the Union. North Dakota ranks second among the wheat-producing states, and has immense farms in the valley of the Red River, in some instances, containing as many as 30,000 acres. Each of these is operated under a highly developed system, and in summer often employs from 200 to 300 men.

The soil of North Dakota is a rich alluvial loam, ranging from six inches to three feet, with a clay subsoil that retains the natural moisture. These conditions create the wonderful productivity that has given the Dakotas a world-wide fame. On the great "bonanza farms" in the eastern counties may be seen grain fields often miles in extent, and in harvest time, with the long line of reapers sweeping across a yellow set of standing grain, they present a scene that fills the mind of the on-looker with admiration.

The largest percentage of acreage in Minnesota is devoted to the cultivation of its wheat crop, and the state ranks third in the value of its wheat crop.

Across the border line from Minnesota into Canada we find about 4,000 square miles of the richest wheat land in the world. The deposits of clay and silt left by the receding Lake Agassiz, overlaid by from two to four feet of black vegetable mold, are the fertile wheat lands of Manitoba. The soil is a rich, deep loam resting on a deep clay subsoil. It is well adapted to wheat growing. In 1902, when the harvest was exceptionally good, the yield of the province averaged 26 bushels to the acre.

HARVESTING ON A GREAT WHEAT FARM

On the immense wheat farms of the Pacific Coast, the most elaborate devices have been called into play to serve the grain growers It is only these states of the Far West that there can be seen in operation the combined harvester and thresher, a miracle of modern

invention, which dragged slowly across a field, cuts the standing grain, threshes it as it moves, and drops the filled and tied sacks to be gathered up by the wagons that follow. Some of these great machines are drawn by steam engines; others by teams of twenty-five to thirty horses and mules. A single machine with four men will gather and thresh from seventeen hundred to three thousand bushels of wheat in a day.

But how are these great crops of wheat cared for after they leave the field? This is almost as great a business as raising the wheat. At some of the railroad stations and at all the large grain ports, there are large elevators, or granaries, for storing grain until it is wanted for sale. There are such granaries at New York and New Orleans, and at all the large cities upon the Great Lakes. There are many of them at Minneapolis, and a single one has storage room for more than a million bushels of grain. The elevators at Minneapolis alone can hold almost thirty million bushels at one time.

Elevators are usually built along the wharf and by the railroad siding. Some of them are built as high as a six-story house. The grain is moved to the upper part of the mill by an endless chain of little buckets of tin or zinc, there it is weighed and poured into the deep bins. When it is taken out it flows through pipes into the cars or the ships which are to carry it to the markets.

There are elevators of this kind at the ports at the head of Lake Superior, into which the grain is taken from the cars, and later poured into the steamers which are to take it down the Great Lakes to Buffalo, whence it is carried through the Erie Canal to New York, to be shipped to Europe.

Minneapolis is a magnificent city of more than a quarter of a million inhabitants. It is situated on the Mississippi, at the falls of St. Anthony. These falls furnish a water power as great as could be given by forty thousand horses pulling at once, and their situation so near our wheat lands has made Minneapolis one of the milling centers of the world. There are numbers of big flour mills here which are grinding away day and night. One single mill can grind twenty thousand barrels of flour in a day.

HOW THE GREAT LAKES BENEFIT THE FARMERS OF THE GREAT WHEAT FARMS OF THE NORTHWEST AND EQUALIZE THE PRICES OF CEREALS IN OUR COUNTRY

Duluth and Superior City, built at the western end of Lake Superior, are at the head of navigation on the Great Lakes. They have fine harbors and great docks and grain elevators are built there. Duluth is at the eastern end of the Northern Pacific Railroad, and receives immense quantities of wheat from the large farms of the valley of the Red River, which is probably the most perfect wheat farming region in the world.

Let us now listen to how the grain is taken from the great elevators and carried to the eastern and foreign markets. We may see the famous whaleback steamships which carry immense quantities of iron ore and grain, lying under the shadows of huge wheat elevators at the wharves of Duluth. They are more like enormous barrels than like steamships, and as they lie there in the water they make

us think of some sea monster or whale. They are now being filled with wheat which is poured into their holds by pipes from the elevators.

Thousands of bushels of grain will be stored in a single whaleback vessel within a few hours, and the load it will carry will be more than could be hauled by a train of two horse wagons ten miles in length. The average load of a whaleback is about 70,000 bushels of wheat.

The chain of Great Lakes forms one of the chief commercial highways of the globe. The upper portions of these lakes are frozen during the winter, and for five months they are almost as deserted as the icy seas about the North Pole. It is only during the seven warmer months that ships can navigate them; but in this time more freight is carried upon them than all that is brought into Liverpool or London in a whole year.

Were it not for these lakes our immense harvests of grain could hardly be taken to the seashore. A whaleback will steam out with its great load of 70,000 bushels of wheat to Buffalo, or it may even pass through the Welland Canal and go on down through Lake Ontario into the St., Lawrence River, and out across the Atlantic to the seaports of Europe. There is a navigable waterway from Duluth to the sea, and if the destination of our whaleback is Liverpool, it will have to travel more than half of its voyage in fresh water before it gets to the Atlantic Ocean, at the Strait of Belle Isle.

LOW FREIGHT RATES

The journey can be made so cheaply that for a few cents a bushel of wheat can be brought from the greatest wheat farms in the world, which are located in the heart of North America, to the seaboard, and for thirty cents a ton can be brought from Buffalo back to Duluth. The cost of carrying grain by water in this way is less than one-half the cost of carrying on railroads. It is this cheapness that has caused many towns and cities to spring up at the harbors along the Great Lakes, and due to these cheap freights that the price of wheat is nearly the same in Chicago as in Philadelphia and New York.

In years to come as population increases and the demand for food becomes greater, it will become necessary for the cereal farmer to pay more attention to maintaining and increasing the fertility of his soil. We have seen soils in our locality, which thirty years ago produced from 25 to 30 bushels of wheat per acre, cropped so frequently with wheat that the yield was brought down to 12 to 15 bushels per acre. The same land after changing owners, and the owner himself becoming the operator, has restored and finally increased the fertility and yield to 32 bushels per acre. What is true in this instance is true and may be in many others. We think that a greater percentage of our farms should be operated by their owners, and it appears that something must be seriously wrong or they would be.

In many states about 50 per cent. of the farms are operated by tenants. The last census report shows that nineteen counties of Pennsylvania have lost in numbers of people. Iowa, which is strictly

a cereal producing state, has less people than it had ten years ago, showing that farmers and farm laborers are leaving the farm homes and going to manufacturing cities.

Pennsylvania farms should be operated by their owners, more cattle fed upon them, less grain, hay, and straw sold from them, and as a result a very much greater yield would be secured. A large percentage of our Pennsylvania soils have not been worked more than 100 years and seem to be worn out, but they are not, simply robbed and can be restored. England and Germany have worked their soils for about 2,000 years and produce about 100 per cent. more grain than we do. Let us follow their example.

REPORT OF THE COMMITTEE ON ROADS AND ROAD LAWS

By HON. J. C. WELLER, *Chairman.*

The Legislature of 1911 passed upon more road legislation of far-reaching consequences and greater importance than any previous legislation in the history of the Commonwealth. By the act of May 31, 1911, the Highway Department of the State was reorganized, consisting at present of a Highway Commissioner, a First Deputy Highway Commissioner, a Second Deputy Highway Commissioner, a Chief Engineer and a largely increased clerical force in all of its departments.

Section 6, states the purpose of this Act, that all those existing public roads, highways, turnpikes and toll roads or any parts or portions thereof, subject to the provisions hereinafter made in the case of turnpikes and tollroads forming and being main traveled roads or routes between county-seats of the several counties of the Commonwealth and main traveled roads or routes leading to the State line, and between principal cities, boroughs and towns, shall be known marked, built, rebuilt, constructed, repaired and maintained by and at the sole expense of the Commonwealth; and shall be under the exclusive authority and jurisdiction of the State Highway Department and shall constitute a system of State highways, the same being more particularly described and defined as follows: Route No. 1, from Harrisburg to Sunbury to Danville, and thus continuing Route No. 296, from Scranton to New York State line, completing a net work of highways that will connect the county seats and principal cities and boroughs of the Commonwealth.

All of which is conditioned upon Joint Resolution No. 3, passed by the last Legislature amending the Constitution of the State as follows: "That the General Assembly may authorize the State to issue bonds to the amount of fifty million of dollars for the purpose of improving and rebuilding the highways of the Commonwealth." As a rule, farming communities are not in favor of bonding the State. Where the money derived from the sale of bonds is to be used in build-

ing a system of State highways which would mean so much to the rural Commonwealth, there should be little opposition to such a plan. When the amendment is submitted to the popular vote, as it will be required after favorable action by the next Legislature, there should be no hesitancy in its adoption by a large majority of the voters of the Commonwealth. Of the provisions of the Act the one likely to meet with most serious criticism is Section 8. "Whenever in the construction, reconstruction, maintenance, and repair of any of the State highways it shall appear to the Commissioner that any part or portion of a State highway as now defined and described in this Act, is dangerous or inconvenient to the traveling public in its present location either by reason of grades, dangerous turns, or other local conditions, or that the expense to the Commonwealth in the construction, building, rebuilding, maintenance and repair thereof would be too great or unreasonable, and could be materially reduced or lessened by a divergence from the road or route, the Commissioner is hereby empowered to divert the course or direction of same and he may diverge from the line or route of same as herein described in such direction or directions as in his discretion may seem best in order to correct said danger or inconvenience or lessen the cost to the Commonwealth: Provided, that the said Commissioner shall first submit a plan of the proposed change to the Governor and the same shall be approved by him."

I fear when the day arrives when actual work begins in constructing these highways as designated by the route number, many will contain dangerous turns, too steep grades or the expense to the State in their construction will be too great, particularly to the person living some distance from the described route who, by raising a kick, would hope to have it pass by his farm or door.

This act carries with it an appropriation of three million dollars for the two years for constructing and repairing State highways, also one million dollars for building or reconstructing State aid highways, the State paying only 50 per cent. of the cost of construction and 50 per cent. of cost of repairing State aid highways. Should the provisions of this act be fully realized and the golden period dawn of this network of roads constructed extending over the State connecting the county seats and principal cities of the Commonwealth, with all the State aid highways the total number of miles would not exceed ten thousand miles or about 10 per cent. of the public roads in the State. What of the remaining 90 per cent. of public roads? Surely the local communities will have something to do in the way of road construction for many, many years to come.

Another Act passed by the Legislature of 1911 is known as the "dirt road act," which provides that each township shall receive annually from the State fifty per centum of the total amount of road tax collected by such township, as shown by the sworn statement of the board of township supervisors, contained in the annual report furnished to the State Highway Commissioner on or before the first day of January in each year as hereinafter provided for: Provided, that no township shall receive in any one year, more than twenty dollars for each mile of township road in said township; the sum of one million dollars or so much thereof as may be neces-

sary is hereby appropriated to carry out the provisions of this act, for the two fiscal years, beginning the first day of June, A. D., 1911. This amount was reduced by the Governor to one-half million dollars, because of insufficient State revenue. This Act, to my mind, is misleading, for the reason that it would require a much larger appropriation than one million dollars to pay the fifty per centum. In my estimation, a sum equal to the amount annually appropriated to the public schools would be more nearly the amount required. Judging from my home school district the State appropriation to schools never reaches fifty per centum of the taxes raised by the school district, and the road tax rate is never less than the school rate. No township shall receive in any one year more than twenty dollars for each mile of township road in said township. From this we infer that $60.00 per mile is the average maximum amount to be applied or expended annually on roads. How far would sixty dollars go in permanently improving one mile of road? An average expenditure of sixty dollars per mile on all of the public roads in the State in the aggregate would amount to almost six million dollars annually and in ten years to sixty millions and no roads worthy of the name.

The good roads problem is surely a perplexing proposition. You cannot solve it without the expenditure of large sums of money; and possibly the recommendation of Governor Pennypacker that the natural resources of the State, coal and oil, be taxed to raise a fund for road making has the true ring, for we have numerous instances where persons have amassed great wealth from the development of these natural agencies and are donating of their means, large sums of money to objects wholly without the limits of the State. Had a portion of this money been expended in constructing good roads, it would have proved a lasting blessing and benefit to many of the citizens of the Commonwealth.

REPORT OF THE COMMITTEE ON FRUIT AND FRUIT CULTURE

By J. P. YOUNG, *Chairman*

As Chairman of your Committee on Fruit and Fruit Culture, I beg leave to report as follows:

The growing of fruit in our State has been successful as well as profitable in the past and should continue, as commercial men have found that intelligently grown Pennsylvania fruit always receives the preference of the buyers.

This is the era of the boom in fruit culture. Our State is passing through such a boom in fruit culture as never has been experienced, probably anywhere in any branch of agriculture. In this boom condition of the apple industry, there is the usual exaggeration and misrepresentation.

The many apple growing stories now going the rounds of the newspapers, showing how "John Smith grew so many barrels of apples per acre and had he sold them for so much, he would have made a fortune," make good reading for our city cousins who look enviously back at the farm, forgetting that it often includes getting up at 4 A. M. It makes very good copy for the young reporter who gets paid by the inch, but it cannot help in the end to do anything but injury to the apple industry. After reading these stories, the city consumer, on whom we must in the end depend, believes that all the producer does is to plant a few trees on some worthless piece of ground, and after a little, pick a fine lot of big red apples and send them down. He growls at the grower when he pays for the fruit, forgetting that the latter gets less than half of the money.

PLANTING

A very great increase in planting has taken place. Without figures, it is safe to estimate that the number of trees has doubled during the last three years. We are not the only state showing such increase. It is true all over the country from the Atlantic to the Pacific. This great increase of planting has been largely in apples everywhere, although there has also been an extraordinary increase in the planting of peach and other fruits. However, it is clear that the apple will remain as always, "King of Fruits." In our neighboring states of Virginia and West Virginia, this immense rate of increase is even greater than here in Pennsylvania, while in New York and New England it is probably almost as great.

Through the kindness of Prof. J. P. Stewart, I am able to give his experience in orchard work, and he is regarded as one of the men who has left nothing undone to obtain the best results.

(1). His experience has shown that in some orchards, lack of plant food is the crop limiter. In such cases the gains from certain fertilization have run from 4-17 times the amount of fruit produced on the checks, and net profits have ranged from $120 to $420 per acre. Tillage and cover crops have not been the equivalent of fertilization in such orchards.

(2). That in general, the common advice to apply phosphates and potash for apples is incorrect, in the absence of nitrogen such applications, as a rule, have not paid. In its presence, however, moderate amounts of these minerals are often profitable.

Neither phosphates nor potash have had any material influence on color or size, their influence has been favorable, especially potash.

(3). Nitrogen has had greater influence in increasing yield than any other element. It also has materially decreased color. This is due primarily to delay in maturity, and may be overcome by later picking which is advantageous with such varieties as the Baldwin. The delay on it in one locality the past season was three weeks.

(4). Contrary to a prevalent notion, growth and fruiting are not antagonistic, unless either occurs in abnormal amounts. Our best growing plots, as a rule, have been our best fruiting plots.

(5). Manure has usually proved profitable, doubtless essentially because of its nitrogen contents. Whenever it has been beneficial, however, its net profits have been approached or surpassed by certain combinations of artificial fertilizers.

(6). In a few orchards, however, no form of fertilization has as yet produced material response. This we consider due to the presence of other limiters of which improper moisture supply is frequently important.

(7). The existence of such orchards emphasizes the need of local tests before making large and regular expenditures for fertilizers.

(8). In the long run, any orchard that is actively producing and growing is likely to require fertilization, since the total plant food draft of such an orchard is quite heavy, more per acre for every constituent than is required by a 25-bushel crop of wheat.

(9). Where plant food is needed, a good fertilizer is one carrying about thirty pounds actual nitrogen, fifty pounds actual phosphoric acid, and twenty-five pounds potash per acre. The nitrogen may be obtained in cover crops.

(10). Injury from fertilizer has appeared in a few cases, especially in young orchards and in connection with strong applications of muriate of potash on thin soils.

(11). Some definite correlation has appeared between certain fertilization and fire blight, the latter being worst on the manure plots and in those making strongest growth. Fruit spots also has been much worse on the manure plots in certain cases.

(12). With the four principal cultural methods tillage, tillage and cover crops, sod mulch and sod without fertilization. The second method has been best for yield and growth in a mature orchard. With fertilization, the mulch method has excelled in both matured and young orchards, and also without fertilization in the latter, sod has given the highest color in all cases.

(13). Color is essentially dependent on maturity and sunlight, conditions increasing one or both of these factors, such as late picking, light soils, open pruning and sod culture increase color. Opposite conditions decrease it. Iron application to the soil have not been shown to improve color.

SIZE OF CROP

Owing to a very favorable season in part and in part to new orchards coming into bearing, this year's apple crop was probably the largest in the history of the State. The yield of peaches and other fruits, while not a record breaker, was about the average and fair prices were received.

PRICE OF APPLES

In contrast to the fair and satisfactory prices received by the grower for his peaches, was the exceedingly low prices offered for apples. Only fruit of exceptional quality commanded a price that would justify the grower in handling it, and undesirable varieties and other than best grade fruit in many sections hardly paid the cost of harvesting.

MARKETING

One noticeable feature in the marketing of this crop, was the absence of competition among the buyers. In many districts the price offered by different buyers was practically uniform, in most cases too

low to be profitable to the grower. The grower had little choice, he could either sell to the buyer at the offer made or keep his fruit. Local markets were full. Unless put into storage, the fruit would rot, but when the grower applied for storage at many plants he usually found the space already engaged. Thus, little was left for him to do but to go back to the buyer and sell at the latter's own terms. Contrasted with conditions in many of the apple growing districts was the fact that any ripe eating apple was retailing in the larger cities at a price equal to the average of other years.

VALUE OF CROP

While there are no means at hand at this early date to state accurately the value of this year's crop, it can be very safely estimated at twice that of last year, from which the grower received little larger gross returns than last year and that he received even less net returns than for a crop half the size the year before.

One of the things lacking in fruit growing, is a better organization, not for the purpose of overcharging the consumer, but for the purpose of better distribution, as it often occurs that one market is overstocked with fruit while another is wanting a supply. This would perhaps ease the city house wife's mind, as she cannot understand why the fruit growers are not all rich when she considers the enormous price she pays for fruit.

REPORT OF THE COMMITTEE ON POULTRY

By W. THEO. WITTMAN, *Chairman*

Probably the most outstanding feature of the poultry situation within the State for the last year is the continued enormous increase of the amount of poultry kept by suburbanites, by villages and by city people. Practically, this is all pure bred poultry too. All of which has up to this time been reflected only in a very slight degree as regards poultry on our farms. However, already wherever there is a farm in the State that by its buildings, by its crops, and by its four-footed stock shows that its owner is progressive, there is sure to be pure-bred poultry and pure-bred poultry only. And the time is rapidly coming when at least most of the farms within the State will have reached at least that progressive stage in poultry keeping that only pure-bred flocks will be found.

Never before have the exhibits of poultry at the fall fairs been as large or so many local poultry shows been held, as this winter. Never before has the poultry press been so active; it being not unusual for one poultry paper to have hundreds and even thousands of subscribers in one county. The Philadelphia and Pittsburg Sunday papers continue to carry pages of all sorts of poultry advertising, where only a few years back they carried inches. Also farm

papers, household papers and the great popular magazines even have paid much flattering attention to poultry husbandry within this last year.

Nor have as many students in any one year been enrolled as taking the poultry courses as this year at our State College. Nor has all this great increase in interest and knowledge and amount of poultry kept, as yet affected prices as some would seem to think. Or, as some would even fear, that the business be overdone. So large is the demand for fresh eggs and good table poultry, and so enormous the amount of both annually imported into the State, that it will be many years if ever that the above will come about. What temporary slump there has been in prices in poultry meat and in eggs, was due to that the past summer was unusually favorable for the rearing of late chicks, throwing an enormous amount of killing stock on the market. And the very unusual weather conditions of December set the pullets of this late stock to laying, where usually it would have been postponed until February. In fact it set all sorts of non-winter laying fowls to laying and thus lowering the price of eggs by the unheard of increase in supply.

Most important of all, never before has the poultry industry included within its ranks so many earnest, intelligent and resourceful people, and the industry at large has in this country today *the largest and most active livestock organization in the world.* Pennsylvania has never before had so many organized poultry associations. One at least in nearly every county and in some counties two and three and even four. Its State organization, known as the Pennsylvania Branch, American Poultry Association, includes all the larger and most of the smaller of these organizations as members.

At their annual convention at Scranton last week, they transacted much important business looking towards the uplift of the poultry industry in this State; among other things, voting unanimously to make an effort to secure from the next Legislature an appropriation giving State College a suitable plant and equipment to teach poultry culture, and as auxilliary to this, an annual appropriation for the support of poultry shows, where people could be interested and shown directly and locally the work being done at State College. Also, an annual appropriation towards the support of a Division of Poultry Husbandry of the State Department of Agriculture, for the more direct benefit of the people at large wanting advice or aid or needing protection or regulation so that they may have actually fresh and clean eggs and clean and healthful meat.

THE INFLUENCE OF FERTILIZERS AND OTHER FACTORS ON YIELD, COLOR, SIZE AND GROWTH IN APPLES

DR. J. P. STEWART, *Experimental Pomologist, State College, Pa.*

The Pennsylvania Experiment Station has been conducting experiments bearing upon the above subject during the past five years. Altogether, it has now in operation 18 such experiments, involving soil types and 3,660 trees. In many respects, this series of experiments is by far the most comprehensive of any similar series thus far reported in America. In number of soil types; in number of treatments and checks; in number, variety and range of age of the trees; in duplications of the experiments of a given type; in the amounts of fruit involved; and in the fact that the experiments are distributed over the State and located, as a rule, in regions generally recognized as being well adapted to apple production; in all these respects we believe that the Pennsylvania orchard experiments enjoy distinct advantages over most previous efforts to answer the questions involved.

The results considered in the present paper are chiefly from 10 experiments, containing 2,219 bearing trees and involving 10 different types. The soil types range from heavy clay loams, in expt. 219, through silt and plain loams to light sandy and stony loams, in expts. 216 and 219. Some of the general features of these experiments are given in Table 1:

TABLE I. LOCATION, SOIL TYPES, VARIETIES AND TREES IN EXPERIMENTS AWAY FROM COLLEGE

Expt. No.	County	Soil	Varieties	Age 1911, yr.	No. of trees
215[1]	Adams,	Porters loam,	York & Stayman,	12	160
216	Franklin,	Montalto fine sandy loam.	York & Jonathan,	12	160
220	Bedford,	DeKalb stony loam,	York & Baldwin,	13 & 23	160
217	Franklin,	Montalto loam,	York & Gana,	18	358
218	Franklin,	Hagerstown clay loam,	York & Albemarle,	12 & 16	400
219	Bedford,	Frankstown stony loam,	York, Jonathan, Ben Davis & Gana.	9	320
221	Wyoming,	Chenango fine sandy loam.	Spy & Baldwin,	39	115
336	Chester,	Chester loam,	Grimes, Smokehouse & Stayman.	9 to 11	120 & 105[2]
337[3]	Mercer,	Volusia silt loam,	Spy, Baldwin & Rome,	4	180 & 180
338	Lawrence,	Volusia silt loam,	Baldwin,	23	80 & 105
339	Bradford,	Lackawanna silt loam,	Baldwin & Fallwater,	17	120 & 16

1. The names and addresses of the owners of the orchards in which these experiments are located are as follows: 215, Tyson Brothers, Flora Dale, Pa.; 216, D. M. Wertz, Quincy; 220, Mrs. S. B. Brown, Manns Choice; 217, J. H. Ledy, Marion; 218, Ed. Nicodemus, Waynesboro; 219, J. H. Sleek, New Paris; 221, F. H. Fassett, Meshoppen; 336, A. Darlington Strode, West Chester; 337, A. M. Keifer, Greenville; 338, J. B. Johnston, New Wilmington; 339, F. T. Mynard, New Albany.

2. In the two sets of figures in this and the following experiments, the first gives the number of trees under fertilizer experiment, the second those under differing cultural methods. In Experiment 339, the latter includes only a mulch plot.

3. Trees set out in connection with these experiments and not yet in bearing, hence excluded from consideration at this time.

The first three experiments deal with the influence of fertilizers, and involve 10 treatments and 6 checks in each case. The next four experiments deal with cultural methods and involve 12 treatments in each case, except the last, which has six. The last four experiments are a combination of portions of the first two types and deal with both fertilizers and cultural methods.[4] As shown in the table, the trees are of 10 varieties, though with one exception there are two or more varieties in each experiment. In age at the present time, the bearing trees range from 9 to 39 years; and since the work started they have produced over 1,315,000 lb. of fruit.

In this one item of fruit, we may call attention to the facts that, so far as American experiments are concerned, this amount is more than treble that reported in any other single experiment, and very distinctly more than the total fruit reported from all other similar experiments combined. This does not mean that the importance of the experiments elsewhere is to be minimized in the least, but it should help to emphasize the fact that, in those cases where conclusions or attitudes are in conflict, very careful attention should be given to the actual and relative amounts of evidence upon which the differing attitudes are based. In fact, within our own experiments we can find the counterparts of practically all those reported elsewhere. If we had fewer experiments—for example, only one on fertilization and another on cultural methods—our conclusions could be much more easily formulated, and we might readily become ardent partisans on either side of the questions, the side depending merely upon which of the present locations our experiments chanced to have. In other words, if we attempted to base our conclusions upon any one or two of our present experiments, those conclusions would be very different from any we would now formulate, on the basis of all the results. There can be no doubt that when the whole truth is known, we shall be able to account for *all* of the facts, and this is what we are undertaking to do.

THE INFLUENCE OF FERTILIZATION

The first factor to which we shall give attention is that of fertilization. Can the yield, color, size and wood-growth[5] of apples be influenced by fertilization, and, if so, how and under what conditions? This has always been an important question, and five years ago, when we were starting our experiments, we could find no data upon which to base a definite, well-founded answer. We do not say that we can fully answer it yet, but such progress as we have made may be partially seen in Tables II and III.

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4. For further details, see our Bulletin 100 and our Annual Report for 1910-11.

5. Quality is omitted from consideration at the present time, not because we do not consider it important, but because as yet we have no measure of quality sufficiently accurate and impersonal to enable us to make satisfactory comparisons of the fruit under different treatments.

TABLE II. INFLUENCE OF FERTILIZERS ON YIELD. (Johnston Orchard, Experiment 338).

(Total yields of fruit on each plot and annual yield per acre.)

Plot	1 Check	2 N. P.	3 N. K.	4 Check	5 P. K.	6 N. P. K.	7 Check	8 Manure	9 Lime	10 Check
Yr.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1908,	90	528	237	446	57	759	211	278	558	106
1909,	675	6018	5257	1932	3089	6021	2[illegible]8	3581	1216	1266
1910,	2575	3265	1[illegible]2	3168	3552	2108	1[illegible]0	6140	3185	3505
1911,	293	7563	7[illegible]6	617	1227	8[illegible]9	1[illegible]2	4874	388	106
3 yr. totals,	3533	16846	14[illegible]5	5717	7868	16938	4909	14554	4789	4877
Bushels per acre,	141.3	673.8	595.8	228.6	314.7	677.5	200.	582.1	191.5	195.

TABLE III. EFFECT OF FERTILIZERS ON YIELD. (Johnston Orchard).

(Average returns from certain treatments during past 3 years.)

Treatment	Checks (Av. 1, 4, 7, 10)	Manure (Plot 8)	N-Fertilizer (Av. 2, 3, 6)	P. K.-Fertilizer (Plot 5)
Totals 3 yr.,	4781 lb.	14554 lb.	16226 lb.	7868 lb.
Ratios,	100	304.4	339.4	164.5
		100	111.5—	
Av. An. Yield per A.,	191.2 bu.	582 bu.	649 bu.	314.7 bu.
Av. Gain per A.,		390 bu.	457 bu.	123. bu.

These tables are from one of our "combination" experiments, involving both fertilization and cultural methods, and started in 1908. The fertilizers have, therefore, had a chance to affect the crop only during the past 3 years, and it is for that period that the totals and annual yields per acre are computed.

Even a glance at these tables can leave no doubt as to the positive and profound effect of *proper* fertilization on the yield of apples. It will be noted that the checks run fairly uniform, averaging a little over 190 bushels per acre annually. Lime applications (at the annual rate of 1,000 lb. per acre) have given almost exactly the same returns as the average check. The phosphate and potash combination has affected yield in this case rather decidedly, having raised it by 123 bushels per acre. This may be partly due to a slight superiority in location, as indicated by the fact that its adjacent check is the highest in yield and is within 88 bushels of the phosphate-potash treatment. While this increase in yield is fairly satisfactory, there is nothing in the growth or appearance of the trees of Plot 5 that would leave one to believe that their treatment is appreciably superior to that of the checks. In other words, the trees of Plot 5 still look starved and indicate that there is something else lacking, although it will be noted that this is the fertilization ordinarily recommended for orchards.

This lack is very decidedly met by the manure treatment of Plot 8. In this plot, the trees are making a luxuriant growth, both in wood and foliage, and the yields have been increased by 390 bushels per acre annually,—a very satisfactory exchange for 12 tons of stable manure. Even this increase in yield, however, is considerably less than those obtained on the plots receiving a nitrogen-carrying fertilizer. Under the latter treatment on three plots, the *average annual yield* has been increased from 191 bushels on the checks to 649 bushels on the fertilized plots, or an annual *increase* of 457 bushels of apples per acre. This resulted from fertilizer applications that actually cost less than $17, and the essentials of which can be bought at retail for about $10 per acre. During the past year, the fourth year of the experiment, as shown in Table II, the yield on Plots 2 and 3, compared with that of their adjacent checks, was at the rate of 17 to 1, the yield on the checks being at the rate of 54 bushels per acre, while that on the intervening nitrogen plots was 922 bus-

bels. Surely it is not necessary to further defend the proposition that proper fertilization may very profoundly affect the yield of apples.

There is no reasonable possibility of these results being due to any other agent than the fertilizers. The trees are all of the same variety and same age. They receive the same spraying, pruning, soil handling and other care. The soil is practically level and very uniform. The treatments are abundantly checked. In fruit, foliage, growth and general health of trees, the benefits stop abruptly where the fertilizers stop, and similar results are being obtained by the owner in other parts of the orchard, on the same and other varieties, with the combinations of fertilizers found effective in the experiment.

In regard to the relative values of the different fertilizer elements, it will be seen in Table II, that nitrogen is evidently the first limiter. Thus, the phosphate and potash combination in Plot 5 has given an increase of 123 bushels per acre, while by the addition of nitrogen to this combination, in the adjacent Plot 6, we get an increase of 486 bushels. In other words, the addition of nitrogen to the treatment ordinarily advised for orchards, resulted here in nearly quadrupling the benefit. In Plot 3, where the phosphates are omitted, it will also be noted that there is an annual deficit which amounts to nearly 80 bushels per acre. This doubtless indicates that phosphorus is the second limiter and that the yield in Plot 3 is being reduced by lack of this element. Potash applications, on the other hand, have been of practically no avail in this experiment. This may be seen by comparing Plots 2 and 6. The annual addition of 150 lb. of actual K_2O in the latter treatment has resulted in a gain of only 3.7 bushels of apples.

The above results were obtained without any aid from tillage or cover-crops, the fertilizers being merely sowed over the surface of untilled soil, on which there was a light sod composed chiefly of mixed grasses. Here the question may be raised as to whether equal or superior benefits may not have been obtainable with some form of cultural methods. This question is answered in Table IV.

TABLE IV. CULTURAL METHODS AND FERTILIZERS ON YIELDS
(Johnston Orchard.)

Plot Treatment	XIII Sod	XII Sod Mulch	XI Tillage & Cover Crop	(Av. 2 & 6) N-P-Fertilizer
	lb.	lb.	lb.	lb.
1908,	1170	2265	2843	2813
1909,	17982	7455	10702	27649
1910,	2940	16789	17254	11752
1911,	3550	2629	7560	34502
Totals last 3 yr.,	24472	26873	35456	73903
Ratios,	100.	109.8	144.8	302.
Ratios,		100	131.9	275.
Ratios,			100.	208.4
Av. An. Yield per A., 3 yr.,	223.7 bu.	245.7 bu.	324.1 bu.	675.7 bu.
Av. Gain per A.,		22. bu.	100. bu.	452. bu.

In this portion of the experiment, which is devoted to cultural methods, the plots are larger and contain 35 trees each. The yields of Plots 2 and 6, from the fertilizer portion, therefore, are raised to their corresponding values for plots of equivalent size. No fertilizers were used on the cultural methods plots, until the season just past. They were used then uniformly on all treatments, primarily because the sod plot had gone two years with very little fruit, though all the trees of these plots were plainly in need of something additional.

In Table IV, the sod plot shows a little higher annual yield than the average of the checks in the fertilizer portion, this being due to an exceptional crop that occurred on this plot in 1909, and from which the plot has not yet recovered. In the next plot, we see the effect of adding a mulch to the sod treatment. In this case, although all the herbage that grows is left in the orchard, and a further application of 3 tons of straw per acre is added to the plot, the average annual gain is only 22 bushels per acre. In the next plot, we find that tillage and leguminous cover crops have given a fair increase, amounting to 100 bushels per acre on the average. This, however, is hardly to be compared with the 452-bushel increase shown in the next case, which is obtained without tillage of any kind, merely by the addition of a fertilizer that carries the elements that are evidently lacking.

In some quarters one would gather the impression that apples can scarcely be grown without tillage. While we have nothing against proper tillage as an orchard treatment, yet this and other results from our experiments show that it is by no means indispensable in the production of first grade apples and that it can be readily over-emphasized like anything else. There are many situations that are otherwise very well suited for apples, where tillage is decidely inadvisable, and where, with proper management, the trees would get along very much better without it. In such situations it is undoubtedly preferable to sow the orchard down to some leguminous crop as a permanent cover and follow the mulch system, properly supplementing it with fertilization. For this purpose, hairy vetch is doubtless preferable, on account of its relatively low moisture draft, and its usually excellent staying powers when once well seeded down. Whenever it is crowded out by the grasses, the orchard may be re-plowed and again sowed to vetch, if the trees seem to require it.

DATA ON FERTILIZERS FROM OTHER EXPERIMENTS

Thus far we have confined our attention to a single experiment, primarily because the contrasts in it are so great that both the existence and nature of the effects could scarcely fail to be recognized. To go through each experiment in this way would be impossible in our present space, hence we have condensed into the next two tables a statement derived from the results of six experiments, including the one just discussed. These tables show the average effects of the different fertilizer elements, obtained in six experiments, during periods covering from three to five years as indicated. The effects are calculated as closely as possible and are expressed in terms of per cents. of benefit based on the normal performance of the treated plots. The methods followed in making the

calculations are described briefly in our Bulletin 100 from the Pennsylvania Station, and described in full in our Annual Report for 1910-11.

TABLE V. EFFECT OF FERTILIZER ELEMENTS ON YIELD, COLOR, SIZE AND GROWTH

(Calculated Per cents of Benefit.)

Expts. 336, 338 & 339	Yield		Color—1908-11.	Size—1909-11	Growth—1908-11
	1908-11	1911			
	%	%	%	%	%
Nitrates in combination,	94.05	163.1	—13.3	—4.81	24.11
Phosphates in combination,	36.65	35.8	— .95	4.01	—3.97
Potash in combination,	—4.65	—6.42	— .1	13.2	4.17
Complete fertilizer,	122.5	166.4	—16.0	5.93	27.50
Manure,	144.1	169.8	—14.3	30.8	37.49
Lime alone,	19.5	—3.07	— 2.9	19.4	8.04

TABLE VI. FERTILIZER ELEMENTS ON YIELD, COLOR, SIZE AND GROWTH

(Calculated Per cents. of Benefit.)

Expts. 215, 216 & 220	Yield		Color—1908-11	Size—1908-11	Growth 1907-11
	1908-11	1911			
	%	%	%	%	%
Nitrates in combination,	41.7	18.05	—12.35	—1.67	14.83
Nitrates alone,	30.0	39.10	—16.00	—6.23	18.33
Phosphates in combination,	15.4	9.35	— 1.55	.925	.62
Phosphates alone,	— 7.4	—7.37	2.80	—1.21	.52
"Floats" alone,	—18.8	6.4	7.70	—1.92	—6.00
Potash in combination,	15.2	12.80	6.55	5.67	2.71
Complete fertilizer,	68.8	65.7	—16.00	4.30	19.10
Manure,	101.-	221.90	— 9.90	4.73	24.70
Lime alone,	—12.0	15.1-	.8	—1.05	3.1

In general, these tables corroborate and extend the deductions obtained from those already considered. The addition of the results from the other experiments have reduced the apparent benefits somewhat and the relative values of certain materials are also slightly changed. We have included the results of the first year in the yields of Table V, which also reduces the apparent benefits, since the fertilizers had not yet had time to operate. Even at that, however, we see that the yields during the 4-year period have been nearly doubled by the addition of nitrates, in experiments 336, 338 and 339 and with the same material they have been increased by 41 per cent. in the younger experiments of Table VI.

Phosphates, when used in combination with nitrogen or in a complete fertilizer, maintain their position as the next limiter after nitrogen, though they are closely pressed by potash in Table VI. On the other hand, neither acid phosphates nor "floats" nor lime, when used alone, have shown any consistent benefits on yield thus far. Their apparently *negative* influences on yield may be smoothed out in time, as indicated by some of the results of the past year. There is some evidence, however, that certain of these negatives really indicate a toxic action that is manifested only under certain conditions, but we have not yet carried this far enough for definite statements.

The important advantage shown by manure, especially in Table VI, is doubtless largely due to the very full crops on the manure plots of those experiments during the past year, which was rather of an off year for the similar plots receiving complete fertilizer. The better moisture-conservation under the manure and the larger amounts of plant food carried in it also probably account for a part of the superiority. In general, however, we do not find any important superiority in manure over a proper commercial fertilizer, neither in actual or net increases. Manure is undoubtedly a safe and valuable material to apply in orchards, when it can be satisfactorily obtained in sufficient amounts. But with very few exceptions, thus far in our experiments as a whole, wherever manure has given important increases, these increases have been approached or surpassed by a proper commercial fertilizer.

CORRELATION BETWEEN YIELD AND GROWTH

In regard to growth, it will be observed that, in general, the improvements in it have accompanied those in yield. The same materials that have improved the one have generally improved the other. In other words, as a rule, our best growing plots have been our best fruiting plots. Contrary to a prevalent notion, therefore, we may say that growth and fruiting are not necessarily antagonistic, but rather are associated, unless either should occur in abnormal amount.

DATA AND DEDUCTIONS ON COLOR

In regard to color, it will be observed in Tables V and VI, that none of the applications have given any important increases, and most of them have given decreases. Similar results have also been uniformly obtained elsewhere, so far as we have received the reports. The same is essentially true of applications of iron salts. From these and other considerations, therefore, we believe that color in apples can not be materially *improved* by soil applications, and that it is *primarily dependent on maturity and sunlight.*

This refers only to the red colors in apples. The yellow colors can probably not be affected by any external agency. Physiologically, the yellow color is connected with certain bodies located in the superficial layers of cells in the apple skin. It develops independent of light, and its intensity depends merely upon the degree of maturity or ripeness. The red color, on the other hand, is a constituent of the cell sap; it is capable of being influenced by a number of

agencies; and its intensity is dependent primarily upon the amount of light received during the latter stages of maturity. In other words, we get back to its dependence upon maturity and sunlight. Conditions increasing one or both of these factors, such as late picking, light soils, open pruning, and sod culture will increase color. Opposite conditions decrease it.

From this viewpoint, the reduction in color caused by the nitrates and the manure is easily explained. It is evidently due to delayed maturity. That such is the case was shown the past season, especially in the Johnston orchard, where the fruit of the nitrogen plots was left on the trees until it reached approximately the same stage of maturity as that on the checks when they had been picked. The difference in the dates of picking, which corresponded closely with the delay in maturity, was exactly 3 weeks—from September 28 to October 19. And when the final picking was done, the amount and brightness of the color on the nitrate plots was actually greater than it had been on the checks. The average increase in color on the treated plots, 2, 3 and 6, over the checks, 1, 4 and 7, was actually as great as 10.3 per cent. The great importance of maturity on the trees in increasing color is thus clearly shown.

The importance of sunlight, we had already determined in an earlier experiment. In it, we found that after the apples were picked, exposure to sunlight increased their redness by 35 per cent, while the checks in the dark and those exposed to electric light showed no definite increase.

We may also mention the facts that color may be materially affected by certain kinds of spraying and by internal variations such as appear in the solid-colored variants from the Gravenstein and 20-ounce. These points also are discussed in our Annual Report for 1910-11, but space is too limited for further consideration here.

RELATION OF FERTILIZATION TO SIZES

Again referring to Tables V and VI, we see that nitrates have apparently reduced the average size of the fruit. Phosphates have given only a slight benefit, if any; while potash and manure have given quite important increases. This apparent benefit from potash is interesting, and it may indicate an actual fact, since size depends upon moisture and potash has been credited physiologically with the ability of increasing the osmotic power of plant cells.

All these apparent influences on fruit-size, however, must be considered in their relation to the size of the crop on the trees. A year ago, we plotted a number of curves from data given in connection with a fertilizer experiment at the New Jersey Station, in order to determine definitely, if possible, whether any relation existed between these two factors,—fruit-size and size of the crop on the tree. We found that no correlation exists below what we may call a certain critical point, and that, under the New Jersey conditions, the number of fruits on even moderate-sized trees had to exceed about 1,400 per tree before any perceptible correlation appeared. *Above this critical point*, however, it is probable that *crop-size is the dormant influence on the size of the fruit*, though the exact position of the critical point may doubtless be raised or lowered somewhat by local conditions of moisture, plant food, etc.

In our judgment, this has a bearing upon the fact that nitrogen has apparently failed to increase the size of the fruit in our experiments. The crop-size was raised so much that full size of the fruit was not obtainable.

It also has an important bearing upon thinning. It means, in general, that if one thins an apple tree of even moderate size before the number of fruits has reached a critical point, which may be 1,400 or more, he can hardly expect to modify the size of the remaining fruit, and the most effect of the thinning will be an actual reduction in total weight of apples at least for that year. Exceptions to this may appear in varieties of extra large size, or in seasons or locations that are exceptionally dry.

It also means that, below the critical or the thinning point, there is opportunity for the other factors to exert their influence. It is here that such factors as fertilizers, cultural methods, moisture-supply, and heredity show their effects, and they may co-operate in such a way to materially raise the critical point. This assumes that the variety is properly located in respect to temperature and length of growing season, both of which are factors that may have an influence on fruit-size. We also may mention here the factors of pollination and number of seeds per fruit, which have been found to affect fruit-size by Ewert and Müller-Thurgau in Germany.

SUGGESTIONS ON THE USE OF FERTILIZERS IN ORCHARDS

The foregoing discussion does not mean that all fertilizers or all orchards will give a profitable response to fertilization. There are too many other limiters for that. Some of our experiments and some treatments have given no important results as yet. This may be due to improper moisture supply, relative youth of some of the trees, or to the action of some other one or more of the many possible limiters.

All the facts, therefore, emphasize the necessity for local or community trials. It is unsafe for the grower to assume either that all orchards need fertilizers or that no ochards need them. Either of these attitudes, if consistently acted upon, is almost sure to prove costly to its possessor. The only safe attitude is the one that views the orchard like other crops, knowing that lack of available food is undoubtedly the limited at times, and using proper fertilization extensively only where and when it is needed.

As to what constitutes a proper fertilizer, on the basis of present results, we are suggesting a combination that will carry about 30 pounds actual nitrogen, 50 pounds of actual phosphoric acid (P_2O_5) and about 25 pounds of actual potash (K_2O) per acre. Where there is evidence that potash is needed, the above amount may be increased to 50 pounds of K_2O. The former amounts are carried in 500 pounds of a 6-10-5 fertilizer, and the latter are given by the same weight of a 6-10-10 material. We apply the nitrogen by using 100 pounds of nitrate of soda and 150 pounds of dried blood, thus getting quick action and also one that is prolonged well through the season. The phosphates may be carried in 200 ponnds of steamed bone meal or raw rock phosphates; or in about 350 pounds of acid phosphate or basic slag. The potash may be carried in 50 or 100 pounds of muriate

or high-grade sulphate, depending upon which of the formulas is desired, or in 100 or 200 pounds of low-grade sulphtae. Upon the relative values of these latter carriers, we have very little evidences as yet.

The above amounts are intended as annual applications for bearing trees of medium age where most of the ground is to be covered. For younger trees, they may profitably be reduced, approximately in proportion to the amount of soil to be covered. On older trees or in special conditions, the combination is expected to be varied as later results direct. For example, in some instances, especially in connection with sod, we have found that the amount of nitrogen is apparently a little too low, while with tillage and leguminous cover-crops it is likely to be somewhat higher than necessary.

As to where fertilization is needed, this is more difficult to define, and probably the only certain method of determining it is by actual trial. These trials are very simple. Merely leave a typical portion of the orchard untreated, for three or more seasons, as a check on the value of treatment, and carefully mark and record the trees in at least one of the groups. There are a number of points, however, that will aid one in determining the relative size to make these groups, or in other words, aid in deciding whether to leave most of the orchard in the check or in the treated portion.

In general, for two years at least, the check should be much the larger in most young orchards or in any orchard that is doing well through late August and September. The fact that the trees are well loaded in a given year, however, is no sufficient reason for omitting the fertilizer that year. In fact, that is one of the best reasons and times for applying a proper fertilizer rather liberally, in order to prevent the total absence of a crop the following year and in the long run tend to steady the annual production.

In case of the reverse conditions—old orchards or those not retaining a thrifty look throughout the season or not growing and bearing regularly and satisfactorily—it is best to reverse the procedure and fertilize most of the orchard, leaving only a small block as a check. In all cases, however, we strongly advise the use of a check until the real value of the treatment is thoroughly established. Even then it is not desirable to omit either the check or the treatment entirely. The less valuable one may be reduced to a small space, but it should not be omitted entirely if the grower cares much for his orchard. One of our experiments, for example, showed practically no response until the fifth year, and then, when the cropping strain began to appear, quite marked differences arose in favor of the properly fertilized plots.

The time of application we also consider important, especially in the case of the nitrates. While our evidence is by no means complete on this point, yet we have some indications that nitrates applied too early in the season may be wholly lost to the trees. Other evidence leads us to believe that distinct harm may be done by making nitrate applications too near the fruit-setting time, especially in the case of peaches. We feel, therefore, that nitrates should be applied not earlier than petal-fall in apples, and probably not later than the first of July, though we have had some very good results from applications made as late as July 8. Making the applications

within this period also permits one to vary the amount applied somewhat in accordance with the amount of fruit set on the trees.

With the less soluble and slower acting minerals, the application time is less important. We know some careful observers, who regularly apply their phosphates and potash in the fall on peaches and claim that this gives the best results. Thus far we have felt that the time of application for the minerals is of relatively little importance, since they are rather quickly fixed in the soil, in any case, and they do not leach readily. We therefore apply them along with the ntirogen, at the time that we consider best for it.

The method of application that we have followed is merely to scatter the fertilizers broadcast over the surface of the ground, taking care not to get it too close to the tree trunk, where there are few absorbent roots, and extending the applications well out beyond the spread of the branches. This may either be left on the surface to be washed in by the rains or it may be lightly harrowed or plowed into the soil. With this all done, it is well to remember that the fertilizer applied in any given season can hardly affect materially the yield of that year, since the fruit buds are formed in the latter part of the preceding season. Important results, therefore, should not be expected before the following season at the earliest, and, as stated above, they may not appear until considerably later and still prove of value.

REPORT OF THE BOTANIST

By PROF. W. A. BUCKHOUT, *State College, Pa.*

The correspondence during the past year has been along the usual lines and has presented but little out of the ordinary. The practical botanical questions which interest the people are chiefly seed and plant determinations and weed eradication. In the latter matter one can simply reiterate that there is ordinarily no quick, shorthand way of getting thoroughly rid of pestiferous weeds. It is simply a question of common sense methods of cultivation and general handling of the land concerned. Many are unable or unwilling to do this: hence the frequent appeal for advice.

I would again call attention to the excellent series of Farmers' Bulletins issued gratuitously by the Department of Agriculture, Washington, D. C., among which are the following which every one interested in weed destruction should procure. No. 28, "Weeds and How to Kill Them;" No. 279, "A Method of Eradicating Johnson Grass;" No. 368, "The Eradication of Bindweed or Wild Morning Glory;" No. 464, "The Eradication of Quack Grass." No spoken or written directions can take the place of these excellent bulletins.

A good illustration of the importance of correct and exact determination of seeds came to my attention by a sample of Catalpa seed, with the inquiry whether this was the seed of the Catalpa species most valuable for forestry purposes. There are three species of Catalpa now in common use. Catalpa speciosa, the most desirable, bignonioides, less so, and Kempferi, a small Japanese tree useful only in ornamental planting. The seeds in all three are of the same general type, but varying in size and different minor points readily detectible by one who has studied them. Since forest trees are even longer in proving their exactness of kind than are fruit trees it follows that one should be careful from the start, lest he find years afterward that he has used seed of the wrong kind. In this instance the seed was true to name and would produce the larger, straighter and longer-lived forest tree which was desired.

Inquiries regarding special crops, particularly ginseng have become so frequent that a brief circular on this latter species has been prepared. Since it expresses the essential things to be borne in mind by those who are inclined to undertake ginseng cultivation it is embodied herewith:

GINSENG AND ITS CULTIVATION

Ginseng is a native American plant, growing wild over the eastern United States and Canada, preferably in rich, loamy soil and in woodlands throughout the Allegheny region and the northern states west of Minnesota and Missouri. It is one of about seven species native of the district above mentioned and eastern Asia.

It is an herbaceous perennial, low growing and reaching maturity only after several years of growth. It has characteristic five parted leaves, quite distinct from any other species. One familiar by practice can readily distinguish it from wild sarsaparilla or other plants commonly associated with it. The stem is insignificant and scarcely noticeable, except when bearing the cluster of bright red berries which follow the small flowers. In the fall, leaves and stems disappear, except that a short basal stem bearing one or two buds persists just beneath the surface capping the small tap root. The plant grows slowly. At the end of the third year the root, if favorably placed, may be as large as one's finger, not unlike a small parsnip, but less symmetrical and generally quite irregular and branching. This root is the usable part of the plant. It is commonly gathered for sale when several years old. The bulk of the roots of commerce are five or more years old. Collection of the wild roots which when dried meet with ready sale has long been common in the hardwood districts where the wild plants are most abundant. The high prices obtained and the fascination of hunting it have combined to diminish the natural supply and to threaten the extinction of the plant.

As explaining the great demand for ginseng roots it may be said that they have no medicinial value whatever in the estimate of American or European authorities, but from time immemorial the Chinese have held them in the highest repute and are willing to pay fabulous prices for them. For some years the export of American roots to China has been approximately 150,000 pounds per year and formerly it much exceeded this. Apparently the natural supply is being ex-

hausted, hence the cultivation of the plant has attracted attention and much of the root now handled is thus derived. The experience of the last few years has shown that there is no inherent reason why its cultivation may not be successfully done; whether profitably is another question. There are two ways of starting a ginseng bed: by seeds, and two year old roots. In raising plants from seeds it should be noted that the seeds lose vitality very quickly on drying. Hence so soon as they are gathered they should be stratified in leaf mold. Mix the seeds with four times their bulk of leaf mold or make alternate layers of leaf mold and seeds in a wooden box, and leave out of doors over winter in some protected place. These seeds should not be disturbed until the spring of the second year, since but few seeds will germinate before they are eighteen months old. Of course seeds may be planted as soon as they are gathered, as nature does, but the risk of loss during the dormant season is very great. Beds are more generally made by planting two year old roots. These are dibbled in like any other trans-plants and may be placed only a few inches apart. It goes without saying that whether seeds or roots are used the bed should be most carefully prepared. No success need be expected unless this is rigidly attended to. The after care must be entirely by hand-weeding and working, and presents no peculiarities worthy of special mention. Ginseng is so nearly a wild plant that careful attention to the conditions under which it naturally grows is quite necessary. It has been found that it is essential to make beds in partial shade either of surrounding large trees or of artificial frames. For obvious reasons the latter method is most feasible. A light screen of lath so as to give about one-half light is most suitable. This may be placed close to the ground or supported upon posts high enough to enable one to work under it easily. The latter is much preferable. A fence tight enough to exclude dogs, cats and domestic fowls is practically a necessity.

All these features together with the relatively high cost of the seeds or roots put ginseng in a class by itself, and make it absurd to talk about it as one would of ordinary farm and garden crops.

While, as stated, there are no inherent reasons why ginseng may not be successfully cultivated it is none the less true that there are special difficulties and diseases which must be reckoned with. The former have been, perhaps, sufficiently indicated already, the latter become more and more marked with time. This is true of all sorts of plants, none are likely to long remain immune. The principal diseases of ginseng are: (1) The wilt of old plants. This is of the same general character as the wilt of cotton, melons and other garden plants. The name expresses the character of the disease very well. (2) Wilt of seedlings. This is of the same general nature as to results, but affects the young and delicate seedlings, often spoken of as the "damping off" of seedlings. There are several causes of this malady. There is but little, if any, remedial treatment for these diseases short of starting cultivation anew with clean stock in clean soil. (3) Black rot, Soft rot, and Leaf spot fungus are likewise not seldom met with, and are difficult to control or correct.

(4) Worms and insects are sometimes serious pests. The roots often show galls looking like beads on a necklace. This is caused by multitudes of small worms particularly liable to occur in rich soils. Snails and a stem boring insect larva sometimes do serious injury.

Enough has been said to show that the cultivation of this plant, while entirely feasible, is accompanied by the same class of difficulties as are the more common plants of cultivation, and is moreover of a highly special character, requiring both a special knowledge of the nature and habit of the plant itself, and, also, a most careful attention to detail methods of treatment not generally called for. Any one who desires to grow ginseng should spare no pains to inform himself thoroughly on all these points. If possible he should visit some grower and study the plant and its treatment, as well as get the owner's experience. In default of ability to do this he should get some of the publications on the subject. The Orange Judd Co., 429 Lafayette street, New York, publish a small book for fifty cents. The various dealers and companies issue attractive and highly seductive circulars setting forth the ease of cultivation and the certainty of reaping enormous profits. A large part of the money made in ginseng comes from the sale of seeds and roots to novices who are tempted to try its cultivation. If they do not well understand the fundamental features which this paper has outlined they are doomed to disappointment and failure. The Bulletins of the U. S. Department of Agriculture and the State Experiment Stations are generally out of print, but may be found in General and Annual Reports. Two of these should be available in various public and private libraries in Pennsylvania. It is strongly advised that they be consulted. No copies are available for distribution by the Station.

(1). Report. Pennsylvania State College, 1902-3. Page 185. "An Experiment in Ginseng Cultivation."

(2). Report Department of Agriculture, Pennsylvania. Part I. 1897. Page 617. "The Cultivation of American Ginseng in Pennsylvania."

REPORT OF SPECIALIST ON FEEDING STUFFS

By GEORGE G. HUTCHISON

To the Members of the State Board of Agriculture of Pennsylvania: As your consulting specialist on feeding stuffs, I beg leave to make the following report for 1911.

This has been a year of high prices for feeds in Pennsylvania. The one great reason was the drouth that passed over this State in the late spring and early summer, and in some sections, there was

a great shrinkage in the corn and oats crops. Another reason was that in the West there were failures and a large amount of live stock was placed upon our markets and found buyers among our feeders and these had to be fed.

In regard to the law that was placed upon the statute books a few years ago, I beg leave to state that it has not been questioned on its constitutionality and in fact, we have only tried one case in court, the manufacturers and dealers having paid their fines before the Magistrate. The statement that I made in my report of last year, that all feeds should be sold on their protein and fat analysis and their low fibre constituents, or the higher the protein and fat and the lower the crude fibre, the more valuable the feed. This is the sermon the salesmen of the large feed concerns who are seeking our markets, preach in regard to their feeds, and if our feeders would study the tables furnished them, they could be just as well informed in regard to the composition and value of feeds as the salesman who sells the same.

To prove my contention, I will ask you to compare the analysis of a sample of gluten meal which analyzes as follows: Protein, 29.30%, fat, 11.30%, crude fibre, 3.30%. Sample of wheat middlings, protein, 15.60%, fat, 4.00%, crude fibre, 4.60%. Buckwheat middlings, protein, 28.90%, fat, 7.10%, crude fibre, 4.10%. Cottonseed meal, protein, 42.30%, fat, 13.10%, crude fibre, 5.60%. This is a sample in which there were no cottonseed hulls. Linseed meal, protein, 32.90%, fat, 7.10%, crude fibre, 8.90%. These are among the very high grade meals that are found on all our markets and are bought by all our feeders. These are some of the feeds that you should see that are pure and you should buy on this guarantee.

The feed question and the digestibility of feed is the one great question which our experimental stations should take up and work out for our farmers and feeders. The manufacturers and compounders of commercial feeding stuffs claim that a given amount of their feeds are digestible, but they do not give you any feeding test. What you gentlemen want is a test of these feeds on your horses for work and driving purposes, your cows for butter and milk and your other domestic animals for growth and fattening.

There are tables given of some reports, and we do not doubt their correctness, but the only true way is to feed a feed to a cow a given number of days and to keep a correct account of what she eats and what she produces in milk, if the feed is fed for milk, or if the feed is fed for butter. Give the amount she consumes and the amount she produces. This is the kind of table that will show in dollars and cents what the said feed will give in return for the money invested.

A new book on stock feeds and feedings has been published in the last year by Jas. E. Halligan, Chemist in charge of the Louisiana State Experiment Station, Baton Rouge, La., and published by the Chemical Publishing Co., of Easton, Pa. It is one of the latest and best books that has been published on this subject, and anyone who is interested in this great subject should secure this book and make a study of the question. You are the men who are paying

the feed bills and you should take time to look into this question. I hereby give you a table of analysis of feeding stuffs and also the adulterants:

TABLE OF ANALYSIS

Name of Feeding Stuff	Crude Protein	Crude Fat	Crude Fiber
	Per cent.	Per cent.	Per cent.
Corn,	10.40	5.00	2.00
Hominy chop or feed,	9.80	8.30	2.80
Gluten meal,	29.30	14.30	3.30
Gluten feed,	24.00	10.60	5.30
Dried distillers' grain, largely from corn,	30.80	13.30	12.10
Oats,	11.80	5.00	9.50
Oats shorts,	16.00	7.10	6.10
Wheat,	11.90	2.10	1.80
Wheat bran,	15.40	4.00	9.00
Wheat middlings,	15.60	4.00	4.60
Wheat shorts,	14.90	4.50	7.40
Barley,	12.40	1.80	2.70
Barley meal,	10.50	2.20	6.50
Brewers' grain, dry,	26.00	5.60	1.40
Malt sprouts,	27.20	2.00	13.00
Rye,	10.60	1.70	1.70
Rye bran,	14.70	2.80	3.50
Buckwheat,	10.00	2.20	8.70
Buckwheat bran,	12.40	3.50	*31.90
Buckwheat middlings,	28.90	7.10	4.10
Buckwheat shorts,	27.10	7.60	8.30
Cottonseed,	18.40	19.90	23.20
Cottonseed meal,	42.30	13.10	†5.60
Flaxseed,	22.60	33.70	7.10
Linseed meal, O. P.,	32.90	7.90	8.90
Linseed meal, N. P.,	33.20	8.00	9.50
Corn silage,	1.07	0.80	6.00
Alfalfa hay meal,	14.3	2.20	25.33

*Note high per cent. †No hulls.

This table gives you the analysis of the cereals as nature produces them. It also gives you the analysis of the by-product as the chemists find them, and I hope that this table may aid you in becoming educated in regard to the feeds that go to make up the concentrated pure feeds that are on the market.

I am often asked the question, "What is the analysis of the adulterants that are mixed with the feeds that are found on our markets?" I will give you a table of the adulterants that we have found on the markets of Pennsylvania:

Name of Adulterant	Crude Protein	Crude Fat	Crude Fiber
	Per cent.	Per cent.	Per cent.
Corn cobs, ground,	2.40	0.50	30-33
Oat hulls,	3.00	1.00	29.33
Buckwheat hulls,	4.60	1.10	43.30
Cottonseed hulls,	2.00	----------	40.00

The trade journals that are devoted to the sale of grains, flours and feeds are large advertisers of what is known as chicken wheat. This wheat is a very low grade, a large percentage of the grains are shriveled up, containing a very low percentage of starch and is almost worthless. They also buy a large amount of screenings which contain a large amount of weed seeds, but, as stated by me before in this paper, they are not selling the same in Pennsylvania, as the activity of the Department of Agriculture in enforcing the law has rid our markets of these worthless grains.

We have a large number of samples of feeding stuffs in our laboratory. I had hoped that we would be able to place our exhibit before you, but the winter fair which was held last week in Pittsburg had requested the Secretary to have this exhibit made there, and it has not been returned in time for us to make an exhibit here, but if you will call at the laboratory on the fifth floor of this building, the Chief Chemist or Assistant Chemists will gladly show you samples of feeding stuffs. Our exhibit at Pittsburg was visited by hundreds of people, and a large number of requests for Bulletin No. 208 were made. This bulletin was compiled by Mr. James W. Kellogg and great credit should be given him for the ability he has shown in this work. If it were possible for each farmer and stock feeder to have a copy of this bulletin on his table, he could be saved large sums of money in buying feeds. If you or your friends will send your names to Mr. Kellogg, he will place them on our mailing list and mail to you a copy of Bulletin No. 208. We now have a list of 6,000 names and this is increasing each year. The bulletin for the work done in the year 1911 is now being prepared and will be published in due time.

I herewith give you a table showing the work done by us in the visitation of the agents of the Department of Agriculture. You will see by this table, the agents visited a number of towns and did not obtain samples. The reason for this was that they had secured samples in neighboring towns of the same brand of feed. In 1910 we secured 1,500 samples, and in 1911, 1,000. The reason for this difference is last year our agents took a large number of samples of wheat bran and middlings. We found that the wheat brans and middlings were pure, and as the mixing of ground corn cobs with brans and middlings had ceased, and to save expense of analyzing, we have not drawn so many samples of bran and middlings. But we do not want you to think we are not taking samples of wheat bran and wheat middlings. We take a few of each manufacturer we find on the markets, and in this way, we keep a check on what is being sold in our Commonwealth:

TABULATED STATEMENT

ADAMS—	
Idaville,	1
ALLEGHENY—	
Pittsburg,	16
Tarentum,	2
Wilkinsburg,	8
Homestead,	1
McKeesport,	6
Carnegie,	6
Pitcairn,	3
Braddock,	8
E. Pittsburg,	1
Turtle Creek,	3
Wilmerding,	11
Duquesne,	0
	65
ARMSTRONG—	
Apollo,	4
Vandergrift,	3
Leechburg,	2
Kittanning,	8
Ford City,	0
Freeport,	0
Manorville,	0
	17
BEAVER—	
Beaver Falls,	5
New Brighton,	5
Beaver,	1
W. Bridgewater,	3
Monaca,	3
Freedom,	0
Rochester,	0
	17
BEDFORD—	
Hopewell,	3
Saxton,	3
Bedford,	2
Everett,	6
Hyndman,	0
Coaldale,	0
	14
BERKS—	
Topton,	1
Barto,	1
Kutztown,	1
Lyons,	1
Fleetwood,	2
Leesport,	2
Shoemakersville,	0
Hamburg,	1
Womelsdorf,	1
Robesonia,	1
Wernersville,	1
Shillington,	1
Mohnton,	1
Birdsboro,	0
Mertztown,	1
Bowers,	1
Shamrock,	0
Hancock,	1
	17
BLAIR—	
Altoona,	23
Tyrone,	5
Juniata,	2
Bellewood,	0
Duncanville,	0
Gaysport,	0
Hollidaysburg,	0
	30
BRADFORD—	
Troy,	8
Canton,	0
Alba,	0
Towanda,	0
Wysox,	3
Ulster,	1
New Albany,	2
BRADFORD—Continued.	
Monroeton,	1
Sayre,	0
Athens,	0
Wyalusing,	1
	25
BUCKS—	
Doylestown,	14
Chalfont,	8
	22
BUTLER—	
Zelienople,	4
Butler,	9
Slippery Rock,	0
Evans City,	0
Harmony,	0
Mars,	0
Valencia,	0
	14
CAMBRIA—	
Johnstown,	12
Barnesboro,	1
Carrolltown,	3
Ebensburg,	1
Cresson,	4
Patton,	4
Dale,	0
Conemaugh,	0
Franklin,	0
Gallitzin,	0
Hastings,	0
Lilly,	0
Portage,	0
South Fork,	0
Sealp Level,	0
	25
CAMERON—	
Emporium,	8
Driftwood,	0
	8
CARBON—	
Weissport,	0
Lehighton,	0
Mauch Chunk,	0
E. Mauch Chunk,	1
	1
CENTER—	
Phillipsburg,	8
CHESTER—	
Downingtown,	4
West Grove,	3
Kennett Square,	5
West Chester,	6
Coatesville,	8
Atglen,	3
Embreeville,	1
Pocopson,	1
Avondale,	0
Malvern,	0
Parkesburg,	0
Phoenixville,	0
	31
CLEARFIELD—	
Du Bois,	8
Clearfield,	8
Coalport,	2
Glen Hope,	3
Madera,	1
Munson Station,	2
Morrisdale Mines,	2
Osceola Mills,	3
Penfield,	3
	32
CLARION—	
Clarion,	3
E. Brady,	0
New Bethlehem,	0
	3

CLINTON—
Lock Haven, 7
Mill Hall, 0
Renovo, 0
7

COLUMBIA—
Bloomsburg, 2
Berwick, 4
Millville, 3
Orangeville, 0
Catawissa, 0
9

CRAWFORD—
Saegertown, 1
Meadville, 5
Linesville, 8
Cochranton, 0
Titusville, 0
14

CUMBERLAND—
Carlisle, 1
Mt. Holly Springs, 2
Boiling Springs, 1
Longdorf, 4
Newville, 1
Mechanicsburg, 4
Shippensburg, 2
Huntsdale, 0
Barnitz, 0
Shiremanstown, 0
15

DAUPHIN—
Hummelstown, 1
Harrisburg, 1
Penbrook, 1
Dauphin, 0
Halifax, 1
Millersburg, 2
Elizabethville, 3
Lykens, 1
10

DELAWARE—
Chester, 14

ELK—
Ridgway, 6
Johnsonburg, 3
St. Marys, 8

ERIE—
17
Erie, 15
Corry, 12
Union City, 0
Belle Valley, 0
27

FAYETTE—
Uniontown, 20
Brownsville, 2
Bellevernon, 0
Connellsville, 0
Dunbar, 0
Fairchance, 0
New Haven, 0
22

FOREST—
Tionesta, 3

HUNTINGDON—
Huntinngdon, 6
Mapleton, 2
Orbisonia, 3
Mt. Union, 1
12

INDIANA—
Blairsville, 6
Homer City, 2
Clymer, 1
Indiana, 6
Saltsburg, 0
Blacklick, 0
Creekside, 0
15

JEFFERSON—
Lindsey, 3
Reynoldsville, 4
Brookville, 4
Big Run, 0
Brockwayville, 0
Punxsutawney, 0
Summerville, 0
11

JUNIATA—
Mifflin, 5
Port Royal, 0
5

LACKAWANNA—
Carbondale, 1

LANCASTER—
Lancaster, 31
Manheim, 8
Lititz, 4
Ephrata, 4
Kinzer, 2
Elizabethtown, 15
Rohrerstown, 3
Quarryville, 5
New Providence, 2
74

LAWRENCE—
New Castle, 12
Elwood City, 4
Wampum, 0
16

LEBANON—
Lebanon, 9
Annville, 3
Palmyra, 13
Prescott, 4
29

LEHIGH—
Allentown, 7
Bethlehem, 2
S. Bethlehem, 2
Macungie, 1
Orefield, 1
Emaus, 2
Alburtis, 0
Catasauqua, 0
Slatington, 0
15

LYCOMING—
Williamsport, 16
Jersey Shore, 3
Muncy, 5

LYCOMING—Continued.
Montgomery, 0
Montoursville, 0
24

McKEAN—
Kane, 3
Smethport, 4
Bradford, 11
Port Allegany, 1
Eldred, 0
Mt. Jewett, 0
19

MERCER—
Greenville, 6
Sharpsville, 1
Sharon, 1
Mercer, 0
Wheatland, 0
12

MIFFLIN—
Lewistown, 12
McVeytown, 9
Newton Hamilton, 0
21

MONROE—
Stroudsburg, 1
E. Stroudsburg, 0
1

MONTGOMERY—
Pennsburg, 1
Red Hill, 2
E. Greenville, 0
Palm, 0
Green Lane, 2
Spring Mount, 2
Colmar, 6
Lansdale, 13
West Point, 14
Hatfield, 13
Ambler, 6
Conshocken, 1
Souderton, 1
61

NORTHAMPTON—
Easton, 0
Bangor, 0
Nazareth, 0
Siegfried, 0

NORTHUMBERLAND—
Sunbury, 15
Mt. Carmel, 3
Milton, 6
Northumberland, 1
Shamokin, 0
25

POTTER—
Coudersport, 6
Galeton, 0
6

SOMERSET—
Windber, 1
Somerset, 11
Meyersdale, 3
Berlin, 0
Rockwood, 0
Salisbury, 0
Stoyestown, 0
15

SULLIVAN—
Dushore, 0

SUSQUEHANNA—
Montrose, 1
Hallstead, 0
Great Bend, 2
Forest City, 1
4

TIOGA—
Wellsboro, 8
Westfield, 2
Knoxville, 6
Blossburg, 0
Elkland, 0
Mansfield, 10
16

VENANGO—
Oil City, 15
Franklin, 6
Polk, 0
Siverly, 0
Utica, 0
Emlenton, 0
21

WAYNE—
Honesdale, 1

WARREN—
Warren, 6
Clarendon, 0
Sugar Grove, 0
Tidioute, 0
Youngsville, 0
6

WASHINGTON—
Charleroi, 5
Monongahela, 6
Washington, 15
Canonsburg, 8
California, 0
Roscoe, 0
34

WESTMORELAND—
Latrobe, 4
Greensburg, 10
New Stanton, 2
Mt. Pleasant, 6
Scottdale, 5
Bellevernon, 2
Avonmore, 1
Parnassus, 5
Irwin, 3
Manor, 3
Derry, 6
Jeannette, 8
Arnold, 0
Bolivar, 0
Livermore, 0
Monessen, 0
N. Bellevernon, 0
55

WYOMING—
Laceyville, 3
Meshoppen, 1
Mehoopany, 0
Tunkhannock, 0
4

YORK—
York, 23
Spring Forge, 2
Dillsburg, 1
Glen Rock, 1
Wrightsville, 1
Hanover, 1
Dallastown, 0
Red Lion, 0
9

Number of counties visited, 56
Number of town visited, 327
Number of samples taken, 1,000

The number of samples sent into the laboratory by citizens of Pennsylvania was two hundred. This has been a great source of furnishing information to the dealers and buyers of feeds. Anyone who may want to have a sample of feed analyzed can have the analysis made by forwarding the same together with fee of one dollar to the Chief Chemist. A number of persons who are purchasing high concentrated feeds such as cottonseed meal, linseed meal and gluten feed which were bought on a guarantee for protein and fat and low fibre, have sent in samples and had them analyzed, to keep a check on the firms that were selling these high priced feeds. This is a capital way for men to know what they are buying. A carload of feed to-day amounts to between five and six hundred dollars, and by the investment of one dollar, the purchasers can know whether they are receiving true values or not; but so very few take advantage of this splendid clause in the law.

The Secretary of Agriculture, Hon. N. B. Critchfield, ordered prosecution last year in forty cases. Conviction was secured in thirty-nine of these cases. One case has been appealed to court and will be tried in due time. In 1910 there were sixty cases prosecuted. This shows a decrease of twenty cases. This is a chart to show that the feed conditions under our law are improving.

I am going to digress a little and call your attention to a table that has been placed in my hands a few days ago by a friend and incorporated as a portion of this report:

COMPARATIVE AGRICULTURAL STATISTICS, STAPLE FARM CROPS FOR THE YEAR 1911.

COMPILED FROM STATISTICS PUBLISHED BY UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF STATISTICS

COMMODITY	TERRITORY	Total acreage	Average yield per acre	Total production	Average farm price Dec. 1	Total farm crop value Dec. 1
BARLEY—Bushels,	UNITED STATES,	7,627,000	21.0	160,240,000	$0 86.9	$139,182,000
	PENNSYLVANIA,	7,000	25.0	175,000	65	114,000
BUCKWHEAT—Bushels,	UNITED STATES,	833,000	21.1	17,549,000	72.6	12,735,000
	PENNSYLVANIA,	291,000	21.9	6,373,000	69	4,397,000
CORN (Shelled)—Bushels,	UNITED STATES,	105,825,000	23.9	2,531,488,000	61.8	1,565,258,000
	PENNSYLVANIA,	1,435,000	44.5	63,858,000	68	43,423,000
HAY—Tons,	UNITED STATES,	43,017,000	1.10	47,444,000	$14 64	694,570,000
	PENNSYLVANIA,	3,148,000	1.00	3,148,000	$20 00	62,960,000
OATS—Bushels,	UNITED STATES,	37,763,000	24.4	922,298,000	45	414,663,000
	PENNSYLVANIA,	1,121,000	28.3	31,724,000	50	15,862,000
POTATOES—Bushels,	UNITED STATES,	3,619,000	80.9	292,737,000	79.9	233,778,000
	PENNSYLVANIA,	270,000	56.0	15,120,000	93	14,062,000
RYE—Bushels,	UNITED STATES,	2,097,000	15.9	33,119,000	83.2	27,557,000
	PENNSYLVANIA,	285,000	15.1	4,304,000	80	3,443,000
TOBACCO (Leaf)—Pounds,	UNITED STATES,	1,012,800	893.7	905,109,000	9.4	85,210,387
	PENNSYLVANIA,	46,000	1420.	65,320,000	9.5	6,205,400
WHEAT (Winter)—Bushels,	UNITED STATES,	29,162,000	14.8	430,656,000	88	370,151,000
	PENNSYLVANIA,	1,289,000	13.5	17,402,000	92	16,010,000
TOTALS,	UNITED STATES,	230,955,800	Yield Va	lue per acre,	$15 38	$3,552,104,387
	PENNSYLVANIA,	7,892,000	Yield Va	lue per acre,	$21 09	166,476,400
PERCENTAGE,	PENNSYLVANIA,	3.417%				4.687%

NOTE—No report on Acreage, Production, &c., is made by the Bureau of Statistics on Apples, Grapes, Pears, Peaches or Sweet Potatoes nor on Spring as distinguished from Winter Rye—both are combined. The figures on "Winter Wheat," for Pennsylvania, embody all Wheat raised in the State, comparatively little Spring Wheat being produced. (Compiled by William J. Rose, Freight Agent, P. R. R.)

I have been asked by a number of my friends and fellow-farmers, What have you new to present to the Board this year on the feed question? This is a hard question to answer, as this has been a year where a majority of the large firms and manufacturers shipping feeds into Pennsylvania have put forth their best efforts to comply with our law. The weed seed question has been the one that has given us the most trouble. A number of manufacturers who placed weed seeds in their molasses feed have removed the same. We waged a strenuous warfare on the manufacturers of chicken feeds. They were placing on our markets a chicken feed that contains a large amount of whole weed seeds. This was contrary to our law. The Secretary ordered prosecution and we secured conviction in all cases.

I present to you a sample of a certain chicken feed which has a large sale in our markets and which contained large quantities of weed seeds. I present to you a second sample that we found was composed of good cereals. This is a good lesson and will show you what good effect our law is when properly enforced. We find that the great trouble has been in the past with our own people. They do not take time to look into these subjects, and in place of buying good red wheat, good clean oats, buckwheat and corn to feed their chickens, which they can buy at a fair market value, they will go to the store and buy a feed that has been compounded or mixed by some firm in the far West and pay a price ranging from two to two and one-half cents a pound or from forty to fifty dollars per ton.

Here is what a member of the Board of Trade of St. Louis says in regard to these persons who come to attend the Board and buy grains to compound chicken feeds: "There are a dozen buyers there every day for chicken feed, wheat, corn and oats so badly damaged they cannot use it for any other purpose."

Pennsylvania is a great agricultural state and has great possibilities, if she could have her sons and daughters engaged in agricultural pursuits; but they go to towns and cities to make their fortunes and leave the old farm. How many of them succeed we cannot tell, nor can we tell how many fail, but in our visit to Pittsburg last week, the cry of the rich was to return to the farm, and if our young people could understand the conditions that exist in the cities, this table might be of some benefit to them. If you will take the time to read this table when this report is published, you will find that it contains some very encouraging data in regard to the average production of Pennsylvania. I would call your attention to a few of the cereals:

We will take barley. We find that the average production in the United States is 21 bushels, and that Pennsylvania produces 25 bushels, or an increase of four bushels.

Shelled corn, United States, 23.9 bushels; Pennsylvania, 44.5 bushels. Oats, United States, 24.4 bushels; Pennsylvania, 28.3 bushels. (Leaf) Tobacco, United States, 893.7 pounds per acre; Pennsylvania, 1,420 pounds per acre. In summing up the value per acre of barley, buckwheat, corn, hay, oats, potatoes, tobacco and wheat, we find the average money value per acre in the United

States is $15.38, in Pennsylvania, $21.09, or $4.29 in favor of Pennsylvania. This does not give the value of the apples, grapes, pears, peaches or sweet potatoes.

Before closing this report, I would like to call the farmers' attention to the importance of the calf meals that are being compounded and are upon our markets. These are high protein and fat and low fibre meals, and if they are fed according to the directions, you will have no trouble in raising your calves on your farms without the use of a small amount of milk, and after they get to be two months old, you can dispense with the milk and raise them on the meal. These feeds will grow the calf and develop its structural formation. I have had experience in growing calves at home with these meals. They are also splendid to feed to young pigs when you have a scarcity of milk, or to mix with milk. The price of one of them is high, but the other two meals sell at a fair price. I am here to advertise any special brand of calf meals, but I am here to try to encourage the dairymen to raise their heifer calves and by so doing, to increase the number of dairy cows in Pennsylvania.

It is a sad sight to see so many good heifer calves taken for vealing purposes, when they might produce some of the very best dairy cows and in this way increase the supply of butter and milk in our Commonwealth.

I wish to thank the Secretary of Agriculture, Hon. N. B. Critchfield, for his kindness and courtesy to me in my work as his General Agent.

I also wish to return thanks to Mr. James W. Kellogg for the many courtesies he has extended to me during the past year and for the friendly and courteous manner in which we have worked as co-laborers.

I also wish to thank Mr. John F. St. Clair and Mr. W. John Stiteler, Special Agents, for the able manner in which they have discharged their duties.

I also wish to thank Mr. John Spicer for the able manner in which he prepared our exhibit and the courtesies that he extended to the farmers who came to examine the same.

THE PRACTICAL SIDE OF LOCAL ORGANIZATION IN AGRICULTURE

By J. ALDUS HERR, *Lancaster, Pa.*

This much talked of topic has received more attention the last year than at any previous time, and in many instances has resulted in much good to the producer as well as the consumer.

Organizations are of early origin, but most of these pertaining to the uplifting of farm life have chiefly been along the social side,

and the practical part has partially been neglected. Organizations of this kind are designed to further their interests and particularly bring the producer and consumer, the farmer and manufacturer into direct commercial relations without the intervention of the middlemen.

Nearly all industries have established organizations for the betterment of their interests, even in the conservative County of Lancaster. We have two agricultural clubs that have been in existence for many years: namely, the "Octoraro Farmers" and the "Fulton Farm Club." I have read the report of these meetings when the writer was a mere boy. Then came the Lancaster County Agricultural Society, this was followed by the Grange, and more than a half dozen similar organizations pertaining to farm life, all doing work along their respective lines. But their advancement has been chiefly social instead of dealing with the more practical side of their occupation.

The question which confronts most of us is, How can we combine the two with better advantage to the majority of persons interested?

The two chief interests confronting the farmer today are more economical production, and better distribution of marketing.

Too many of the crops on the farm are produced at an actual loss, or probably just sufficient profit to maintain the industry. Following this is the finding of the best markets for the products, too often there are instances where some markets are glutted at the expense of other poorly furnished ones.

These are the two chief interests that have been neglected in most farm organizations, except a few large companies who have tried to solve the problem with some degree of success, but often being too large, and beyond the control of the producer and consumer alike.

The State and National Grange have done much good in general, but in our county it has been a dismal failure, few persons knowing there is one in existence. About twenty years ago there was a local Grange in our community, but it long since has gone the way of many other good organizations for want of actual effort. The social side was a glowing success, but the business and financial part was sadly neglected, thus the result mentioned.

Now how best to overcome these serious failures is the question to solve. The very nature of the farmers' calling should induce him to organize locally for the purpose of selling the crops he produces, and buying the articles he must have in his business, and to learn to deal more direct with the consumer and producer; thus to eliminate to a certain extent the middlemen who have been a very costly adjunct in the business life of the American Farmer.

The farmer of the future must be more of a reader and thinker for his own benefit. The more direct he deals with the consumer and producer the more intelligence he must put in his business.

After having produced a valuable crop, it requires some business and executive ability to put his products before the purchaser in the most attractive appearance with a profit to himself, as well as a reasonable price to the consumer. Not forgetting the fact that a pleased and satisfied customer is the best "ad" in any line of business and much cheaper, and more durable than printers' ink. The time has never existed when there was an over-production of a good,

first-class article, if properly distributed, and goods of this class always demand a paying price, and in many instances the purchaser will look up the producer who has goods of this class for sale.

We as farmers should think more of the consumers' wants and desires, who are willing to pay good value for goods received, if in so doing they actually receive full value for what they pay. We should take a full broad view of the business relations between the producer and consumer.

The more familiar the farmer is with the life of the consumer and *vice versa*, the more satisfactory it will be for all concerned. Invite the consumer to come and see the plant where the articles offered for sale are produced, by so doing you would receive the confidence and advertising medium of a good customer, which is a long step in the line of success.

The origin of all Government is the home. The basis of all large organizations must be of local origin; no wheel is stronger than the weakest cog within its circle.

The foundation for a business organization must be laid by the members within reasonable bounds of their local community.

No one is more capable of knowing the wants and desires of a community than the residents thereof, and they should be more efficient in the management of said local organization. Whenever a company expands beyond a certain limit it becomes unwieldy and throws itself liable to many dangers which are detrimental to the control and a menace to the best development along the line of business intended. Self-government, which begins at home, is also appreciable in local organizations, and in a very great degree, means nothing more than good common sense, which is frequently lacking in many business propositions.

The country at large today is more aroused about the organization of the farmer than it has ever been before. Most dailies, and many of the most prominent magazines give considerable space to the discussion of this most worthy subject.

The place to foster this worthy child of the "Farm Organization" I believe must be in the public schools. The child who will make the successful farmer of the future must be better equipped to deal with the problems that will confront him. He must see farm life from a higher and different aspect than he has ever seen it before. The day is at hand when the manual training system of education must be the prevailing school established for the rural as well as the city districts.

The ever pressing demand for education that will train the child to be a self-sustaining bread winner, will be the power; and when started right, it will control the best interests in the United States. Then, and not till then, will the farmer receive his just demands, and the now dominating powers will give recognition when asked for, or be trodden on by the onward move of justice.

As far as farm organization has gone, it is a step in advance of education. The rural schools as well as those of the city should become a unit of power in the betterment for agricultural uplift, for the destiny of both classes is dependent upon the success of agriculture.

All other industries are at the mercy of the great calling, tilling the soil. The issue of the day is better government for local organizations. Local farm organizations have been started in many places and have proven beneficial; with few exceptions the farmer has not received his portion of the dollar in the disposal of his products, as yet these organizations have more efficient buyers than sellers. The most direct road to dispense with the middlemen's profit, is through more direct buying from the manufacturers, this end of the problem has been fairly well solved.

The Lancaster County Farmers' Association which we started five years ago, was of very humble origin, the first season ending in 1911. They did a business of $122,000.00, paid 5% on the capital stock and conducted the business on a 2½% basis. They have capitalized at $75,000.00 and have 1,000 members in good standing.

A very important feature of this organization is that all business is done on a cash basis. It is the duty of the General Manager to receive prices on all lines of goods to be purchased. If any member refuses to pay cash, he is denied the privileges of the association and cannot deal with it.

This organization has a main office, with four branches, its 1,000 members ordering all goods through the General Manager; but each branch is responsible for its own indebtedness and should any of the branches fail it cannot in any way affect any of the other branches.

At present two of the branches here built substantial brick buildings for stores, costing about $4,000 each, the two branches carrying about $18,000.00 worth of goods needed on the farm, coal, feed, flour, seeds, oils, implements and farm machinery in general. You can buy nearly everything needed on the farm from a tack to a four-horse wagon. As mentioned before, the way to eliminate the middlemen is by direct selling to the consumer. If the members of an organization, like the one in Lancaster county, would unite in disposing of their crops in carloads, having some responsible man to whom to ship to regularly, it certainly would be of immense benefit to the producer.

The thousand members could create a demand for first-class products, and to a great extent, solve the problem of dividing the dollar between the producer and consumer, without the assistance of the much talked of middlemen.

But in selling direct as well as purchasing there are many problems of importance to be met, and right here is where the public schools are deficient in not giving the pupils an education on a more substantial bread-winning basis. Had the new school code of Pennsylvania given us this much needed training for the men and women of the future, we might excuse the remainder of that voluminous document.

In direct selling, there must be a confidence established between the seller and purchaser, of the highest standing; and great care should be taken that this confidence should never be misplaced.

Oh! hail the day, for it is near at hand, when the onward movement of Local Farm Organization will be heard all along the land, and the elements of resistance that are defying our advance, will listen and take warning, when many of the shackles will be cast asunder.

Then, and not till then, will the farmer receive to a large degree the profits of his toil.

ADDRESS OF PROFESSOR HAMILTON

It is needless to say that I am always glad to get back to Pennsylvania—particularly when it gives me the privilege of looking into the faces of the men of this Board whom I have long known, and honored for their substantial work in the interest of agriculture.

In thinking of the Board and its services to the State, I feel that some one should be deputized by the Secretary of Agriculture to write its history, not simply a history of the Board as a whole, but of its individual members.

The SECRETARY: I have been trying to get it done, but so far the Nestor has refused to be pressed into the work.

PROFESSOR HAMILTON: I think it should be done. I have been thinking while sitting here, "What if the State of Pennsylvania were to employ this body of men by the year to give their entire time and attention to the development of agriculture in their respective sections?" If so much has been done by these men, meeting three or four days in the year, what would be the result if they were to devote all of their time to the development of agriculture? I believe we have come to a time when in every state a body of experts to assist agricultural people at their homes will be employed by the year. In is coming to this that in every county in every state of this Union in which farming is an important feature there is going to be an expert giving all of his time and attention to the development of agriculture.

In the stronger agricultural counties, as Lancaster and Chester, there will be six, eight, or ten men who will do nothing else but attend to the development of their agriculture, and I may add, domestic science as well. These men will be responsible to some central agent or head, such as the State Board of Agriculture or the State Agricultural College.

There is a notable instance of the effect of that method that has just been brought to the attention of the world by the publication, in French, of the condition of agriculture in Belgium. Belgium in its political divisions is something like Pennsylvania. It is divided into Provinces similar to our counties; its population is about equal to that of Pennsylvania, numbering about seven millions, of whom about one million are farmers. Its area, however, does not compare with that of Pennsylvania. In size it is about equal to the State of Delaware.

Twenty-five years ago agriculture in Belgium was in a condition so depressed that the livelihood of the people were seriously threatened. It became necessary to do something for its development. Their wise men got together and after considering the situation at home and looking at agriculture as pursued in different other countries, adopted a plan that has proved to be marvelously successful. They did not begin with four or five experiments, but selected one and carried it on for 25 years. It consisted in the creation of an office called "Agricultural Supervisor." This supervisor was placed over the entire Kingdom. The country was divided into three divisions, and an agricultural expert was placed in each of these divisions. Later they appointed an expert for each Province. Each of these men was required to give his entire time and attention to the development of agriculture in his District. No one could be appointed to the position who did not possess a certificate as Agricultural Engineer, except an occasional man who had been conspicuous for his success along some line of agriculture, and he only after he had passed an examination before an expert board. The results have just been published and we have had the report translated in our office.

There are today thirty-two of these experts in charge of agriculture in the various provinces. As a result in the Province of Antwerp, arable land was raised in 25 years from $105 per acre to $162. Prairie land from $146 to $243; heath land that was pretty nearly valueless, went up from $4.00 to $16.00; sandy land was raised from $160 to $225. In East Flanders the best land was raised from $243 to $405,—an increase of $160 per acre.

Similar advance was made in value in every variety and character of soil, sandy, peat, bog and other kinds. There was nothing done by the State for the improvement of her agriculture but that one thing,—simply putting one or two experts into each Province to show the people the most advanced methods of agriculture.

We heard in Mr. Hutchison's paper, something about the amount of wheat grown in Pennsylvania. Here is what they did in Belgium. At the time the experiment began in 1885, they were producing in Antwerp an average of 23.75 bushels of wheat per acre; in 1910, it was 31 bushels, an increase of 7.30 bushels per acre. The yield of rye in 1885 was 23.45 bushels per acre; in 1910, it was 31.07 bushels; an increase of 7.62 bushels. Potatoes, 207 bushels per acre in 1885, as against 294 bushels in 1910,—an increase of about 87 bushels per acre. The increase for the Province of Brabant was wheat, 14.73 per acre; rye, 19.44 per acre; barley, 36.62 per acre. In beets they raised the percentage of sugar from 11 to 16 per cent. The increase in wheat for the whole country was from 24.53 to 38.55 bushels per acre, or 14 bushels. Farm animals show the same proportion of increase.

This was all brought about through the efforts of these experts. The information available was first put into their hands and they were sent out to disseminate it among the farmers. I am confident that if we were to adopt similar methods, we could have similar results. We have just as good land as any that is found abroad, just as good climate, and just as capable people, and yet we are away behind in our results. The State of Pennsylvania could not invest

her money in a better way than by employing capable men to go out into the fields and apply the things, we Institute people have been preaching. I hope the day is not far distant when the State will take up this line of work,—whatever expense is involved will be amply repaid.

The Province of Ontario started a similar movement five years ago. They had great difficulty in getting an appropriation for it, but they finally succeeded and hired men to go into different districts and take up this work. Today they have thirty-two counties in which they have these experts located the entire year. All of the reports of their work are of most satisfactory character.

The result of twenty-five years successful operation in Belgium will surely justify a trial of the system in the United States.

ADDRESS OF GENERAL BEAVER

Mr. Chairman: I have been very much interested in this little story of Belgium. The people of Belgium don't compare with the people of Pennsylvania as far as I know. They have not been educated as we have been educated. They cannot assimilate ideas as we can, and they cannot carry them into effect as we can. I know that we have better educated men than they have—even with their agricultural doctors, although they may be equal to the demands made upon them there.

Now, Mr. Hamilton spoke of Mr. Hutchison's paper. The statistics in it were furnished by a railroad agent. What have the railroads got to do with it? Why, everything! If they don't stimulate agriculture in every way they can, they won't have anything to keep up their railroads. James J. Hill understands that. He is scattering prize bulls along his road in order to raise the standard of the livestock, and he induces them to be sent each spring to Chicago to compete with other prize cattle. This is not only a stimulation to his community, but it is a stimulation, also, to his railroad which brings him in his income. Now we have been thinking that the Pennsylvania and Reading systems were doing a very generous thing when they offered to send agricultural trains into Pennsylvania. Why, it is the most selfish thing they can do, and yet it is the only thing they can do, short of a system such as Prof. Hamilton has told us about in Belgium and Ontario. We may not reach this in five, ten, or even in twenty-five years, but it will come, if not through the direct agency of the authorities of Pennsylvania, it will come through the United States. Why, there are now five bills pending before the United States Congress, one to have agricultural instruction—that is, instruction in agriculture in sufficient amounts in each state so that whatever subject the people may be specially interested in, they may get information about.

Now, I was much interested in Prof. Stewart's demonstration this morning. That was a good thing to listen to; but how many of us who have heard it will take it home with us? Now if Prof. Stewart was to go to Adams county and go to a half a dozen of the farmers there and show them by ocular demonstration what can be done, these methods would be carried out all up and down the County of Adams, which has become one of our great apple-producing regions. I asked, on one occasion our friend from Berks county, what the best apple was for all purposes; and he said "Stayman Winesap," and I have had that on my brain ever since, and several weeks ago I asked Mr. Tyson to send me a box. In a few days I got a box by express and there is no reason why Pennsylvania could not produce the Winesap, as one of the leading varieties.

My old Secretary got me to go out to the Carnegie Library last year to talk to some of the boys. A friend of his who had charge of a lot of boys in Pittsburg thought the boys might be interested in a man who had only one leg and uses crutches. Now, I never have any hesitancy to exhibit myself to boys at any time, so, of course I went. On the way he ran into a fruit shop, and knowing my fondness for apples, came out with a Winesap for me. I asked him what he paid for it; he hesitated a little, and I said "You need not be ashamed of it, Pearson; you know I value it as much if it cost two cents as if it cost twenty-five cents." He said as a matter of fact, he had paid ten cents for it. I went one year into the store of Henry Hallowell & Sons, on Broad St., below Chestnut, Philadelphia, and looking around I said, "You don't mean to tell me you erected this building?" He said, "Yes, they had just handed it over to the Real Estate Trust Co., and had it conform with theirs, so that it would rent more readily." I said, "I guess we will have to pay for it." He said, "You have paid for it." I wanted a Bellflower apple, he brought me one nicely wrapped up in a piece of tissue paper. I said, "But that is not a Bellflower." He said, "Oh, yes, it is a Western apple." I said "That accounts for it; they couldn't come up to the Pennsylvania fruit." You can't have a Bellflower without the fragrance and the taste. I wouldn't give a bushel of them for one Bellflower that comes from Centre county, Pennsylvania. And I paid five cents apiece, or sixty cents a dozen for them! Why? Because they pay attention to the picking and the packing, and consult the tastes as well as the taste of the consumer. Now, I was glad to get that box from the Tyson's the other day. Every apple was nicely wrapped up in tissue paper. They, too, are studying the tastes as well as the taste of their consumer, and there is no reason why their method should not be more generally adopted by Pennsylvania growers.

Well, now, I got off my story a little on the apple question. About these bills that are pending in Congress, I know of two or three. I heard of a couple more last night. One of them was introduced by the Senator from Georgia, who was President Cleveland's Secretary of the Interior, Hoke Smith, who has since then been Governor of Georgia. He is very much interested in agriculture. In fact, the Southern people are taking much interest in improving their agriculture, through the Department of Agriculture, of which our friend, Prof. Hamilton is an honored member—under Prof. Hays,

he told me last night they have just as much pride in their agriculture in the South as we do here. Before the war, corn and cotton were kings, but now they are turning to the raising of crops such as we raise; by which I judge they are raising their corn to feed their stock and have taken to raising "hog and hominy" as well as corn and cotton.

Hoke Smith has introduced a bill, authorizing appropriation to land-grant colleges, and then giving certain amount additional in proportion to the amount appropriated by each State Legislature. For instance, it would give Pennsylvania sixty thousand dollars based upon so many millions to be divided among these states according to the amounts appropriated by their Legislatures; say the equality of Pennsylvania would be fifty thousand dollars; we would get that according to our population, providing the State Legislature would appropriate a like sum. Now, you see what this amount would mean in carrying on the agriculture in a practical way in the different counties. If you could take Stewart into the ordinary farmer's dining-room and sit around the table with half a dozen men with note-book and pencil, and have him go over his story so that they could take it down, and it would make a difference in five years such as he showed this morning, and you could sell the apples for two dollars and fifty cents a bushel, like I paid for my box from the Tyson's the other day, you see what that would mean. Why, we have not started in our apple production in Pennsylvania, although some of them think they are getting along in certain locations.

My friend Hiester, who has gone to his Heavenly home the other day, was an enthusiast along this line. When he told me ten years ago what the possibilities of apple production were in Pennsylvania, I laughed at him. In order to get even with me, he sent me from the next meeting of the Horticultural Association, a box of Baldwin and Grimes' Golden, originated in the orchards he produced. They laughed at me for three months. I recognized the quality; there is no question about that, and there is no question about the amount, if we simply get our heads together and go to work. We used to think that Western New York was the place to raise apples; well, it is not better than Pennsylvania. Our Soil Survey shows it. Some locations are better than others. The Soil Survey people put an auger down into the ground and pull it up and tell you that that is the place to plant a Baldwin.

Now, why, I don't know, but I suppose some elements in the soil. Iron will produce color, and that is the reason the fruit is lighter in color in some localities than in others. In Centre county we are underlaid with Hematite ore, and I suppose enough of it will get into the fruit to produce color. The fruit needs the minerals as well as God's rain and sunshine. You take an apple and see what is enveloped in it, in the way of high art—in the way of beauty of color, of taste, and fragrance all combined, and then compare it with the fact that one man will devote his entire lifetime to the development of a single point in agriculture, and then think he is doing a great thing, such as Dr. Armsby is doing at State College in which he puts a steer into the Respirator Carometer and measures the breath which the steer gives up every time it breathes, and knows

just how much of it is waste, and how much of the feed which is given the steer is waste, and thinks he is doing a big thing; you take this, and then you can imagine what it is to take agriculture as a whole and try to undertake to carry it out. Why, gentlemen it is the biggest thing in this world, and God made it so, because we are all dependent upon it; and if we were just able to carry out the provisions of the Hoke Smith bill—I don't know just the details, but I do know the scope of it—we could revolutionize agriculture in Pennsylvania, as they will in Georgia.

We are talking about Missions, nowadays. I have been insisting for years that the mission of America to China is agriculture. We could revolutionize it; they would be more ready to accept Christianity and we could also learn something from them. Their agriculture is altogether intensive; they have no extensive agriculture such as we have, and while we show them something of our extensive methods, we could learn something of the intensive from them. Why think of what we might accomplish, if we were to establish an agricultural mission, as they are now trying to do from State College, by means of a young fellow who went over there to become a Professor in a Christian College, and they have him teaching agriculture and horticulture and landscape gardening, and about everything else they can get him to do, and he came home again and said: "If you will stand by me, we will start a little college settlement over there in agriculture to produce plants that you can use here, and we have plants here that can be introduced into China, so that we can be mutually helpful;" and they are going to try it. Why, there is just one of the things the Master did when he was in this world—he fed the men who were hungry, and then he preached to them, and I don't believe America could influence China more quickly and effectively than by showing them just how we do things in this country. If we could teach them to farm as we farm here in Pennsylvania, to cultivate as we cultivate here, I have no doubt we would never again hear the cry from more than three million dollars—yes, twice that, to save the lives of three million men who are starving because there is not enough for them to eat. And that is simply because they know nothing of farming. Instead of cultivating the river banks, which wash away, we would teach them to cultivate and develope the interior.

Any man who knows what he is doing and who farms intelligently, must use his brains as well as his muscles; brain and brawn are both required to produce results in agriculture. No man who undervalues what he is doing is fit, in my judgment, for his business, for it is the biggest on earth; and it takes brain as well as brawn to develop it in its fullest, and the man who undervalues it, undervalues himself as well as his business, and he also undervalues the sunshine and the rain of our common Father, which sink into the earth and cause it to produce for us the elements of life. We cannot overvalue it; let us value in its true place, what agriculture in Pennsylvania is, and may become to the generations that follow us, if we value it as we should and reach the largest results in our work.

LOW GRADE NITROGENOUS MATERIALS IN FERTILIZERS

By DR. WILLIAM FREAR, *Chemist*

The average complete fertilizer sold during the spring of 1911 in Pennsylvania contained about 1.5 per cent. of nitrogen, 8.25 per cent. of phosphoric acid, and 5.0 per cent. of potash, but the relative cost to the purchaser of these materials, exclusive of mixing, bagging and freight, was 36; 30; 25; that is, the nitrogen, by far the least abundant constituent, was not only relatively, but absolutely the most costly.

The use of commercial fertilizers is steadily increasing and the demand for fertilizer raw materials is growing at a similar rate, notwithstanding the larger measure in which legumes are used in our rotations and the better conservation of domestic manures, the demand for organic nitrogenous raw materials for fertilizers is growing far more rapidly than the supply of first class materials, such as bone, tankage and dried blood. The cost of nitrogen from these sources is rising far more rapidly, as a consequence, than that of rock phosphoric acid and potash.

The fact that nitrate and ammonia nitrogen now cost less than organic nitrogen from prime materials, might suggest that fertilizer makers would turn to nitrate of soda or sulphate of ammonia more largely than in the past. Fertilizer analyses do not show any marked tendency, however, toward such change. Manufacturers explain that fertilizers whose nitrogen is exclusively supplied by nitrate of soda or by sulphate of ammonia do not hold condition well, and consequently are unsatisfactory to the buyer because he cannot conveniently drill them; and that moreover, fertilizers that become available gradually through the season are better for most crops than are such fertilizers as hold all their nitrogen in immediately available form. There is a third reason he doesn't say much about, namely, that he has found a way to use cheap organic materials to supply the nitrogen and that, at least in many cases, he is supplying an important portion of the 1.5 per cent. we find present, by the use of hair, wool waste, leather, garbage, tankage and peat.

Decades ago, these cheap and abundant nitrogenous materials were tried and found wanting. While horn meal gave considerable crop return, woolen rags some, and hair, leather, and peat a little, these low grade materials, despite the large proportions of nitrogen some of them contained, were found to have only very low fertilizer value; consequently their use as fertilizer ingredients was condemned.

In recent years, this condemnation has gone to the length of requiring their use, when it occurs, to be declared. In the new fertilizer Act of 1909 for Pennsylvania, this requirement is made specific for pulverized leather, hair, ground hoof, horn, or wool waste, raw, steamed, roasted, or in any form.

Since the passage of this Act, no instance of such declaration has in any case come to my attention. Furthermore, a careful microscopic examination of thousands of samples has failed to show their presence. Yet these low grade materials continue to go by the trainload to the fertilizer factories and doubtless do not stay there, but come out in some condition in the fertilizer output.

These facts are admitted in a general way by fertilizer manufacturers. They explain that these raw materials, with the possible exception of peat, are, while employed in the make-up of the fertilizer, not introduced as leather, hair, etc., but are, in the course of manufacture, changed into other substances whose nitrogen is available; that by such use the general cost of fertilizer nitrogen is held down far below the point to which it would rise if the manufacturer were limited to high-grade sources of supply; and that the buyer is not injured because he really gets, as the result of the process employed, a highly available fertilizer.

I have yet to be convinced that the buyer is not somewhat injured because of the price he is asked to pay for this nitrogen in mixed fertilizers, even though the truth be admitted that the manufacturer has been at some expense in its treatment and has, by its general use, somewhat held down the prices of high-grade materials.

At this time, however, I desire to confine attention to the question whether the process or processes used, do really change the nature of these low-grade materials so as to increase considerably their availability.

The process is simple and consists either in disolving the hair, leather, garbage tankage, etc., in the sulphuric acid later to be used in dissolving the phosphate rock that forms the major part of the fertilizer; or, in other factories, in putting the ground rock and leather, hair, etc., together into the mixer and then adding the acid. The product is a dark, spongy material called "base goods," because it is not sold directly as a fertilizer, but forms the base or principal part of various mixtures with high-grade nitrogenous materials, nitrate of soda, sulphate of ammonia, potash salts, usually with some ground limestone to act as a dryer or neutralizer of the excess acid, and sometimes with raw, ground peat to serve as a conditioner; that is, as an improver of the drilling quality of the mixture, whenever that seems advantageous.

To determine whether such treatment fully destroys the hair, leather, etc., upon which it acts, and whether the products are really much more available to plant, I have made a careful study of the effects of the treatment upon a large number of substances, with the aid of my assistants in the Department of Experimental Agricultural Chemistry of the Experiment Station. The full description of the experiment and of its results will appear in the forthcoming report of the Station, but I have considered the question dealt with of such present importance as to warrant my placing before you at this time the conclusions thus far reached.

The list of materials studied included sole leather scrap, soft leather from glove factories, pulverized steamed leather, cleaned cattle hair such as plasterers use, rotted hair, impure wool waste, fine horn meal, impure hoof scrap, peat meal and garbage tankage, together with a sample of "base goods" from a large fertilizer fac-

tory. It was found that the treatment with acid of the strength used in the fertilizer factory, destroyed with practical completeness, the tissues of these materials, so that they were no longer recognizable under the microscope.

The treatment increased the water-solubility of the nitrogen greatly in every case. In the original materials the percentage of the total nitrogen that could be dissolved by water ranged from none in the fresh hair and sole leather to 13-14 per cent. in the rotted hair and slightly fermented horn meal; but after treatment, the water soluble portion ranged from 40 to 78 per cent. of the total nitrogen present.

Furthermore, while of the total nitrogen present as ammonia in the original materials the quantity ranged from but 0.1 per cent. in sole leather to 6.1 per cent. in rotted hair, in the acid treated materials the proportion of ammonia nitrogen to the total nitrogen ranged from 1.7 to 14.1 per cent. The increase was, therefore, very considerable, but not sufficient to warrant the manufacturer in saying, as he often does, "The process converts the nitrogen to ammonia." For clearly, most of the nitrogen remains after the acid treatment in an organic condition.

It is well known that most organic materials used as fertilizers must, before they can be taken up by the plants, be converted into ammonium salts and especially into nitrates, and that these changes are effected in the soil to varying degrees with different materials by the help of certain soil bacteria. It is needful to know concerning these nitrogenous products, how they respond to the attack of these bacteria.

The experiment included, therefore, a study upon this point. It was found that, in our soil, taken from the Station farm in a mildly acid condition, the nitrogen of the original soft leather, wool waste, and garbage tankage did not experience any change what ever to ammonia in the course of seven days, the duration of our test; but that of the nitrogen of the horn meal, 12.67 per cent., and that of the rotted hair, 15.29 per cent., appeared as ammonia at the end of this time, the other materials remaining intermediate between these extremes; whereas, a good sample of dried blood showed 19.44 per cent. of its nitrogen as ammonia after the test. In the acid-mixed materials, on the other hand, the proportion of ammoniacal nitrogen ranged from 19.6 per cent. in the garbage tankage to 84.95 per cent. in the hoof-scrap. In like manner, the nitrification test, continued for five weeks, showed in case of every material upon which it was tried a large increase of nitrification in case of the acid-treated as compared with the corresponding raw nitrogenous substance.

Finally, these laboratory tests were followed by a field test of the effect of the fertilizers, before and after acidulation, upon rye. These field tests were so affected by a mechanical source of error that I do not feel that dependence can be placed upon their indications with respect to the *individual* nitrogenous materials. By confining the attention simply to a comparison of the *group* of materials under test, the disturbing effect of this source of error are largely elminated.

Stating the results so as to show the increase in yield of air-dry rye, straw and grain harvested when the grain was still in the dough stage, in pounds per acre, the comparison is as follows:

	Pounds	Increase due to nitrogen
Rock and potash fertilizer,	882.4	
Complete fertilizer with dried blood,	1,391.4	509.0
Original inert materials,	11201.5	320.1
Acid treated materials,	1,599.4	717.0

It is well established that the rate of bacterial change experienced by the same material in different soils, is widely variable. I think it unwarranted, therefore, to assume that results so favorable as those above stated, will occur with acid-treated leather, hair, etc., on all soils. It is my judgment, however,—and this is supported by the results of tests made earlier at the Massachusetts Experiment Station by Lindsey upon acid-treated leather and by Haskins upon acid-treated peat, that the fertilizer manufacturers are correct in claiming that the acid-treatment of most of these materials result in a very marked increase in the availability of their nitrogen.

REPORT OF THE ENTOMOLOGIST

By PROF. FRANKLIN MENGES

The season of 1911 must have been in many ways favorable to the propagation of some insect life; especially has this been true of the Hessian fly *(Cecidomyia destructor)* and the common locust *(Rispa)* or leaf mining and skeletoning beetle, scientifically known as the *Oclontata Dorsalis.*

The Hessian fly has destroyed from 10 to 50 per cent. of the wheat crop of the State and has, therefore, cost us millions of dollars. Spraying for this insect is impossible and the insect enemies, which number so far as our present knowledge goes, from 10 to 14 different species, seem to lose absolute control of this fly during some seasons, while during other seasons they keep it in subjection and little damage is done.

DRY SEASON DESTRUCTIVE

Entomologists who have investigated the fly tell us that a dry season, especially during July and August, is very destructive of the pupa or the quiescent stage in the life history of this fly and, therefore, we would conclude that very few of the pupa of this insect would have escaped one of the longest, most extensive and destructive periods of dry weather (that of 1910) that has been experienced in the State for a long time, and yet the following season the Hessian fly was the most abundant and destructive for many years. The question naturally comes up, why is this if dry weather is such a menace to the development of this fly, and in so far as possible we shall endeavor to answer this question. In looking up the temperatures for July, August and September, 1910, we find that the weather was comparatively cool, in fact so much so that the farm crops did not suffer such extreme desiccation as they would had the temperature been higher. The same is true of the Hessian fly, for we find that the desiccating effects of the hot sun when the ground is dry have, in many instances that have been thoroughly investigated, destroyed well nigh the entire brood lying dormant in the wheat stubble and on the ground. Here we have two climatic conditions that will destroy the Hessian fly, hot and dry weather, therefore, if immediately after harvest the ground is dry, the weather hot and plowing difficult, and a wheat stubble field is known to have quite a brood of dormant Hessian fly in its stubble and on the ground it is not necessary to plow the field early to destroy the fly because heat and dry weather will do this just as well.

BOTH SOWINGS INFESTED

But, if a drought prevails, as it did in the summer of 1910, and the weather is cool, the pupa of the Hessian fly will lie in the stubble until there is moisture sufficient for the fly to change from the dormant to the adult stage, or the full-fledged fly, which, on account of there being a little rain in 1910 until very late in the fall, may not have taken place until, perhaps October, so that both early and late sowing were equally badly infested. Another thing. In some places where there was sufficient moisture together with the prevailing cool weather there may have been more than the supposed usual two broods of fly and the likelihood is there were more than the two broods in some places.

PARISAN EXPERIMENT

Dr. Paul Marchal, of the Institute Agronomique, in Paris, France, in order to determine how many broods of Hessian fly could be produced under the most favorable conditions, began a series of experiments in April, 1894. His plots of wheat were enclosed so that there would be no infestation from without. From puparia which had been collected March 12, of that same year, imagos issued April 5. These proceeded to lay eggs on the wheat growing in the plot in which they were inclosed. These eggs hatched larvae that fed on the wheat as they would in Nature's realm and changed into puparia from which flies issued May 30. These flies were put into another plot of wheat, especially prepared for them, and the third generation of flies was flying in these cases July 1. In like manner

a fourth generation of adults developed from this third one, by August 5, and from these the fifth generation appeared September 4, and sixth by October 18, which deposited eggs that produced larvae which changed into the puparia and went into winter quarters.

WHEAT IS GOOD FOOD

These experiments were made in France where usually climatic conditions are most favorable for the development of the Hessian fly. The likelihood is that it is seldom the case that anything like such conditions prevail in any section of this country, that food for the larvae such as growing wheat, rye and barley, which seem to be the only food plants upon which the larvae feeds, are provided in nature in anything like sufficient quantity to develop such a number of broods, but in some instances similar conditions may have prevailed last season. During July, August, September, October, and even into November of 1910 this dry and cool weather prevailed.

BRED WITH EASE

In many places on the farm, either in the unplowed stubble field, for many farmers on account of the drought did not plow until late, or in the stubble field sown with grass there was sufficient moisture for the fly to pass with ease through all its stages of development and with few of its parasitic enemies present as was the case last year, and with sufficient volunteer wheat growing either on the unplowed stubble field or on the field sown with grass to furnish food for the larvae, ideal breeding places were provided on the farms of well nigh all wheat raising farmers, for the development of perhaps three or four broods of this pest during the past season.

LIKE STUBBLE FIELDS

The stubble fields sown with grass is an especially favorable place for the breeding development of the Hessian fly, because if there has been a fair stand of clover and timothy it furnishes protection from the dessicating heat of the sun. If this has not been the case weeds will soon spring up to do the same thing. Volunteer wheat comes up early and late, depending on location, and grows and furnishes food for the larvae which go on their way of reproduction unmolested by inspectors or poisonous sprays.

FREQUENT CULTIVATION

The stubble field that is to be plowed to be sown with a second crop of wheat may have similar conditions to the ones already described as pertaining to the field sown with grass, but in this case if thhe field is plowed early and after plowing frequently cultivated to prevent volunteer wheat from growing, no food for the larvae is provided, and consequently no adult flies can develop. This is farming to destroy the Hessian fly, whereas sowing grass with the wheat and raising weeds after harvest as is the case in the stubble field sown with grass, is farming to raise Hessian flies, because here the most favorable conditions prevail.

WHY IS IT NOT WORSE?

With agricultural practices as we have described them, providing favorable breeding places for this pernicious insect during the whole period of time which it develops with volunteer wheat, which begins to germinate soon after harvest and only stops with the coming of winter, is it not a wonder that our wheat fields are not annually devastated by this insect? That they are not so devastated is due the parasitic enemies of this fly, which keep on its heels so closely that it is seldom abundant and destructive for more than a year at a time. Here is a field for investigation and original research as to how the farmer may co-operate with these parasitic enemies of the Hessian fly in his agricultural operations that it may never be abundant and thus save millions to the State and nation.

ANOTHER WHEAT PEST

The wheat midge *(Diplosis Tritic)* seems to have appeared in some sections of the State. The larvae of this insect comes from an egg deposited by the adult midge in June, in the blossoms of very young kernels of the wheat head and feeds upon the kernel and dwarfs it or causes its entire abortion. Deep plowing and either packing the chaff or using it for roughage will keep down this insect.

SPRAYING MIXTURES

In my report of 1910 I referred to the injurious effects of some insect and fungicide spray mixtures especially fungicides. It has been assumed that solid bodies can not enter the epidermis of healthy plants, and so far nothing has developed to show that they can, and with this assumption not disapproved the question naturally arises why then do arsenical sprays that have been regarded insoluble in water injure foliage. The fact that under the conditions of solubility as tested by the chemists in which a substance is exposed to the action of the solvent, which is pure distilled water, for a comparatively short time the substance may be insoluble, but the same salt, when exposed for whole nights and days at a time to water completely saturated with the gases of the air or in natural water such as is used for preparing spray mixtures and usually containing chlorides, carbonates, sulphates, etc., of the alkali and alkali earth metals in quantities as these in natural water these arsenicals become soluble. This is especially true of the arsenate of lead as it appears in the markets. W. H. Volck, of Watsonville, Cal., * *has found that the foliage of fruit trees of the Pajaro Valley, which opens to the ocean and because of the atmospheric conditions on this account becomes covered early in the evening with dew which remains on the foliage all night and often far into the day, because of the fogs that prevail and continue at times for several weeks, that here the foliage of apple trees is remarkable susceptible to such an extent as to interefere with the effective control of the codling moth by these sprays. It was found that different samples of arsenate of lead, when dissolved in natural water and when applied at the same time under similar conditions of dew and fog and the same kind of foliage, did no harm, whereas in the case of other samples the effects varied from from slight injury to well nigh entire defoliation. These effects indicate a radical difference in the chemical properties of

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these samples of lead arsenate which was found to be the case. For example it was found that lead arsenate as it comes into the markets usually contains the pyroarsenate, which is soluble in ammonia and the acid arsenate which are stable under acid conditions, but under neutral and alkaline conditions these change into the orthoarsenate the most stable compound, with the liberation of arsenic oxide or an alkaliarsenate, which are soluble in water and destroy foliage. From this is appears that when arsenate of lead, if prepared for spraying in water containing alkali salts, or when it is exposed on the surface of the leaves, the action of the neutral water of fogs and dews that the pyroarsenate and the acid arsenate change into the orthoarsenate, liberates arsenic oxide or an alkali arsenate which, because of its solubility, is taken into the leaf and the leaf tissue destroyed. Therefore, the orthoarsenate is the only compound that should be used in spray mixtures, and it has been found wherever this substance has been used in the pure state no burning of foliage has taken place. As already stated, the pyroarsenate of lead is soluble in ammonia, and also that when the arsenate is exposed to neutral water and water containing alkali salts, it changes into the orthoarsenate of lead with the liberation of arsenic oxide or an alkali arsenate. If, therefore, there is any pyroarsenate or acid arsenate of lead present in a sample of lead arsenate the only thing necessary is to take a sample of half an ounce or an ounce macerate it and mix with about a gill of water in a granite or porcelain lined vessel. Then add as much strong amomnia as water and mix again and heat slowly and mix while heating and finally bring the substance to a boil. Set aside and allow the mixture to settle and cool, and then pour the clear solution through a filter into a funnel. Boil the solution until about all the ammonia is driven off. To the solution that remains after the ammonia is driven off add acetic acid or strong clear vinegar until it is distinctly acid, then a clear strong solution of lead acetate or sugar of lead, to which a little acetic acid or vinegar has been added, if a white precipitate forms when the solutions come together or are shaken up together, then the sample of arsenate or lead contains arsenic oxide or a solution arsenic and will burn the foliage of fruit trees.

Here it seems we have at last an arsenical that can be prepared in such a way that it will not burn foliage.

ADDRESS OF DR. SPARKS

I am sorry I could not spend more time with you today, but I spent most of my time in the Department of Health, trying to convince them that I knew better where a sewage disposal plant should be located than they did. I have been beaten, I may as well confess, so I will turn to a more pleasant subject.

What can we do to disseminate more information to the common people? How can we bridge over the chasm between the people and the college and the experiment station? We have tried bulletins,

more recently we have tried the experimental trains; and yet we cannot reach them—more especially, we cannot reach the boys and the homes that need the information the most.

There is a bill before the Federal Congress. Mr. Hoke Smith has the bill in charge, I believe, and we have very great hopes that it will pass the House of Representatives. Mr. Smith is very desirous to know what the sentiment is, in Pennsylvania, towards this bill, and I hope before you adjourn, the State Board of Agriculture will vote to express approval of this bill which provides that a fund of $6,000,000.00 be set aside for the purpose of spreading information on agriculture, domestic science and pursuits in rural life.

The second thought in my mind is, that I believe much of the success that has come to the College has come from the efforts of the State Board of Agriculture.

What can we do for the farm in order that we may keep our boys and girls there? How can we show that education in agriculture is just as necessary as education in reading, writing, literature and the curriculum of the public schools? The trouble is that the teachers don't know how to do this. In many states we have legislative acts requiring agriculture to be taught in the public schools, and this means that the teacher will simply take a text-book and ask the question at the foot of the page. I think it should be labelled, "First aid to the injured," because that is what it is. The last paper shows the result of scientific study, and only scientific study can properly enable one to teach agriculture successfully. Last year I was at an Institute in a state, not Pennsylvania, where the law required that a part of the Institute time should be devoted to this work, and the County Superintendent said, thirty minutes would satisfy the law. So the instructors drew lots to see which one should give this half hour's talk. Under such conditions, how can it be expected that any interest will be aroused in agriculture?

Another bill introduced into Congress is known as the "Page Bill," and provides for a sum of money to be granted by the United States for the purpose of teaching agriculture in the Normal Schools of the United States. This may help out to some degree. We must first teach the teachers the subject, and we are trying to do this to some extent by the Summer session for the teachers at State College.

Here is where you give me the opportunity to advertise as you so kindly do. The first summer we had one hundred and forty-seven teachers in the Summer session. We have only pedagogue classes, so that any class is a teachers class. The second summer we had two hundred and nineteen, and this next year we expect to have at least three hundred. The third session begins about the 19th of June and continues during the four weeks of July. Most of the teachers take the course in agriculture. They pay $3.50 a week for board, and if the price of butter does not go any higher, we still hope to be able to give them butter and not oleomargarine, even at that price. Then they pay $1.50 for room rent, and $5.00 for instruction during the six weeks session. This last five dollars is simply a nominal charge to arouse their interest, because we do not believe it pays to give something for nothing. The teachers last year spent an average of $41.00 aside from carfare. We think this is

about as cheap as we can afford to make it. I ask your help in spreading these things, so that the teachers may learn of them and come to spend the last two weeks of June and the four weeks of July at the College and still have the entire month of August left for recreation.

The next item is that the new school code, as passed by the last Legislature, gives us four new assistants, to Dr. Schaeffer. One of these assistants is an expert in agriculture, and his subject is to study how to introduce agriculture in the public schools. Much will depend on this man, and much will depend on the help you give him. We have found the man; first he has been a country teacher, and later became a principal of a high school, at a salary of eighteen hundred dollars, and then entered college as a man of mature years. Now I trust you will all give Mr. Dennis, (this is his name) all the help you can, so as to make him as useful as possible in studying and establishing agriculture throughout the country. I commend Mr. Dennis most heartily to your consideration.

I will not take your time in speaking of my favorite topic—educating the country boy to take an interest in the farm, instead of leading him towards the city, as the present curriculum does. Once he is convinced that it requires some brains to be a farmer as well as a three dollar a week clerk in a store, he will want to stay on the farm.

I congratulate the State and the Board, the Secretary, and Mr. Martin, and the host of Institute workers throughout the country, on the strides agriculture is making.

This Page bill also carries a provision that calls for an appropriation of money according to the rural population in proportion to the rural population of the United States.

REPORT OF COMMITTEE ON COMMERCIAL FERTILIZERS

By J. H. SCHULTZ, *Chairman*

The writer of this report has been a farmer for thirty years, but at present he is engaged in the manufacture of Commercial Fertilizers; consequently this report is written from the standpoint of the farmer, as well as the manufacturer.

The last ten years have brought about great changes in the fertilizer business. In the past when the farmer wanted to buy fertilizers, he asked the dealer for a $15.00 or a $20.00 fertilizer, and if the dealer had a brand that would sell for that price, the farmer would buy it without considering the analysis or the manufacturer that made the goods, and, if the analysis entered into the deal at all, it was only in a casual way, because in the majority of cases the farmer did not know what analysis a fertilizer ought to have in order to be of the greatest value to him. But with the aid of the State

Board of Agriculture, our Agricultural College, Experiment Stations and Farmers' Institutes, the farmer of to-day is better informed. As a result of this education, the consumption of the better grades of fertilizers is increasing much faster than the lower grades, because the farmer has learned that he buys a unit of plant food in a high grade fertilizer for less money than the same amount of plant food can be bought at in a low grade fertilizer. When the farmer is in the market to buy fertilizer he wants plant food and if he buys a low grade goods he must very often buy two tons of fertilizer in order to get the same amount of plant food as contained in one ton of high grade goods. It costs the manufacturer as much to mix, bag and sell a ton of low grade goods as it does for a ton of high grade goods; consequently the farmer is compelled to pay the cost of mixing, bagging, selling and the freight on an extra ton, where if he was properly educated he could buy the same amount of plant food in one ton and thereby save the labor of handling the extra ton. The use of high grade fertilizer would eliminate the question of a filler which is a source of great worriment to many farmers. The fact is that the manufacturer has never made a cent of profit on the filler which is used in low grade goods and I am sure that the farmer is not benefited. When the writer is in the market for fertilizer for his own farm, he wants nothing but the highest grade of fertilizer he can get, because in that grade of goods he is sure that the manufacturer is not obliged to use a filler of any kind.

A very important point that I want to take up in this report, and that is the source from which the manufacturer derives the different elements of plant food contained in the fertilizer he manufactures; and this is a point on which the farmer has not got the proper protection. This has reference more particularly to ammonia, as a unit of ammonia in leather scrap or hair refuse can be bought for $1.00, while a unit of ammonia from animal tankage, blood or bone costs the manufacturer $3.00 or more on the present market, and when the State makes an analysis of the two different ammoniates it gives one as great a commercial value as the other in spite of the fact that one costs $1.00 and the other $3.00 per unit.

Some of our chemists tell us in the most positive terms that they can tell the source of ammonia; whether derived from leather scrap, hair refuse or from animal tankage, blood and bone. We have on our statutes a law which compells the manufacturer to print it on the fertilizer bags if he uses leather scrap or hair. We do not know of any manufacturers who are printing their bags in this way, but we *do* know that thousands of tons of leather scrap and hair refuse are used in the manufacture of fertilizers and sold to the farmers of Pennsylvania. If the chemist cannot tell where the ammonia is derived from, then it is very important for the farmer's protection that the State appoint inspectors to visit the different fertilizer plants to see what materials are used and thereby restrict the use of inferior or worthless materials.

If this method is not pursued, it will continue to work a hardship on the manufacturer who is making an honest fertilizer; because he must meet the competition of low grade materials. If the farmer was more observing to note the results obtained from the use of the different makes of fertilizers on his crops, this matter

would not be so serious, as he would find that a fertilizer manufactured from animal tankage, blood and bone would give far better results than a fertilizer manufactured from inferior materials, such as leather scrap, hair refuse, etc., and he would be guided more by results in the field than by the commercial value. The writer wants it thoroughly understood that this does not reflect upon our Department of Agriculture in any way as he feels that under the present statutes the Department is doing everything in its power to protect the farmer from being imposed upon; but it is unfair that the chemist has no sure method of telling from what source the nitrogen is derived and the only methods that the writer can suggest to overcome this evil is the appointing of inspectors to vist the different fertilizer manufacturers doing business in the State of Pennsylvania.

The last few years has proven to be years of great progress in the fertilizer business, both from an inventive as well as from a manufacturers' standpoint. With the improved machinery, fertilizers can be manufactured and handled at less expense than it ever could before. The scientific man has found a way whereby he can extract the nitrogen from the air and put it in a commercial form, to be used in commercial fertilizer, and by this method he has procured a supply that is unlimited. The ammonia that is sold in this form is known as Calcium Cyanamid. A very complete article on this subject can be seen in the American Fertilizer of September 23, 1911.

Quite recently a process has been patented whereby the phosphoric acid in phosphate rock can be made available without the use of sulphuric acid, and by this method the injurious effect of sulphuric acid to the soil will be eliminated. The process consists of first grinding the phosphate rock into floats and then mix with the floats about 15 per cent. of niter cake and roast this mixture in a rotary kiln, heating the floats to a temperature of 2,700 degrees Fahrenheit.

By this process a unit of phosphoric acid can be made available at less expense that it can be done by the use of sulphuric acid, and yet it is preferable to the old method on account of the injurious effect sulphuric acid has on the soil. By this method it is possible to make a phosphate that contains 30 or 32 per cent. of available phosphoric acid and this can be done with phosphate rock containing 72 per cent. of bone phosphate of lime. The writer has given considerable of his time and means to the development of this process, and the parties interested expect to, in the near future, to put it on the market in a commercial way.

31—6—1911

REPORT OF THE COMMITTEE ON WOOL AND TEXTILE FIBERS

By A. L. McKIBBEN, *Chairman*

In the year ending 1910 there were 57,216,000 sheep in the United States, having a total farm valuation of $233,664,000 or a valuation of $4.08 per head. The increase in total numbers during the last decade was 36.6 per cent.; in total farm valuation 90.4 per cent. and in valuation per head 35.9 per cent. Increase in numbers and increase in relative value per head being practically the same. The total number of sheep in the world in 1910 was 605,050,853, the United States ranking fourth, with Australia, Argentina and the Russian Empire leading in the order named.

Totally, the world's production of wool in 1910 was 2,985,000,000 pounds, representing an output of 4.9 pounds per head. While ranking fourth in number of sheep, the United States ranks third in production of wool. In 1910 the total production of wool in the United States was 328,000,000 pounds; in Australia, 718,000,000 pounds; in Argentina, 414,000,000 pounds and in the Russian Empire, 238,800,000 pounds. The fact that 3 pounds of wool represent the production per head in the Russian Empire and 5.7 in the United States explains our higher ranking. (Pounds of Wool per head is considering hereby the total number of sheep and not by the number at shearing age).

Imports of sheep in 1910 were 126,152 head, valuation being $5.52 per head. Decrease of 218 per cent. in imports, and an increase of 54 per cent. in valuation was shown during the last decade. The exports of sheep from the United States totaled 44,517, and the price per head was $4.69. During the past ten years exports decreased 182 per cent. and valuation decreased 24 per cent.

Year ending June 30, 1910, the total imports of wool into the United States were 263,938,232 pounds, having a total valuation of $51,220,844. Of all the imports, including animals and animal by-products, excepting silk, wool is the highest in value. The United Kingdom leads in importation of wool into the United States with 91,000,000 pounds; Chinese Empire ranking second and Argentina third. Mainly first and third class wool is imported. (First-class, clothing; second-class, combing; third-class, carpet or blanket).

The total production of wool in this country is 281,400,000 pounds exclusive of 40,000,000 pounds pulled wool. Every state in the Union produces wool. Pennsylvania ranks thirteenth with a production of 6,300,000 pounds. In 1910, this State had 1,030,000 sheep of shearing age, 6 pounds of wool being the average weight of fleece. The shrinkage of wool was 48 per cent., while that of the United States was 60 per cent. Pennsylvania ranks thirteenth in production, eleventh in numbers, twenty-first in shrinkage and twenty-fourth in

total weight of fleece. Wyoming ranks first with 36,000,000, and Montana second with 33,600,000 pounds. Of the states east of the Mississippi, Pennsylvania ranks third as a sheep state, led by Ohio and Michigan.

SHEEP AND WOOL PRODUCTION IN PENNSYLVANIA, 1840-1910.

Year	No. of sheep at shearing age	Wool production	Wool per head
		lb.	lb.
1840,	1,767,620	3,048,564	1.75
1850,	1,822,357	4,481,370	2.43
1860,	1,631,540	4,752,522	2.91
1870,	1,794,301	6,561,722	3.65
1880,	1,776,598	8,470,273	4.77
1890,	945,002	4,800,610	5.08
1900,	776,677	4,666,062	6.00
1910,	1,030,000	6,300,000	6.00

Wool production has been associated with Pennsylvania from its very existence. In 1683, a letter by Wm. Penn states that wool production was one of the agricultural features in which the Quakers were interested. Its production gradually increased as an industry until 1840, when the number of sheep in the State reached a climax, at which point the number of sheep raised remained practically constant for more than forty years. However, improvement was going on, the production of wool increased. During this period and previous, the production of wool within the State was not constant. The fine-wool sheep gradually went westward from eastern counties around Philadelphia to Washington, Greene, Fayette, Mercer, Erie, etc., in the western part of the State. In 1880, the counties of Washington, Greene and Fayette were recognized as the breeding center of fine wool breeds of sheep in the United States.

Due to the cheaper production of wool in the West, we find that the production had decreased 2,091,449 pounds in 1890, and by 134,548 pounds more in 1900. In 1910 we have an increase over 1900, showing that the West must now compete with the East in cheapness of production of wool and mutton.

The average price of wool on the Philadelphia market in 1910 was 32c per pound. According to the recent investigation by the Tariff Commission, the duty on wool will be lowered. Expert investigators have concluded that the raising of sheep for wool alone will not be profitable with the lowering of the tariff. Therefore, the demand for wool will have to be satisfied as it has to some extent in the past, by the raising of sheep for wool and mutton. Smooth-bodied, mutton-typed, fine-wooled sheep and such medium wooled breeds as are efficient in both wool and mutton will be raised.

Pennsylvania has considerable land lying idle which could profitably produce wool and mutton. The limestone sections of this State are especially adapted for fine-wooled sheep. It is quite generally conceded that such soil will give whiteness, pliability and silkiness to wool, also affording the best pastures and abundance of winter feed.

Sheep are cheap feeders, and breeding stock can be maintained on cheap roughage rations supplemented with concentrates during pregnancy and suckling periods. Much feeds will be utilized by sheep which otherwise goes to waste. J. E. Wing says, that out the 600 known varieties of farm weeds, 576 will be eaten by sheep. This fact shows their usefulness as weed destroyers on the farm. Breeding animals of fine wool type over-pay their coat of maintenance by the wool production. Most medium and long-wooled breeds will pay from $\frac{2}{3}$ to $\frac{3}{4}$ their cost of maintenance by their wool production. Sheep can give, especially on rough land, more profitable returns than any other class of livestock. The fertility of the soil is greatly enhanced by sheep. The fertility value of sheep manure is above that of horses and cattle.

The dog nuisance and parasites keep farmers generally from going into the sheep business. The dog nuisance is exaggerated, but is a factor to be considered. Laws should be passed and enforced to limit the number of stray dogs. Care and management of his flock can keep the farmer out of danger of loss from parasites.

Silk is another animal fiber, 70 per cent. of which is produced in Asia. The production of silk is less than the demand, artificial silk being manufactured as a substitute. In 1910, $67,129,603 was the value of silk imported into the United States. Imports of silk were $15,891,759 in advance of the value of imported wool.

Cotton is the leading vegetable fiber produced in America. The cotton crop of the United States for the past year broke all previous records with a production of more than 14,000,000 bales. In 1910, 11,941,563 bales were raised, in which year the United States produced 66 per cent. of the world's crop of cotton.

The acreage of flax seed was greater in 1900 than 1910 by 794,483 acres. Production, however, was less by 354,591 pounds. In 1910 the acreage was 2,916,000 and the production 19,624,901 pounds. Importations increased by 47 per cent. during the last 10 years. Its production is mainly confined to the Central and Western states.

Government experimental results show that hemp is a most valuable fiber for the manufacture of high quality paper. As wool is not cheap enough and as the scarcity and the increasing value of wood pulp continues, the value of hemp in the production of paper may soon be realized. The production of hemp in the United States in 1911 is estimated as being 12,000,000 pounds.

Of all fibers, wool is the important one from an agricultural standing in Pennsylvania. With its suitability to wool and mutton production, this State should continue its increased production.

REPORT OF COMMITTEE ON LIVESTOCK

By A. P. YOUNG, *Chairman*

One of our leading experiment station directors is reported as saying recently: "It is the livestock of the English farms to which they owe the wonderful maintenance of their fertility." Scarcely any farmer be he grain, hay, dairy, or truck farmer has manure enough for the needs of his crops because his way of doing it does not provide for the support of a large number of growing horses, cattle, sheep or hogs to the acres he covers. So far, too little attention has been given to this matter in this country; too many of our farmers raise crops to sell as grain and hay instead of working them up into more concentrated forms and saving the resultant fertility to make the farm more productive. Every farm should have a large stock of young animals coming on and a corresponding number finishing off. In support of these he should devote the land contiguous to the barn to leguminous soiling crops and to crops for filling the silos of which he should have at least two, a small one to bridge over summer droughts and a larger one for use during the main feeding season, depending upon these and upon soiling more and upon pasturage less to maintain and finish off his animals.

Ensilage and leguminous crops, including alfalfa, will enable the farmer to feed profitably a large number of animals. When the farm of one hundred acres is able to feed thirty to fifty cows, a goodly number of young stock, besides the number of horses necessary, together with colts and hogs, either of these may be a leader, each farmer choosing the animal he fancies and his particular farm is best adapted to handle, supplementing the feeds produced with others from the market to make each animal do its best, and saving the resultant fertility to apply to the crops. That kind of farm management will soon make the farm a noted one in the community. The environment and the temperament of the farmer should both be taken into account in determining the kind of animals to receive most attention. The man who has particular liking for horses may, if his farm is adapted to their handling profitably, engage in the production of marketable horses. Horse flesh sells for more than beef, pork or lamb, indeed it will average about as high in the rough as dressed turkey and when facilities are right for handling does not cost more pound for pound than either of the first named meats. There is a wide range for choice, the draft horse, trotting horse, mule and all that lies between. The man wishing to go into horse production should be sure that he can get on good terms with his animals. They should always be pleased to see him approach. If this be so they will soon learn to have confidence in him and willingly do whatever may be required of them and their value be enhanced accordingly. Pennsylvania should raise more of the horses she needs, the conditions are all right in many section of the State to make the business profitable.

The process of subduing a new acre to supplement a worn one culminated a generation or two ago, the result of that way of doing brought into cultivation many acres that should have remained in forest. In the hilly portions of our State are to be found much land that can never be made highly fertile, the soil being light, if filled with humus it becomes lighter still and the dashing rains carry it away. Such land may be handled better by keeping it most of the time in grass either as mowing or pasture land thus enabling the keeping of more animals and making the acres more advantageously situated, more productive. We have spoken of the horse first because of the nobility of his nature and the commanding position he occupies in the economy of our farm operations.

When we come to consider the matter from a dollar-and-cents point of view the Bovine race takes first place in both number and value. Wherever it is possible to cultivate the soil, and indeed in places where cultivation is well nigh impossible, the cow and her progeny may be made to assist man in his battle for comfortable subsistance. As healthful and acceptable food producers there are no rivals. They can rough it on the mountain side or luxuriate in the valley, adapting themselves to the surroundings and to the fare provided by the locality. If milk is wanted, the developed cow is able to produce it in profusion. With equal facility some of the family with man's manipulation are made to turn out butter fat profusely. This with the solids accompanying it makes cheese possible; milk, cream, butter, cheese, veal, beef and all related mixtures and possibilities. What a bill of fare; and all from one source. The possibilities of the ox as a laboring beast is of no inconsiderable importance in some sections, this, too, is worthy of credit to this class of farm animals.

In the economy of animal food production, swine comes next to cattle, the facility with which they increase and the short time required to come to maturity makes its comparatively easy to stock up with them and get ready for an anticipated market. Some mathematical expert has figured out that a sow having a litter of six at a time in ten generations will produce 6,500,000. Nearly every farmer and many householders who are not farmers keep two or more pigs to utilize the waste of the table, the trimmings of the vegetables, all of which are turned to good account by the pig which in turn makes no inconsiderable addition to the family larder. Ham, bacon and lard, the various smoked products, to say nothing of sausage, scrapple, spareribs and other dainties prepared at butchering-time are handy to have in reach at any season of the year.

The most profitable hog is the one that will most quickly turn raw material into more valuable pork. Living and growing on suitable pasture, utilizing otherwise waste products, and requiring no great amount of extra food to round him out at the close of his career, the hog is an economical proposition to every householder who is situated so as to care for him properly. In that section of our country spoken of as the corn belt, the possibilities of the hog are immense, and even in Pennsylvania very good returns may be secured by good management even if so large herds are not kept. As in other branches of the livestock industry, the sire is important, he may not be literally, "half the herd" but in most cases much of the profit depends upon him.

In hog raising a good start is important. A stunted pig is often a losing proposition and this conditions is easily brought about by improper feeding of the mother in the early days of the youngsters lives. Little feed and that of a somewhat bulky and easily digested kind should be the rule for the first few days. After the litter is a week old if all has gone well the embargo on feed may be raised and good feed and plenty of it supplied, soon as the little fellows manifest a desire to eat a side table, accessible to them, supplied with such as they like will push them along up towards 300 pounds at eight or nine months old. Grass, clover, rape, peas are good for growing hogs; so are potatoes, apples and roots generally, remembering that potatoes and roots should be cooked.

Although the dog nuisance has nearly wiped out the sheep industry in some sections of the State, a report on livestock will not be complete without reference, at least to it. We have in Pennsylvania some sections well adapted to sheep raising. For some of our hillsides it is not best to practice a regular system of rotation cropping, on account of the tendency to wash. Some of these may be made ideal pasture lands for sheep, which, if not overstocked, will grow more and more fertile under the tread of the "golden hoof." The price of wool and mutton fluctuates more than some other commodities, but they usually bring remunerative prices at some time in the year. Wool may be stored with no risk of deterioration and is sure to be in demand at no distant day. The demand for mutton is increasing and lamb—not the cold storage kind—is nearly always at a premium. As the Western ranges are cut up into farms, sheep husbandry will return to some of the rugged hills of our State and give good returns for labor and care bestowed upon it.

Poultry is often put in a class by itself and treated as a separate production from livestock, but its aggregate value, which has been increasing very rapidly of late years, attest its importance and puts it far upon the list of income sources to him who will give the necessary care. No farm is complete without its flock of poultry. Village and town residents, too, whenever they have room have a poultry coop larger or smaller as space and inclination determine. Where other stock can not be kept, poultry may be made to consume the crumbs that fall from the table and make good returns in eggs, broilers, roasters and stews as well as in the enjoyment their care affords.

Secretary Wilson places the yearly product of poultry at 500,000,000 of dollars, truly a magnificent sum surpassed by only a few of the leading sources of income from the farm. The hen is omnipresent. The turkey, goose and duck are somewhat more restricted, but they too may be made valuable where surroundings are congenial.

There is another bird sometimes domiciled on the farm that demands a paragraph. The honey-bee, while not a beast nor bird, may appropriately be classed with the livestock on the farm. A few enthusiasts make a fair income from a bee-yard, and there is no good reason why many more farmers might not add this to their sources of profit and enjoyment, especially since so little care, expense and risk are required to secure at least a supply of honey for the home table. Buckwheat cakes and honey for breakfast on a frosty morning! Think of them!

We have up in Columbia county another species of livestock in a herd, flock or covey of ostriches. Some of them not long from over the sea, they are said to be contented, and apparently to enjoy their new home. It is not anticipated that any of their eggs will come in competition in the market or be put in cold storage for some time to come, nor will they come in competition with the turkey for Thanksgiving roast. Your Committee, however, is hopeful that in the near future sufficient of the birds and feathers may be produced for ladies' hat trimmings so that song and insectivorous birds may be exempt from such use. There may, however, be one drawback to their use in this connection; if a whole bird be mounted the hat will of neccessity have to be even larger than it is now.

REPORT OF THE COMMITTEE ON DAIRY AND DAIRY PRODUCTS

By DR. M. E. CONARD, *Chairman*

Dairy statistics of Pennsylvania today reveal rather surprising conditions, notwithstanding the increase in population the number of cows in Penna. is less than a few years back. We also find a quite general decrease in rural population of the State, with today about 55 per cent. of the entire population living in cities, towns and boroughs leaving only 45 per cent. of the people in charge of the prinicpal source of Pennsylvania's food production. Considering that a large proportion of the 45 percent. of agriculturists by reason of location, aptitude or inclination, are following other lines of agriculture pursuits, we find the dairy business is in the hands of a comparatively small per cent. of the consuming public. And we will all agree that there is no more important branch of agriculture than the dairy. It is the one source a farmer has to sell his rough farm crops as a manufactured product, and do the manufacturing himself. The manufactured food on account of its vast importance should bring him directly into the very best markets of the State. The high cost and inefficiency of labor has done much to influence many farmers to discriminate against the dairy business. The disproportion existing between the prices demanded for commercial feeds and those paid for the products of the cow has narrowed the margin upon which the dairyman must depend for existence until it requires the most strenuous efforts and careful management to keep the head above water. Indeed, I venture the assertion, that if all dairymen in Pennsylvania were called to a financial reckoning today it would be a small proportion that could show a net profit over cost of investment, labor and feed.

There is probably no branch of the farming business where there is so much contention and dissatisfaction existing between the producer and purchaser, dealer or consumer of the finished product as in the sale of dairy products, very largely because the producer is not willing to put forth any special effort to make his wares of better quality and worthy of a better price and put himself in a position of more independence with regard to the sale of his goods. Who ever heard of a man asking $1 per bushel for 75c potatoes, because if he could get it he would try to raise better ones next year. This is too near the attitude of the average milk producer. He wants the increased price before he improves the quality of the goods. Now these are all rather discouraging and might almost seem to be pessimistic statements, but they are conditions that confront the man who produces for us what should be the most perfect and complete food that God has entrusted to our care, the food that supports the weaker members of our families and the infants. Is it right and as it should be that this most important part of our daily food must be produced at a loss and that so many of our farmers must sacrifice the comforts of their homes and their life work in producing it because it will not yield him a profit? I hope not.

We almost daily hear of some new preparation or product of milk on the market. It is sold entire or in parts. The following are some of the many names under which we find it in trade: Milk, skim-milk, cream, butter, butter-milk, cheese, dried curd, condensed milk, evaporated milk, modified milk, sugared milk, powdered milk, kumyss, milk-sugar, malted milk, and many others. It cannot be for want of a demand for milk and its products that the business is unprofitable. There is no corner of this State so remote as to exclude it from some of the markets offered for the many products of the cow.

Taking general views of the situation, we believe the greatest drawback to profits, exists in the dairyman himself, because he so generally ignores as useless the application of methods in his dairy work and in the selection of his herd, and the feeding of it, that must and will reduce the cost of production just to the extent of his perseverance. But instead he looks to the purchaser to make up the deficiency resulting from his own negligence.

We are glad to notice that statistics show a small, per head, increase in the annual production of the Pennsylvania cow. Just how much of this is due to the extension of dairy education we are at a loss to say. There are other influences that may be at work that may not be noticed. But it does seem to us, I am sorry to say, that to a considerable extent it may be the involuntary result of the high cost of feed, scarcity of labor, coupled with the tempting prices paid for beef cattle which has resulted in many of the more beefy individuals of the herd being sold out of the dairies to reduce work and feed bills, and if this be true the result would be an unconscious culling process, hence, the per head increase. Now, whether this is the result of systematic culling or involuntary culling we do not know; probably both. But it does prove to us that if we apply the best modern methods in the selection of dairy cows and raise and keep only those individuals that will yield a profit over cost, the individual product would very soon go well above the present figures.

There is just one condition that is the limiter of the dairy profits: namely, ignorance. there are very few people who are not willing and anxious for more information provided they do not have to expose their ignorance in getting it. We do earnestly hope the diligent and persistent dissemination of dairy instruction through the entire State, taking it to those who cannot avail themselves of the instruction and excellent object lessons afforded them at the State College. The teaching how to select or breed up a profitable herd, the growing of crops on the farm suitable for their feed, correct housing and stabling, feeding to avoid waste and loss, stable care, handling and milking, handling and care of the milk, testing and preparing milk for market and selling it for what it really is, are subjects that should be carefully discussed in language and in such ways as can easily be understood and assimilated. Much of this must be done in a very primitive way for it is much like feeding strong feed to a babe, to be assimilated, must be given in small doses.

It should be generally known that the cow is an artificial animal, and to keep her from retrograding requires eternal vigilance, and that her product is the most easily injured of all foods, but if undefiled it is the best.

Dairy sanitation seems to be the hardest dose for the less progressive dairyman to swallow. He feels that it is one more straw on the already overloaded back. It is hard for him to believe that there are thousands of active organisms who are responsible for much of the annoyance to the dairyman that are so small that their presence is only revealed to him by the results of their work. This branch of the instruction oftentimes requires much tact.

Now dairy education will do much toward establishing a wholesome respect for the business and will eventually help to narrow the gap now existing between the producer and consumer and to a great extent the margin in price.

The city business man who has his farm and dairy for recreation is an important factor in the intermingling of dairy interests as well as a valuable object lesson to his neighbors.

We believe the question of dairy improvement in all of its phases is a matter of education and much of it must be carried to the farmer at his place of business, if it is to be effective. The national increase in our population must make this fact more prominent.

ADDRESS BY MR. BAYARD

Mr. Chairman and Members of the Board: When I am called out in this way, it does kind of get my heart to palpitating. I'm very much like an old negro I used to know, who said, "If I knowed whar I come from, I'd like to go back home." You want me to tell you about the Fair. Van Norman and such bachelors ought to tell you about the "fair."

I am sorry Secretary Tyson was not here this afternoon to hear the apple session. I noticed a good many "bald'uns" in the audience.

One thing about the apple session that impressed me was, what we should *not* do so much here in the East. You noticed that Professor Stewart threw an apple picture on the screen, and I noticed how most of you were impressed with its beauty. I saw this same orchard out in Lawrence county, and this picture does not begin to show its full beauty; but instead of looking at the beauty of it, we go off into "bug" and "punk" and "rots and spots." We are all inclined to do this here in the East. Out West not one man will show you anything, or tell you anything, about bug, or blot, or rot. He tells you that where he is, is the best place in the world, and he really wants you to think so, and if you stop there very long without saying so, he will invite you to "move on"—and mean it too. Now, we here in Pennsylvania don't want to think of "moving on." I believe in Pennsylvania is really the best place in the world, and here is where I am coming to the Show I am supposed to tell you about.

This Show was gotten up for the purpose of showing city people that Pennsylvania is a great State to live in. We had a show that really was worth having the people of Pittsburg look at. Why did we take it to the city? Well, because over four hundred thousand dollars has gone from Pittsburg alone to be invested in apple orchards in the West, and not one of these people will have an apple orchard. We have had as much as two hundred and fifty thousand dollars go out from close neighbors to be invested in apple orchards in the far Northwest. What is the sense of going 3,000 miles away to raise apples, when we can raise them better at home? That is the reason why we had the show, and it was a good show. There was one thing that went wrong about it, and that was, it was no good financially. It is not a very deep hole, however, and we will creep out of it. We didn't intercede with the weatherman soon enough, but we will keep on. We had a magnificent show of livestock. Professor Van Norman sent down some splendid specimens, bred until in the fifth or sixth generation we came down to 1/264 pure bred, and they were all excellent producers. We had scores of livestock, and fruit, and lectures all the time, and the beauty of it all is that it was a Pennsylvania show. There was not a thing from outside of Pennsylvania, except one hog (I mean one four-footed hog; I don't know how many of the other kind were there); Oh, yes, and there was a few sheep; and there was nothing shown that we could be ashamed of. I hope it will be the beginning of a great fair, supported by the State. We need it; our State needs it. We need a great many other things, but we need that especially. As Mr. Hutchison says, this show seemed to bring about a better understanding between the city people and country people.

We have had in the City of Pittsburg two land shows; but they were in the interest of the South and Southwest and of Canada. It was simply giving our citizens an invitation to come and see what other states can do. Now let us do it for Pennsylvania. Let us all get together and take for our slogan the motto we have put at the head of our paper—"Boost Pennsylvania." We can do things here, if they can do things there. We can raise apples here, if they can raise them three thousand miles away from here. We can raise

cattle and horses on our acres if they can do it there. There is not a single animals, unless it is the sheep, (which has dropped pretty low lately) that can't be raised in Pennsylvania. We have simply gotten out of the habit of doing things. A few years ago you could buy horses at almost any price out West. Several years ago a fellow went out to Kansas City and bought four horses when he thought he was buying one; he didn't know it until he came to take his horse away, and the dealer asked him where to send the other three. You can't do that today. There is not a state where a good horse, today will not sell for more than it cost to produce him. It is the same with cattle. I know when the price of cattle was so low that it didn't pay to raise them. It isn't so today; look at the prices and see. We can do things. The thing for us to do is to stop looking with longing eyes to Canada and the South and boost our own state. Let us go home and "Boost Pennsylvania."

HYDROPHOBIA

By DR. W. FRANK BECK, *Altoona, Pa.*

I have been prompted to write a paper on this subject on account of the many mad dog scares that has occurred the past summer, Then, again, I believe in educating the people on such subjects as vaccination, tuberculosis, diphtheria and hydrophobia.

If such a course was carried out as it should be, there would be less trouble and many lives would be saved. I am reminded that we are from the same people that over one hundred years were burning witches at the stake. There are thousands of people die every year of typhoid, when every case could be prevented, if we were properly educated to care for our bodies.

It is terrible to think that one-third of all the children die before they reach the age of six, for the same reason that I have just stated. Every year, over 500,000 American people die needlessly. There is no really proper energetic National, State or local effort to fight many of these diseases that kill so many people.

DESCRIPTION

Hydrophobia is a specific and infectious disease, common to all forms of animals, which may be communicated to many by direct inoculation. It is characterized by high fever, spasms, with paralysis, and always ends in death.

Pasteur has found poison abundantly present in all the nerve centers of the body, and has transferred the disease by taking bits of brain substance derived from an infected animal and inoculating them into healthy subjects. The usual mode of infection in man is through

the bite of a rabid animal, the virus being contained principally in the saliva, and in an immense majority of cases the dog is the offending party. The cat, wolf, cow and horse also suffer from this dreadful disease, and in rare instance they communicate it to man.

The history of one bitten by a mad dog is something like this: The period in which you are liable to become mad after receiving the wound is six weeks to three months. The usual premonitory symptoms are fever, headache, loss of appetite, sleeplessness, great depression of spirits, and sometimes darting pains radiating from the seat of the bite and the glands that are near the wound become swollen.

The invasion is in two stages: First, the stage of excitement, the patient wearing an expression of the most intense anxiety, and the special sense exhibit the most keen vigilance, such as a draft of air or noise of any kind may cause great disturbance or violent spasms. Quite early, the mere sight of water is dreaded by the patient. This symptom is so prominent that has given the name to the disease—Hydrophobia. The mere sight of water causes great spasms to the throat, the patient having thirst that he cannot control. The muscles of the mouth exhibit convulsive movements, causing the patient to make sniffling sounds, and foaming saliva may be ejected from the mouth.

The second stage, is the paralytic stage, the patient passing into actual unconsciousness without spasms. This lasts 18 hours and always ends in death.

How shall we know if one has Hydrophobia? If the patient has fever, shows great uneasiness after he has been bitten by a dog and at the sight of water, goes into spasms, there is great indication that he has hydrophobia. This is most important, for few cases recover when once left to develop.

TREATMENT

Upon reception of a case of dog bite, thorough disinfection, followed by canterizing of the wound with caustic is a measure that can be quickly carried out.

As soon as possible after the bite, place the mouth to the wound and suck out the poison. This is a method much used in the dissecting room by medical students and is most effective, as is eliminates the poison before it enters the circulation.

PASTEUR TREATMENT

This is a precautionary measure of the most importance. Pasteur showed that the virulence of the virus which he obtained from the nervous system, is modified by passing it through animals, the same as vaccination. He also found that if fragments of the spinal cord were suspended in a dry atmosphere, they would gradually lose their strength and finally become inert.

From a bit of the cord, treated in this manner, a medicine is made in the form of an emulsion. This is used for inoculation in man and constitutes the great Pasteur Treatment, that we hear so much about. If you were bitten by a dog that you thought was mad and sent to one of the Pasteur Institutes, your treatment would be something like this: The first day you would be inoculated with a medicine made from a cord 14 days old. You would be inoculated for nine days, each day with a cord one day fresher.

The success of the Pasteur treatment is almost universally attested, and the results have been marvelous. The patient should, however, be sent to the institution at once, as delay tends to diminish the protective power of the inoculation.

The Pasteur treatment is not used after the symptoms develop, but it must be before. After that it defies all known methods of treatment.

What I have said pertains largely to the professional side of this subject. Its relation to the farmer has a different story to tell. Any disease that effects not only the domestic animals, but his family as well, must indeed be of much interest.

I would not dare to say that there was no such disease as hydrophobia; but on the other hand, will say that it is a very rare disease in our State. In many years of practice, I have never seen a case, either in man or dog though treating many cases of dog bite under all kinds of conditions. To show you still further how extremely rare it is, I have interviewed 40 physicians whose practice has extended over many years and not one of them has ever seen a case of hydrophobia. Dr. Osler, the most widely known investigator, reports that he has only seen two cases since 1867. I could cite you to other ones of high authority that give the same history of this dreaded disease. There is scarcely a day that we do not hear of some mad dog scare, but they are mostly fakes and end in the poor dog getting the worst of it.

While working in a State laboratory some years ago I went with eminent physicians to kill a dog that had been reported as dying with hydrophobia. This dog was in a wealthy section of the city and had almost caused a riot before we had reached the place. Our object was to obtain the brain so as to examine it in the laboratory. We were fully armed for such an expedition. When we saw the dog every one agreed that this was indeed a true case of hydrophobia. The dog was killed, his head cut off and to our surprise we found a sharp chicken bone in his throat. In a few minutes we all slipped off, with our heads down, much ashamed for what we had done.

In another case where a dog showed symptoms of hydrophobia a thorough investigation revealed the fact that the dog had not had water in any form for 20 days.

During one of the very warm days this summer, I had a collie dog under close observation and I found that in 6 hours he had drank water 12 times. Among country people it is the custom to see that all the animals on the place have been watered, but the dog is left to look out for himself. I want to say that if there is any thing that will make a man or women show signs of hydrophobia, just let them do without water for 20 days.

Every dog that is frothing at the mouth, snarling and biting, or acting strange in any way, does not have hydrophobia by any means. You must remember that when a dog has pain or is distressed, it is as natural for him to bite as it for the horse to kick or for the cat to scratch.

Along this line, let me give you an example that I know to be true, and it first started me to thinking on this subject. It happened at my home while I was living at 1214 8th Ave., Altoona. I had a young collie dog. One afternoon he was in the backyard and became

violent, jumping in the air and rolling on the ground, as well as clawing at his throat. Everyone that saw him, declared that he was going mad. Mrs. Beck was the only one that was at home at the time. Against the protest of the crowd that had quickly gathered, she firmly held his head between her knees pulling his mouth open, looking down, saw a large bone wedged in his throat. She took a stick and pried it out which of course, ended the trouble. Now the point that I wish to make is this: With the excitement that it made, within a few minutes some one would have turned in a mad dog scare. The police would have arrived on the scene, the dog would have been shot, and the reports gone around that a dog had been killed with hydrophobia.

Many people take no precaution as to what they feed their dogs, imagining that they can swallow anything, when in reality such food as sharp chicken bones are extremely dangerous. If you have any doubt as to whether sharp chicken bones will produce symptoms of hydrophobia, just try eating some. You are about at able to swallow them as the dog.

I am giving you these practical examples for the purpose of showing, that there may be other conditions effecting the dog-producing symptoms, in most every case, similar to those of hydrophobia.

Another thing I wish to mention. In case a dog bites you do not leave them kill the dog at once. Tie him up so you can see if he will develop hydrophobia. By at once killing the dog, you destroy your best means of diagnosis.

NITROGEN: ITS FORMS AND SOURCES

By DR. C. W. STODDART, *State College, Pa.*

"Nitrogen is, after water, the greatest factor in the creation, growth and working of nature; to bind it and be its master, that is the problem; to make use of it, therein lies real agriculture; to bring its sources which are inexhaustible into service, that it is which creates wealth."

Ever since Schultz-Lupitz, the pupil of the great Baron Von Liebig, made that statement some fifty years ago, "the nitrogen problem" has disturbed statisticians and even scientists from time to time; for nitrogen is a most necessary and useful element in human life and progress. It is useful in the manufacture of many synthetic medicines and poisons, very powerful medicines and poisons they are, too; beautiful dyes; gun-powder; celluloid; nitro-glycerine; collodion; guncotton. It is a necessary constitutent of human foods, for it is an integral part of every living cell, and of most bodily tissue such as muscle, skin, hair and bones.

But what is the source of this nitrogen that is so important?

For the manufacture of most of the commercial products containing nitrogen, nitric acid is used. For example, gun-cotton is ordinary cotton treated with nitric acid; collodion is a form of gun-cotton dissolved in alcohol and ether; nitro-glycerine is glycerine treated with nitric acid. Nitric acid is made from sodium nitrate. Sodium nitrate is mined in Chili and is being consumed at the rate of some 2,000,000 tons per year. Statisticians tell us that there is not enough to last more than 40 or 50 years longer. In other words, our commercial products, so useful and even necessary, are almost wholly dependent on this supply of sodium nitrate. Hence, the hue and cry about the nitrogen problem.

But what we as farmers are particularly interested in, are the sources of agricultural nitrogen which helps make our foods. Directly or indirectly food nitrogen is obtained from crops, and the source of crop nitrogen, then, is our present inquiry.

Chemically nitrogen is a gas, colorless, ordorless, rather lazy, for it does not combine easily with other elements. It forms four-fifths of the air we breathe. On every acre of the earth's surface there rests 35,000 tons of nitrogen. But only in combination with other elements is nitrogen of any value; for example in nitro-glycerine as a liquid together with carbon, hydrogen, and oxygen; in sodium nitrate as a solid together with sodium and oxygen. Only as a nitrate, that is in combination with oxygen and some base like sodium or calcium, is nitrogen of use to the ordinary crop plants.

In the soil, nitrogen occurs as complex organic compounds resulting from the decay of plants or animals—as humus, if you will. Bacteria act on this nitrogen and convert it to the nitrate form with the help of lime or some other base derived from the decomposition of rocks. The crop plants for the most part, when they are plowed under returns to the soil only then nitrogen taken from the soil during their growth. There is no gain in nitrogen. But legumes, clover, alfalfa, peas, beans—have growing on their roots colonies of nitrogen fixing bacteria which can take nitrogen from the air, and make it combine with other elements in such a way that the legume plant can make use of it, and by its decomposition furnish available nitrogen to succeeding crops. Estimates based on analyses have shown that in this way there may be added to the soil anywhere from 40 to 200 pounds of nitrogen per acre in excess of what may have been present before. This gain in nitrogen is made by merely plowing under the stubble remaining after a hay crop, or such growth as may have occurred after the crop was removed and before the spring plowing.

This is one of the most important sources of nitrogen for our crop plants: Atmospheric nitrogen made to combine with other elements and added to the soil without any labor other than the planting of the seed,—and the hay is obtained in addition to more than pay for that labor.

Another source common to every farm is barnyard manure, which is one way of returning to the soil only what has been removed therefrom, unless the stock is fed on purchased material which comes from another soil,—a case of robbing Peter to pay Paul.

The principal sources of agricultural nitrogen is commercial fertilizers. In considering these forms, perhaps it would be well to divide them into three classes:

First. Those immediately available.
Second. Those very quickly available.
Third. Those slowly available.

Of the first class *Sodium nitrate*, or Chili saltpeter, is the chief representative, although not the only one as will be shown a little later. Sodium nitrate has its nitrogen in such a form that the plant can take it up and use it in making plant tissue and seeds, just as soon as the nitrate dissolves in water, and that is as soon as it applied to the soil. This form of nitrogen is immediately available, and all of it is available at once. The sodium nitrate of commerce, containing 15-16 per cent. of nitrogen, is made by solution and crystallization of an impure material called "caliche" which is mined in large quantities from a high, dry plateau of Chili. The theory of its formation is that nitrifying bacteria—those bacteria which make nitrates in the soil—acted on large quantities of decaying vegetation which grew ages ago in the mountains above this arid plain. The base supplied in this case was sodium, so there was formed sodium nitrate instead of calcium nitrate, as would be the case in our own soils. Rains washed the sodium nitrate so formed down into the desert where the water evaporated, leaving the nitrates to accumulate.

Of the second class *Ammonium sulphate* is the principal representative. This material *possibly* can be used by the corn plant just as it is, and is hence immediately available, but for most crops certainly it must first be changed by bacteria to nitrates. This process is very rapid, for in the change of complex organic matter to nitrates, the formation of ammonia is the first step, and the hardest step. The rest of the process is easy and rapid. Consequently the nitrogen of ammonium sulphate is very quickly made available to plants.

Ammonium sulphate is made principally from the ammonia given off in the making of coal gas or coke. The ammonia is absorbed by sulphuric acid, and crystallized out. It contains 19-20 per cent. of nitrogen. Every coke oven can be equipped with the apparatus to make ammonium sulphate at very little expense, relatively speaking, and the product will more than pay for the expense of the retorts.

The third class comprises those substances containing nitrogen in complex organic forms which have to undergo decay and bacterial change in the soil before plants can make use of their nitrogen. In many cases the decay is very slow, that is, the initial decay and change to ammonia is slow. Of these very slow acting fertilizers,—these inert nitrogen carriers.—Doctor Frear has told you, and stated how they can be made more quickly available—I refer to *leather, hoofs, hair, garbage tankage, peat* and so forth.

Other forms which are quicker acting are *dried blood*, containing 10-14 per cent. of nitrogen; *fish scrap*, 7-9 per cent. nitrogen and 6-8 per cent. phosphoric acid; *tankage*, refuse from slaughter houses, not garbage tankage, containing 5-20 per cent. nitrogen and 1-14 per cent. phosphoric acid; perhaps there might be mentioned *cottonseed meal* and *linseed meal*, running about 5 per cent. nitrogen. These last products, however, are better fed to stock and the manure applied to the land.

Barnyard manure, already mentioned above, would come under this class of slow acting fertilizers for the most part, although some of its nitrogen may be in the ammoniacal form and very quickly available.

There remains two products which should be mentioned now:

Calcium cyanamide or *lime-nitrogen,* a substance made in Europe by heating in an electric furnace a mixture of coke or charcoal and lime over which is passed a stream of nitrogen. The nitrogen is obtained with but little trouble from the air. The final product is a compound containing 17-20 per cent. nitrogen which decomposes on treatment with water to form ammonia. This of course is what happens when lime-nitrogen is added to the soil; and the ammonia can very quickly be changed to nitrates for plant use. It is a fertilizer of the second class, can be made cheaply, and is almost as good a fertilizer as sodium nitrate.

Basic calcium nitrate is a fertilizer now on the European markets to some extent, as cheap as, or cheaper than sodium nitrate and exactly as good, containing about the same amount of nitrogen, 13-15 per cent. It is made in Norway by passing air through a furnace containing an immense disc-shaped arc, some five or six feet in diameter, produced by a very powerful electric current between water cooled copper electrodes. The disc-shape of the arc is obtained by an immense electro magnet which pulls the ordinary arc out of shape. The action of this intense heat on the nitrogen and oxygen of the air causes them to unite to form oxides of nitrogen. These oxides of nitrogen are passed up through granite towers full of crushed quartz down through which trickles water. Nitric acid is formed. This nitric acid can be concentrated and sold as such, or it can be neutralized by lime and the basic calcium nitrate formed.

We have here a process which makes nitric acid for use in commerce, and nitrate for use in agriculture. Air is the source of nitrogen for useful articles and for necessary crops. We can be independent of the naturally occurring instincts of soda; its disappearance need not cause any anxiety. And more than this the farmer has in the bacteria on his clover and alfalfa roots an agency for utilizing atmospheric nitrogen which is cheap, efficient and reliable.

The nitrogen problem is solved; we have bound it and become its master; we have brought its inexhaustible sources into service.

REPORT OF THE MICROSCOPIST AND HYGIENIST

By PROF. JAMES W. KELLOGG

At our meeting last year an attempt was made to illustrate how the microscope has been of great aid to the scientist in the investigation of food adulterations, and the detection of the source of disease, and to bring before you the importance and need of a law which would regulate and control the sanitary conditions of the communities in which we live.

It is a well established fact that a great deal of ill health and many diseases have been caused by the unsanitary manner in which many of our cities and towns have been conducted. The source of the water supply has not been protected. Creameries and milk depots have not been kept clean. Sewers have been left open and refuse matter and all sorts of filth have been left uncovered and exposed in the streets, alleys and back yards. This state of affairs has not only existed in the past, but may be found to exist to-day, if one should take the trouble to investigate.

It is right and proper that we should have pure and unadulterated food, that we should be so protected from fraud as to be able to obtain food which is wholesome and free from injurious or poisonous substances; but it is much more right and proper that the source of food contamination be eliminated, and that markets, cafes and restaurants where food is sold and prepared for consumption, be so clean and sanitary that no fear of sickness or spread of disease need be entertained. If we are to have these clean and sanitary places, it is necessary that the energy of every citizen be devoted to a campaign for cleanliness, and that we see to it that not only our streets and neighbor's premises are free from filth, but that our own back yards are in the proper condition to prevent the spread of disease.

We know from sad experience how often a whole community has suffered from the outbreak of an epidemic of some dread disease, and how often the cause of the trouble has been traced to a polluted stream, an uncovered sewer or the presence of filth of all sorts, in which is bred the agencies known to be capable of spreading disease. It has been proven that one of the greatest agencies engaged in the spread of disease is the house fly. It does not seem possible that so small a form of life could cause so much trouble, but all the facts in the case point to the fly as one of our greatest enemies. Anything which is conducive to the existence of the fly or the conditions which promote their breeding is, therefore, responsible for the spread of disease. The favorite breeding place of the fly is in horse manure and other excrementitious matter, and many other forms of decayed animal and vegetable refuse. It would not be stating the case too strongly to say that any city, town or person permitting the breeding places of flies to exist, is directly responsible for the spread of sickness and ill health. "Eliminate the cause and you eliminate the effect," and to eliminate the breeding places of flies is what must be done if we expect to succeed in any campaign against the fly. It has been demonstrated by scientists who have made exhaustive experiments, that the house fly can and does spread typhoid fever, dysentery, tuberculosis, Asiatic cholera and is capable also of transmitting leprosy, erysipelas and smallpox.

There are a great many species of the fly, but the one which we are concerned most about is the common house fly. This insect in its development from the egg to the adult, passes through several complete changes, "each unlike the other: The egg, the larva or maggot, the pupa or resting stage and the imago or full grown insect." Dr. L. O. Howard, of the Bureau of Entomology of the U. S. Department of Agriculture, reports that the fly commonly lays its eggs upon horse manure, about 120 eggs being deposited in one mass, usually in several layings. At the end of twenty-four hours the larva or maggots

are hatched. They begin feeding at once and thrive and grow for from five to seven days. At the end of this time, they crawl into the loose ground or under dry boards or into dry places and enter the pupa or resting state. This period occupies from five to seven days and in some cases a little longer. Then the fly comes forth fully developed, the total life round requiring, therefore, from ten to fourteen days. This time is influenced somewhat by climatic conditions, requiring a shorter or longer time, according to the cold or warmer temperatures. During the winter the adult fly hibernates in some warm or favorable place and becomes active again in the spring. The size of the fly is also influenced to some extent during the larval or growing period. If the larva are well fed, the flies will be full grown.

Prof. Wm. B. Herms, of the University of California, reports that he has estimated the number of larva which had hatched in four samples of manure, weighing in all fifteen pounds, and that 10,282 were found present. This would average about 685 larva per pound. By estimating the weight of such a pile of manure, astonishing figures can be obtained. Many other similar experiments have been made, and it is easy to understand the reason why such great numbers of flies exist in the neighborhood of stables or places where decaying vegetable or animal matter is exposed. The way in which the diseases mentioned are spread, is by the flies migrating from one place to another, alighting upon all sorts of refuse material to obtain their food and then, of course, going into the house, crawling over our food, eating utensils, getting into milk and water, and also by crawling over our bodies and sometimes getting into the mouth. They are especially dangerous to infants where bottles and milk are not kept covered or away from them. The legs and bodies of the flies are covered with small hairs to which germs easily cling.

Prof. Herms also reports that the number of bacteria which a single fly may carry will reach all the way from a few hundred to several millions and these germs, under favorable circumstances, will live as long as twenty-three days. Early in the fly season the numbers of bacteria are comparatively small, while later, this number increases greatly. The mouth parts of the common house fly are not adapted to biting or stinging as is commonly believed. Other species of the fly, one of which is the stable fly, has a mouth part so constructed as to be able to pierce the skin. This form of insect can inject disease into the blood directly. The danger in the flies which infest our dwelling places lies in their power to carry germs on their bodies to food as above stated. Typhoid fever is one of the most serious diseases of man, and because the fly has been so energetic in transmitting this ailment, Dr. Howard has called this insect the "typhoid fly." Typhoid fever has been prevalent in many of our army camps, and it is now known that it was caused by the large number of flies, which, in turn were caused by the unsanitary manner in which the camps were cared for. During the Spanish American War, the Army Surgeons were especially energetic in their campaign against sickness, and by eliminating all sources of breeding places, typhoid fever was reduced to a minimum. From all the information we can gain on the subject, it is clearly evident that if we are to

wage a war against the fly and enter into the "Swat the Fly" campaign, it will be necessary to go further than killing all the adult flies and to prevent their coming into existence.

The Health Officer of every community should see to it that every section of the town or city is kept scrupulously clean, if the sickness in that town or city is to be reduced to a minimum. Many methods have been suggested for taking care of the refuse material, such as building closed receptacles in which to place refuse of all sorts, removing it from time to time in closed wagons, and by the use of chloride of lime, solution of Paris green, kerosene and other similar substances.

Bulletins have been issued by the United States Department of Agriculture, in which instruction is given along these lines, and these bulletins can be obtained by writing to the Superintendent of Public Documents at Washington.

The amount of money which has been spent for screens, fly paper and fly poisons in the United States would amount to many thousands of dollars, and the number of deaths, which cannot be estimated in dollars, which can be directly traced to the fly, will reach into the thousands. The value of real estate in fly infested districts has been materially reduced, and wherever this pest thrives in great numbers, it is easy to understand what an enemy they are. It is earnestly hoped that a strenuous campaign will be waged in every community against the unsanitary conditions which promote the breeding of flies, and that no effort will be spared to get rid of this pest and protect the lives of our people.

COMPUTING DAIRY RATIONS

By PROF. H. E. VAN NORMAN, *State College, Pa.*

In taking up the computing of rations, I shall outline my suggestions in new terms—that is new to many of you who have for so many years been discussing the feed problem in terms of protein, carbo-hydrates and fats.

You known Dr. Armsby has been conducting his experiments on the carbroymeter by means of which he measures the power of the food content. For instance, if we have one hundred pounds of coal in our fire machinery, it will turn into steam and this steam is the energy that is required to do work. Our new term is simply measuring the power of the food content by the power to do work. We measure it by the amount of heat it would produce if burned up, but all of the feed is not available for milk production; a part of it is lost. There is a loss of energy in the faeces, in the urine, in the gases, in the labor of chewing, swallowing and digesting the food, what is left is available for milk production and for energy stored for a gain in weight. Therefore I am going to outline to you a method of figuring it in terms of net energy, with the losses all taken out. In the old method only one loss was taken out.

For instance, one hundred pounds of corn meal is given 41 per cent. net; that is 58 per cent. is lost, or required for digestion. When we get to timothy hay, 51 per cent. is required, leaving only 49 per cent. for production, wheat straw, only one fifth of all the energy available for milk production. That means that corn meal has only four times as much energy as wheat straw. These figures explain why it is that our new standard is a more accurate measure of net energy, than is our old standard.

Now when we come to figure out a ration for the animals, we know from practical experience and experiments that have been performed, that every animal requires a certain amount of energy for her maintainance; that is a dry cow, that is not in calf requires a sufficient amount of food to keep up her strength. That is what we speak of as maintenance, therefore, we must give that cow enough feed to take care of herself. The amount of feed she requires more than that is for the milk she produces. A lot of us have lost money in times gone by, because we didn't feed a cow more than she needed for her own use. To put it in practical terms, suppose she needs six therms (or we can call them units if you wish) of net energy to keep herself, if she is going to produce twenty pounds of milk, she will require another six therms, which is twelve; and if you only feed her nine of them, you cannot expect her to produce twenty pounds of milk In fact, she won't do so. Why? Because you haven't given her strength enough to take care of herself and of her milk.

You can take that milk to the laboratory and find just how much energy there is in that milk. Let me emphasize that statement in this way. The amount of milk a cow gives is measured by her ability to eat food above that required for her maintenance When you go through the country and see a cow running thin, you may be sure she was not fed enough to keep up her energy and produce milk. The dairy cow is primarily a mother, and she makes milk to feed her young. As soon as you see her getting fat, you have proof conclusive that she is getting more feed than she needs to produce milk. There are thousands of farmers in this State who are losing money because they do not feed enough to produce milk There are a few farmers who go to the other extreme. But that is not the only thing we can get energy from; coal produces energy but the cow cannot use coal so we must feed her something that she can eat and digest—something that she likes. So we feed her carbo-hydrates and fats to produce milk. One hundred pounds of milk contains a little less than sixty-four pounds of casein, and casein contains nitrogen which comes only from carbo-hydrates; therefore we must supply protein in sufficient quantities to produce the milk. If a mason begins a foundation without enough brick of any kind, he cannot complete it, because he cannot make mud take the place of brick; but if he needs only one or two bricks, he can make mud take the place of them. You cannot get a good milk production with an insufficient supply of protein. It is true that when a cow is just fresh, in the first month or month and a half of her period of lactation, if you feed her an insufficient supply of the milk producing feeds, nature has constituted her that she will take the fat from her own body and make milk. That is why a cow gets thin after freshening. Dairymen have profited by that. The Missouri Experiment Station

have made an experiment on that. They allowed a cow to draw her fat when she was producing twenty-five to thirty pounds of milk. At the end of thirty days she was giving the same amount of milk, but she was only fed the amount required for her maintenance. What was the result? She had drawn on her body to make this milk, and she was so weak that she could hardly stand up, and had to be helped on her feet. That shows how strong is Nature's determination to furnish food for that calf.

Now, after that calf gets to be from six, or eight weeks old, it is presumed to be able to care for itself, and the amount of milk supply decreases unless the cow is given from a half to a pound of protein to take care of herself. She requires six therms of energy to take care of herself. If she is supposed to produce milk she requires six therms more. A thousand pound cow, giving twenty pounds of four per cent. milk, needs twelve therms of energy and one pound of protein. I will not go into details with the figures because we are about to issue a bulletin at the College, which you can get by addressing us, and which will give you all the figures.

It is not possible for me to figure out exactly the ration required for your cow. In the next place, it is not possible for you to guarantee to me that your silo is exactly the same composition as the silage of the bulletin? Now, there is no use quarreling over these small details. There is no use spending a dollars worth of time to get fifty cents worth of exactness on paper. Now, what is required of you is to get a reasonable ration that will give her the required amount of energy and then feed her in proportion to the amount of milk you expect her to produce.

The next rule: Feed your cow a grain mixture for the purpose of making flesh, and then give her all the roughage she will eat. A good proportion is one pound of grain to each three pounds of milk, or if the grain is high priced and she thrives on roughage make it one pound of grain to each four pounds of milk; anywhere along there is safe; and you can get the most ignorant farm hand to follow this rule and be sure of good results. Our roughages are usually short of protein, so we must mix it with grain and in order to produce twenty pounds of milk a day, we must give the cow from one pound to one pound and a half of protein; so we must make the mixture to cover the difference. If you feed timothy hay, corn stover and silage, you must have a good deal more protein in your mixture than if you are going to feed from clover or alfalfa. The amount of grain will also tell a little the amount of protein there must be in your grain mixture. The more grain you feed the less protein, in proportion to your energy will be required.

Now I divide our roughages up into three grades. The first grade is timothy hay, corn stover and silage; with this you have one pound of protein for every four therms of energy. But if you have for your mixture clover hay and timothy, or clover hay and silage, then the protein is one in five. Of clover hay and alfalfa, you get as high as one in seven or eight; in fact I think you can go so high as to feed simply straight corn meal. In following any of these rules, I have tried to give you simply enough protein to safely expect the cow to do her work. In fact, I think you are giving her more than she needs.

It may be a quarter of a pound of protein more than she needs, but it is not as expensive as two or three of the robber cows that most of us have been keeping.

Now when we come to making up a grain mixture, I believe it is advisable to make the mixture of at least three or four different kinds of feeds. We want to stimulate the appetite of the cow, and experiments of the New York Experiment Station show that the animal does best on a variety of feeds. The four things then we want to remember in studying what would be a reasonable ration for the cow are:

(1). Cost of the feed.
(2). Effect on the system of the cow.
(3). Practibility.
(4). Bulk.
(5). Variety.

The relative economy of two feeds is not measured by their cost price, but is measured by the cost at which they furnish the needed energy. The cottonseed meal is to-day almost the highest priced feed per ton on the general market, and yet it is one of the cheapest feeds we buy, because it furnishes a larger amount of the needed energy per dollar than any other feed we buy. Now a lot of you have a mistaken notion that you can pay a low price for some of the cheap hull feeds, but if you divide the cost of one hundred pounds by the therms of energy it furnishes, and the cost of the one hundred pounds of protein by the amount of energy it produces, you will find that the cheap hull feeds are not so cheap after all. I would ask you to use the best feeds you can get; it will pay you. The cheapest feeds are the ones that produce energy the cheapest. That at this present time will be corn meal or corn and cob meal. The feed that will furnish protein the cheapest will be cottonseed meal. Next, it will be gluten, or Ajax or brewery grain. Wheat middlings is one of the cheapest feeds we can buy at the present time in our Middle states. All are good, so we will take the one that has the best effect on the system of the animal. Some animals are individually constipated and some are individually lax. We want to counteract the one by the other. If we don't have any silage or roots, or beet sugar meal feed, we put a little oil meal into the mixture about once a day. If we have any of the other feeds, we do not use the oil meal, because it is expensive. Most animals can be taught to eat anything that is desirable. Boys can't, because they were spoiled in their bringing up. Start small; put in a teaspoonful if necessary, and then bring up the amount. But it is usually desirable to feed them what they want, if it doesn't cost too much.

Next, comes bulk. The cow's machinery is usually built to hold a large amount of feed. But we can overdo it; a cow cannot eat all clover hay and do her best work, therefore we want that bulk composed of something that will increase her energy. I would mix with the hay, some corn and cob meal or distillers' grain, or gluten. If you have to use only heavy feeds, I would chop some of the hay.

Next, comes variety; I don't know how important this is, but most of our men who do experimenting believe that cows work better when they get a good variety of feed; and from the results of these experiments, I believe that this is true.

Now, the next point that I would make is, that in making up a grain mixture we get down to an actual method of work. If that cow is to be of much profit, you want to get that energy as cheap as possible. We take one hundred pounds of protein, as a basis, and to this we add the amount of cottonseed meal you think should be used; then the amount of gluten feed; then add this up and divide the possible protein into the possible energy. If it comes out right you get a mixture from that standpoint. If not, you can add to it until the sum total of the protein divided into the sum total of the energy gives he right total, and you can work according to this rule, no matter whether you mix twenty-five pounds, or fifty pounds, or one hundred pounds, or two hundred pounds, or three hundred pounds you will find it simplifies wonderfully the mixing of the rations.

Another thing that our bulletin will contain is totals in which we have dropped the decimals. Now, if you will take the trouble to compare you will see that cottonseed meal has 84.23 therms of energy, and 10.27-28 of protein. Now I have figured that in making mixtures of this kind, it will simplify matters to drop the decimal, and use only the whole numbers, the small amount contained in the decimal will not matter. Again I am recommending that we use one hundred pounds value instead of fifty or twenty-five pound values; however, you will find a table in which I have given the protein and energy in connection with twenty-five, one hundred, two hundred,

and three hundred pounds you can make up almost any kind of a total and figure the amount of protein. Now to give you a sample list, which I have figured up here:

RATIO OF PROTEIN TO NET ENERGY FOR DIFFERENT ROUGHAGES, QUALITIES AND QUANTITIES OF MILK

When roughage is	When feeding one pound of grain for each four pounds of milk per day	When feeding one pound of grain for each three pounds of milk per day
GROUP I Consisting of Timothy Hay or Corn Silage or Corn Stover or any two or three of them, make a mixture.	For cows producing less than 15 lbs. of milk per day, make a mixture containing 1:3.5 of net energy. If producing over 15 lbs. milk per day, make a mixture containing 1:4 of net energy.	For cows producing less than 20 lbs. of milk per day, make a mixture containing 1:4.5 of net energy. If producing over 20 lbs. milk per day, make a mixture containing 1:5 of net energy.
GROUP II When in addition to silage or fodder, 5 to 7 lbs. of clover or alfalfa are fed, or when mixed hay is half clover.	For cows producing milk testing 3 to 3.5% fat, Protein 1 to 5 net energy. For cows producing milk testing 3.5 to 4.5% fat, Protein 1 to 5.5 net energy. For cows producing milk testing over 4.5% fat, Protein 1 to 6 net energy.	For cows producing milk testing 3 to 3.5% fat, Protein 1 to 5 net energy. For cows producing milk testing 3.5 to 4.5% fat, Protein 1 to 6 net energy. For cows producing milk testing over 4.5% fat, Protein 1 to 6 net energy.
GOUP III When all the rougage is clover or alfalfa hay.	For cows producing milk testing 3 to 3.5% fat, Protein 1 to 6 net energy. For cows producing milk testing 3.5 to 4.5% fat, Protein 1 to 6.5 net energy. For cows producing milk testing over 4.5% fat, Protein 1 to 8 net energy.	For cows producing milk testing 3 to 3.5% fat, Protein 1 to 6 net energy. For cows producing milk testing 3.5 to 4.5% fat, Protein 1 to 7 net energy. For cows producing milk testing over 4.5% fat, Protein 1 to 8 net energy.

THE RELATIVE NET ENERGY IN CORN MEAL, TIMOTHY HAY AND WHEAT STRAW

Total Energy	Lost in feaces	Lost in gas	Lost in urine	Lost in labor	Total loss	Net energy
%						
100 Corn meal,	9.2	9.3	3.9	36.3	58.7	41.3
100 Timothy hay,	48.9	3.8	3.1	29.5	85.3	14.7
100 Wheat straw,	54.8	9.0	2.5	27.7	94.0	6.0

TABLE III—MAINTENANCE RATIONS FOR COWS

	Pounds digestible prot.	Therms net energy
750 lb. cow requires for maintenance about,	.4	4.95
1000 lb. cow requires for maintenance about,	.5	6.00
1250 lb. cow requires for maintenance about,	.6	7.00
1500 lb. cow requires for maintenance about,	.65	7.90

TABLE IV—REQUIREMENT FOR MILK PRODUCTION IN ADDITION TO MAINTENANCE

	3% Milk		4% Milk		5% Milk	
	Protein	Energy	Protein	Energy	Protein	Energy
For 1 lb. milk,	.045	.22	.05	.30	.055	.39
For 10 lb. milk,	.450	2.20	.50	3.0	.55	3.9
For 15 lb. milk,	.675	3.30	.75	4.5	.825	5.58
For 20 lb. milk,	.900	4.40	1.00	6.0	1.10	7.8
For 25 lb. milk,	1.125	5.50	1.25	7.5	1.375	9.7
For 30 lb. milk,	1.35	6.60	1.50	9.0	1.65	11.7

Ration 196	Protein	Therms energy
175 lb. Corn and cob meal,	7.	126.
100 lb. Cottonseed meal,	35.	84.
100 lb. Distillers' grains,	22.	79.
100 lb. Linseed meal,	29.	75.
475 lb. Contains,	93.	364.
1 lb. Contains,	.195	.766
Ration 107		
200 lb. Corn and cob meal,	9.	144.
150 lb. Cottonseed meal,	52.5	126.
175 lb. Distillers' grains,	38.5	139.
100 lb. Gluten feed,	20.	79.
625 lb. Contains,	120.0	488.
1 lb. Contains,	.192	.780

		Protein and Net Energy in					Price per ton	Price 100 lb.	Cost 100 lb. protein	Cost 100 T. energy
		25 lb.	50 lb.	100 lb.	200 lb.	300 lb.				
Ajax Flakes,	P	5.5	11.	22.	44.	66.				
	E	20.	40.	79.	158.	237.				
Barley,	P	2.	4.	8.	17.	25.				
	E	20.	40.	81.	161.	242.				
Brewers' Grains, dry,	P	6.	9.5	19.	38.	57.				
	E	20.	30.	60.	120.	180.				
Brewers' Grains, wet,	P	.9	1.9	4.	8.	11.				
	E	3.7	7.5	15.	30.	44.				
Beet Pulp,	P	1.7	3.5	7.	14.	20.				
	E	15.	30.	60.	120.	180.				
Buckwheat Mid.,	P	5.5	11.	22.	45.	67.				
	E	19.	38.	76.	152.	228.				
Corn,	P	1.7	3.5	7.	14.	20.				
	E	22.	44.	89.	177.	266.				
Corn and Cob Meal,	P	1.	2.	4.	9.	13.				
	E	18.	36.	72.	144.	216.				
Corn Hearts,	P	3.5	7.	14.	28.	43.				
	E	21.	42.	84.	168.	252.				
Cottonseed Meal,	P	9.	17.5	35.	70.	105.				
	E	21.	42.	84.	168.	253.				
Distillers' Grains, Corn,	P	5.4	11.	22.	44.	66.				
	E	20.	40.	79.	158.	237.				
Distillers' Grains, Rye,	P	2.5	5.	10.	21,	31.				
	E	15.	30.	61.	122.	183.				
Gluten Feed,	P	5.	10.	20.	40.	60.				
	E	19.	39.	79.	142.	237.				

Gluten Meal, Chi.,	P	8.	16.5	33.	66.	99.	------	------	------	------
	E	20.	39.	78.	157.	235.	------	------	------	------
Hominy,	P	2.	3.5	7.	14.	21.	------	------	------	------
	E	21.	42.	84.	168.	252.	------	------	------	------
O. P., Linseed Meal,	P	7.	14.	27.	55.	83.	------	------	------	------
	E	20.	39.	79.	158.	237.	------	------	------	------
N. P., Linseed Meal,	P	7.	15.	29.	58.	88.	------	------	------	------
	E	19.	37.	75.	149.	234.	------	------	------	------
Malt Sprouts,	P	3.	6.	12.	25.	37.	------	------	------	------
	E	11.5	23.	46.	93.	139.	------	------	------	------
Oats, ground,	P	2.	4.	8.	17.	25.	------	------	------	------
	E	16.5	33.	66.	132.	199.	------	------	------	------
Sucrene,	P	.8	2.	3.	7.	10.	------	------	------	------
	E	14.	29.	37.5	115.	173.	------	------	------	------
Unicorn,	P	5.	10.	20.	40.	60.	------	------	------	------
	E	19.	38.	76.	152.	228.	------	------	------	------
Union Grains,	P	4.	9.	18.	35.	53.	------	------	------	------
	E	18.	36.	71.	143.	214.	------	------	------	------
Wheat Bran,	P	2.	5.	10.	20.	31.				
	E	12.	24.	48.	96.	145.	------	------	------	------
Wheat Mids.,	P	3.	6.	13.	25.	38.	------	------	------	------
	E	19.	39.	72.	155.	233.	------	------	------	------

A Member: With one hundred pounds of union grains, how much cottonseed meal would it take to make up the required number of therms—in union grain there is about 27 per cent. of protein.

PROF. VAN NORMAN: I think it would be one hundred to three or four hundred. The following is a mixture which would go well with timothy hay and corn stover.

400 pounds of corn meal.
100 pounds of cottonseed meal.
300 pounds of distillers' grain.
100 pounds of gluten feed.

Now that amount of grain would contain 7.44 therms of energy. If you want to find out whether it is a cheap ration or not, figure out what it would cost you at your price, and divide by 7.44 to get the cost of the energy, because that amount of grain contains 7.44 therms of net energy. At the present market price of grain, you should be able to furnish the necessary amount of protein at less than two dollars, our's costs one dollar and seventy-nine cents, buying in carload lots, as we have been able to do. Now that is protein, 1 to 5 per cent. net energy.

Now I will give you over two other mixtures, which you may like to figure out. Here is a mixture which I believe can be fed profitably at the present prices, but there are many of our farmers who have to figure on their own home grown products; they want to figure linseed meal, because it is low in price, and corn meal and oats, and bran, because they have them.

300 pounds corn meal.
300 pounds linseed meal.
200 pounds oats.
400 pounds bran.

This contains 8.14 therms of energy; divide the cost by 8.14, and it gives you the cost of the feed to you—not the cost of the energy—and I think you will find it runs somewhere near 2.15 per hundred as compared with 1.85 for the other.

In making up your grain mixture, spread on the barn floor, first the bulky feeds; put on top of these the next lightest and so on, with the heaviest on the top, then spread it as a good cement mixer spreads his cement; then take up a shovelfull and lift it clear off the floor and throw it over to the right or left, and then throw on the next shovelful, spreading it as you go, and mixing it, and then throwing it back again into the middle of the floor in the same way; at the end of the third handling it should be properly mixed.

Now it is usually no trouble to weigh the feed; if not every day, I believe it is wise to weigh it once a week at least. If she gives eighteen pounds of milk, she should have three pounds to eat. Mark the amount on the stall, if you don't care to weigh it up each time get a measure that will hold the proper amount. The greatest need of our farming is business methods.

The last five years have been years of science and bacteria, the next ten years are to be years of business and profit. We must get down to figures. If you only sell two hundred dollars worth of

business off your farm, you cannot have two hundred dollars worth of profit. Study your profits, or don't do business.

The next step will be the science of feeding—the study of economy in feeding. Find out what your cows are doing, and don't buy forty dollars worth of feed for a cow that only gives thirty-five dollars worth of milk.

EAR-MARKS OF THE FARM

By S. C. GEORGE, *West Lebanon, Pa.*

It is not my intention in this paper to try to instruct such an intelligent audience as this, yet we would consider our time and efforts wasted did not some one gather some thought from it that would be of use to him, for we know that it is he who has knowledge who thirst for more.

In choosing our subject we were guided partly by an article in the "National Stockman and Farmer" from the pen of W. D. Zinn in which he said, "That good farming had certan ear-marks that could not be mistaken." While this is true, poor farming also has its ear-marks, that are equally easily discernible, and as straws indicate which way the wind blows, so there are certain marks that point to good or poor farming.

We should emulate the good farmer; we should strive to learn all we can from him; his methods, his operation, and his achievements. But we can also learn a great deal from the poor farmer by avoiding his failures, noting his carelessness and his mistakes.

WHAT ARE SOME OF THE EARMARKS OF THE FARM?

When we see the buildings in good repair, the machinery carefully put away when not in use, the fences neatly built, fence-rows trimmed with care, a good sod on the fields, the growing crops thrifty, the manure hauled out on the fields at the right time, the animals sleek and in good condition, we known that the owner or caretaker of that farm is a good farmer, and one whom we can safely pattern after.

But on the other hand when we see dilapidated buildings, buildings not old but out of repair and neglected, where paint has not been used, where doors are off their hinges, gates hanging by one hinge, or perchance lying on the ground, where the boards are loose on the fences, fence-rows grown up with briers, elders and bushes of all kinds that you could not plow within a rod of the fence, fields covered with weeds, golden-rod, aster, wild carrot, daisy, and thistles instead of grass, the machinery standing in the field where it was last used or in a fence-corner, or under an apple tree, the fowls roosting on the trees, the cattle looking as if they had the "hollow horn" or "wolf-in-tail," had lost their cud and not enough in their stomach to make a new one; then we see some of the marks of the poor farmer.

Have you ever noticed in traveling along the highways or in the railway car the differences in farms? Even if there be no fences you can easily discern farm lines by the different appearance in the farms. Or, if there be fences, one man will have his side clean up to the fence, while the other side cannot be reached by several rods. And this only makes work harder for the man who strives to keep his farm clean; where a spinster owns a farm on the west of you and a so-called city farmer owns one to the northwest, where weeds are left to grow unmolested, to ripen and be blown by the wind or carried by birds, it is a difficult problem and it is only by persistent efforts that one can succeed.

And while it is not our purpose in this paper to tell how to do things, yet right here we would say that the use of the mowing machine, the scythe, the brier hook or the mattock at the right time is one means by which we surmount many difficulties and where our work, on the farm, will show to good advantage.

But you do not need to go to the farm to distinguish between the careful and the careless farmer. Meet him on the road with his team, go to the market place, the mill, the coal mine, the railway station, or wherever farmers congregate with their teams, and note the difference, and you will have an ear-mark of what you are likely to find on the farm. One with a broken spring on his wagon seat propped up by a piece of plank, the wagon bed so badly broken that it would hardly hold pumpkins, the harness tied up with binder twine or baling wire, and you may be sure to find similiar conditions on the farm, where no modern methods are used; a man who says Farmers' Institutes are a farce and that farm papers are fit only for kindling wood.

But on the other hand you notice different conditions; the harness kept well oiled, broken places and nuts kept tight about the wagon, the harness good, and the horses neatly groomed, and you draw different conclusions. You are sure on that farm to find a man who takes time solving the problems that arise on the farm, one who uses all the means to advance the productive powers of the farm.

We can also learn a lesson in economy right here, for while it is necessary to be neat and careful, we do not need to be extravagant. And how often do we see a team loaded with rings and regalia simply to try to outdo one's neighbor! It is a pretty guess, that in the house the good wife is struggling for some needed article of necessity.

WHAT IS THE TRUE AIM OF FARMING?

Is it to buy more land, to raise more corn, to raise more hogs, etc., etc., ad infinitum? What should be the object of any man's life? If it is not to enjoy the fruit of his labor?

The home is one of the ear-marks of the farm that is too often overlooked. The home should be attractive. In our great cities where land is dear, houses have to be built on small areas and into the air; but this is not necessary in the country. It may have the comforts of a city house without looking like one. The tasteful home has a sale value in the country as well as in the city. It adds value to the farm as well as enriching the soil to make it more productive, yet this is a wealth that cannot be counted in dollars and cents.

The conveniences in the home are marks of distinction. The fuel and the water are of great importance, especially the latter. How often the water has to be carried up steps or from a far-away spring, or pumped out in the cold, when for a few dollars the water could be had in the house.

"Its great to be a farmers' wife,
And live upon the farm
And rise up early in the day,
To make fires bright and warm,
That the farmer man has kindled
For his faithful loving one,
Who now prepares the breakfast
And thinks it first class fun.

"It's great to be a farmers' wife,
And breathe the country air,
To raise the chicks and gather eggs
And sell for prices fair.
The children love their mother,
And the father loves her too;
And to keep her kingdom moving
Is all she has to do."

CO-OPERATION OF HOME AND FARM

Co-operation in the home and on the farm is one of the essential factors in success and happiness. It is just as necessary here as in a business firm. The wife and children should feel that they are members of the firm, and not merely boarders. It is not always necessary that such services shall be paid in money, but oh! there are so many ways of rewarding where money could never pay the debt.

"Little deeds of kindness,
Little words of love."

When such conditions exist there are no suits in our divorce courts, and the boys and girls are not in a hurry to leave the farm.

There are farmers who sell everything off the farm that will sell, or the best of everything, keeping for himself only that which is not marketable. Is this wise? Is it good farming? The farmer's table should be supplied with the best of everything; not necessarily expensive, but plenty of fresh, wholesome food. The farm will furnish the fruits, the vegetables, the milk, the butter, the eggs, the meat, with little labor if proper means are used. When those things sell high in the market, the farmers are tempted to sell, but he can afford to do so only when the supply is greater than the demand at home.

One of the ear-marks of the farm that cannot be denied, is the reading-table in the home. Let me go into the home and look at the literature, and I will tell you what kind of a family it is. This is a day of reading. It is not enough for a man to have brawn and muscle, but he must have brain. In this day of agricultural schools, experiment stations, farmers institutes, and with the writing in our farm papers of such men as Agee, Zinn, Chamberlain, Lighty and a score of others, there is no reason for a man not to be educated. Allow me to repeat, then that whatever may be the other conditions of life the home should fill the first place. In fact you never know a man till you see him at home.

Good business is a mark of the farmer. How often in the transaction of our affairs do we use no business ability. The farmer should

be a business man, and the farm will soon show the results. He should keep informed as to prices, know when to sell to best advantage, to buy and sell in a business way. Method is another feature that is lacked by many farmers. Doing our work in a careless way and its results are soon seen. But have these ear-marks a value? They surely have. The manufacturer or the dealer has a trade-mark on his wares or his goods which sells them. So should the farmer have; the mark is bound to be there and if he does not put on one of which he is proud, the other kind will put itself there. If your trade-mark is right, when you have anything to sell whether it be an animal, grain, hay, fruit, vegetables, butter or eggs, an "ad" in the paper is enough to bring you buyers in abundance, but if the goods be such that you are ashamed to put a trade-mark on them there is a poor market for your produce. Fellow-farmers what kind of ear-marks are on your farms?

REPORT OF THE APIARIST

By H. C. KLINGER

The year 1911 will pass into apicultural history as one of poorest for the production of honey. Reports have been received from several parts of the State where a small crop was obtained but the general report was "an entire failure." This State is not exceptional in reports of poor crops for this year, since there seems to be a general failure over all the United States and Canada. The failure in this State at least is due to the severe droughts which prevailed the last three years preventing a growth of honey-bearing plants, among which especially was the white clover. The outlook for next year is more promising. The heavy fall rains has started an abundant growth of flowering vegetation, and thus far it was protected by snow, provided the unusually severe winter has not proved disastrous.

The great problems in keeping bees, which men have been trying to solve for years, are apparently unsolved conclusively and still form the subjects of intense study and research. Conditions of weather and climate, sources of honey, manipulation, and numerous other matters enter into making a success or failure possible.

The wintering of colonies has undergone a change. It was formerly thought that all colonies north of 41° of latitude should be wintered in the cellar; but practice has changed so that colonies as far north as Canada are successfully wintered on their summer stands. A crop of honey frequently depends on successful wintering. A colony should go into winter quarters with plenty of young bees and to insure this brood-rearing should go on late in the season. This may necessitate stimulative feeding in the fall after the main honey flow is over. The amount of winter stores depends on the

method of wintering and the length of the winter? Cellar wintering requires less stores than outdoor wintering since there is a smaller consumption of food necessary to keep up the temperature of the hive, but it requires greater care in keeping up an even temperature of the cellar and is, therefore, more desirable for the experienced and those of leisure.

Every colony should have from 25 to 50 pounds of good honey or sugar syrup to winter on. A poor grade of honey in the combs had better be extracted, and the colony fed on a 2 to 1 sugar syrup (two pounds of granulated sugar mixed with one pound of water). The amount of protection for out-of-doors wintering depends on the severity of the winter. In the South no protection is needed. For our latitude hives should have double walls packed between with some dry material, planer shavings, leaves or chaff. If the hives are single-walled they should have an extra cover of either wood or several thicknesses of heavy paper. An absorbent cushion should be placed over the frames as a means of taking up the moisture coming from the bees. If colonies go into winter with plenty of young bees, plenty of stores, and are fairly protected, they are almost certain to come out strong and in good shape for a crop of surplus honey.

Recently there appears to be a tendency of changing from producing comb honey to that of extracted. The question of producing comb honey or extracted depends largely on locality and market. Comb honey brings better prices on the market than does extracted, but the latter is simpler in production. More extracted can be secured from a hive, since the bees are not required to build any comb as the same comb can be used successive times. Again, when there is only a light flow they are very slow to go into section supers than into full drawn frames. At present there is an exodus from comb honey to extracted, and those who produce quantities of the former and are successful may be wise by continuing, as the indications are that comb honey will command fancy prices in the near future. At this time there is practically no comb honey on the market.

The question of controlling swarming during a honey flow, has perhaps received more attention within late years than any other. Formerly, the criterion of success in bee-keeping was the number of swarms; but now it is recognized more as contrary to success. The ideal condition of a colony for producing honey, toward which all progressive bee-keepers aim, is to have the colony "full to overflowing" but not overflowing with bees. This condition is difficult to maintain. With the stimulation to brood-rearing in the spring, agitated by a flow of nectar, there is a tendency to swarm. Very few succeed in eliminating swarming entirely, but with proper methods and care it may largely be controlled. A system of hive manipulation has been brought out within the last year known as the Hand system which is supposed to do away with swarming entirely. It is a method of operating a hive or rather a double hive by which a colony can be made very strong, and by the turning of a switch at the entrance, the working force of bees can be turned into any part of the hive desired, and in this way there is no loss of energy or force in carrying surplus, and the causes which produce swarming are

arrested. The practical utility of this method remains yet to be worked out fully, although those who have tried the system claim it to be a success.

The greatest progress that Apiculture has made in this State during the last year, and perhaps that has ever been made, is the passage of a Foul Brood law by the last session of the Legislature. The bill was drawn up by the State Bee-Keepers Association, endorsed by this body and the Horticultural Association before it was presented. Through the efforts of these various bodies and the earnest efforts of bee-keepers and their friends, the bill passed almost without any opposition, while similar bills in former sessions were ridiculed and hopelessly defeated. The bill provides for State Inspection of all apiaries in the State under the direction of the Secretary of Agriculture. Where the disease is found, directions are given for treatment of colonies infected. Where bees are kept in old-fashioned box-hives the owner may be required to transfer them into movable frame hives. It also provides for the destruction of hives and colonies where necessary and prohibits the sale of infected combs, bees or hive material. The unfortunate part of it all is, that the appropriation far carrying out its provisions was lopped off by the Legislature, thus preventing its being carried out effectively for the present.

During the year other states have been active in securing legislation. Similiar laws were passed in Kansas, New Jersey, Vermont, Tennessee, Minnesota and Illinois, and in British Columbia, for Canada, while progress has been made in other states that have not yet passed any laws of inspection. There are now 33 states that have laws in some form for the inspection of apiaries.

While argument is sometimes brought that the territory would be too large to be covered by inspectors and a law would be ineffective, the fact is true that in states where laws have been in operation for a number of years the disease has been practically brought under control. Pennsylvania bee-keepers, who have suffered so much from the disease, are so eager to make a fight against it that during the convention of the State Bee-Keepers' Association, held at Lancaster recently, a number of members qualified themselves by taking an examination, conducted by Dr. Surface the State Entomologist, and volunteered to inspect apiaries. As there are no provisions made for their payment of services, they expect to do it gratis.

The Bureau of Entomology of the Department of Agriculture at Washington is planning to do greater work for apicultural interests. Dr. Phillips and his corps of assistants are doing splendid work in combating diseases. A number of bulletins on bees have been published for distribution and may be had by writing for them to the Department of Agriculture. One of these is Bulletin No. 397, "Bees," an instructive work on keeping bees; another is Bulletin No. 442, "The Treatment of Bee Diseases." This should be in the hands of every bee-keeper. It describes the indications and symptoms of the various diseases, how they are spread and how to treat them. The treatise is by Dr. Phillips and is the most up-to-date and reliable of any thing that was ever published.

As a further means of distributing information, Secretary Wilson, after a consultation with a committee of bee-keepers, has consented to authorize the publication of several additional bulletins: one on

the relation of bees to horticulture and another on the value of honey as food, besides ordering the preparation of press notices to every paper in the United States.

A number of years ago Pennsylvania was not known among the fruit states, and only within recent years was it discovered that choice fruit, equal to that of any progressive district of the United States, can be produced here. We have only recently awakened to the possibilities of our State. When we consider that only a few colonies of bees covering in flight a radius of a few miles can store a ton of honey, and when we see acres upon acres of land not winged by bees, we realize that there must be millions of nectar-secreting flowers that remain unvisited by them, and there must be tons of honey wasted upon the desert air.

If the soil is uncultivated, there still remains in it a latent power that some wanderer may find centuries later; if the mineral in the earth remains unearthed, it loses none of its virtue or value. But here is a product, formed daily, that may satisfy the desire of a peasant or grace the menu of a king, that "if the harvest is ready and the laborers are few" or none, it is lost forever.

REPORT OF THE COMMITTEE ON LEGISLATION

The Committee on Legislation beg leave to make the following Report:

This being a year when the Legislature is not in session, the Committee on Legislation have somewhat abbreviated their Report, reviewing the demands for the past rather than claiming new laws to be passed, from any new claims made by the present State Board of Agriculture.

The farmers of Pennsylvania have long been united in sentiment, however, short in action upon the proposition, that the roads to which the State owes its greatest obligation are those thousands of miles of township roads which the farmer must traverse in carrying his crops to market. We look upon this proposition as important, economically, to the city man as well as the farmer. We, therefore, review our stand for a law which will pay to townships, by the State, fifty per centum of all road taxes collected in said townships not, however, to exceed $20 a mile. Such a law has twice passed our Legislature only to be made inoperative by executive disapproval. We regret that our last Legislature failed to appropriate sufficient money to meet the obligation assumed by the State, when it passed the Jones' Road Bill in 1909. We urge all farmers to insist that they use their votes and influence with the view of securing sufficient appropriations by our next Legislature to meet the deficiencies created in every township in Pennsylvania.

We approve the plan of the State to build 8,000 miles of inter-county highways, as provided for, by what is known as the Sproul Road Bill passed by the last Legislature. This work will not only provide good roads, but will tend to reduce local taxation, as these roads will be maintained solely by the State. Bonding the State, however, for fifty million, we are not so free to say is good business management.

CHESTNUT TREE BLIGHT

We favor all active efforts towards the suppression of what is known as "The Chestnut Tree Blight," which is attacking the chestnut timber in various parts of the State.

We endorse and hope for the passage of the Bill now before Congress appropriating $80,000 for the aid of this very important work.

EQUALIZATION OF TAXATION

We most strongly assert that the taxes as levied and collected in Pennsylvania place an unequal and unjust burden upon the farmers and home-owners, inasmuch as corporate and personal property pays but 3 mills on the dollar while real estate pays 16 to 18 mills. As a means for equalizing taxation we urge increased appropriations for roads and schools, both of which are State, and not local matters of interest and import. We have outlined above our position upon road appropriations. As to schools, we reiterate our demand that the State pay to school districts a sum equal to the minimum salary of all teachers employed in each district for the minimum school term. As a means for increased revenue, we suggest that a tax of 1 mill might be placed upon oil and coal and such revenue go towards the construction of good roads.

OLEOMARGARINE

One of the items of great importance to the farmers, is legislation affecting our great dairy interests; and there is *no greater* menace to this interest than the colored product known as oleomargarine used as an imitation for butter. We have an excellent law in Pennsylvania upon this subject, which only awaits vigorous and conscientious enforcement to make it a sure and safe protector for the farmer. Efforts were made by the oleomargarine people before the last Legislature to hobble this law, but were blocked by the intelligent presentation of the facts by the organized farmers, led activity by the State Grange. It is our duty to be ever alert upon this subject. At the present time a strong effort is being made, on the part of the packing interests who control the market in oleomargarine, which is largely made-up of by-products from the slaughter houses, to secure Federal legislation which will place oleomargarine on a level with good butter. The danger to the farmer is apparent, and the damage to be done by such legislation *cannot be estimated.* We should see that our Congressmen and United States Senators are informed, in no uncertain terms, that the farmers of Pennsylvania are opposed to legislation which will permit the placing of this substitute upon a *level with the real dairy product.* The fraud in oleomargarine is in the *coloring* of it, and this is the *one great point* at issue,

and the *only one* the packing trust cares to carry. We strongly insist that it be so dealt with so as to prevent its being colored. Yellow is the *natural* color of butter. The natural color of oleomargarine is *white.*

POPULAR GOVERNMENT

We believe that the government of this—and every other state—should be brought more closely to the people. (Government has been taken from the people by years of tolerance until there is a condition when a few political manipulators have the power, through patronage and the control of the public funds, to make and unmake laws to suit themselves). We believe the people should be trusted with absolute sovereignty, and therefore reiterate our demand for these great principles of real democracy. We urge the submission to the people by our Legislature, to pass a constitutional amendment which will unite these proposition into the fundamental laws of our State.

As a part of this same item, we further urge the direct election of our United States Senators.

PARCELS POST

The farmers of America have for years demanded of Congress the enactment of a law which will entrust the government with the carrying of parcels as is done by all other governments in the civilized world. However, we stand by the expression made by an honored member of this Board that we should have "*a real parcels post;* no fake substitute." The Express Companies are parasites upon the legitimate functions of the postoffice department. We see no reason why the farmers should not have the same collect and delivery privileges, enjoyed by the town and city dwellers, nor do we see why anyone should pay the outrageous tribute imposed by the Express Companies, when we have our most efficient and trustworthy mail department of government ready at anytime to assume all of this carrying, from the most thickly-settled urban section to the most remote rural section, and vice versa. We favor the passage of the bill now before Congress, known as the Lewis Bill.

PROTECTING AGRICULTURE

We earnestly commend the work of our Department of Agriculture in safeguarding the farmer's welfare throughout Pennsylvania. We regret that the bills asked for by the Department for the rigid inspection of Paris green and linseed oil and for the proper labeling of field seeds, were not passed by the last Legislature. We believe a pure seed law should provide for a penalty for those who sell seeds containing noxious weeds, or being less than 99 per cent. pure. We regret that the Agricultural Extension Bill, providing for an appropriation of $60,000, failed to become a law; passed the House but failed in the Senate. We urge increased appropriations for Farmers' Institute work, recognizing the great good thus done by the Division of Farmers' Institutes under the supervision of Hon. A. L. Martin.

In conclusion, we again urge our farmers to look upon these matters in a practical, rather than a sentimental, manner. We get nothing by adopting resolutions. We must join words with works and see to it, through our efforts as citizens, that our demands are enacted into law.

STATE COLLEGE

We demand increased appropriations for our Pennsylvania State College, of which institution and its magnificent work and excellent management we are justly proud.

FRUIT INTERESTS

We recognize that the fruit interests of our State is becoming a great factor, and that Pennsylvania is being noted as a leading State among other states of the Union for its production of delicious fruit. The good work accomplished by the Division of Zoology is apparent to us all.

Your Committee on Legislation reiterates the position long held by this body, that one of the important duties of the farmer is to be alert at all times and in all seasons as regards the laws under which we must carry on our work. We believe in the improvement of farm methods, the advance of agricultural science and education. But we *recognize* the fact, that the farmer must also safeguard his interests through legislation if he would occupy the position in our political life to which his economic importance entitles hm.

To ths end, we reaffirm our conviction that there are too few farmers in our legislative halls. We most heartily commend the work of the farmers who have been members of our law-making bodies in the past, and insist that more farmers should be elected to represent the people. We, therefore, urge that all members of this Board and all farmers throw aside partisan and selfish considerations, and determine, by their votes, that we shall have more actual, bona-fide husbandmen in our legislative halls.

REPORT OF THE ORNITHOLOGIST

By PROF. H. A. SURFACE

(This address was illustrated with lantern slides).

As no very remarkable events have occurred in the ornithological field during the past pear, the Ornithologist of the State Board of Agriculture, in giving his Annual Report, thinks it best to base his remarks upon our present State law in regard to birds, and to show illustrations of the birds that are unprotected by law, with emphasis that all other kinds of birds than those here specifically mentioned are definitely protected by law in this State at all times, unless they are definitely named as game birds, when they have stated open and closed seasons. Those that are upon the "black list" are as follows:

(1). Blue Jay.
(2). English Sparrow.
(3). European Starling.
(4). Kingfisher.
(5). Shrike.

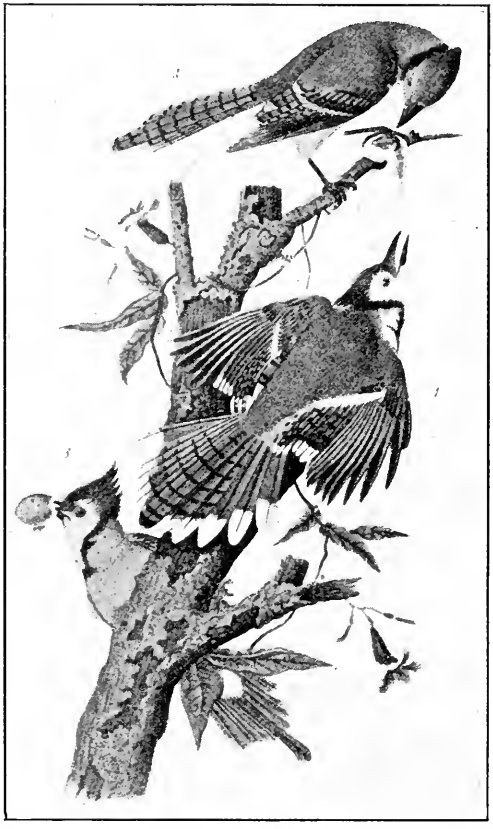

Fig. 1. Blue-Jay.
1. Male. 2. Female.

(6). Eagle.
(7). Buzzard.
(8). Osprey.
(9). Sharp-shinned Hawk.
(10). Cooper's Hawk.
(11). Goshawk.
(12). Duckhawk.
(13). Pigeon Hawk.
(14). Great-horned Owl.
(15). Barred Owl.
(16). Crane.
(17). Heron.
(18). Bittern.
(19). Crow.
(20). Raven.

Let us discuss each in turn.

BLUE JAY

The Blue Jay (see Fig. 1) has a bad reputation for its supposed destruction of the eggs and young of other birds. It is very doubtful if this be true, but it is quite a destroyer of insects, and certainly is not nearly so bad in regard to egg destruction as the English Sparrow, which we so wrongly tolerate. The Jay lives mostly in more or less wooded districts, or in orchards, where it can find concealment during certain parts of the day. It is with us the year round, and is often conspicious by its noisy calls, and brightly colored blue, white and black plumage. In condemning it for its habits of feeding on the eggs of other birds, we must not forget that it feeds also upon insects of several kinds, while the bulk of its food consists of wild berries, seeds and acorns. We know that where the Blue Jay is abundant, there we also find other birds, and therefore the Jay is not so seriously destructive in character. We do not wish to think of the day when the Blue Jays are exterminated, and we, therefore, regret that it is upon the unprotected list.

In writing on "The Blue Jay and its Food," Doctor Beals, who carefully examined the contents of stomachs of about three hundred Jays, published in his official report in the year book of the Department of Agriculture for the year 1896, the following:

"The most striking point in the study of the food of the Blue Jay is the discrepancy between the testimony of field observers concerning the bird's nest-robbing proclivities and the results of stomach examinations. The accusations of eating eggs and young birds are certainly not sustained, and it is futile to attempt to reconcile the conflicting statements on this point, which must be left until more accurate observation have been made. In destroying insects the Jay undoubtedly does much good. Most of the predaceous beetles which it eats do not feed on other insects to any great extent. On the other hand, it destroys some grasshoppers and caterpillars and many noxious beetles, such as Scarabaeids, click beetles (Elaterids), weevils (Curculionids), Buprestids, Chrysomelids, and Tenebrionids. The Blue Jay gathers its fruit from nature's orchard and vineyard, not from man's; corn is the only vegetable food for which the farmer

suffers any loss, and here the damage is small. In fact, the examinations of nearly three hundred stomachs shows that the Blue Jay certainly does far more good than harm."

In view of the above authoritative statements expressing views which are emphatically endorsed by the writer of this report, is it now time that the intelligent citizens and law-makers of Pennsylvania get busy to bring about legislation to protect instead of destroy the bird, which is at once so useful and so beauiful.

ENGLISH SPARROW

The English Sparrow (see Fig. 2) is multiplying with remarkable rapidity, due chiefly to the indifference of mankind. On almost every point, it has proven itself a veritable nuisance. Not only does it feed upon grains of field crops, and upon garden plants of many kinds, but it is objectionable because of its filthy effects in soiling property that might otherwise be clean or presentable. Also, it is certainly the chief aid in carrying the San Jose scale from place to place, and in the poultry yard its presence results in considerable loss through devouring the food intended for poultry.

We believe that the English Sparrow nuisance would be greatly reduced if it were made illegal to let this bird nest upon the premises. It is not difficult to modify its nesting site, so that it will be unable to find a footing upon the cornices of buildings and in other places where its litter is heaped into an uncouth mass and used as a nest. Where it starts to build a nest in an accessible place, it is well to permit it to do so, and wait until after the nest is finished and the eggs are laid and hatched before destroying it. In fact, if the young birds be left in the nest until they are almost ready to leave it naturally, this will lengthen the period until the production of the next brood and result in fewer birds per year than though this nest were destroyed as soon as discovered, or by the time its eggs were laid. To do this, some persons are now placing for the sparrows nesting boxes provided with lids which permit the removal of the young or eggs. In removing nesting material it should be burned rather than merely thrown upon the ground and left for Sparrows to carry away in the formation of new nests.

EUROPEAN STARLING

The European Starling (see Fig. 3) is a comparatively newly introduced bird in America, which multiplies rapidly, and to which your Ornithologist has called attention in previous reports. In appearance it is very much like the Blackbird, or female Cowbird, and in habits may be said to be intermediate between our ordinary Blackbird and the English Sparrow. During the recent cold weather the Starling was seen in large flocks in the eastern part of the State. It is supposed that they came from the region between New York City and Philadelphia, where they have recently been multiplying. It is our opinion that the Starling is a good seed-eater, which will prove to be as objectionable as the English Sparrow, and it should, therefore, be known and destroyed. It lives and feeds mostly in open fields, and can be recognized by its single short whistle or note.

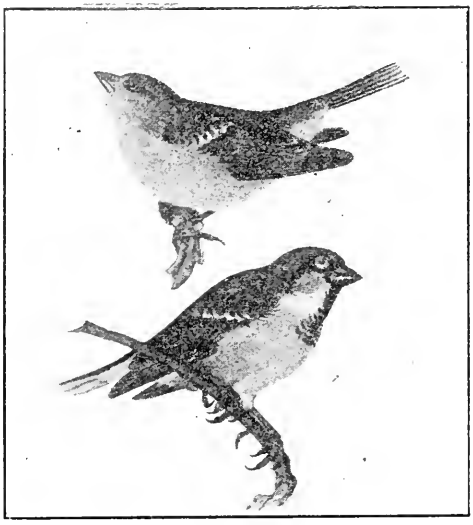

Fig. 2. English Sparrow.
1. Male. 2. Female.

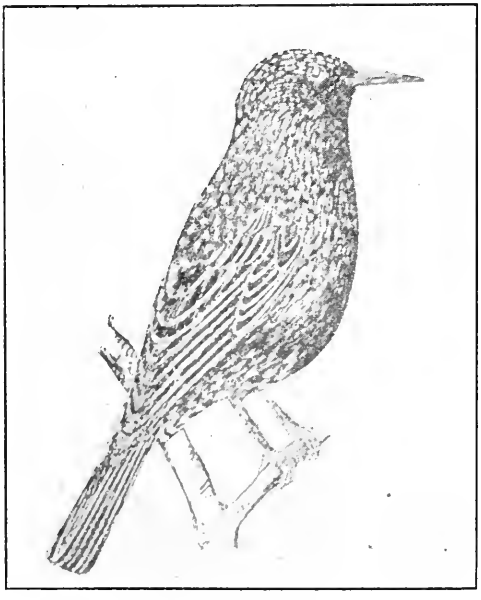

Fig. 3. Starling.

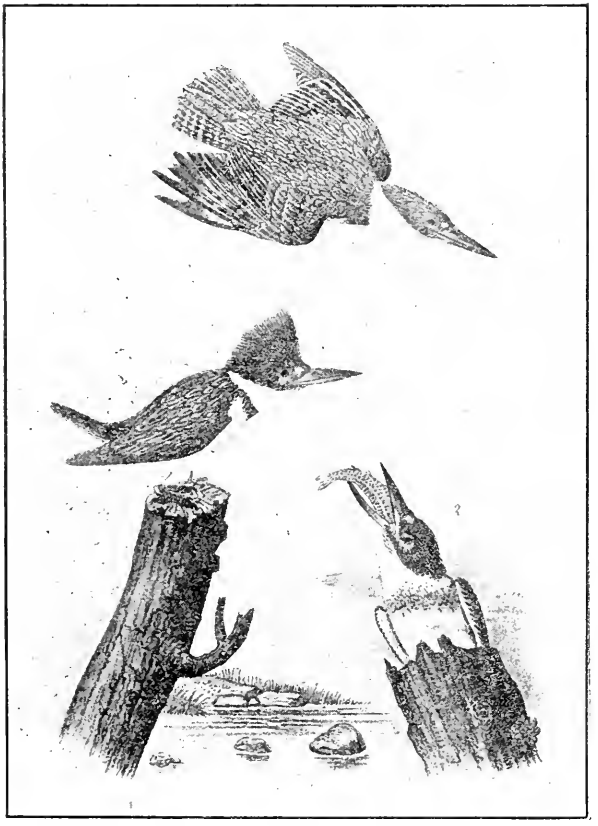

Fig. 4. Belted Kingfisher.
1. Male. 2. Female.

Fig. 5. Logger-headed Shrike.
1. Young. 3. 4. Adult.

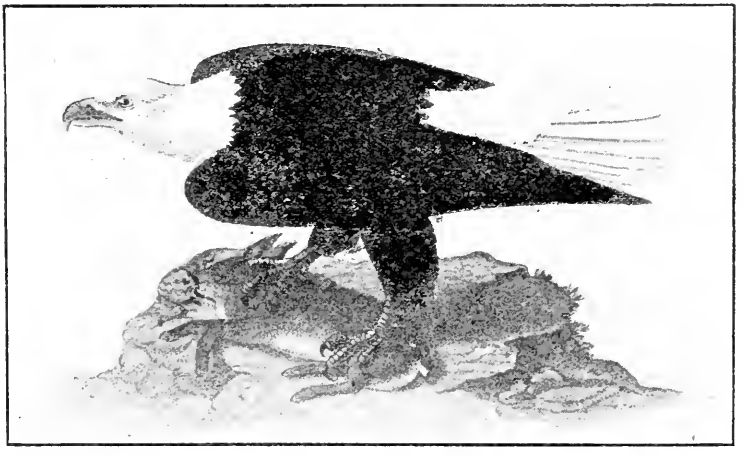

Fig. 6. Bald Eagle.
Adult.

KINGFISHER

The Kingfisher (see Fig. 4) is doubtless on the black list because it destroys fishes; but as all "suckers" are not alike, so all fishes are not the same kind. A careful study of its habits shows that it feeds mostly upon minnows, suckers and other soft-rayed or slow fishes, which are in turn the enemies of the eggs of the higher or spiny-rayed fishes, such as the perch, bass and pickerel, which are really the fine game fishes. The trout is too wary to be caught by Kingfishers, except where they are kept in artificial conditions, as in ponds, where they do not have opportunity for natural concealment. This bird is one of the most beautiful and interesting in the natural elements in landscape scenery, and from a scientific, as well as an esthetic standpoint, is worthy of preservation.

THE SHRIKE

As a matter of fact, there are two species of Shrikes liable to occur in Pennsylvania. One is the Great Northern Shrike or the Butcher Bird; the other is the Southern Shrike, and is also called the "Loggerhead." (See Fig. 5). These are Passerine or Perching Birds, which have acquired the raptorial habit. They live like small hawks. They are peculiar in the fact that they will kill insects, frogs, mice, small birds, etc., and hang them in bushes or impale them on thorns near their nests or in other favorable storage places. They appear to do this in times of plenty, in order to establish larders upon which they can draw in periods of scarcity.

During the winter we have not infrequently found large grasshoppers impaled upon thorns where the Shrikes had evidently placed them during the previous summer. While it is possible that they may feed upon a few small birds, like our native sparrows, and thus may be objectionable, we do know that they are among the great enemies of mice, the large insects of many kinds, and the English Sparrow. We have seen them pursue the latter with the tenacity of the hound following its prey, until the Sparrow became so fatigued that it would attempt to seek protection in a bush, there only to be sought out and killed by the Shrike.

This bird generally breaks away the skull of its victim, eats its brain, and hangs its remains upon a spine, or in the small fork of a bush. Because of its value in destroying mice, insects, and the English Sparrow, we regard it as more beneficial than obnoxious, and regret that the laws of man have seen fit to place this bird upon the black list.

THE EAGLE

The law does not state which of the different species of Eagles are to be unprotected in this State. The two most commonly found, though rare, are the Golden Eagle and the Bald Eagle. (See Fig. 6).

The stories of the Eagle carrying away children are, so far as we can learn, almost always unfounded. These birds live mostly along the seashore, where fish can be obtained, or scattered in the mountainous districts. As long as the Bald Eagle is the "Emblem of our Country," it is entitled to our respect and efforts at protection.

THE BUZZARD

By a remarkable turn of events, the Turkey Vulture or "Turkey Buzzard" (see Fig. 7) which was once among the most carefully protected of birds, has now become an outcast, seeking a friend. This is because science has revealed the fact that this bird, which feeds solely upon dead animal material, may carry the germs which cause death, and spread them to other parts of the country, thus facilitating the spread of disease. In the streets of some of the Southern cities, such as Charlestown, S. C., the Turkey Buzzard can be seen as much at home as "chickens in our gardens." They are there protected because of their value as scavengers, and in the economy of Nature we certainly believe them to be properly recommended. If they are so serious in effects as to justify extermination, this should be the sentence; but we believe it far better for our State to pass a law providing for the proper and immediate disposal of the bodies of all domesticated animals that die from contagious or infectious diseases, rather than for the destruction of the Turkey Buzzard, because he may, perchance, in rare instances, spread such disease when performing his natural duties as scavenger and thus filling its place in an infinite plan. Especially is this true when we remember that germs of such diseases are liable to spread by several other means, such as contaminated water, crows, dogs, winds, etc. As the term "Buzzard" is accurately applied to the Hawks of the genus, Buteo, are wondering why our State does not change the name to "The Turkey Buzzard," which belongs to the family of Vultures, if this is the bird that it was intended to legislate against?

THE OSPREY

The Osprey or Fish Hawk is rare in this State, but rather common along the Atlantic Coast. (See Fig. 8). We wonder how many farmers in Pennsylvania ever saw a live Osprey? Certainly but few. We are also wondering how many Pennsylvania fishes were destroyed during the past year by the Osprey. Certainly far fewer than were kept from coming up-stream by means of the McCall's Ferry Dam, with its geometrical puzzle called a "fishway." We are wondering if it is advisable to legislate against a bird so interesting, and also so rare, and so absolutely innocuous to the farmer as the Osprey or Fish Hawk!

SHARP SHINNED HAWK

Among the hawks on the black list are the Sharp-shinned (see Fig. 9) which is sometimes wrongly called the "Pigeon Hawk;" the "Cooper's Hawk;" sometimes called the "Chicken Hawk;" the Goshawk, which is sometimes called the "Blue Hen Hawk;" the Duck Hawk, and the Pigeon Hawk. Among the hawks protected by law are the Sparrow Hawk, Kites, Marsh Harrier, Red-tailed Hawk, commonly called the "Hen Hawk," Red-shouldered Hawk or Buzzard, Swainson Hawk, the Broad-winged Hawk, and the Hough-legged Hawk. Among these are the most common of the larger hawks in Pennsylvania.

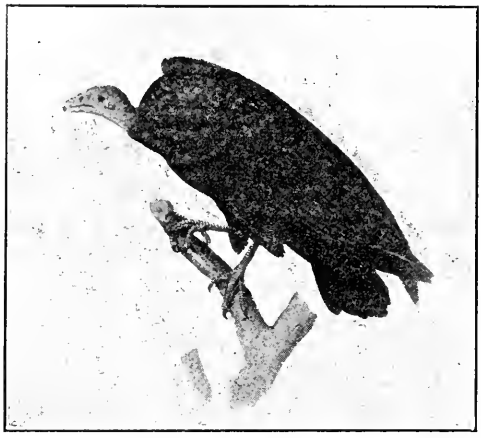

Fig. 7. Turkey Buzzard or Vulture.

Fig. 8. Osprey or Fish Hawk.

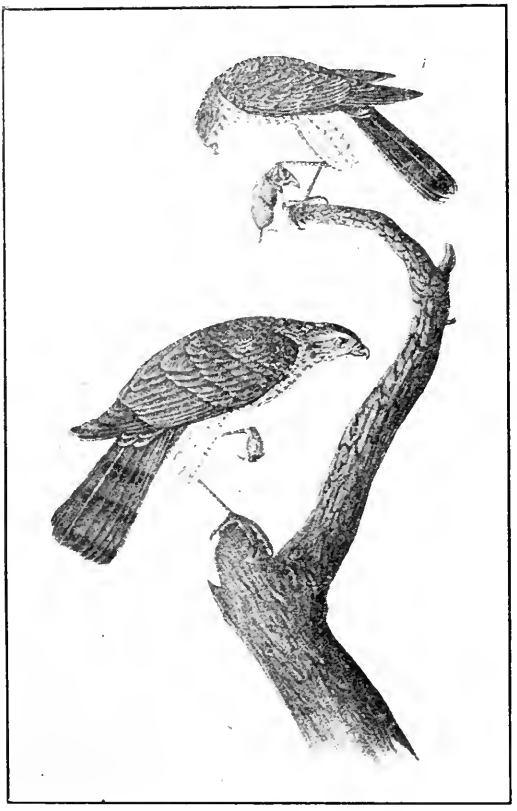

Fig. 9. Sharp-shinned Hawk.
1. Male. 2. Female.

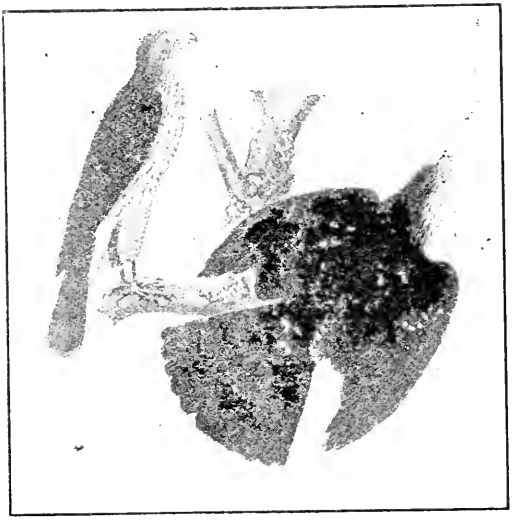

Fig. 10. Cooper's Hawk.
2. Male. 3. Female.

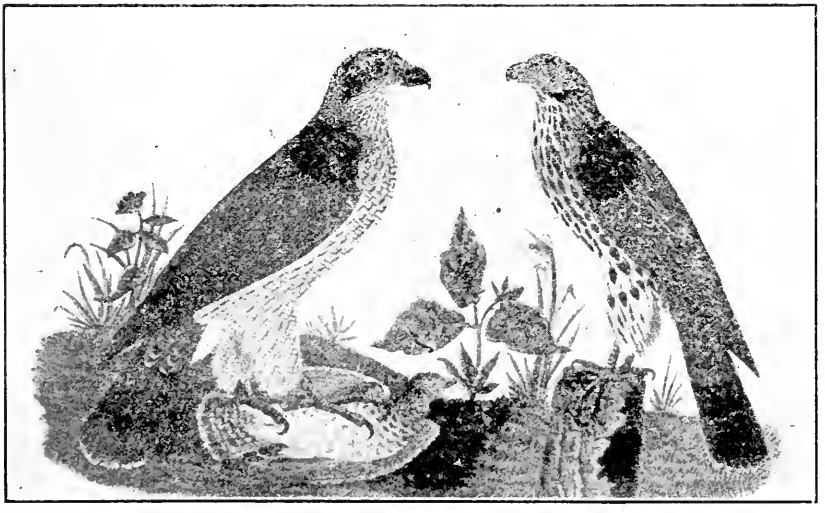

Fig. 11. American Goshawk.
1. Young. 3. 4. Adult.

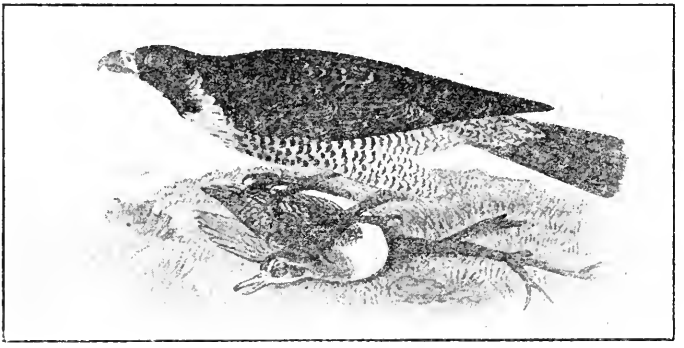

Fig. 12. Duck Hawk.

Fig. 13. Pigeon Hawk.

Fig. 14. Great Horned Owl.

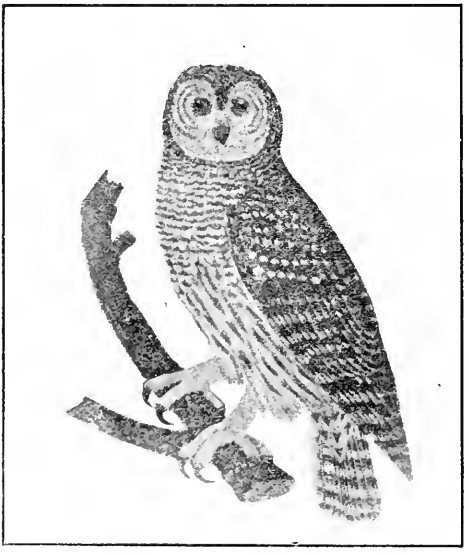

Fig. 15. Barred Owl.

COOPER'S HAWK

It is evident that the reason for placing the Sharp-shinned Hawk and Cooper's Hawk (see Fig. 10) on the black list is that these birds sometimes destroy poultry or smaller birds, but, in truth, they are among the most effective enemies of the mice and English Sparrow, and are not always enemies of poultry. Their economic results would probably justify their extermination.

THE GOSHAWK

The Goshawk (see Fig. 11) is with us in the winter only, and feeds chiefly upon rabbits and the game bird known as the Ruffled Grouse, and, in this State, wrongly called the "Pheasant." It also occasionally feeds upon poultry during the winter, but is not with us in the summer. It is probable that this hawk is justly under the legal ban, yet horticulturists who are suffering the loss of their trees from the devastation of numbers of rabbits would, indeed, welcome it in their young orchards.

DUCK HAWK

The Duck Hawk (see Fig. 12) once fed almost entirely upon wild ducks, and as these have become very rare, it likewise has become very rare in this State. It now feeds mostly upon small birds and mice. It is one of the most beautiful birds, but so rare that the occurrence of it in Pennsylvania would be justification for scientific record. There is absolutely no need of a law protecting a bird that is so nearly exterminated as the Duck Hawk.

PIGEON HAWK

The Pigeon Hawk (see Fig. 13) is a species of Falcon, and is supposed to be black-balled because it feeds on pigeons and small birds. However, it is a great enemy of mice, rats and young rabbits, and insects, and thus has its good as well as its bad points, with the former predominating. The United States authorities have published "Though they feed on the flesh of birds, they destroy enough insects and noxious mammals to partially offset the injury they do."

The Red-tailed Hawk and Red-shouldered Hawk are among our most abundant of the larger hawk. Both of these are commonly called "Hen-Hawks," but at the present time both are properly on the list of birds protected at all times in the State of Pennsylvania.

THE OWL

Among the Owls that are unprotected are the Great-horned Owl (see Fig. 15) which is sometimes called the "Hoot Owl," and also the Barred Owl. It is difficult to tell why the Barred Owl, the Long-eared Owl, the Short-eared Owl, the Great Grey Owl, and the Snowy owls are not found on this list, together with the two other owls mentioned, but we are glad that the list of owls mentioned is short. It is probable that the Great-horned Owl is legislated against because it occasionally eats poultry and rabbits, but we do know that it is a good rat-killer and a very influential enemy of the Skunk. The Barred Owl is probably on the black list because it occasionally takes rabbits, although it feeds much more upon rats and mice, and

is not nearly so serious in its detrimental effects as is supposed. Where poultry is not permitted to roost out in trees, being kept under a roof at night, as they should be, the owls do not harm them. We regard it as more important to protect poultry by shelter than by legislation.

We hope that the other owls named here, as well as the little Screech Owl, which is the enemy of the English Sparrow and house mice, will never be placed on the list of unprotected birds. Gunners should remember that there are more kinds of owls and hawks found in the State of Pennsylvania that are protected by law at all times of the year, than there are that are unprotected.

THE CRANE

Among the wading birds that are unprotected by law, are the Crane, Heron and Bittern. It is impossible to tell just what is meant by the Crane. There are two species of Cranes found in the United States. Both are Southern birds. The Sand Hill Crane lives chiefly in the Southwestern part of the United States, and is not known in Pennsylvania. The White or Whooping Crane (see Fig. 16) is also a Southern bird, and on very rare occasions may stray into Pennsylvania as a straggler. It can be said of it that it eats fishes, frogs and other aquatic creatures, but it is probable that its attacks on fishes are confined chiefly to those that are sluggish and easily captured, or slow-moving species, which, in turn, feed upon the eggs of the wary, quick-moving, spiny-rayed fishes, like the bass, the perch, the pike and their allies. At least, it can be said that the White Crane is altogether too rare and interesting to call for anything else than our most serious efforts for its protection, when it is wafted into this State. apparently by the Southern breezes, and should then become an object of intense interest and study for our school children.

THE HERON

There is no one bird known as the "Heron," and the law does not state that the Herons are unprotected by law. We think it better that it be specific and make a statement as to what species of Herons are to be unprotected. Among Pennsylvania Herons are the Great Blue Heron, the Little Blue Heron (see Fig. 17), the Green Heron, and two species of night herons. All these are wading birds, feeding mostly upon aquatic creatures and taking chiefly more or less soft-rayed fishes. However, the Great Blue Heron has been quite effective as an enemy of gophers and other rodents which live in the ground, and which it has been seen to capture and destroy. From the stomachs of different species of herons, we have taken insects and cray fish to a great extent, showing that they feed on something else than fishes and there is justification, from the economic standpoint, in their preservation.

THE BITTERN

The "Bittern" is a term likewise used in the generic manner, for which there is no one bird. There are two species of bitterns found in this State. One is known as the Indian Hen, or American Bit-

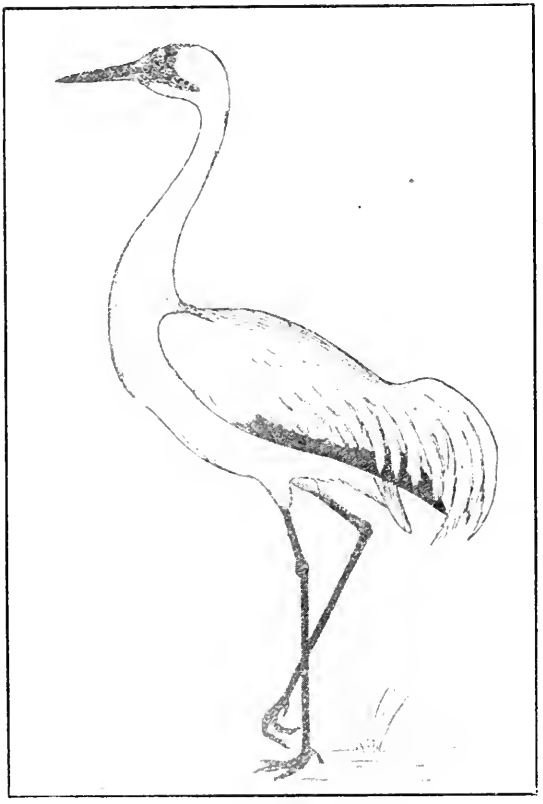

Fig. 16. White Crane.

Fig. 17. Blue Heron.

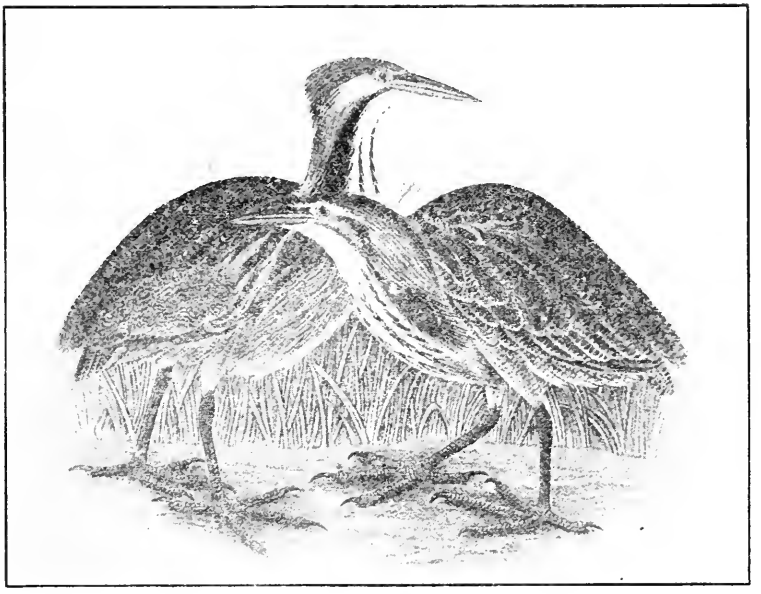

Fig. 18. American Bittern.

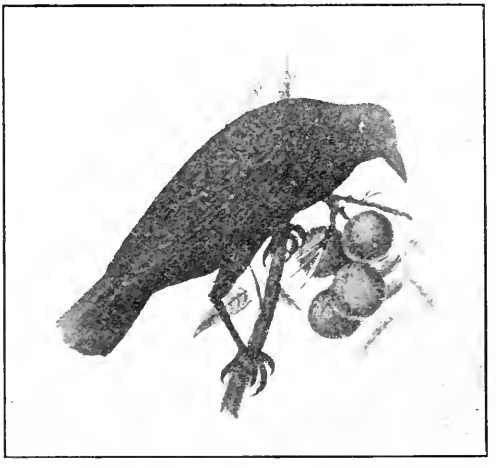

Fig. 19. American Crow.

tern, (see Fig. 18) and the other is called the Least Bittern. Their habits are similar to the various species of herons mentioned, and there is no more justification in exterminating the Bitterns than the Herons.

CROW AND RAVEN

The unprotected list ends with two birds which are, indeed, black in color as well as reputation. These are the Crow and the Raven. (See Fig. 19). We all know that the crow presents a very objectionable habit in eating corn from fields in the spring of the year, and again before it is husked in the fall, but we should likewise realize its value as an insect destroyer. Not many weeks ago, a Mr. Lee, of Bedford county, reported to the writer that last spring, as he was plowing his corn ground, crows in great numbers followed him closely, and would fly from one side of the field to the other, in order to walk in the furrows, and travel over the freshly-turned soil. They were constantly feeding in great numbers. He said that he examined the soil, and found worms, grub worms and wire worms, so very abundant as to be quite alarming, and he felt that he would lose his crop; but he permitted the crows to remain and feed on these insects. Later in the summer it was found that his crop had been effectively protected by the crows well cleaning up the larvae in the soil, while his near neighbors who did not have the crows feeding at the time of plowing, lost their first planting entirely, and were obliged to plant again.

The crow is a suspicious bird, and its injuries to sprouting corn can be avoided by first soaking the corn in water containing a tea spoonful of tar dissolved in each gallon. The bitter taste thus imparted to the corn is enough to make the crows let it alone.

The raven is a rare bird, living only in wild and mountainous regions of this State, and is of such peculiar interest and scarcity as to justify its preservation.

Let us now ask if it is worth while for mankind to attempt to throw his influence in the balance of Nature, as though in his wisdom the twenty species of out-lawed Pennsylvania birds were created in vain. Did not the Almighty create a natural equilibrium, and is it not our duty to maintain it? What is the experience of our farming friends who live where they are best adapted to making observations? Are destructive insects decreasing owing to the suppression by birds and the operation of laws in decreasing the numbers of birds of the kinds above mentioned? Are the song birds and insectivorous birds increasing, due to the absence of these supposed enemies of birds? In regions where hawks and owls are but rarely seen, and, in fact, where the birds mentioned above are less abundant, the song birds and insectivorous birds are likewise most reduced in numbers. Are the ravages by rats and mice growing less? Would not the Balance in Nature be better maintained if mankind would better understand and preserve the enemies of these things? Is it at least not worth while that we should study both sides of the question, even though we may have to acknowledge that our present Game Laws pertaining to birds are about as nearly correct as it may be possible to make them?

This report is to place the other side of the subject of these creatures before the public, showing their place in Nature, which may not have been fully recognized when they were placed in a wholly unprotected list.

While we have based the above report on economic features alone, we should call attention to the ethical and educational value of our birds. Who has not been inspired by the free and open song of a wild bird, now too scarce? Seriously, who would be willing to see the twenty black-listed birds named above forever exterminated in this State. In addition to their cash value, we should make an appeal for the birds on account of the uplift they give us. The bird lover, on the wings of the bird he loves, in some true sense, is lifted up, up, up, where the Alps on Alps rise, to those far heights where he could never climb alone, and this was the feeling in the heart of the poet Bryant, when he watched the wonderful waterfowl take her flight and cried out:

"Thou'rt gone, the abyss of heaven
Hath swallowed up thy form; yet on my heart
Deeply has sunk the lesson thou hast given,
And shall not soon depart.

"He from zone to zone,
Guides through the boundless sky thy certain flight,
In the long way that I must tread alone,
Will lead my steps aright."

REPORT OF THE MINERALOGIST

By BAIRD HALBERSTADT, F. G. S.

In the short time allotted, it would be idle to attempt to give an account of all the minerals found within the confines of the great State of Pennsylvania, so abundantly has it been endowed, exceeding in mineral wealth perhaps that of any other state in the Union.

Within it are found the great Anthracite coal fields, exceeding in value and extent those of any known anthracite fields in the world. The Connellsville coking coal, surpasses in value the coal of any other developed region in the United States for the manufacture of coke. Nor have we anywhere in this great country of ours a coal for illuminating gas making purposes that excels or even equals that mined in the Westmoreland-Youghiogheny gas coal region embraced in the western townships of Westmoreland and southeastern townships of Allegheny counties. Many of the mines in Clearfield, Cambria and Somerset counties produce ideal steam coals.

ANTHRACITE COAL

The anthracite region produced in 1910, 75,331,413 long tons which, with that dredged from the rivers (91,833 tons), makes up a total of 75,433,246 long tons or 84,485,236 short tons, whose spot value was $160,275,302, or nearly three times the value of the entire coal product of West Virginia, the second state in rank as a coal producer.

BITUMINOUS COAL

The tonnage mined from the Bituminous coal fields of Pennsylvania in the same year was 150,521,526 short tons or more than double that of its nearest competing state, West Virginia. The spot value of this tonnage was $153,029,510. The spot value of Pennsylvania's total tonnage for 1910 was $313,304,812, while that of the United States was $629,557,021. Pennsylvania produced 46.8 per cent. of all the coal mined in the United States in 1910. The tonnage of the entire country was 501,596,378 tons of which amount Pennsylvania produced 235,006,762 short tons or more than three and a half times as much as any other state. In fact, the production of coal in Pennsylvania in 1910 exceeded the combined tonnage of West Virginia, Illinois, Ohio, Indiana, Alabama, Kentucky, Colorado, Iowa, Wyoming, Tennessee, Virginia and Missouri by over 50,000 tons. To mine, prepare and ship this tonnage of Pennsylvania required an army of 344,900 men and boys.

It is more than of passing interest to know that the United States mines nearly 40 per cent. of the annual output of the entire world. Pennsylvania and West Virginia produced more coal in 1910 than Great Britain; Pennsylvania's production was but 10,036,538 tons less than that of Germany.

COKE

Pennsylvania produced in 1910 more than 60 per cent. of the entire coke output of the United States, its production being 26,315,607 short tons, valued at $55,254,599. The quantity of coke manufactured in the United States was 41,708,810 short tons, valued at $99,742,701; more than 50 per cent. of all the coke ovens in the country are in Pennsylvania.

PETROLEUM

Although Pennsylvania produced the first petroleum on a commercial scale from a well at Titusville in 1859, and long remained the leading oil producing state, it has dropped from the first to the seventh in rank of oil producing states.

The total production of petroleum in the United States in 1910 was 209,556,048 barrels, valued at $127,896,328. Of this amount, Pennsylvania produced 8,794,662 barrels, valued at $11,908,914. Although seventh in rank as a producer, Pennsylvania stands fifth as to the value of its product.

Up to 1876, Pennsylvania and New York were the only states producing petroleum on a commercial scale. In that year, Ohio, West Virginia and California took their places as producers. These were followed by Kentucky and Tennessee in 1883, Colorado in 1887, Indiana and Illinois, Kansas, Texas and Missouri, Oklahoma in 1891, Wyoming in 1894, Louisiana in 1902.

California (34.84 per cent.), Oklahoma (24.83 per cent.), Illinois (15.82 per cent.) in 1910 produced over 75 per cent. of the entire petroleum output of the United States. In 1859, the total production of petroleum in the United States was but two thousand (2,000) barrels.

The production in 1910 was over one thousand times greater than it was in 1859, and in value had jumped from $32,000 to $127,896,328.

NATURAL GAS

The production of natural gas of the United States in 1910 was 509,155,309,000 cubic feet; its value was $70,756,158. The production of this valuable fuel in Pennsylvania amounted to 126,866,729,000 cubic feet, valued at $21,057,211.

In addition to the enormous production of her own, Pennsylvania consumed over forty-two billion cubic feet drawn from other states. It will be observed that the value of gas produced in Pennsylvania was nearly double the value of the petroleum produced in the State in the same period.

IRON ORE

The production of iron ores in the United States in 1910 amounted to 56,889,734 long tons. Of this amount, Pennsylvania produced 739,799 tons as follows:

Hematite, 846 tons; brown ore, 106,544 tons; Magnetite, 632,409 tons. The production of hematite in 1910 was but 16.4 per cent. of the production in 1909. The brown ore production showed an increase of 25,829 tons. The production of magnetite showed an increase of 51,379 tons in 1910 over the production of 1909.

The value of iron ore mined in Pennsylvania in 1910 was $911,847. Minnesota, Michigan and Alabama produce over 88 per cent. of the total production of the country.

Pennsylvania's quota was but 1.3 per cent. of the whole.

With the single exception of New Jersey, Pennsylvania produced more magnetite than any other state in the Union. This ore mined at the Cornwall ore mine in Lebanon county formed 24 per cent. of the entire production of the United States for that year.

As an iron ore producing State, Pennsylvania is seventh in rank, but in the value of product, it is outranked by eight states.

ZINC

Although there are many localities in the State at which zinc blende is found, I find no return made of this as a commercial product in 1910, from Pennsylvania. The New Jersey Zinc Company has an extensive smelting plant at Palmerton, but the ores smelted are mined in New Jersey.

COPPER

Several mines in Adams county are reported as producing copper, while in Lebanon county, blister copper is produced at the Cornwall iron ore mine. The production amounted to 740,626 pounds. There were produced, in addition to this amount from all sources including old slags, smelter cleanings, precipitates, etc., 186,734 pounds, making a total production in the State of 927,360 pounds. If the average price per pound (12.7c) be used as a basis, the value of the copper production of Pennsylvania in 1910 was $117,774.72.

GRAPHITE

During the year 1910, Pennsylvania produced 696 tons of crystalline graphite, valued at $82,194. This product was mined in Chester county. Graphite was formerly mined at Boyertown and Mertztown but these mines are, at present, not producing.

STONE INDUSTRY

Pennsylvania leads all other states in value of its production of stone of various kinds. These include Granite, Trap Rock, Marble, Sandstone and Limestone. The value of its limestone product exceeded that of any other state. The total value of the various kinds of stone produced in 1910 was $8,621,937 as against $76,520,584, the value of the production of the United States; Pennsylvania's quota being 11.27 per cent. of the whole.

FELDSPAR

The production of feldspar in Pennsylvania in 1910 was 15,091 tons, valued at $104,751. The mining of feldspar in Pennsylvania is confined to Chester and Delaware counties.

QUARTZ

The quartz industry of Pennsylvania is confined to Adams and Chester counties, there being in 1910 but two producers, the Columbia Flint Company of Marietta, and H. T. A. Rhodewalt of Chester county. The quality and value of the product mined are not available for publication, but the combined production of Pennsylvania and Maryland was 13,588 tons, valued at $71,864.

SAND AND GRAVEL

The sand and gravel produced in the United States in 1910 amounted to 69,410,436 tons and was valued at $21,037,630. Of this amount, Pennsylvania produced 5,676,509 tons, valued at $2,974,221. The quantity of the said was 4,253,163 tons valued at $2,607,215. Of gravel, there were produced 1,423,347 tons, valued at $367,006.

The classification of the sands is as follows: Glass-sand, Moulding, Building, Fire, Engine, Furnace and other sands. More sand and gravel were produced in 1910 than in any year previous to this.

PORTLAND CEMENT

In 1910, the total production of Portland cement in the United States was 76,549,951 barrels, valued at $68,205,800. Pennsylvania is again in the front rank, its production being 26,675,978 barrels, valued at $19,551,268. It produced over three times as much Portland cement as its nearest competitor (Indiana).

NATURAL CEMENT

The output of Natural cement has rapidly declined and will probably continue to do so until better methods of treatment can be found whereby the natural cement can be made equal in tensile strength to that of the best grades of Portland cement.

In the production of Natural cement, Pennsylvania produced but 196,331 barrels as against 304,598 barrels produced in New York. But ten (10) states produce Natural cement as against twenty-six (26) producing the Portland brand.

PUZZOLAN CEMENT

The production of Puzzolan cement, prepared by mixing slaked lime and furnace slag is, like the Natural cement, declining. Of the four (4) plants reported, one of these is in Pennsylvania. As there is but a single plant in Pennsylvania, neither its production or value of its product can, for business reasons, be given.

CLAY PRODUCTS

The total value of the clay products of Pennsylvania in 1910 as shown from the reports of the Clay working industries was $22,094,-284. Ohio was the only state whose products exceeded in value those of Pennsylvania.

Brick, including the common, vitrified and front varieties, were manufactured to the number of 1,101,448,000, valued at $8,578,389. The value of the fire brick produced was $6,545,928, or a combined value of all variety of brick, except the enameled, of $15,033,317.

SLATE

The value of roofing, mill stock and other slates produced in the United States in 1910 was $6,236,759. The value of Pennsylvania's production was $3,740,806 or nearly 60 per cent. of the whole. Pennsylvania not only stands first in the rank of producers but her product exceeds in quantity and value that of all other states combined.

The four counties from which this product is quarried are Northampton, Lehigh, York and Carbon. The school and blackboard slates are produced only in Lehigh and Northampton counties, because of the fine cleavage of these slates for this particular purpose.

The slate quarried in Carbon and York counties is used for roofing purposes, while that of both Lehigh and Northampton can be utilized for both roofing slate and mill stock.

TALC

Talc was mined and shipped by three operators in Pennsylvania whose plants are all in the same vicinity. New Jersey has but a single operator. The combined tonnage of Pennsylvania and New Jersey in 1910 was 13,192 tons, valued at $62,833. The greater part of this tonnage was mined in Pennsylvania.

MINERAL PAINTS

Ochre

The production of ochre in 1910 in this country was 11,711 tons, valued at $112,445 to which amounts Pennsylvania contributed 3,642 tons, valued at $32,254 or 31 per cent. of the quantity and 29 per cent. of the value.

The total quantity of Umber and Sienna mined in the same period was 1,015 tons, the greater part of which was produced in Pennsylvania.

The production of metallic paints in Pennsylvania was 8,063 tons, valued at $91,714.

Pennsylvania produced of mortar colors 2,711 tons, valued at $33,752, as against 9,960 tons, valued at $107,780 for the entire country.

SLATE AND SHALE

A considerable quantity of slate and shale are annually ground up for use in pigments and as fillers. In 1910, the individual figures of State production are not available; Pennsylvania's production, however, places the State in the front rank.

MINERAL WATERS

From forty-four springs in various counties of the State, Pennsylvania produced in 1910, 2,536,337 gallons of mineral water, valued at $221,685.

The standing of Pennsylvania is as follows: In the number of springs, third (3rd), quantity sold, fifth (5th); in total value, eighth (8th).

SALT AND BROMINE

A considerable quantity of both salt and bromine were produced in Allegheny county, Pennsylvania, but unfortunately, both the quantity and value are not available for publication.

LIME

Pennsylvania, in 1911, burned more lime than any state in the Union; Ohio ranking second with a production of less than one-half that of Pennsylvania.

The quantity of lime burned in the United States was 3,481,780 short tons, valued at $13,894,962. This was produced by 1,125 operators. Pennsylvania's contribution made by 572 operators was 877,714 short tons, valued at $2,440,350.

The average price per ton was $2.78, as against an average of $3.99 for the entire country. The highest price per ton was $9.65, the average price of lime in Oregon.

POTASH SALTS.

It will be interesting to the farmers of Pennsylvania to know that an investigation has for some time and is still being pursued to learn of any and all sources in the United States from which potash can be derived. It is to be hoped that a successful termination of the investigation will occur and that our country will supply all the demands and that recourse may not be then necessary to import this needful fertilizer, so necessary to the farmer, from foreign lands.

The figures given in this report have been derived from the Division of Mineral Statistics of the U. S. Geological Survey.

REPORT OF THE MEMORIAL COMMITTEE

Harrisburg, Pa., Jan. 25, 1912.

Again we are called upon to record the removal by death of two of our associates in the agricultural field of our State, Gabriel Hiester, of Dauphin county, and J. F. Johnson, of Fulton county.

Gabriel Hiester was born on the ancestral acres on which he died, April 28, 1850, his death occuring January 19, 1912. He was graduated at Pennsylvania State College in 1868 at the age of 18 years. His father was one of the founders and until his death, one of its honored trustees. Mr. Hiester was graduated in the course in Agriculture and returned to his father's farm and carried on advanced general farming, specializing in Pomology, in which he became an authority.

He became a member of the Pennsylvania State Board of Agriculture, also a member of the then Fruit Growers' Association in 1882, serving in the Board for many years as a member and officer, and for many years as its Pomologist. He continued a member and was President of the State Horticultural Society at the time of his death.

In addition to the original homestead, he purchased a farm in Perry county, Pa., and converted it into a fruit farm in which he succeeded in growing apples and peaches and cherries, giving an important object lesson to our fruit growers.

He has been a prominent Trustee of Pennsylvania State College since 1879, and served for many years on its Executive and Advisory Committee. His was a master mind which was shown in every line of work he pursued.

When the history of Pennsylvania agriculture is written, the name of Gabriel Hiester will be in the foremost rank of its progressive members.

He was a man of unbending integrity and a high sense of honor; courageous and aggressive, yet courteous and affable, he possessed the qualities of a great leader. His death is not only a loss to the Board, but to the entire State.

Mr. J. F. Johnson was an active member of this Board for two consecutive terms, a prominent citizen and farmer of Fulton county. He died at his home, in February 1911, aged about 54 years. While a member of this Board, he was a regular attendant and interested in its work.

We desire to express our loss by the demise of these co-workers, and extend our sympathies to their bereaved families.

We ask that this report be spread upon the minutes of this Board and a copy be sent to the bereaved families.

J. A. HERR,
JAS. A. BEAVER,
A. J. KAHLER,
HENRY C. SNAVELY,
MATTHEW RODGERS,
Committee.

SECRETARY CRITCHFIELD: It was my pleasure to know both of the gentlemen who have passed away within the last year, and in regard to Mr. Hiester, I may say that I knew him very well. It has been my privilege to meet him at a number of public gatherings, and I also have had the pleasure as well as privilege of meeting him repeatedly at his own home.

Mr. Hiester was, as has been already said, a gentleman in his instincts and manners, a man whom no one could know well or intimately, without having been made better by acquaintance and association with him.

He was a great lover of Nature, and wherever he went, he could see something to admire—the fruit and flowers, the mountains, the great gulches cut through them and the beautiful river that flowed by his home were full of interest to him. He often called my attention to them and spoke of their rugged beauty. All these were pictures that to him were worthy of special admiration and attention.

Mr. Hiester was a true friend. I doubt whether I ever knew a man who was more loyal and devoted to his friends than he; and while he loved to attend the meetings which it was his official duty to attend, on account of the opportunity it afforded him to serve the generation to which he belonged, he also appreciated the privilege it afforded of meeting his friends.

As a husband and father, he was devoted and affectionate. All his thoughts seemed to embrace the good of those who belonged to his household. I have been to his home since the illness of his wife, which has been very severe within the past few months, and I noted the tender regard he manifested for her and his constant solicitude for her comfort. Before the last meeting of the Trustees of State College I called on him personally to see if he could go to the meeting. I knew how much he delighted to be there, how he loved his Alma Mater, and how dear to him were all her interests, but he said, "Mr. Secretary, there is nothing that would give me greater pleasure than to go, if all was well at home, but my duty at present is here with my afflicted wife." It may be said, therefore, that he possessed that best of all traits—deep, earnest affection for those who, under God, were placed in his charge.

I feel that in the death of Mr. Hiester I sustain a personal loss. No man who has a proper sense of duty can occupy a place of responsibility without feeling the importance of having some one near at hand, in whom he has confidence, to whom he can go for counsel. On more occasions than one, have I gone to Mr. Hiester, to talk over with him and get his view upon some matter of interest to the Department that is under my charge, and I always found him ready to lend his counsel and aid.

It gives me pleasure to bear this testimony to the noble qualities of our departed friend.

We shall all miss him; if we who only occasionally had the privilege of grasping his hand and receiving his cheerful salutation, so regard our loss, who can estimate the burden of grief that has fallen like a shadow over his home, crushing the hearts of those who were near to him by the ties of nature and constant association, and it is most fitting that in these resolutions we express our sympathy for his loved ones left in the home that is made desolate by the great loss that has come to us all.

MR. A. P. YOUNG: I have a tribute I should like to bring. It is a little poem I have admired ever since my schooldays:

"There is no death! The stars go down
To rise upon some fairer shore:
And bright in heaven's jeweled crown
They shine for evermore.

"There is no death! The dust we tread
Shall change beneath the summer shower
To golden grain or mellowed fruit,
Or rainbow tinted flowers.

"The granite rocks disorganize,
And feed the hungry moss they bear;
The forest leaves drink daily life
From out the viewless air.

"There is no death! The leaves may fall,
And flowers may fade and pass away;
They only wait through wintry hours
The coming of the May.

"There is no death! An angel form
Walks o'er the earth in silent tread,
He bears our best loved things away;
And then we call them 'dead.'

"He leaves our hearts all desolate
He plucks our fairest, sweetest flowers;
Transplanted into bliss they now
Adorn immortal bowers.

"The bird-like voice whose joyous tones,
Makes glad these scenes of sin and strife,
Sings now an everlasting song
Around the 'Tree of Life.'

"Where'er he sees a smile too bright
Or heart too pure for taint or vice,
He bears it to that world of light
To dwell in Paradise.

"Born into that undying life
They leave us, but to come again,
With joy we welcome them—the same
Except their sin and pain.

"And ever near us, though unseen
The dear, immortal spirits tread,
For all the boundless universe
Is life—there are no dead."

MR. HUTCHISON: Mr. Hiester was one of my best and truest friends. I have known him for many, many years. We were thrown together quite a good deal. Our sons were schoolmates at College, they graduated in the Class of '98, his only son and my oldest son. His son visited my house and a friendship sprang up between the two boys, and led to a friendship between the fathers. He has been at my home. I traveled with him over the State to the Farmers' Institutes. I loved the man. I knew him very well. He always had a good word for everyone. I never heard him say an unkind word to any one. If he could not say a good word, he said nothing.

He was an authority on fruit culture. His name was known not only in our own State, but in adjacent states. His death is a distinct loss to the Commonwealth. I regretted when he left the Institute force, but he felt he could not leave his wife and daughters alone and travel over the State. He was a true friend in

every way, and a true friend to State College, and what a loss to the College is his death! His father, as has been said was one of the earliest trustees of the College, and the son followed his father. He was much interested in the orchard established there, and took great pride in its development. But he has gone. We cannot bring him back. The only thing we can do is to endeavor to go where he is, and see him in another and happier world.

MR. JOEL A. HERR: I presume there is not one present who has had as long an acquaintance with Gabriel Hiester as myself. When I first came on the State Board of Agriculture in 1879, Mr. Hiester was quite a young man, but even then interested in fruit culture. Naturally this formed an opening wedge of the friendship between us and I always regarded him as a man of authority along these lines. I have visited him at his home and traveled with him to Farmers' Institutes. We have had him in my own home County of Clinton at Farmers' Institutes. He was one of the most sensible, high-minded, and yet affable and agreeable men I have ever known. He could not be approached with anything that was not entirely correct and proper. I doubt whether his word was ever questioned. Everything he said, "went" and his neighbors all over the county looked up to him as a leader among men—which he certainly was. We don't appreciate what we have lost. Who is there in Pennsylvania to take his place? We have other good fruit men—men who make extravagant statements. You never heard Hiester make an extravagant statement. Whatever he said was plain, straight fact. He seemed to my mind, to possess all the elements of a great man, and the greatest pity is that he could not have lived—that he died in the prime of his manhood. He could have been of immense use to the Horticulture of this State, and I join in regret for his departure.

DR. HARVEY: Let me add, that while I did not know Mr. Hiester as well as some of you, I met him at some of our meetings and was very favorably impressed with him. He seemed to me to be a man to whom could truthfully be applied the words of Shakespeare:

"His life was gentle, and the elements so mixed in him, that all Nature might stand up and say 'This is a man.'" I have often heard a man say—a most eloquent preacher from Texas—"Oh, I like a *man*!" And that is all there is to this world, if we have a man's head and a man's character. We know, furthermore, that God has His own, and we will know them wherever they are. I came across a few lines the other day, which impressed me very strongly:

"He who believing strongly lays his hand
Unto the work that waits for him to do.
Though men should cavil, measures prove untrue
Friends write their trusted promises on sand
And failure mock him with its threatening hand,
Still, in the end, he fearless shall pursue
Till crack of doom, will find a power which few
Or none with cause less righteous may command.
For conquest is not built on the defeat,
Of any man whose aim is human good,
Who fights for justice hath already won,
Before no show of loss shall he retreat.
However crossed, maligned, misunderstood
He knows but triumph, in the work, well done."

ADDRESS OF PROF. COCHEL

Whenever a man has the labor and facilities that will permit him to go into the production of dairy products, it would certainly be a foolish thing to change from the production of dairy products to beef. On the other hand, we find in many other sections of the State that are deficient in labor and have larger divisions of farm land that they can properly cultivate. They have large areas that are, or should be, devoted exclusively to grass.

We have a market and a climate that is especially adapted to the cultivation of beef, hence, we should under these circumstances go into the production of beef on a marketable basis, always taking into consideration that the cow that is cultivated as beef is turning the crops into a more marketable product, increasing the humus of the soil, and enabling us to utilize what would otherwise be waste products into a profitable part of the farm. In other words the beef cow changes waste areas into a marketable form.

Now, in studying beef production we divide it into two classes: one class produces feeders for the market, the other produces the marketable steer in the more finished form. The reason for this is that the sections of the State that are especially adapted to the production of feeders, do not, as a rule, grow a sufficient amount of crops to turn them into the finished product. Where we have the rough finished lands that are not capable of being plowed to any extent, we can raise our feeders on roughage, largely. On the other hand, where we have land that is too valuable to be turned into pasture, people naturally turn into finishing the beef for market.

We find that in the development of this State, and other stock states, the cattle imported from Europe were of the beef type. They were imported because they were especially adapted to the needs of that time. Later, when the country became more closely settled in Pennsylvania and Ohio and Illinois, the people of Pennsylvania quit raising beef cattle. They went to the Western prairie states for their feeders, and finished them for the market. Later the people of Ohio and Indiana did the same thing, depending on Iowa and Nebraska and other Western states to produce cattle for Pennsylvania and Ohio and Illinois. A little later the Middle West went out of the beef production and it moved onward toward Western Kansas, Montana, Wyoming and the Western Mountain states.

A large percentage of the cattle finished in the corn belt of the United States, are produced west of the Missouri, rather than east of it. At the same time, the demand for feeding cattle is becoming larger in Pennsylvania, Ohio and even as far West as Iowa. Consequently the supply has not kept pace with the demand, while the market price has more than kept pace, so that the feeders of Pennsylvania are not complaining of the price they get for the finished product.

In the spring of the year the market was especially well priced for the finished product. At the same time there was a deficiency in cheap and relatively unfinished cattle, so that cattle that required

only two months more feeding to finish them properly, brought twenty-five cents a hundred less than that finished up to the standard. That was about the condition of the market which made all our cattle go into market faster than they could be made; later on in the year there was hardly a time when the finished cattle could not be shipped into the Chicago market at a higher price than ever before. In the Pittsburg market they quoted beef from the blue grass cattle at eight dollars per hundred advance. The demand therefore is, not only for beef cattle, but for beef cattle of a correct type ready to meet the market demands. It shows the tendency toward the production of beef in our State. Our breeders and our feeders now are beginning to aim their attention to the production of beef cattle in Pennsylvania. I have been in Pennsylvania a little over two years and just now we are receiving more letters in regard to the raising of beef cattle in Pennsylvania in a week than we did during the entire year I was at college. Within the last month one farmer at least, and very likely two, have established the nucleus of a beef herd in Lancaster county, so that the tendency is to produce more beef cattle than ever before.

Now, the question is whether these men will be justified in the change. During the last twenty-five years there has been a tremendous change in the beef market. Take an average of five years periods in the Pittsburg and Chicago markets, we find at the end of each five years that the cattle were worth more, and the demand was larger than during the preceding five years. So that the price of cattle is increasing and at the same time our soils in Pennsylvania, and in the West, are increasing in fertility and the tendency is to put more animals on the farm and put back the fertility, and at the same time use up the roughage. When we pay more attention to the question of soil maintenance, we will have a great many more cattle than we have at the present time. At the College we have now twenty pure bred beef cows that we are trying to handle in the most economical method possible, and see whether it will pay in Pennsylvania to keep a cow for the calf she produces. We are feeding them a ration of corn silage and cottonseed meal—about forty-five to fifty pounds of silage and one pound of cottonseed meal per head daily. Since the first of December they have gained a trifle over a pound a day per head, which shows that they are not only maintaining themselves but are putting more fat on their bodies. Throughout the summer they will be granged without grain, and in the meantime we are feeding two market lots, one of which is given all the cottonseed meal they can eat, without grain, and the other is put on a grain ration with corn silage and cottonseed meal. You will notice we have absolutely discontinued feeding hay to our market cattle this year.

This is not because hay is not good, but in our local market we have hay selling for from twenty-four to twenty-six dollars per ton, while silage is costing us less.

REPORT OF THE ECONOMIC GEOLOGIST

By DR. ISAAC A. HARVEY

In 1906, having noted in the newspapers some discussion and controversy relative to the coal supply in the United States, I shortly wrote to the Philadelphia Press an estimate of the entire amount of coal in the several states of the Union, based on the latest reports of the National Geological Survey, and such additional data as I had acquired from other sources.

The estimate of the entire area of coal in the United States as published prior to 1906 was 270,000 square miles, and I ventured to increase the same to 450,000 or 500,000 square miles by adding a reasonable per cent. to the figures in the several states and territories, so that my final figures of the amount of coal were about three trillion tons, which at the persent rate of production and consumption and with allowances for a certain increase in demand, proportionate to the years past, would last as long as the world has been in existence according to the Mosaic records.

Some time last year, Mr. Carpenter, the noted reporter and correspondent of the Philadelphia Press interviewed Prof. Smith, now Director of the United States Survey, and derived from him a computation or general view of the coal in the United States and similar to my own figures as sent to the Press. His calculation was the same in substance as mine and intimated that the body of coal in the United States might last as long as the world has stood. I admit that such a computation seems fabulous and unreal, but as the several coal seams in forty or more of our counties in this State, if laid flat as one workable seam, would more than cover the entire State; so, also the various coal areas in the United States, if arranged in the same position and as one good workable seam of four feet or more in thickness, would very much more than cover or equal the area of the entire nation and all its dependencies.

Going to Arizona and Senora, Mexico, in 1889, for Mr. Dodge, of New York, I made some examinations for copper and coal and with the data so obtained ventured the prediction, that, within a generation, Arizona would exceed Michigan in its product of copper, being mostly found in low grade ores and yielding variously from five to ten per cent. of this metal. This result has been realized as the records show. Prior to this trip, the coal in Arizona was considered an unknown quantity and no figures had ever been given by the United States Survey, the several efforts at local development on the Apache Reservation, and incidentally elsewhere, failing to afford any encouragement of workable deposits or any satisfactory guarantee that Arizona would ever show any available basins for coal operations or production that would justify development or mining.

I saw enough of the deposits in Arizona and Senora to persuade me to believe, or at least hope, that Arizona would ultimately yield her proportion of the carboniferous products in the shape and quality of good coal of several kinds to place her in the list of the coal producing states. Within the last three years, or about eighteen years after my hurried exploration down there, the assistants of the United States Survey secured some accurate information and reliable figures, whereupon they have announced, with the approval of the Director, that Arizona contains as much available coal as the entire amount thus far mined and used in the whole country, and, of course, this means many billion tons.

Thus, while the actual epochs or periods in which coal may "exist" have been ascertained to a certainty and geologists have proved the limit of the rocks that contain coal, yet the defective estimates of acreage and extent is due to the superficial and hurried manner in which the coal fields are in the first instance examined; and, thereby, the actual extent of the coal bearing rocks not demonstrated or determined in a given field, locality or state; and, as a result, the maps and reports very much circumscribe the coal basins, and exclude from the estimates and surveys much of their area that otherwise and by careful investigation would be contained in the figures that report the same.

In after years, a revision of these reports and a more careful and thorough development show a very marked increase from the original figures and estimates, both of quantity and area. This applies to every state that contains coal, and in which the tendency to submit a conservative report has so often warped the judgment and furnished a minimum computation with reference thereto.

Thus, in my report to you two years ago, I estimated from ninety to one hundred billion tons of coal in this State; so that my prior figures in a venture to estimate the amount in the United States assumed that our State contains about one-thirty-fifth of the entire quantity of coal in the United States. The length of time that this amount would supply the people, (varying figures having been suggested by prominent geologists,) depends, of course, upon the increasing demand, the economical and careful mining, with the probable discovery of devices or methods whereby the coal waste will be reduced to a minimum, its by-products utilized and the entire body of heat produced be controlled and husbanded with the least possible loss.

Again, what skill and invention may do to provide for some of the needs now depending on coal and thereby reducing the demand, or at least restraining the demand, no one can conjecture; and that it may be many centuries, perhaps some thousands of years may elapse, before the Nation shall experience a coal famine; and what may be provided as a part substitute for coal ere such a calamity may ensue, no one can venture to surmise, "for the thoughts of men are widened with the process of the suns." Genius is limitless in its conceptions and possibilities towards contrivance and invention. Another feature of the utility of coal and its value to the consumer is that while analysis will determine exactly its elements and its amount of combustible matter, yet its chemical composition does not always indicate the real or comparative fuel efficiency which ofttimes seems

more valuable by reason of its structure than its chemical composition. Thus the product of a certain coal seam may contain fuel matter (fixed carbon and volatile matters) to the amount of 90 or 95 per cent. and comparatively very pure but so soft and friable that it crumbles or disintegrates very readily and its use is very much reduced by waste through the grate bars under the boilers of locomotives or stationary engines; and instead of complete combustion and reduction to ashes, a very considerable per cent. is never consumed, thus impairing its fuel efficiency when compared with other coal which may show the same analysis, but being compact, hard, and as some call it,—lumpy, will have a decided advantage over the softer coal in the production of steam or even for domestic use.

So, also, I have seen along certain railroads immense quantities of coal half consumed and mixed with imperfect coke, the product of the locomotive fires and dumped from the ash pan; so that people living along the line find it convenient to use these ashes for fuel in their households. I have stated these facts many times to the superintendents of railroads, and also in my reports on coal properties. I know instances where coal from a certain seam, notably the A., and containing 85 to 88 per cent. of fuel, rendered better service by actual test and use than certain other coal that analyzed 92 or 93 per cent. of fuel matter; the difference in efficiency being due to the compact and solid structure of the inferior coal, chemically, when compared with fragile, friable and crumbling structure of the other.

Hence, do not conclude that the coal that shows a lower per cent. of fuel matter is serviceably less valuable or efficient than coal containing the higher per cent. of fuel matter, unless both are of similar structure. It is the units of heat that are required and the actual production of steam that will determine the value of the coal to the consumer. Bear this in mind, and while having due regard for analyses and chemical purity, also consider the structure, and friability also, that the harder coal, upon the bituminous basis, having an equal amount of fuel with the softer coal, will be found invariably to be of more utility.

It is a subject of much concern how we shall be able to supply the increasing demand for iron ore, not only in this State, but elsewhere. Much of the ore now used in Pennsylvania is imported from other states—from Cuba and elsewhere on this continent and consists largely of red hematite or steel ore, so called, from Michigan, Wisconsin and along Lake Superior; the product of metallic iron, being almost invariably 65 to 68 per cent. and in some exceptional instance 70 per cent. In our State and elsewhere are some important deposits of magnetic ore, magnetite and sometimes nearly or quite as high in metal; but often yielding as low as 35 to 40 per cent. The red hematites having singular value by reason of their being readily converted into steel without the basic process; that is lining the converter with an alkali preparation,—and hence producing the steel at considerable less cost. With the exhaustion of steel ore, red hematite and, in fact, the magnetic ores, we will have remaining certain veins or deposits of brown hematite associated with our lime stones, and, notably, the lower silurian rocks, with incidentally, the

same ores in the Clinton shales, Catskill, etc., and the gray carbonate ores of the coal measures and sub-carboniferous rocks producing from 20 to 50 or 55 per cent. of metallic iron. These are sometimes used in the production of pig metal, and, especially, where convenient for mining and transportation, but are not deemed valuable in comparison with the richer steel ores, magnetites, etc., that are imported as described.

Again, there are extensive deposits of red shale with their associated rocks that contain from 15 to 25 per cent. of metallic iron, and an urgent question is today, or will be ere many years will elapse, how shall we utilize these low grade ores, and by what process make them valuable for iron and steel products with reasonable cost? There are chemists experimenting towards a solution of this question, and I have seen some favorable and encouraging, if not complete, deductions in this direction; in one instance, a Southern gentleman having demonstrated to a Wall Street Company, engaged somewhat in promoting such various devices and inventions, that it is possible to reduce low grade or lean ores by a chemical or electro chemical process, whereby the ores containing as low as 6 or 8 per cent. of metal, can certainly be made useful and at a nominal cost, so far as the process is concerned. Whether these samples, as shown to me, were typical of the results of the process if applied to a large amount of ore, I cannot say, but the results seemed promising to me and others who examined them. This threatened iron ore depletion naturally evokes the question, who will in a sensible and reasonable measure find a substitute for the rapid exhaustion of iron ore; and aluminum has been suggested by virtue of its lightness, toughness and flexibility; so that if its production may be realized at a reasonable cost, the disappearance of iron ore will not create the dismay that is now so ominous, and the process is yet to be discovered whereby the almost limitless clay deposits, with their 15 to 25 per cent. of alumina (oxide of aluminum) may respond to the query as to what will replace iron, and how meet the demand, for iron products or something that will be quite as useful and available, without hardship, when iron ores of the better grade have disappeared.

Again, we must resort finally to chemistry or electricity or both, and who shall put a period to the word electricity, in contemplation of its innumerable devices and the domain that it affords for the exerting of man's skill and almost supernal conceptions and ingenuity. The seemingly impossible solution of many problems of perplexing effort and unusual exertion will be found year after year in the application of electricity or electro chemistry and its wondrous and almost divine devices, phases and potency. While delivering a former report to this honorable body, I referred in a digressive way to the problem of good roads and very briefly suggested a line of experiment that might contribute to the solution of this momentous subject.

Nature has given us pertinent lessons whereby we may clearly experiment and duly acquire some definite ideas towards the making of roads that will not so shortly vanish away in dust along the country thoroughfares, lanes and by-ways, cared for in part by the old time supervisor. We notice the exposures of slate and shale, red, black

and gray, containing from eight or ten to twenty-five or even thirty per cent. of alumina which is the binding or cementing ingredient of all clays used for the making of fire brick and building brick and other clay products, and we often see the roads as smooth and compact as any that can be constructed with limestone and sandstone and less liable to become disfigured if I may use the term, and unsightly by the impact of wagons, autos, etc., which so soon wear out and destroy artificial roads. Is there not a combination of silica, alumina and lime contained in sandstone, limestone and shale, in proper proportion, that will produce a solid and compact road bed, more permanent and lasting, and yet more acceptable to the traveling public, than any road made simply with sandstone and limestone without the aluminum? I think so. In a tentative way, why not test these elements by repeated experiments, using say, from one-third to one-half of clay or clay shale containing, as it does, from fifteen to thirty per cent. of alumina and from fifty to seventy of silica, with a small ingredient added thereto of limestone, and changing the proportions of these several elements time and again, and applying to certain "stretches" of road until the best results are obtained. I mean to say, briefly, that this element of alumina, as found in clay, or shale added to the application of limestone and sandstone or sandstone alone, is rational in theory. Alumina in proper per cent. will make an admirable addition to the road bed, avert very appreciably the wearing away of the road and prevent measurably the dust arising from sandstone and limestone roads. Give this your consideration and notice what nature has suggested.

Aluminum makes the road smooth and level and if not so hard and compact as limestone and sandstone, yet being somewhat flexible or slightly plastic is certainly more to be desired as a component with limestone or sandstone or both than the two latter elements could be without aluminum. In short, shale and slate make a better road than limestone and sandstone, by reason of the presence of a certain per cent. of aluminum which has been almost disregarded in road making. A bastard limestone, which is a native cement rock, would be better adapted to the construction of roads than a pure limestone would be, since it contains a small per cent. of alumina.

Three years ago, I made a few remarks relative to the game and fish laws, with a special reference to deer and trout, and upon the request and insistence of scores of men representing hundreds or thousands of others who enjoy fishing and hunting, I am constrained to make some further comments on the subject.

The almost universal opinion among trout fishers is, that the number of trout that may be caught should be prescribed by law, and not the length thereof, and no one with experience in fishing the trout streams, can deny that three-fourths or more of the small trout, being less than six inches, die after being caught and thrown back into the stream, and thus the streams are largely depleted of the same. I am sure that instances have become very frequent where the fisher has actually hooked two hundred or three hundred small trout before getting what is termed the limit of forty trout, as allowed by the statute. I tried a stream several years ago and caught nine trout of less than six inches in length, and throwing them back, noticed that most of them turned on their sides

and probably died. The acceptance of the opinions of thousands of men who know these facts by experience would be wise and expedient in framing these laws. In our county (Clinton), 161 bucks were killed last season and the number of hunters was six or seven hundred, estimated, or a hunter for every thousand acres of the area of the county. In 1910, the number killed was 140, and the excess of last year's sport due, not to the fact that there were more bucks in the county, but to the tracking snow that continued almost through the entire fifteen days of the season; and the season of 1910 was not so favored, and had the smaller number of deer slain. I have talked with scores of hunters, probably with hundreds, and know the trend of opinion of all classes of men who seek sport of this kind in the woods, and nineteen out of twenty are positive in the opinion that the most wise, just and effective law would provide for the killing of one deer by each hunter, regardless of the sex thereof, leaving the hunter to secure either a buck or doe as the opportunity afforded. This view I have derived from hundreds of men and ranging from twenty to seventy-five or eighty years of age. Moreover, it does not seem to them that the section that requires a hunter to see the horns before shooting at a deer is in any sense, or leastwise only in a limited way, a protection to the life of those who are in the woods in the hunting season, but that the many sad accidents were formerly due to carelessness and to the excitable state of mind of certain persons who lack self-control and nerve; and that later the hunters have learned to be more upon their guard and self-restraint and wear caps or clothing that will at once distinguish them from deer or other animals. Sad experience has taught more care and forethought, so that accidents or shooting into the bush at some indefinable object are almost certainly averted, simply by the schooling that has been experienced. Any man that would shoot an indistinct object in the bush upon a nervous impulse would not be so deliberate in any emergency, as to look first whether it has horns or not, and such persons should be barred from hunting under any and all circumstances. Three years ago I noticed some bear tracks in the snow in a remote part of West Keating township, in my own county, and as a bear had been shot a few days before, within a short distance of these tracks, by hunters to whom I showed his "signs," in the snow and near a spring, I got a Winchester from one of my men, then prospecting in that locality, and standing in a small natural clearing where many tracks appeared, I noticed, just beyond, the brush shaken by some object moving therein, and with a slight nervous tremor, but a self imposed injunction to "hold on quaker" and be cool, I waited for the object to appear in the clearing with a determination to kill a bear; but, very soon one of my men with dinner pail in hand and returning to camp half an hour early emerged from the brush. I didn't shoot but severely rebuked him for not being a bear. Now, what would have been the result if I had fired into the oak brush two or three times? Probably, I would have killed a man for whom I had a very kindly friendship. Moreover, the theory that the present law is effective towards the preservation and increase or propagation of deer is erroneous as avowed by all the hunters, with one or two exceptions, with whom I have conversed on this subject; inasmuch as all claim and affirm most posi-

tively, that there are very few fawns now in the woods and very many barren does, which fact as they say is due to the destruction of the bucks; further, that each buck has its mate for a period of many months and rarely seeks other does; and ordinarily, will not go any very great distance to consort with other does after it has found a mate. I have noticed many deer tracks in the snow in hunting sections after the season closes and through December, January and February, and there was a most woeful absence of buck tracks, which are readily distinguished from the doe tracks.

Now, the question has arisen, what limit there will be to the killing of bucks and will the time arrive when these animals will be entirely exterminated, barren does in numbers probably left to die of old age, or be killed by the wanton hunter; and finally, all tracks and traces of deer become obliterated. I cannot conceive that the well spun theory, intelligently formulated and the laws therefrom enacted can avail with the same desired results for the propagation of deer and the prolonging of the hunters enjoyment, as any law or section thereof based upon the actual experience and concensus of men of all classes and grades of intelligence and many nearly of the same or equal stamina or discretion with the members of the assembly who frame the laws in this respect. Is it not true, that the country members supposedly informed upon this subject, do not participate in the preparation of these laws upon the idea of equality with the city members, who to the number of forty, fifty or sixty, very largely control the legislation in this and other directions, in a sense, excluding the knowledge, wisdom and experience of the country members who may only have been in the Assembly, at most, a term or two. An old hunter remarked that "these hunting and fishing laws are made by men down at Harrisburg who don't understand the human nature of the deer and trout, as well as us fellows that live in or near the woods." Kindly bear in mind, that I have no strictures or criticism for the Game and Fish Commission, or upon its worthy and efficient Secretary, Dr. Kalbfus, since they and he are effectively enforcing the laws; but being impelled and urged by so many men whom I know to be wise in these things, I could not refuse to refer to the matter, and have been many times assured that the brief suggestions in my former report were read and widely approved by the men who enjoy hunting and fishing and are anxious for a continuance of these sports.

A majority of the counties represented in this meeting contain wide areas of forest and woodland where trout and deer and other game should abound and afford good sport, but from the thousands of acres of nearly primitive woodland in some of these counties both trout and deer have nearly or entirely disappeared.

AGRICULTURAL GEOLOGY

By W. H. STOUT, *Agricultural Geologist*

SOIL

Soil is defined as the upper stratum of the earth, the mold or that compound substance which furnishes nutriment to plants, or which is particularly adapted to support and nourish them.

There is much concern of late regarding our natural resources and their preservation. Forests, streams and minerals appear to be considered the most valuable from a business point of view, and while all are essential to civilization as necessities, they are only secondary in importance to the human race.

The soil is our most precious inheritance, deserving more care and consideration than is commonly bestowed upon it. It has taken ages of time and ceaseless work of natural forces, physical and chemical, to create the first few feet of arable soil, that is of any value in the art of Agriculture. It is comparatively only a short time since the country was settled by the white race, yet soil depletion to the point of exhaustion is evident where the early settlers first located.

Waste and destruction follow in the wake of civilization. Before the advent of the Europeans, the demand upon soil resources was limited. The tribes then in possession lived a primitive life upon natural resources of game, fish, fruit and vegetables, with a little corn and beans cultivated, along with some tobacco, in a limited way in some localities.

There are periods in the history of every country when agriculture becomes more urgent, and this country has arrived at, or is approaching a time when the supply of food products will not be sufficient to maintain an increasing population.

This is, however, not a matter of immediate concern but the admonition is timely, with the knowledge that poverty, ignorance and superstition follow the decline of prosperity, which is ever measured by the abundance of soil products, and such products are contingent upon the fertility and texture of the soil.

Some of the one-time most productive and wealthy countries known in history, where art, science, education and religion had their birth-places, have lost their identity and are divided among and are under the dominion of German, British, French and American rule. China is the only extensive territory that has maintained its independent existence for a long period. There is, however, much poverty and suffering in that empire, where thousands of the inhabitants are starving at times, and the revolution now in progress is attributed to the suffering of the laboring class.

The Chinese have lived a long time upon the products of the country, consuming at home what was produced, and caring religiously for all wastes and fertilizers available. Subsisting upon a plain and meagre diet that does not appeal to Europeans, the

Chinese cultivate their land in small tracts with hand tools, and live or exist with great economy. They have not depleted their soils by exporting grain and other products that contain fertilizing elements that impoverish the land, and as a result they were able to maintain an existence as a nation longer than any other.

It appears that since the world civilizers have gained a foothold in the ancient empire, their troubles have increased and multiplied in proportion as modern methods of business, transportation, education and civilization has progressed. (Under the convincing power of gold, thirteen-inch Mausers and gatling guns, and the benign influence of promoters from New York, London, Paris and Berlin have succeeded in converting the heathens to worship the Golden Calf, adopt civilized costumes and cut off their hair).

The primitive methods, the scrupulous care and economy necessary to maintain a bare existence does not appeal to our race, and that the poor of this country may be forced to adopt in the future similar methods is not a pleasant prospect to anticipate. Instead of preserving their fertility at home like the Chinese, the farmers of this country as soon as land could be made available to produce crops for export, commenced sending them abroad in increasing quantities, often without any profit and often at a positive loss. We take pride and boast of great wealth in our rich lands and the ability to supply other countries with all sorts of farm products. It did not occur to our people that every bushel of grain, every pound of meat, cheese and other products carry away fertility that is absolutely lost to our soil.

From the statistics we learn that during fifty-five years to 1910, the farmers produced twenty-two billion bushels of wheat, of which five and a half billion were exported as grain and flour. Calculating the fertility loss at four cents a bushel, it amounts to two hundred and ten million dollars. The remainder of the twenty-two billion bushels (four times as much as was exported) was consumed in the country and also lost, except what was fed to stock. Thus we lost upwards of eight hundred million dollars in fertility on the wheat crop alone, and much more adding other grains, animal products, cotton, etc., makes a sum almost startling in the amount.

We are robbing posterity of their share of Nature's provisions for existence, in exhausting the soil fertility accumulated during ages since the Tertiary period and the beginning of the Quaternary, when the climate became favorable for the support of vegetable and animal life.

Notwithstanding the industry of American farmers in robbing the soil to produce crops for use and export from this country, according to an expert in international finance, our debt to foreign countries is $6,575,000,000. We exchange for our soil products the essentials for existence, the products of other climes, that add nothing to our resources excepting the potash and nitrate imported. We import silk, wool, coffee, cocoa, wines, hemp, flax, hops, molasses, sugar, dates, figs, raisins, oranges, olive oil, camphor, rubber, jewels, diamonds and various other articles for the millions in value of our soil resources. This generation seems dissatisfied with the waste and destruction wrought by its inhabitants but invite all nations to our feast of abundance to aid in its more rapid exhaustion.

These are conditions facing this country, just being realized by thoughtful persons, and how to increase crops at reduced cost is the serious consideration of consumers. This is the one industry that is urged and encouraged to produce excessive supplies regardless of cost or the price. Other industries are not operated on this plan.

Returning to the text the "Soil," there is much to consider. Soil making is in constant progress. Rain, heat and frost acts as disintegrating forces liberating particles from the solid rocks, which form the basis for soils of various degrees of texture according to the nature of the rock from which the material is derived. There are various chemical elements in the rock formations, some of which are essential to plant life to a small extent like lime, iron, magnesia, potash, soda, phosphoric acid and nitrogen, in addition to silica the most abundant of soil constituents.

There is probably no state having a greater variety of soils than the old Keystone, and certainly no better farmers. The folding of the rocks east of Allegheny mountains brings to view thirteen geological divisions and many strata. The Delaware, Lehigh, Schuylkill, Susquehanna and minor water courses cut squarely across the anthracite coal basin, with the Pottsville Conglomerate, Mauch Chunk Red, Pocono Sandstone, Catskill, Chemung, and others of the Devonian System, followed by the Silurian, New Red sandstone, granite and traps.

There is little uniformity of soil until the Silurian south of the Blue mountain is reached, where the Hudson River, Utica shale and limestone valleys spread over considerable areas. The New Red, the latest formation, extends over various counties mixed with the traps from Reading to Philadelphia. Some sections in Northampton, Monroe, Carbon, Luzerne, Columbia, Montour, Northumberland and Lycoming are partly covered with glacial drift and the edge of the Moraine, with is boulders, sand and clay of various degrees of agricultural value.

In the glaciated district, the old lake bottoms and swamps are very fertile where drainage can be effected and on the elevations the soil is generally productive, excelling all others for fine fruit of best quality, Spy, Baldwin, King and Greening apples grow to perfection, and other fruits are successfully produced. The great potato districts in Maine, New York, Michigan and Wisconsin are on drift soil, an ideal condition of soil and climate for potatoes.

Northwest and west, the same conditions exist in Tioga, Potter, Warren, Crawford, Venango, Butler, Lawrence and Beaver counties where the soil is more uniform, resting on horizontal rocks of the bituminous coal, with the mountain limestone.

The anthracite coal field contains no soil of value excepting where the Mauch Chunk red appears in valleys, like the Conyngham, Catawissa, Lykens and Quakake. The various red soils, Mauch Chunk, Catskill, Clinton and Mesozoic or New Red produce fair to very good soil according to depth and texture.

The Devonian and part of the Silurian systems between the first (Blue) and second mountain has some narrow strips of good soil, but is quite various on account of the many strata standing on edge coming to the surface composed largely of shale. The soil on hills is commonly shallow and leachy while the bottoms consist of a cold

wet clay soil derived from the clay shale deposited on an impervious rock bed. In some counties, the Lower Helderberg limestone forms good soil of considerable extent, and is useful on the shale and clays, especially so on clay bottoms on account of its mechanical effect in granulating the finely divided particles.

Besides the use of lime to change clay soil to make it more friable, lime may have a chemical effect, to free potash and phosphoric acid from soil combinations and correct acidity. Sand and clay are the principal constituents of all soils and, if in proper proportion, give it texture, and when vegetable material is mixed with it forms mold.

Mixing soils is quite practical, but with present conditions also unprofitable, considering the value of good lands. An acre of soil to a depth of nine inches weighs about two thousand tons, so it would be necessary to move a thousand tons to spread four and a half inches of either clay or sand for mixing. At a very low calculation of twenty-five cents a ton for handling it would cost $250.00 to prepare an acre which is more than the average value of good Pennsylvania soil.

The soil samples presented here are only a few of the many existing over much of the State. All soils are derived from two sources; Igneous or Volcanic and Aqueous, deposited by water. From these are derived the great variety, changed by the every active elements: wind, rain, snow, heat and cold.

The igneous being the first formed rocks over the surface of the earth, all the others are necessarily derived from that source, through disintegration and transportation by water, ice, gravity and volcanic activity. All elements from which soils are formed were once a general mass of unorganized material.

The various minerals are all derived from the oceans, excepting coal and graphite which obtained their carbon from the atmosphere. The substances useful in agriculture, aside from the rocks, are deposits like salt, potash, phosphates and lime which accumulated from previous existing forms, and held in solution in water.

The Dead Seea and Great Salt Lakes are examples of the condensation going on and the salt mines and brines from which salt is condensed are evidences of rock formations having been deposited at later periods, which covered the saline deposits. The other elements useful in agriculture are derived from the same sources.

All soils contain certain fixed substances in varying proportions and are fertile so long as certain elementary substances exist in a soluble form. Whenever the time arrives through continued cropping that a soil is depleted of the soluble elements accumulated during past periods regardless of its origin, it will no longer produce remunerative crops.

Its restoration and maintenance then becomes a problem of economics of vast importance. Some soils like those of igneous and organic origin, possess inherent substances in larger quantity and a more soluble form than most of the sedimentary of clay and sand.

Numerous chemical analyses of soil from various sections prove that the same formation differ widely. The igneous granites and traps from Bucks, Montgomery, Lehigh and Philadelphia counties have a large per cent. of potash and soda varying from four (4) to thirteen (13) per cent. Lime, magnesia, iron, silica acid, alumina

is contained in various proportions. A sample Mesozoic (New Red) from Bucks county contained three per cent. potash, a little lime, two and a quarter per cent. iron, seven and a quarter per cent. alumina, a small quantity of phosphoric acid, eighty-four per cent. silica.

The restoration of exhausted soils to a productive condition is expensive. Notwithstanding the abundance of the plant elements found by analysis in soils, crops can not be successfully produced without given quantities of soluble materials.

Chemistry is of invaluable service in many lines of human endeavor including agriculture. The farmer has, however, a wider field for experiment than the chemist in his laboratory confined to a limited space with his acids and crucibles. The farmer has for his domain the mountains, hills and valleys, proclaiming in unmistakable language the fertility or sterility of the soil. Poverty grass and cinque-foil, huckleberry and hogberry, scrub oaks and alders, laurel and fern, rock oak and red oak, Giant Sequois and cedars, pine and hemlock, walnut and chestnut, hickory and sycamore, beech, birch, and maple with the many grasses and plants indigenous to the surroundings, constitute in Nature a laboratory more delicate and more refined than the most elaborate equipment in the hand of science.

Supplied with a tract of ground, some seeds and plants, patience and industry, fertilizers of various kinds, the practical farmer can solve the problems of fertility and crop production better than any one else. Plants like animals require a balanced ration; the one nitrogen, phosphoric acid and potash; the other protein, carbohydrates and fats. The business of the farmer is to take the crude material, and through his chemical laboratory on the land change it into the refined products useful to mankind. This appears to be a simple process of transmutation; it is surrounded with many difficulties, contingencies and hard labor, that is so irksome to many persons, retarding the back to the land movement.

Practical farmers are not so much interested in scientific research and theories as in the conditions with which they have to do and how to use what they possess to the best advantage to provide for themselves what is required by them and of them. Soil depletion like the shadow of an eclipse moves westward having reached the 100 degrees west longtitude in its progress over the Continent.

We have the assurance that "seedtime and harvest shall not fail," so we may trust to Providence for the future of agriculture; in the meantime preserve the soil and trust to explorers and prospectors to find new stores of potash, nitrogen and phosphoric acid somewhere on the national domain.

While the Government is engaged in preserving natural resources, one of the most valuable elements is wasted; nitrogen in explosives, by firing salutes to thirty-cent Potentates, Embassadors, striplings of Royalty and Kings from the Cannibal Islands, etc., costing hundreds of dollars and the game not worth the powder.

REPORT OF FORESTS AND FORESTRY

By I. C. WILLIAMS, ESQ., *Deputy Commissioner of Forestry*

The work of the Department of Forestry may be properly divided into three classes: First, conservation; second, protection, and third, the development of forest resources.

During the year just passed we have added to the area of our forest reserves, 32,714 acres, so that the total area of the forest reserves owned by the Commonwealth, on January 1, of this year, was 966,295 acres. There are now under contract to the Department a sufficient number of acres to bring the area up to a round million, provided we are able to purchase them.

This land was all bought and paid for by appropriations made by the Pennsylvania Legislature, beginning about the year 1898, and consequently covering a period of thirteen years; and the average cost of this land to the State on January 1, 1912, was two dollars and twenty-four cents per acre. As land goes in Pennsylvania, this would seem to be an exceptionally low price, and it is a fact that a large proportion of the acreage purchased is really worth a very great deal more today than two dollars and twenty-four cents; in fact, the value of these reserves to the State today stands about six to seven dollars per acre. To show you, let me cite an instance: An area was bought in 1902, and was then well covered with a fine stand of timber, which the owner thought he could not take out with a profit; consequently he let the State have it for two dollars and fifty cents an acre. There were many trees in the tract as it was—hundreds of them—which were worth more per tree than the price paid per acre. Eight years later, in the year 1910, the gentleman who sold this land to the Department, returned and wished to buy it back at a price more than three times what we paid for it, and he would have been mighty glad if he could have repurchased it at triple the price; but there is no authority of law to sell an acre of this land, consequently we could not sell; and for the further reason that these lands are all too valuable to the State to part with, even if the authority did exist.

Now, as to the care the Department is taking of these lands: There is the pruning and planting, and it is the result of this need that there are today upon the forest reserves forty-six State Foresters, who have received a technical and practical education in the school established and maintained for the purpose of educating foresters. With them there is a corps of helpers of about ninety other men who are known as "Forest Rangers," and all give the State a full return in every direction. First in work. These foresters, with their assistants, the rangers, last year completed over a thousand miles of roads and trails in the reserves—a road sufficiently long to cross the State three times from Philadelphia to Pittsburg. There is no use talking about the value of reserves until you have the means of getting

into them. It takes money to develop forests, but you might just as well throw your money away, if you do not propose to follow up purchase with a good road system. Roads are necessary in order that everything may be used at the proper time and that these areas may be properly developed so they may return to the State the very largest value per acre, much more than it is possible to get from them without means of proper access.

The law gives the Department the right to lease valuable minerals found on such lands. The minerals so far found are mostly valuable rock. In one of the counties in 1903, a lease was entered into to run twenty years. To date it has run about eight years. This land cost the Commonwealth two dollars and seventy-five cents per acre, and the protective measures since its acquisition have added a few cents more to the investment. The whole tract leased cost something over one thousand dollars. The royalty derived from the lease to date has more than paid for the original cost of the land, plus the protective expense, figuring interest at 2 per cent., which value the Commonwealth receives on its deposits in bank. It has left a very considerable margin after paying all the costs, besides its primary value to the State. In addition, we have some twelve more years for the lease to run. Now, that is but a single instance of the profitable development of a piece of land primarily bought for timber.

The Department of Forestry grows young trees upon these lands. For this purpose it has established three large nurseries, and a number of smaller ones which furnish thousands of seedlings each year. These nurseries cover about forty acres. One is located at Mont Alto, Franklin county, one at Greenwood in Huntingdon county, and one at Asaph in Tioga county. Last year the planting of trees in the forest reserves equaled nearly two million young trees. Wherever there is a bare space it is the purpose of the Department to plant it with young trees and protect them in order that they may grow into future good timber. Pennsylvania started out with this point in mind, that forestry is a great economic problem, and involves the economic principle of producing the greatest possible return in the least possible time.

The new School Code, passed last year, provides that the net returns of these forest tracts shall be applied to the public schools of the State. It is not likely that the schools will receive much return in the near future, because most of the land is stripped. The State acquires land only after the lumbermen have stripped it of everything they can remove, and then starts in to re-establish the forest. It is only after the forests have been restored and have become capable of making a return, that a large net profit will be derived. This will take a long time, because it is not possible to grow woods over night.

To show that the work of the State has some magnitude, last year about a thousand pounds of seed of Coniferous trees (mainly pine) were planted, and about three thousand pounds of broad-leaved tree seeds like the oaks and maples. In all, four thousand pounds of seed in one year put into the ground for raising young trees. This is only a beginning, and the future, I think, will show this work doubled and trebled, unless it is so we will not be able to plant these areas in the short period in which they should be covered.

We still have an old problem with us—a problem that has been such since the days when William Penn first entered the woods,—and that is forest fire. It was formerly thought that fires were a necessity, that dead leaves and dead wood might be destroyed, and this idea was not peculiar to Pennsylvania. The effort of the Department of Forestry has been to teach the people that fires are not necessary; in fact that they are unnecessary and that every fire is a distinctive loss. Progress is being made, and the people are beginning to see that forest fires mean loss, and nothing else. So far as the Department is concerned, it does its utmost to prevent fires on reserve lands, but they will come. You know how easily a forest fire is started under favorable conditions, and how hard it is to convince people that fire will not only destroy roughage but also the forests of the State. Just so long as people will not take a reasonable view, so long we will have fires. When we begin to realize that fires mean loss, we will have fewer of them. This is the result of education. When people do not understand things, they will not deviate from an established course. When they are made wise, you will find a new response, and generally in the right direction. This has been proved with the reserves in Franklin county. When fires were once one of the most prevalent things, they are now practically unknown.

The Department has been able to do some work in assisting in the eradication of the disease that is destroying chestnut timber. You have heard something of this at your meeting. We are directed by law to do what we can. The forest reserves are being thoroughly searched for the blight and where found it is destroyed. No specific remedy has been found. The only effective thing we know today is to cut down the infected trees and burn them, even to the stump and branches. However, where the tree has marketable timber in it, the bark is removed and the wood put to commercial use.

I don't know whether you are familiar with this fungus. I have here a number of twigs of trees in which this disease is present. If you care to look at them they are here for that purpose. Now, I am not an alarmist, and do not want you to think so, but, I am confident of this one thing. That unless the chestnut blight is stopped in its march across the State, it will destroy all Pennsylvania chestnut trees, and will do it in a few years. The value of the chestnut timber is too great to let it go by the board. The Legislature saw this, provided for a Commission, and the Commission is producing results. It is known that the chestnut tree blight is not, as was at first supposed, an insect, but a fungus, which attacks the bark of the tree, cuts off the circulation, and finally girdles and thus kills the tree. In this bottle is a piece of chestnut branch covered with pustules of the blight. This has been in the bottle forty-one months, and you will see the disease still has considerable vitality. We had these bottles in Pittsburg last fall, and the tops were tied on to prevent the spread of spores. Here is a specimen which has a split in the bark on one side. Just how the split was made we don't know, but believe that the spores of the disease were carried there and then began their work right and left through the bark, until the tree was girdled. This fungus belongs to the same order of plants as the black knot on the plum trees, or the ergot in the rye fields. It is

spread by means of spores carried by various means. There is this, however, that is hopeful—wherever you find infection, you will find other trees nearby where infection has not started. It does not march ahead like a column of soldiers, but goes forward and attacks in spots.

The Department is doing what it can, as already said, and only the future can tell what the result of their efforts will be. Whether it will be successful or unsuccessful we are not able to predict at this time. Suppose it be unsuccessful. We will then have the satisfaction of knowing that Pennsylvania was the only state with the courage to stand up and say in the face of the invasion of this disease, that she would not be indifferent about it, but would do what she could to prevent the destruction of one of her most valuable forest trees. If it be a failure, the whole moral effect of the effort will be of lasting benefit to the State.

Here is a piece of chestnut which I brought from Long Island in the summer of 1909. This you may handle with impunity, without danger of carrying the spores. In handling it, you will notice how punky it is. That is the result of the disease. As you go across the State this summer you will notice trees wholly or partly killed by this disease.

Now, the thing for Pennsylvania to do is to recognize fully that this thing is among us, and if there is anything to be done to protect the State, it must be done at once; not five years from now, but immediately.

I think I may say one thing more, and that is, that a joint meeting of the representatives of some twenty states is called to meet in Harrisburg the latter part of next month to consider this new situation. The problem is much more serious in the states south of us than it is with us, although we are vitally interested; and it is hoped from this meeting there will result a uniform plan of attack among the states where the disease is active.

ADDRESS OF DR. N. C. SCHAEFFER

I really have no speech. I enjoyed associating with the farmers, and during this week I have been "with the farmer" all the time.

If anything interests me, it is carrying agriculture into the public school. The thing that surprised me a little was, that that particular topic did not appear on the program, because I wish you could have had a chance to discuss it. By this I mean that there will be an expert in agricultural education connected with the Department of Public Instruction, and he will be able to talk with some authority.

I always come to this meeting when I can. I grew up a farmer, but my father early discovered that I would not be worth a copper as a farmer, and he allowed me to be a school master, but in my latter days I see what I missed in not studying what would make the farm attractive.

I happen to own a tract of chestnut timber that belonged to my father. I have never seen it; it is in Berks county. I also own a farm near Reading, which also belonged to him. I consider it a very profitable investment, because whenever anything has to be bought for the farm, I pay for it out of my salary, and whenever anything is sold, I put it down as profit.

I just want to say one thing: I suppose I got all the school advantages that come to a farmer's boy. When I was about ten years old, I was sent to the McAllisterville Academy, in Juniata county, and I was sent to College, and studied in three universities abroad, and some of the institutions in this country, and in all the years I was at school, I was never taught to know what would make me a better farmer. Now, I am glad there is a change coming over our schools, and this change is coming just as fast as you farmers want it to come, and not a bit faster. The idea that a lot of young girl school teachers, who are getting forty dollars a month, should accomplish anything great in teaching agriculture in the schools, is simply preposterous, and you men who represent this State Board of Agriculture, and are being taught the latest things in connection with agriculture, will have to help to get agriculture taught in some rational way in our Township High Schools. This last summer I went to a neighboring state in order to see how they did it there. Well, they had four expert lecturers, and if I wanted to kill agriculture in Pennsylvania, I would import any one of these four. One of them talked as though anybody could teach agriculture; the next one went off on the value of snakes to the farm—a subject which may do very well for Trinidad, where snakes are one of the crops. I heard a third one, who had some little idea that there might be an entering wedge for this subject; but I came home thoroughly imbued with the idea that we will have to do a little more before we can get agriculture thoroughly taught in the schools.

I am glad to have had these few minutes to throw off the feelings of my heart. I am interested in agriculture in the schools, without destroying the lengendary function of the schools, as it has come down through the ages. The school is completely out of adjustment with the conditions of today.

PAPERS READ AT KEYSTONE FAIR ASSOCIATION, HELD AT PITTSBURG, PA., JANUARY, 1912

BEEF CATTLE DEMONSTRATION

By PROF. W. A. COCHEL, *State College, Pa.*

The breeding and feeding of Beef Cattle is associated with prosperity on the part of farmers who make a business of growing corn and grass and utilizing these crops on the farms which produced them. There are four breeds of cattle which have been bred for the purpose of producing beef: Aberdeen-Angus, Hereford, Galloway and Shorthorn. We are fortunate in having before us typical representatives of each breed this morning. The Aberdeen-Angus representative is a bull weighing, in breeding condition, 2,000 pounds. He is typical of the breed, being extremely short-legged and blocky with short neck, deep body, wide back and exceptionally well developed loin and hind quarters. You will notice that he is black and polled, which are both breed characters. Representatives of this breed have won more premiums in individual and carload classes, as well as on the block, than any other and usually find much favor among buyers of cattle for immediate slaughter. This is largely because of their smoothness and quality, which enables their carcasses to be cut with a minimum amount of waste. The only objections to this breed are that they do not, as a rule, attain quite so great a weight, they are not so quiet, and the cows are frequently poor milkers as compared with some of the other breeds. These faults, however, are not universal and can be eliminated by careful selection of breeding animals.

The second animal, with white face and a red body, is an excellent representative of the Hereford breed. He is just two years old this week and weighs 1,500 pounds. You will notice that he is extremely short-legged, thick-fleshed, with wide straight back and deep body, of the same general form and type as the others in this respect. He is in such condition that he would sell at the top of any market in the country and if slaughtered would yield the kind of carcass most sought after by butchers who cater to the best trade. This breed is noted for its early maturity and its ability to fatten rapidly at any age. Herefords are considered by many cattle men as the best grazers of any of the breeds of beef cattle and are largely used on the ranges and plains of the West. The objections to the Hereford are that their fat is not so evenly distributed, many individuals are especially deficient in the hind quarters and as they mature they are apt to become rough and coarse. The cows from some families in the breed are poor milkers.

As in the other breeds, these deficiencies are largely confined to individuals and families, hence may easily be eliminated by proper selection of breeding stock.

The third animal is a typical representative of the Galloway breed, black and hornless, extremely low set, deep bodied with long shaggy coat and an abundance of quality. He has not been fed so long as the Hereford, hence is not in as high condition. This breed is noted for its ability to withstand severe climatic conditions and for the quality of meat produced when slaughtered. They mature at an early age and the cows are usually good milkers. The objections which are usually given do not apply to all individuals or families but are a lack of size, a nervous temperament and a tendency to fatten more slowly than the other breeds. They are especially adapted to the production of beef in some of the most rugged sections of the State.

The other animals, the two-year-old red steer, weight 1,600 pounds, the two roan steers and the white calf are typical representatives of the Shorthorn, which is more widely distributed than any other breed of beef cattle. They represent quite well the same general type of the Angus, Hereford and Galloway, being low-set, deep-bodied, thick-fleshed and showing an abundance of quality. The Shorthorn is the largest of any of the breeds of beef cattle, and the cows are usually good milkers. The objections to them are that they do not mature or fatten so easily at an early age, they are apt to be leggy and are frequently coarse. There is a greater variety of color and type among Shorthorns than any other breed of cattle, depending almost entirely upon the local conditions under which they are produced and the personal fancy of their breeders.

All of these animals represent the type which will be profitable to produce in those sections of Pennsylvania where the land is not too valuable to keep in permanent pastures. In the production of beef, it will be necessary to select one of these breeds, the particular one being determined by the personal fancy of the breeder, and then select them in such manner that they will mature and fatten at an early age and when fattened will produce carcasses which will be most desirable from the standpoint of both packer and retail dealer.

In the dairy business, we find that a profit can be secured from a herd made up of cows of indifferent breeding, provided each individual produces milk or fat at a profit. In the beef business, however, we do not look to the individual so much as to the entire lot of cattle for a profit, as they are usually fed and sold in groups rather than individually, hence all animals should be as nearly as possible of the same breeding, age, type and condition at all times in order that one or two inferior animals should not detract from the value of an entire lot.

The two steers which will be used in the carcass demonstration are a two-year-old pure-bred roan Shorthorn, weight 1,450 pounds, bred in Greene county, Pa., and fed at State College, and a scrub of about the same age purchased in a carload of feeding cattle during the month of November on the Pittsburg market. On examining these two steers closely, you will notice that the Shorthorn has a broad, short head, indicative of the beef type and of the ability to mature at an early age, while the scrub has a long, coarse, narrow

head, showing the opposite conditions and at the same time a tendency to be restless and wild, which detracts from his ability to use feed for the production of fat and flesh. The Shorthorn is smooth and compact over the shoulders, the neck and shoulders blending into each other in such manner that it can hardly be told where one begins and the other leaves off. The Shorthorn is well filled over the ribs and back, carrying his width from one end to the other, while the scrub is flat over the rib, drooping in the loin and heavy in the forequarters as compared with the hindquarters. The Shorthorn is low in the hind flank and full in the thighs, his underline is almost parallel with the ground, while the scrub is cut up in the hind flank, light in the thighs and quarters, all of which detracts from his selling value. The value of the Shorthorn on the Pittsburg market at this time is $8.00 per cwt, while the value of the scrub is $6.00 per cwt. This difference in value is due to the ability of the breeder of the Shorthorn who has given his life to the production of cattle of the most desirable type, as well as to the college which has fed out of him all that was bred in him or a combination of breeding and feeding. The scrub has been bred by someone who has paid no attention to market demands in the production of his cattle but has followed the course of many farmers in simply using the most available bull, with no attempt at anything except possibly to have a "fresh" cow at some particular season. We have too many people producing "scrub" cattle within the State who assume that there can be no profit in handling cattle as they have never secured any, while the trouble is that they have never attempted to breed cattle for the purpose of producing beef. If it is necessary to produce this type, the most profitable time to dispose of them is as prime veal calves weighing 150 to 200 pounds, when they will sell for as much as when they are 15 months of age in stocker condition.

On the other hand, those who produce steers of the type of this Shorthorn—no matter which of the four breeds they come from—utilize them for marketing the feeds that are grown on the farm will invariably find that they not only secure a profit from handling the cattle themselves, but that their farms are continually becoming more fertile and productive from year to year, which, in the final analysis, is the chief reason for producing beef in Pennsylvania or any other state.

ADDRESS

By E. S. BAYARD, *Pittsburg, Pa.*

Ladies and Gentlemen: The farmers, breeders, dairymen and fruit growers of Pennsylvania are proud to present to the public this exhibition of their products. They raised these magnificent fruits, grains and livestock. They are not ashamed for the world to see

them. The farmers of Pennsylvania prepared this show, their representatives working without pay to bring their agriculture before the public. They have guaranteed it financially. They want everybody in the old Keystone State to know more about its greatest industry, which is agriculture, that far surpasses in amount of money invested and value of products all the mines and mills of this the greatest manufacturing state. They want to convince the world that Pennsylvania has an agricultural industry and that those who are engaged in it are progressive. They are progressive enough to determine that the world shall know more about their achievements in agriculture and more about the opportunities that exist for farmers right here in these hills and valleys.

In this same exposition hall the people of Pennsylvania have seen two land shows. There was in them nothing but exploitation of the lands of the South, the Southwest and the Northwest. It was and is entirely proper that those sections should advertise their lands and their opportunities here or anywhere; but it is not right that the great agricultural State of Pennsylvania should keep still and let the other sections do all the shouting, when it has rich soil, cheap lands, fine climate for agricultural staples, right alongside the best markets on the face of the earth for everything that grows out of the soil.

Look at the five carloads of fruit displayed here, and the map made of fruits from every county in the State. Remember that this fruit is produced as cheaply here as anywhere else on earth because Pennsylvania is by nature adapted to the growth and fruiting of trees. Compare its appearance with the fruit raised anywhere. Taste it and see how much better it is than the much-advertised fruits of the Pacific Coast. Realize that its market is a few miles away instead of 3,000 miles away. And then tell us if there is any reason why the thousands of men and the millions of dollars that have gone from this State into the fruit business of distant states should not have remained here. There is no reason why Pennsylvania men and Pennsylvania capital should look beyound the borders of their own State to find the best lands, climate and markets on earth, no reason except ignorance of these facts. And it is to overcome this ignorance, to show the would what Pennsylvania can do, that this exhibition has been put before you.

Why do our men and our money go to the South, to the West and the Northwest in the face of such facts as these? The only reason is that these sections show what they can do and we have been too modest to show what Pennsylvania can do. They advertise their agriculture, we keep ours in the shadow of mills and factories. They proclaim their advantages from the mountain tops, we go to sleep and forget to tell anybody about ours. They believe in their agricultural opportunities, we fail to realize that we have any. These things must not continue; and to the end that they do not continue we present you this magnificent show of Pennsylvania products and challenge comparison with those of any other section. It is time Pennsylvania farmers should realize the situation. In the past two years over a million dollars has gone from western Pennsylvania alone into farm lands of other sections. This money invested right here would have added to the value of every acre of land in the

State. If we want our farms to sell for a fair price, if we want to have a demand for our farm lands that will put and keep their price up to their actual agricultural value, we must let the world know what lands we have and what our land will produce. We must get busy and boost our agriculture as other sections do theirs. The railroads see this more clearly than we do. They have begun a campaign of development, not from motives of benevolence, but because they want to raise more freight. We should begin a campaign of development, not only developing our lands but so advertising their worth that more men and money will become interested in their development. As long as we remain quiescent so long will the rest of the world regard Pennsylvania as a manufacturing state only and forget our greatest industry as it has done in the past. When our farmers realize the possibilities of their situation they will become more enthusiastic, and enthusiasm means success. Let a lot of men go into any agricultural section of this State with the same enthusiasm and determination they would show in developing a new western country and they will succeed. Why not, with roads, schools, churches and public buildings already built and not to be built from taxes on the land and its products? This show is intended to create such interest and enthusiasm, to teach the lessons of development of old instead of new territory.

Many of you, most of you in fact, are consumers of agricultural products rather than producers of them. You consumers have as great an interest in this development of Pennsylvania agriculture as the producers have. All consumers are concerned in the high cost of foods. And why is the cost so high? Because food prices here in Pennsylvania include not only payment of the producer, but payment of freights and transfers part of which might be saved by greater nearby production. The producer gets about 46 per cent. of what the consumer pays for food. The other 54 per cent. is in the cost of getting the food from the producer to the consumer. This is a tremendous waste which can be partly saved by nearby production; but much more of it can be saved if producers and consumers will get together. Here is the place to meet and discuss this problem, which is becoming more acute all the time. Consumers may find here how to buy to avoid the man of false measure. They may learn what quality means by studying these exhibits. They may learn how to buy meats, poultry, dairy products and fruits from the lectures we have provided to instruct them at every session of this exposition. Their children, the city children who never saw a colt or a pig or a lamb, are welcome to come here every morning in care of their teachers. City and country don't understand each other simply because they don't know each other. Here they may meet with a common interest and learn more about each other and the great food problem that only co-operation based on this knowledge will ever solve.

Study this show. You people of Pittsburg tell us if finer police, fire or work horses are to be found in any other city than those in this arena. Look at the magnificent specimen of livestock, all from Pennsylvania farms. See the fruits and note the counties that raised them. Look at the dairy products. Study the modern machines and appliances along these walls. Don't miss the splendid educa-

tional exhibits of Pennsylvania State College, the University of Pennsylvania, the Department of Agriculture and our neighboring State of Ohio's wool exhibit. There is not a fakir or a swindler or a mountebank in this show. There is not a single foreign land corporation to delude you into investing in southern sand lots or western wastes. Hear our lecturers. Attend our meetings. Watch our demonstrations. Then tell us wherein Pennsylvania need be ashamed of anything within these walls. Help us to build up our agriculture, to let the world know about it, to bring producers and consumers together for mutual benefit, to spread the glorious gospel of

BOOST PENNSYLVANIA,

which is our slogan this week and every other week in the year. And now I declare this show open for the upbuilding of our State and our city and the conservation of our men and our money for that purpose. May you all enjoy it and profit by it.

ABSTRACT FROM THE PROCEEDINGS OF THE STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA, HELD AT PITTSBURG, PA., JANUARY 16-19, 1912.

OFFICERS FOR 1912

PRESIDENT

Gabriel Hiester, ... Harrisburg

VICE PRESIDENTS

Hon. W. T. Creasy, ... Catawissa
F. H. Fassett, ... Meshoppen
R. M. Eldon, ... Aspers

RECORDING SECRETARY

Chester J. Tyson, ... Floradale

CORRESPONDING SECRETARY

Wm. P. Brinton, ... Christiana

TREASURER

Edwin W. Thomas, ... King of Prussia

COMMERCIAL ORCHARDING IN PENNSYLVANIA AS A BUSINESS PROPOSITION

By GABRIEL HIESTER, *Harrisburg, Pa.*

I have always taken an interest in fruit culture. Since boyhood I have seldom missed an opportunity to attend a meeting on this subject. Up to within a year or two the discussions at these meetings have been carried on principally by amateurs—from the viewpoint of the home garden and home orchard, and were confined entirely to a comparison of varieties—the merits of the latest novelties, methods of culture and pruning.

We have now reached the commercial stage. Fruit growing has become a business of vast importance in this country, and in addition to the important subjects just mentioned, there are others of a business nature equally important to occupy our attention. It is my purpose to consider some of these newer questions.

To read the flashy articles that appear from time to time in some of our leading magazines, one might easily be led to believe that this is one of the finest "get rich quick" schemes imaginable. That any man—even though he had been a failure at everything else, could go out into the country any where and plant an orchard and the trees would do the rest.

Those of us who have been in the business longest know that it is not a get rich quick scheme by any means. But we do know that an orchard of the right kind of trees, planted in the right place, by the right man, is a thoroughly good, safe business proposition, but it is a business that requires untiring energy, intelligence, pluck and dogged perseverance.

The wonderful development during the past 25 years of railroad, steamship, telegraph and telephone lines has brought the ends of the earth very close together. The man in Pennsylvania who grows fruit for the general market today is the active competitor of every man in the world who grows the same kind of fruit, and must measure wits with some of the shrewdest, sharpest business men to be found anywhere. The orchard that is planted in Pennsylvania today will have as its competitor the best located, best cared for orchards in the world.

Bearing these two facts in mind it behooves us to exercise the greatest care in starting every new plantation. We want to be as sure as we can that we are planting the right tree in the right place.

We are told by very good judges of fruit, men who have traveled over every state in the Union, that we can grow fruit of as high quality in Pennsylvania as can be grown anywhere. We believe this to be true. We know, however, by experience, that while all kinds of peaches, all kinds of pears, all kinds of apples will grow on any well-drained farm in this valley, only a very few varieties will reach their highest degree of perfection on any one farm, often different fields on the same farm produce widely different results. This fact was brought very forcibly to my mind when an orchard that I planted about 40 years ago came into bearing and I found one-third of the trees unprofitable, although I had seen the same varieties bearing profitable crops in Franklin county.

I proposed to our State Horticultural Association that we try to secure an investigation either by the National Government, or the State Government of the effect of soil and sub-soil upon the various varieties of fruit. After agitating the question for about 15 years, Dr. Hunt, Director of our State Experiment Station, secured for us the services of Mr. H. J. Wilder, of the Bureau of Soils, at Washington, for one year, to make this investigation. One year was entirely too short a time, but fortunately for us, Mr. Wilder had been studying this question for 7 or 8 years before he came to us. He had been observing the growth and production of the leading varieties on different soils on what is known as the Appalachian Chain of which these mountains are a part, extending from Massachusetts to North Carolina. He found that over this entire district a certain kind of soil and sub-soil always exercised the same influence over a given variety. I understand the result of his work in Pennsylvania is ready for the printer, so we ought to be able to get it be-

fore very long. While this bulletin will not enable us to make our selection of varieties with absolute certainty, it will aid us very materially and I am sure any young man can avoid making as costly mistakes as I made in my first plantings.

It was a great disappointment to me to have Mr. Wilder taken from Pennsylvania just at a time when he could do us so much good. We had hoped that he might spend another year giving field demonstrations to our people of soil testing and soil comparison so that we could use his bulletins understandingly. When he talked to me about the kind of soil, for instance, that the Baldwin apple delighted in I was convinced that he knew what he was talking about, but it was not at all clear to me that I could identify that soil, but when he took me to one of my orchards where really good Baldwins grew, bored down into the soil three feet and took a sample which he carried to another block where the apples were not nearly so good, showed me the two samples and by sight and touch explained the difference I felt that he was giving me something that I could understand. It is the field work of the expert that counts. It is the field work, the demonstration work that we need in this State to put us properly on our feet. It is the personal touch of the demonstrators right out in the orchard that brings results.

So many boxed apples have been shipped into our markets during the past few years from Oregon and Washington that our people have been educated up to the point where they demand and expect absolute perfection and if we expect to meet this demand we either plant only varieties that are at home in our soil and climate. It is worse than folly for any one to plant anything else.

Someone has said that the training of a child should begin with its grandparents, likewise the man who expects to market fancy fruit must grow fancy fruit, begin by planting the right tree in the right place—then he must spray the trees to keep the foliage healthy and the fruit clean; must prune to allow the sun to reach every part of the tree; must thin when too heavily loaded and when harvest time comes handle like eggs to prevent bruising.

GRADING, PACKING AND SELLING THE CROP

We have much to learn in Pennsylvania about grading and packing. We have become so accustomed to sell the run of the tree in our local markets, having each basket topped out with a few fine specimens that we find it very hard to follow the lead of our progressive western brethern—but we must do it—and it seems to me the easiest way for us to fall in line will be to start as they did, have the growers in each small fruit district co-operate, that is get together and decide upon the different grades of fruit that shall go out from that district and carry their brand into the general market, and determine to stand or fall on the reputation of the fruit carrying that brand. The grading and packing of fruit is an art, it requires time and patience and a certain amount of intelligence to learn it, hence in the fruit districts of the west and south we find expert packers often command very high wages. We sometimes find it difficult to get the right kind of help at picking time to pick and pack our fruit, but I think the establishment of fruit centres along our eastern coast, and the co-operation of the growers at these centres is going to solve

the labor problem very nicely. It is always hard to get one extra hand just when we need him, but it easy to get 50 or 100. These large gangs of men and women who make a business of this work—they start in Florida in mid-winter and work gradually up the coast as the season advances until late fall finds them in northern New York, Michigan or Canada. Now it would be impossible for one man with a ten or twenty-acre orchard to secure the services of such a gang, but if there are fifteen or twenty orchards in a neighborhood they can easily be divided up among them and the work be properly and systematically done, then again one small grower could not induce an expert packer to come to his place for a week to pack his crop but, a community can give him work for the packing season, even at the high wages they demand because each one will only need him for a few days.

It is very important, when introducing our fruit to the general market, that we place the first lot of fine fruit in the right hands. Just how this shall be done is a matter that each fruit district will have to work out for itself, but no fruit should ever be shipped to a dealer by any one either for himself or for his association until he has by careful inquiry assured himself that the dealer is responsible and has established a reputation for fair dealing.

REPORT OF THE GENERAL FRUIT COMMITTEE

By JOHN D. HERR, *Chairman, Lancaster, Pa.*

The present report is the first to be compiled from the reports of the county members of this committee who were appointed by the President of the Association in conformity with the terms of the new Constitution adopted at the Annual Meeting at Harrisburg last year. While none but persons intimately connected with the horticultural interests of their respective counties are serving on the committee, and their reports are accurate and complete, it would add to the value of this paper if a few additional members were added in each county, especially in the more important fruit growing sections.

Reports were received by the chairman from sixty-four counties, and these serve as the basis of the present paper. Much credit is due the local members for their unselfish interest, and the painstaking care and fullness with which local fruit conditions are reported. Without this interest on their part no State Report could as a matter of course be made, and whatever merits this paper may possess is largely due to this disinterested co-operation.

The general yield of fruit in Pennsylvania in 1911 was above the average, both in quantity and quality. Of some fruits it was specially large, winter apples averaging for the entire State 120 per cent. of an average crop and 150 per cent. of last year's crop, while fall apples

average 130 per cent. of the average and of last year's crop. This is considerably above the average for the United States. Pears were a normal crop, but averaged 135 per cent. of last year's yield, which was a short one.

The most conspicuous falling off in the yield of any class of fruit was that of the peach, of which the average of all counties is 70 per cent. of a normal crop and 50 per cent. of last year's crop. Please note that I give this as the average of all counties. This estimate is higher than is justifiable because of the fact that some relatively unimportant peach growing counties report good yields, while other and greater peach sections have had but one-third of a crop or less. It is my personal opinion that the peach crop of 1911 was not much above one-half that of the previous year. The quality of peaches was, however, unusually fine.

Plums drop, also, slightly below the normal yield, being 75 per cent. of an average crop and 85 per cent. of last year, while cherries bore 95 per cent. of an average and 120 per cent. of last year's crop. Strawberries, raspberries and blackberries yielded 75 per cent. of last year's crop, which was slightly above an average for these fruits. The yield of tomatoes, cabbage and beans was below the normal, while potatoes were a short crop in most sections of the State, and with many indeed almost a complete failure.

The prices received by the grower for fall apples averaged 57 cents per bushel. This price does not do full justice to the possibilities of the market for this fruit. This is shown by the statement of some fall apples sold in some markets as high as $2.00; others sold at 20 cents per bushel. The prices received for fall apples is largely a matter of growing sound fruit, packing in attractive form, and facilities for marketing.

There is, without doubt, a good market for fall apples in the cities and towns of all parts of the State which has just been begun to be supplied.

The prices paid for winter apples as reported averages $2.10 per barrel for all varieties, and the prices in the commercial sections ranged about this point. Such fruit as has been packed in bushel boxes from $1.50 to $2.50 per box, while bulk apples sold as low as 40 cents per bushel. Evaporators and canners paid 25 cents per hundredweight for drops and culls. The price of pears averaged 95 cents per bushel, but should be $1.00 as this includes that paid for Kieffers, which is given as 20 cents per bushel in bulk.

This season was the successful peach growers great opportunity, and he who was lucky or foresighted enough to have a crop reaped a golden harvest. The price for all grades of peaches averaged $1.50 per basket. True, the quality was high as a rule, and the fruit was worth the money. This was due to the lighter yield resulting in larger sized and more perfect fruits.

Plums were little cheaper, selling at a premium price of $1.25 per basket, while cherries brought 8 cents per quart box and $2.50 per crate. These figures include the sour varieties. The sweet cherries brought more money.

There are not a great many bearing quince trees in this State, and this may account for the fact that prices of these fruits is quoted at the per dozen rates, which is 25 to 40 cents. This is now the

price of eggs, and more than is usually received for boxed apples, and inasmuch as there is a steady demand for this fruit, and trees of the quince come into bearing early, the quince growing industry is heartily commended to the consideration of fruit growers who are willing to combat the conditions producing twig blight, which is the greatest enemy of the quince tree just now.

Grapes sold at 5 cents per pound, 80 cents per crate, and $24.00 per ton, in the northwestern Pennsylvania grape region. The price per ton for grapes is less than that paid for cabbage in some sections, although the consumer paid at the 5-cent per pound rate or $100.00 per ton. Who gets the $76.00 per ton profit?

The general price for strawberries was 10 cents per quart box, and $2.75 per crate. The same price ruled in the case of raspberries and currants, while blackberries sold one cent lower. Potatoes averaged for all sections 98 cents, and tomatoes 73 cents per bushel.

If the fact be conceded that the measure of the development of the apple growing industry in any section is determined by the amount of fancy boxed apples put upon the market then Pennsylvania has much room for improvement in completing the marketing end of the business. I do not, however, regard this as a fair criterion of judgment in all cases. The great bulk of apples will probably during all time be packed in barrels for the use of the millions. There is, however, an ever increasing demand for fancy boxed apples, and this local demand should be supplied by the growers of our own State instead of importing from outside. This is not yet done, judging from the statement that but $1\frac{3}{4}$ per cent. of the salable crop of apples is packed in boexs. There is, however, an awakening of our people to the possibilities of this package, and from present indications Pennsylvania boxed apples will surely be heard from in the future.

Only 25 per cent. of our apples are packed in barrels. This appears low, but is accounted for by the fact that our numerous local markets offer exceptional advantages to selling apples in bulk during a large part of the season. Bulk apples, therefore, total 50 per cent. of the entire crop.

One statement I am obliged to record, and I do so with shame for my native State, and that is the fact that 40 per cent. of the entire crop of apples grown in this State are culls. Thus 2-5 of the entire crop is made unprofitable by neglect, and since the growing of culls in any large proportion is entirely avoidable there is no excuse for such conditions. Culls can be avoided by spraying and thinning of the fruits. Such culls as are grown should not be offered on the market filthy with the ejects of worms, and covered with unsightly fungous diseases to disgust the consumer and pauperize the producer.

The planting of apple trees is increasing in 40 counties of this State. This increased planting has been going on for several years, and with a corresponding interest in the care of trees and marketing the crop will result in making Pennsylvania the leading apple grow-state in the Union. There are now estimated to be over 33,000,000 apple trees growing in this State.

Planting of peach trees is increasing in 45 counties. In consideration of the fact that the high and northern tier of counties are not peach growing territory the counties reporting increased plant-

ing comprises all the area of the State where peaches can be grown successfully. Over production is feared by some, and possibly with a fair degree of reason, but if quality rather than quantity is kept in mind by the grower, and high grade fruit only is offered on our markets overproduction is not so near at hand as perhaps is overplanting. No one is now planting dwarf apples, even as fillers, except probably the city planter and the experimentalist. Dwarf pears are freely planted as fillers.

Other horticultural operation mentioned by correspondents are the growing and evaporation of sweet or sugar corn and strawberry culture. One of the most notable and successful of these newer industries is that of celery culture in Tioga county. Here hundreds of acres of richest valley soils are planted to this crop, amounting to many thousands of dollars in value annually. Chestnut culture is reported from three counties, but while this industry formerly offered means by which otherwise barren mountain land could be turned to the production of valuable crops the presence of the Chestnut Blight among us is calculated to put at least a temporary check upon chestnut planting.

The price of horticultural land in the State has increased during the last few years in 30 counties and averages 25 per cent. There has also, been a general increase in the value of all farm lands.

All commercial orchards worthy the name are now sprayed. Twenty-three per cent. of all orchards are sprayed at least once during the year. The remainder will be sprayed or else soon go out of existence as producing orchards. The above percentage refers to orchards and not to trees. There is no doubt that over 50 per cent. of the total number of fruit trees within the State are now treated by spraying.

Some system of culture is practiced in 15 per cent. of all orchards, while 16 per cent. are properly pruned. Cultivation of peach orchards is a necessity to full success, and is practiced by nearly all commercial growers. More instruction is needed in pruning, cultivation and fertilization.

The most damaging pests in 31 counties is the San José scale, and in 25 counties the Codling moth. There is no doubt that these two insects, the one attacking the tree and the other the fruits, will continue our most important pests for some time to come. They are responsible for the destruction of hundreds of thousands of dollars of property in this State annually. The comparative ease with which they can be controlled by well-known methods seems to be recognized by nearly all, as they are seldom mentioned as difficult of control. Lime-sulfur for the scale and arsenate of lead for the Codling moth are the reliable remedies.

Other pests mentioned are Oyster-shell scale in 12 counties, while but 5 give any importance to the Curculio. I believe the latter responsible for much damage even to apple, and the arsenical spray before the blossoms open to supplement the regular Codling moth treatment should not be overlooked in spraying for the Curculio where its presence is indicated in the apple orchards.

Borers are mentioned in 6 reports as the most damaging pests and difficult to control. When they once have entered the trunks

of the trees the only course is the knife or carbon bisulphide. Preventive applications are useful, and deserve more general use everywhere.

Pear or Twig Blight has been exceptionally prevalent and destructive on pear and quince. It is questionable whether much damage will be done to apple on the limbs, as it has a tendency to self limitation on apple twigs. Collar Blight, however, which is said to be caused by the bacillus of Pear Blight is one of the most serious diseases of the apple orchards in some sections of the State.

Leaf Blister Mite is spreading through the orchards of the northern half of the State. It is easily controlled by the lime-sulphur treatment given for San José scale and Oyster-shell scale. Canker Worms do much damage in the western half of the State. For these spray with arsenicals early as the caterpillars are seen feeding, and before the trees are defoliated.

Seed Chalcis and Railroad Worm are more numerous than formerly, and these pests because of their habits of feeding inside the fruits are a real menace to the apple industry. No other means of controlling these insects is known to science than the destruction of the infested fruits while the pests are inside them. Unless this be done by the grower recourse must be had to legislation on the subject, and a strict enforcement of the same over the entire infested areas.

One correspondent mentions ignorance as the most menacing pest of fruit growing in Pennsylvania, and with probably some sign of reason. This is an enemy we are constantly fighting, and there is no let-up in our battle against ignorance, especially at the sessions of the Horticultural meetings such as the present. Like the poor, however, we shall always have the ignorant with us, but not as fruit growers. Competition with the well-informed will automatically drive the ignorant fruit grower out of business. Another mentions the "humbug" as the worst enemy the fruit grower has to deal with. The crop of humbugs is, unfortunately, perennial. The humbug goes about often in the garb of an angel of light, like another well-known personage seeking whom he may devour. We can not spray for the humbug it is true, but since it is known that he thrives on ignorance and cupidity by withholding his natural food he starves to death and disappears.

Taking conditions as a whole the Pennsylvania horticulturist has much to encourage him. We have within our borders the finest fruit soil in the world. We can grow all the fruits indigenous to our climate right here at home. Killing spring frosts are very unusual, and on proper sites entirely unknown. The markets at our very doors are unsurpassed by any anywhere. Our people in the cities are employed as skilled labor earning high wages, which makes them good customers. We have no serious pests not now under control. The markets afford fair prices. Care of trees, co-operative selling of fruit, and buying of supplies is being undertaken. All signs point to the time when Pennsylvania, great in so many industries will be the greatest fruit growing State in the Union.

SOME MISTAKES IN FRUIT GROWING

By C. E. BASSETT, *Fennville, Michigan.*

I wish to speak of some of our common mistakes. It is our ordinary practice to boast of our successes and not to say anything about our defeats.

But some defeats are better than some successes, especially if we courageously meet defeat and are not discouraged. It is then we learn a valuable lesson. Real failure consists in failing to rise up after we have been knocked down.

We must start with the idea that we are bound to have defeats, but those who overcome them gain the reward.

We are falling into a bad practice in the way we secure our nursery stock. The old practice was to purchase trees in the fall and have them heeled in, but the large nurserymen found it a difficult matter to make a fall delivery and so they followed a new process, erected large frost-proof cellars and stacked the nursery stock up in them like so much hay, none of the trees being heeled in.

In consequence of this abuse we have had a great deal of failure in getting a stand, especially of peach trees.

It is unnatural and wrong to have trees stored like that, and we do not care for cellar-stored trees, but insist on fall delivery for two reasons. First, we get the pick of the stock; second, we can take good care of the trees, trimming the broken roots off when we heel them in and then they are ready to be set out the first thing in the spring.

Cellar-stored trees are lacking in vitality and in some cases are absolutely dead.

Our greatest fault in Michigan horticulture is that everywhere we have "skinned" the land. We must build up our land and make it richer. We have drawn our cheques upon the soil fertility, and have now little or nothing in the bank, and thus trees already weakened by cellar wintering are also placed in an unfavorable soil.

Many of us are not adapted to fruit growing at all. Many retired business and professional men are coming from the city. These men often make mistakes in their way of handling their orchards, but they can often teach us that we need better business methods on our farms.

It is a great tribute to the occupation that it can yield some return without any business method in selling. As a rule we have no say in the price at which we sell, or at which we buy.

We need in our horticultural and agricultural processes better business methods. We need the system of co-operation which is correcting some of our mistakes.

We are attempting to pass an act in Congress to meet the faults in marketing our fruits. We are doing this partly in consequence of the Canadian "Fruit Marks Act," which has increased their output and decreased ours.

In pruning, I believe we are still not restricting the plants sufficiently. Feeding, restriction and protection are the three things necessary to successful horticulture; and we will meet with greater success when we adopt the same principles as the dairy men do, of feeding heavily at the right time.

But "restriction" is also necessary. The reason why the Baldwin does not bear every year is that it sets a large amount of fruit and men allow their orchards to overload, and then ask the trees to do more than they can.

Often such orchards bloom freely but set no fruit, from exhaustion at blossoming time and want of sufficient plant food. Overloading and under-feeding produces short lived trees.

The principle I want to found my pruning on is to keep close to nature. When you go contrary to that you are going wrong and will be punished for it.

Many want to bring their trees into bearing as quickly as they can, but you take a small boy and build his constitution well and develop his brain well; and the time will come when he will have a strong body and brain and will be equipped so that he can earn large wages.

Apply this principle to trees, for they are like babies, and it is probably better to build up a strong healthy top before asking them to do their best work.

Good pruning of trees—especially apple trees—from the start, is not a mistake. Nip the buds off that you don't want and throw the energy into those you do.

Feeding is our prime need, then restriction by pruning, continued by thinning.

There are two periods of exhaustion. The blossoming time and the time of seed production, and the less you can have of both the better.

The more blossoms the greater the strain and the more fruit the greater the strain. The excess of fruit must be picked off before the seed is formed.

Many of our growers are becoming wedded to thinning apples, because they find that it pays excellently. Apples in clusters can hardly be kept free of Codling moth.

Trees are sometime picked where there are no imperfect apples. I know of a grower in Michigan who picked 23 barrels from two Hubbardston trees; 21 of these were No. 1, two were high grade No. 2 and there were only three poor apples.

These trees gave a return of 12 times what the thinning cost and the man has gained a state-wide reputation.

Our mistakes are based largely on want of feeding, of restriction (pruning and thinning) and of protection (spraying, etc.) These cover the whole process of fruit growing up to the time of picking and packing.

Tree roots should be pruned before heeling in, and the bruised roots cut off smooth with a good sharp knife. This forms a callous and starts the feeding roots of the new system.

I do not care for fall planting, we lose too many trees. It is better to heel them in at an angle and protect them. Trees heeled in an upright position do not come through the winter well. Ridging or banking high will help.

The best time to get a tree is straight from the nursery in the spring, but the nurserymen cannot handle trees on this plan in very large quantities. Fumigation has made a great difference in the way trees are exposed.

Some good growers think that fall is the best time to plant trees. You only require to ridge them up a little and they will do better than in spring, they think.

Among other common mistakes is the failure to select a well-drained, elevated site for the trees. Instead of increasing our acres of fruit, we might better increase our attention to what we now have. Quality pays better than quantity.

Most of our growers seem to spend more time and strength in settling the exact time to prune than they do in performing the work, with the result that trees get away from them and they end up in the "forestry" business.

In our spraying operations we lack knowledge of what we are trying to do and so make most terrible mistakes. In fact, a little more time spent in study and the development of our reasoning powers will pay larger dividends than devoting all our time to manual labor.

Just now we are being told that the trouble with our marketing methods of the apple crop is that we do not make use of the box in place of the barrel. But will you tell me why the barrel is unpopular and the box is sought for in our markets? Is it not because the contents of the barrel is, as a rule, bum poor "crap," while the boxes are honestly packed with good dependable fruit? That is the situation and when we put good fruit in any package and the purchasing public find it out, there will be more call for our products.

The fruit grower who imagines that he can fool "all of the people all of the time" is making the biggest mistake of all. Fair dealing not only gives a clear conscience and establishes self-respect, but it builds up the biggest bank account.

THE FRUIT FARM AS AN INVESTMENT

By FRANCIS N. THORPE, *North East, Pa.*

An investment is valued by its returns. Large returns depend upon favorable conditions—large demand, limited supply, skilled labor, economical adminstration, in brief, the relation of cost of production to gross income.

A fruit farm considered strictly as an investment must be measured by the tests commonly applied to any legitimate investment plus conditions essential to the particular business of horticulture. It is largely the horticultural conditions which must be considered Limiting ourselves strictly to particular fruits, we must first consider local situation, that is, we must select the locality adapted to the par-

ticular fruit: apples, cherries, grapes, peaches, prunes, plums, berries, etc. The first condition for profitable fruit farming is location, and this is determined by climate. Soil is a less important factor than climate. Given the right climate, for grapes, cherries, peaches, etc., soil can, practically, be made. Soil consists of plant environment, which means available food, moisture, heat, humus. Chemical processes in the soil contributory to plant life depend upon climate, that is, temperature, moisture, disturbance of the soil (cultivation) and the actual presence of the plant root. The process of plant life is the fundamental problems in horticulture. Hence the incalculable importance and practical value of our Agricultural Colleges, Experiment Stations, Departments of Agriculture, the results of whose attempts to solve the great food problem are in part made available by institutions, from time to time in various fruit localities. The time has passed for horticulture by "rule of thumb."

The location of the fruit farm within the climatic belt adapted to the particular fruit under consideration is determined, as an investment, by practical tests. As a rule that fruit farm is best worth having which is salable at a good price at any time. It is well to own land which any body interested in profitable horticulture would like to own. This rule includes both new and old farms. New lands are ever "coming into the market" and an investor must be guided by the market value. The tests here are obvious: location as to market; as to ordinary accessibility by good roads; as to local conveniences, school, church, post-office, shops, stores, physicians, etc., in considering which matters, telephone equipment is a factor. A farm near town, village or city, freight station, freight-siding, a farm on a good road, or roads, over which produce may be hauled at minimum cost is always salable. It is the farm, not the farm buildings which gives value. The old saying, "he that has two roofs has one that leaks" hints at economy in building. A farm sells as productive land, not as an aggregate of buildings. A stock farm in the fruit belt is changed to a fruit farm, but the barns, sheds, etc., essential to stock-raising are quite useless on a fruit farm. So Cato, in his classic treatise on farming advises building in middle life, meaning that by this time the farmer knows best what he needs.

Market location is not a local question in a narrow sense. "Much fruit, many buyers" is the ruling principle. The Lake Erie and Chautauqua fruit belt is thronged by buyers through the season. In the city business of a kind by business necessity (laws of profit and loss) locates in a section and there prospers best. So the banks, and wholesale houses, the insurance offices, the commission houses are in little settlements and there remain, the aggregate settlement perhaps moving at long intervals as the city grows. An isolated fruit farm is not easily made profitable unless its size is sufficient to dominate the market. Indeed the usual aggregate of fruit farms is practically, as a world-market, one vast fruit farm. In selecting a fruit farm the investor must like other investors seek to do business where business is done. And now arises the problem of attempting to raise fruit productively in new regions. Climate, soil are highly favorable but the locality is isolated. This means that one or two generations of farmers must wait for marked facilities. It is a question whether a man cares to be either of these waiting generations. That he must decide.

But there are fruit farms and fruit farms, just as there are factories and factories. The land itself must lie right for fruit. A northern exposure, to insure protection against early, premature start of leaf and bud; drainage, or at least the opportunity for it, to secure against drowning and freezing of roots (as climate may determine); and such a lay of the land as permits economical cultivation, level surfaces, moderate grade, tillable soil under modern methods and tools, these are essentials to be considered. It is the rough, poor rebellious soil that cuts down the profits. A farmer is prone to value his land by his best acres, when in truth it is his poorest acres that fix his income. That is the best fruit farm whose poorest land is the most productive. He is the best farmer who takes best care of his poorest land. And it is a question of land, this matter of "The Fruit Farm as an Investment." Soils may be brought back to fertility by proper feeding, and the first question the investor in a fruit farm must ask is "What is the soil feed-bill?" This question is largely a question of the lay of the land. Land that washes is most expensive; hollows and pockets become too rich for fruit though productive of plant growth. A fruit grower is not raising shade trees.

And by no means least to be considered, in selecting a fruit farm, is outlook, neighborhood, scenery, weather conditions, adaptability of the land to practical "fruitscape" results. A well planned, well laid out, well kept fruit farm, well located is always marketable. The widow can always sell to advantage; the heirs (small children) inheriting a valuable farm are precisely in the position of heirs inheriting a valuable factory. Selecting a fruit farm is like selecting a father and mother to be born from; one may as well select a good one.

But every investment if profitable means ceaseless care, economical management, sound administration. This is a question of brains. No fruit farm will run itself, except into the sheriff's hands. No fruit farm is every quite up to the standard its masterful owner has set. Each year has accidents, failures, storms, sleet, hail, frosts, blight, pests, this row of grapes, that section of the cherry orchard killed by lightning; a horse dies; some of the help fail, fertilizers fail to fertilize; tools break down; markets are fickle; fashion for fruits can change, and there are days of sickness and bad weather. But seed time and harvest have their round and the large conditions of horticultural success are matters of experience. The whole problem is one of administration. And here are the "Don'ts" and the "Do's" which experience is ever ringing in our ears:

Feed your land, says Franklin (he said "Keep your shop") and your land will feed you.

Crop your land and you lose your crop.

A hard soil means a lean purse.

Humus in the land is money in the bank.

Labor is capital. Use labor well and your capital grows.

A weak plant is a perpetual loss.

Standard varieties fill the basket.

Let Governments and State Colleges experiment,—unless you are a millionaire.

Rule of thumb is the rule for losing.

The best farmer makes the best book on farming.

It is the pennies that count, not the dollars in discarded tools.

There are times not to do things.

Trim the plant when it is at rest; its work is to bear fruit.

Much trimming means quality of fruit.

Better trim with a pen-knife than an ax.

Don't wound the tree or the vine, no man can at the same time lie in hospital and do active service.

The most profitable labor is profiting by its labor.

The eye makes the package and the package makes the market.

Look out for the lean spots on the farm; one lean spot eats up seven fertile spots.

The land likes a mixed diet, but it must be fed.

The best market comes to the best farm.

The man who knows all about fruit raising has not yet been born.

Handsome fruit brings handsome profits.

Stones and culls in your package sell the other man's fruit.

The quality of your fruit reflects your own. The quality shows the willingness of the land.

Don't expect more from your fruit farm than you put into it.

Results.—Responding to care, a fruit farm located on the South Shore of Lake Erie, Erie County, Pa., shows:

Gross Returns.—$125 per acre, grapes; $400 per acre raspberries; $550 acre cherries (sour); $700 per acre goose berries; $600 per acre prunes; $350 per acre peaches. This means land at $1,500 to $12,000 per acre.

CONVERTING A RUN-DOWN FARM INTO A PAYING ORCHARD AND MARKET GARDEN

By HORACE ROBERTS, *Orchardist and Gardener, Moorestown, N. J.*

Members of the Pennsylvania Horticultural Society: Two weeks ago it was my privilge to attend the session of the New York Fruit Growers' Association, and after attending that meeting and hearing the New Yorkers speak of their own apples and their own barrels, I would be very doubtful about buying a New York barrel of apples without seeing the middle of the barrel. What do I find in a Pennsylvania program? I find on top, a law professor, Dr. Thorpe. In the bottom one of the best known investigators in the United States, Prof. Stewart, and in the middle of the barrel, a plain New Jersey farmer, not even a specialist. I realize I am the middle of the barrel, and Mr. President, as soon as it gets tiresome, cut me off and make room for Professor Stewart.

I will begin by telling you how I started taking up old farms then tell you what the farms have done for me and after that tell you of our system of management.

At 21 I rented the old homestead. I wanted to plant it in fruit at once but my father was older and wiser than I and quickly told me that to plant our cultivated land in orchard would for the time being cut my revenue off and that if I wanted land for fruit I must clear off more woodland. It was good advice to the boy but a death-blow to the timber. Where we cleared in the winter we would plant apples and peaches in the spring and then raise watermelons the first year between the trees. The next year we would plant sweet potatoes on that same ground and have a fresh tract cleared for young trees and watermelons. On virgin soil like that one crop of watermelons or sweet potatoes either is worth more than 50 years' growth of timber. Peach trees bear early and soon began to increase the income from the farm very much so that I had a little ready money. I then tried to buy the old farm but father said no. It was too big a thing, more than I would ever be able to pay for. No one member of his family need ever hope to own it all. As I could not buy the one I lived on, I bought an old neglected fruit farm, 7 miles from home, and farmed it in addition to my home farm. The year before I got it the fruit from that farm had averaged 10 cents a basket and the total revenue for the year had been $1,200. The first year as a result of trimming, spraying and fertilizing our apples on the new farm averaged 20 cents a basket and the farm sales were $1,900. The next year in spite of a severe hail storm our apples averaged 28 cents a basket—and the farm sales were about $3,000. The fourth year our apples averaged 40 cents a basket and the farm sales were over $6,000. All this time, the farm I lived on was also doing a little better each year so that I once more had some free money. By this time father had forgotten that no one of his sons could ever pay for the whole of the home farm and he sold it all to me. After making a settlement for the home farm (largely paper) I still had a little money left and I bought another right away. I engaged an old Irishman as foreman. I felt I could trust that Irishman to raise potatoes for me better than anything else. So we planted a great part of it in potatoes while we were getting it ready for fruit. We had a great crop of potatoes. The sales of the farm the first year were $4,100, the third year were $5,100 and last year the twelfth they were about $10,000 clear of commission. The other farms I have tackled have given me similar results.

How do we do it, simply by practicing intensive culture in an extensive way, by fertilizing, liming, draining and getting humus or life in the soil. We have taken all kinds of land, gravel, sand, clay and their combinations and we have found none that we have not been able to double the productive value of in 5 years or less. It has been our custom to take farms that were out of condition, whose reputation was poor and that other people did not want and after getting them develop them quickly in whatever direction we think them best adapted for. If it is wet we drain it. If it is too heavy and stiff, with lime, draining and cover crops we can soon make it more mellow. If it is too high and loose and inclines to blow away in the spring, by using lime and deeper plowing and keeping the land covered with something it soon gets the habit of lying still.

We believe in keeping the land busy. If you talk to a corn expert you will find he lays great stress upon early plowing and thor-

oughly working up the land several times before the corn is planted. We do this by putting a crop like peas, beans or onions that need lots of tillage ahead of the corn. In this way we get more corn than if we had not done the early farming, the first crop is extra. The same system is true of all such crops as tomatoes, melons and cabbages. Then after all these crops we use cover crops, to protect the soil during the winter and have it in the best condition in the spring. We try to be land builders not land robbers. Nor are we speculators nor boomers. We buy the farms low, they build themselves up and are revenue producers and we do not have to sell them, nor do we want to.

We find in most cases our New Jersey soil especially lacks lime. Nothing is so cheap as lime. We have long known the good results of lime on heavy land but the good effects of carbonate of lime on light land still astonishes us.

Now as to our method of farm management. It has been my custom when I get a farm to engage an ordinary farm hand as foreman by choice a man raised in my own neighborhood. I sort of take him as a partner and we run that farm together.

I pay him by the month, and he has charge of the men on that farm. In twenty years I have never had the first reason to suspect one of my foremen of dishonesty. When you see one of those men, you see a man who really feels he is doing it all. Why, they are so good and true to me, I don't know. I have very seldom had to change foremen; once or twice, but most of my farms have the original foremen on them; the man who started them is there yet. We get along nicely together. They always seem glad to see me come, and I am sure I am always glad to see them. Instead of being a worriment and a care, it is a pleasure to run these farms. A good many in this audience have come out there on the farm and tried to cheer me up a little, and I always enjoy having them.

On of the main things for a farmer is the sympathy of his own household. Now, let me tell you. The very first time I called on my wife—she had been a farmer's daughter and her father had moved into town—I asked her which she liked best. Your life or farm life? She told me farm life. Now, wasn't that encouraging? (Laughter.) That little woman would still tell you she likes farm life best. She generally goes around with me to these farms and is just as much interested as I am. My older boys are as enthusiastic as any farmers you ever saw. The oldest one is at Cornell studying agriculture. The next two will be somewhere studying agriculture next year. They are more enthusiastic than their father, and when they come back we will do still better. I have got a little red-headed boy at home so high. He wishes he could hurry up and grow big and learn how to farm.

My business has been developing these old farms. Instead of buying the high-priced land, I have bought them because they are cheap. I can see the possibilities in them. It is not what they are. It is what you can make them. You can do it out of the farm and do it at a profit, but times are changing. We have been doing this for twenty years. My neighbors are doing it and a lot of other things have come. First, stone roads, then rural delivery, then the telephone, so each farmer could get in touch with his commission man and know what stuff he gathered the day before sold for.

They do business on a better business basis. Times have changed. You have to find a man out of his head almost to have a farm change hands in our neighborhood. Farmers are prosperous. They have automobiles; they have steam-heated houses, and live as well as anybody. Sentiment is all right, but sentiment won't hold boys on the farm. But let me tell you, if you make your boys think that a farmer can make more money, have more fun, lay by a better competence for old age than any other line, you will put those boys in a state of mind that you cannot drive them off the farm with a club. You may think that is not true, but it is, and if you want to talk to real enthusiastic farmers, talk to my boys.

I don't care what kind of soil you have, you have to learn what it is good for, and then apply scientific business principles; we have great faith in the producing value of land and we are only beginning to appreciate our calling.

ESSENTIALS OF SPRAYING

By C. E. BASSETT, *Fennville, Mich.*

Spraying is of really modern origin, and its use has only been general practically during the time I have been interested in fruit growing. The matter of spraying is practically a fixed proposition. It is something I don't believe we are ever going to get along without. I believe it is something we are going to improve upon, and I believe, in a general way, that while spraying is a most expensive operation, it has paid us, outside of the known foes it has combated, in the improved condition of trees and vines and plants. I was rather startled this morning by the statement of Prof. Stewart. I think it was that he feared that spraying was of detrimental influence, had a bad effect. It is possible the chemist may analyze the work and state it has some injurious effect, but at any rate, we know in the cleaning up of our trees, as a result of spraying for San José scale, with lime and sulphur, we have certainly rid the trees of a condition or conditions that were quite disastrous. It is not possible, I believe, for scientists to tell us absolutely what we have destroyed. I try to get to the Department of Agriculture at Washington at least once a year and look over things there, to keep in touch with the improved methods of spraying, and so on, and I have often had it emphasized and brought close to my mind, that although scientists understand a great deal, the knowledge we have yet to gain is many, many times that we have already secured; that really science is an experimental state, and there are many lower forms of plant life which we classify as fungi, that we don't know and in cleaning up our trees with lime and sulphur as we have done for the scale, we have also destroyed certain conditions and have improved the general health of our trees by the application of these chemical sprays.

The success of spraying depends upon three things,—the use of the proper mixtures or the proper chemicals, at the proper time and in the proper way, and just what those proper things are is a difficult matter, perhaps, to absolutely say, but there is one thing that you and I must know first of all. I wish I could talk to some

of the people in the back forties, who are not here. I am talking to men who don't need this talk. I am going to start by saying that nine-tenths of the failures we find in spraying operations are due, first of all, to a lack of knowledge of what we are trying to do; what are the foes we are combating? A prominent man in my county, who had been a fruit grower more years than I am old, took up this matter of spraying, and talked it over with me, and with his friends and neighbors, and we in a general way tried to advise him. He bought a good outfit, and went after those particular pests that he had trouble with. He was trying to raise sweet cherries. He came to me with blood in his eye, for he was a quick-tempered man, and condemned the whole proposition, saying it was all tommy-rot, all foolishness. I asked him what the matter was. Shoving a branch under my nose, he said, "Well, look at that." I looked at it and recognized it as a case of cherry aphis—a little aphis, which you know attacks the foliage and causes it to curl up, and in that cluster of leaves the aphis does its work. He was condemning spraying because he applied the remedy which he said in this case was Bordeaux mixture and poison. As a matter of fact, Bordeaux mixture is a wonderful thing to destroy fungi, but is absolutely harmless as an application on such insect life; and even the poison wouldn't affect the aphis. We don't poison San José scale because the louse doesn't chew and swallow. We have to spray that with a spray that kills by contact, because, it is a different sort of creature. It is an insect which sucks, so we have to remember, among insects we have two classes of remedies, because we have two classes of insects. I am talking in the presence of men who are entomologists. The point I want to make is, that we must have a knowledge of the foes we are combating. That is the first knowledge we must have. This man tried with Bordeaux mixture to destroy a sucking insect —it wasn't the proper application.

The proper application at the proper time and in the proper manner. The proper time, my friends, is a stumbling block. It is easy enough to tell men when to spray to destroy San José scale. We can make almost a cast iron rule for that. We spray in the dormant period, and as far as the application, I don't think Pennsylvania and Michigan will disagree, because I think you have been brought up to use lime and sulphur, and while I don't wish to say oils and other remedies may not be equally as good, I still say from the experience we have had in Michigan, that lime and sulphur is a good friend, and a friend that should not be cast aside at present.

Now, further, from that, the proper time, there are certain things we spray for, when it is most difficult to tell the proper time, and especially in apple growing, in our section, is the exact time for spraying to catch the first brood of the codling moth. We have had in our section the advantage of having the United States Department of Agriculture man doing that laboratory work there for several years. Prof. Waite did his work there on the little peach, and Scott, Quaintance, Hammer and Hawkins, those men have all done grand work in our locality, and they have been of an immense amount of good to us. For instance, let me touch upon this question of spraying for the first brood of the codling moth. We know we want to spray the apple before the blossoms open, then after the calyx drops, but the exact time depends on something else, that is,

the time of the birth of this codling moth and the time of its action. In our section—we are located the same as your section at North East, and we are influenced by exactly the same weather conditions that Dr. Thorpe touched on this morning,—the matter of the lake being our protection, our cold storage and our supply of heat. Now, back from the lake six miles, where I am located, we have a different time of blossoming than they do right at the lake, more than you would imagine; sometimes fully a week's difference between the blossoming, and even the harvesting of some of our early fruit, like the strawberry. It stands to reason you have studied the history of the codling moth, the time of its appearance and disastrous work, would differ as regards locality and climatic conditions. This year we had an altogether longer period of blossoming than we have had in former years, and still it didn't correspond to the appearance of the codling moth. We naturally expect a forward season means a forward appearance of the codling moth, and I wonder, Prof. Surface, if you have noticed anything similar in Pennsylvania.

PROF. SURFACE: I consider there are some instances like that. I think the point is well taken. You cannot fix this time at which to spray. You must depend upon the season.

MR. BASSETT: We had Prof. Hammer, who worked with Prof. Johnson at North East, who was working the life history of the codling worm about eight miles from my home. We started to spray. Prof. Hammer knew it, and he telephoned up, "I think you are too early," so we desisted, and those who followed Prof. Hammer's advice this year had the best crop of apples, and I have no doubt that little bit of advice that Prof. Hammer gave us was worth $50,000 to that particular section.

PROF. SURFACE: What was the state or condition of the blossoms when you sprayed that you got the best results?

MR. BASSETT: A little later than we usually do. We want to be ahead of the closing of the calyx. We always supposed if we started when three-fourths of the petals had fallen, that was the right time, but this year he said he went to the cider mills and gathered up these codling moths, put them into boxes or wire nets right in the orchard, under natural conditions, and bred those. When they came forth, he knew they were coming forth in the orchard, because they were there in natural condition, so he could give us intelligent knowledge as to the exact time when they were coming out. Now, this is pretty difficult to do. I know in our state they advised the banding of the tree, and then watching the coming out of the codling moth from those old bands. We are trying to keep a scientific man there from the government, and hope to do so. But it is essential that this work should be done at the right time, not only the right material but the right time. The third element in this tripod of success is in the right manner, and there is where we often fall down. Now, nine-tenths of the men—and I am with the nine-tenths, who think they have done a good job—don't do a very good job after all. The oil is a good lazy man's spray, because if you don't cover the tree completely over with lime and sulphur, you haven't done the work, and the oil will do some of it, crawling for itself, but I don't suppose you are lazy men, so I am

not going to talk missible oil. The use of this material depends on its application to every affected spot, the very spot where it is liable to be affected, especially on the new growth, with the San José scale. In order to do the work in the right manner, you must have the right tools. I want to devote a little time to a discussion of what I consider are of the improvements in the machinery for spraying, because I think it is practical and because I think you are interested in that.

When we first started in the spraying operation, we had what you might call a common "squirt gun," and we shot the stuff right and left, wasteful to extravagance in the use of the material, and not always hitting all the parts that were to be treated. We went on from that to the use of other machinery, which were improvements. I have something like about twenty nozzles here, but cannot call your attention to all, but I want to call your attention to some of the more common, because they are spray nozzles of a type that is good. Here is a class of nozzles known as the Vermorel, which I believe did wonderful work, grand work. Here is a triple Vermorel and here is the double one to be attached. The Vermorel was a good nozzle, no question about it, and it is a good nozzle today for the man who wants to use it, but the average commercial orchardist wants something which will throw more material, and which doesn't have these protruding parts, which are almost sure to catch in the limbs of the large trees. Those are absolutely bad and those of you who have held the spray nozzle know it, because you ran that up into a tree to spray all the parts, and you have to be able to get them back without pulling very hard, because if you pull hard you are liable to get the thing out of order. These are also quite apt to clog. The aperture is very small and the capacity of the nozzle is limited. There has been a great change in the matter of machines for applying this spray. The old-fashioned hand pump was a crude affair, a common bucket pump, in some instances. From that we have developed a new pump, and I believe a man can raise as good fruit with the ordinary good improved hand pump as he can with any power pump that was ever made. He can do it, but the trouble is, he is not liable to do it. I know from experience that a person who stands and pumps and furnishes the elbow grease and the backache and the tired feeling that goes with the manipulation of a hand pump isn't going to stand there and give that tree all it needs. Sometimes he will think,—"I guess that has had all I care to fool with, and I will move on," whereas, if you can put that on with steam or gas or some traction power, whatever may be your best method, and not have to depend on your own muscle, you will stay until you have done a good job, so I say you had better have something to furnish the power, because the difference between a half job and a good job means the difference between failure and success and the difference in dollars and cents returned may mean even the price of a half dozen good power outfits in the course of one year. We have come to our changed styles of nozzles, partly because we have come to a changed condition and changer demand in our machinery. The large commercial orchardist today must get over a lot of ground. It has to be done promptly. This work isn't like a job of threshing, where you thresh for one man today and one man tomorrow. When we first started this power spraying, some one suggested we could buy one outfit for the neighborhood. That

seemed good, but when you stop to think that time is an essential element in this, instead of one doing the neighborhood job, you may have to have three or four to do one orchard job, and I say from experience, I believe that it does pay a man to invest good money in good machinery, and then take good care of it, and you will get it back in one year, two years or three years, and it will come back with good big rates of interest added to it. When we were spraying, and we had the idea with the hand pump that we were getting about 85 to 150 pounds pressure, and we judged that by the pain in our backs instead of any gauge on that machine to tell that, we thought we were doing something, and of course we used small nozzles, but as I say, when we came to the idea that we wanted more pressure in order to force that spray, a large amount of spray under heavy pressure, so as to force the poison into the calyx and also carry it to every part of the tree in a fine mist, it required more pressure than could be furnished by any man, and there came the question of a power sprayer.

We have changed to a number of other nozzles and attachments which are good. Here is a spray called the long distance spray. Some of you know its type. It had its use and is adjusted by simply sliding this piece of brass here. Here are two large apertures set at an angle. Here is a solid one, quite large, to make a solid stream, and the pioneer one over here, that did very well. We have also here a class of sprays, in which the one, called the Seneca, has one hole that strikes at a different angle on a spreader that will get rid of a lot of material. It does very well. We have men in our locality today that stand by the old McGowan nozzle and the old Bordeaux nozzle. Now we come to a different class, and without mentioning any others in particular, I want to touch upon a class which is more adapted to our present needs, especially to the man who uses a power sprayer. It is a class of disc nozzles, in which a whirling motion is given to the mixture by the way in which it enters this chamber. It either enters through two holes, at an angle, causing this spray to whirl, then passing it through a steel disc, the nozzle being made of brass, or some other lighter material, and causes a whirling motion and breaks up the spray into a very satisfactory spray. These sprays have been manufactured to answer a demand for a large capacity by a number of different manufacturers, and they are all more or less good. They are all built upon the same plan. I don't know whether there is any infringement in the matter of manufacture, but they are practically the same thing, except that this little piece in the centre which admits the mixture and causes it to rotate or whirl, is made of different styles.

Another point I tried to illustrate to you yesterday in that slide, where I showed a spraying apparatus throwing the spray down, as I said, it is impossible to throw down when you are below the point of application, unless you have a hook or angle in the nozzle that will cause that direction to be down, or in that general direction, so to meet that, the manufacturers have done two things, either one of which meets the trouble. They have placed the spray nozzle itself on an angle, and in that case we now have the possibility of throwing that spray down or, in fact, in any direction we see fit, In fact, by turning my bamboo rod, I can get any angle of application nearly as I want it. There is another way of applying that,

even if you use the straight nozzle; that is by using this bent crook, attaching this crook and then putting the nozzle onto the crook. You get the same effect. I want to show you now another nozzle. Most of you have had the experience of holding a heavy spray rod and a heavy brass nozzle at the point out at the end and have realized you wished you had something lighter, and that brought forth one that is made of aluminum. As a matter of fact, the importance of that aluminum is not as great in my mind as anther point. Those of you who have done very much spraying know this, that in spraying up high, you not only have the weight of the rod bearing down on your hand, but you have the reaction or the back pressure of that immense force that is going to force that out, but when spraying down you have just the opposite. You know you can hold a ten-foot rod in one hand like that, when spraying down because there is sufficient back pressure there to balance the weight of that rod, and you can hold it with one hand when spraying in that direction. When you turn it, you have the other way, not only the weight of the rod, but the back pressure pulling it down. There is another matter which I think is very important in the matter of appliance. In the days when you were satisfied with 85 or 100 pounds pressure, hose attachments were not important, because the pressure was not sufficiently great, and you could hold that hose upon the spindle very easily with the ordinary garden hose clamps. The important thing was to have a sufficiently long attachment, but now we have been using 200 pounds or more of spray, and you get it in the eye or down the neck when this thing breaks loose some day, and it will simply enforce upon you more clearly than I can the importance of having everything tight.

Answering the demand of the fruit growers, many of our best manufacturers of spraying machinery have manufactured something which is a big improvement, I think, over the common garden hose clamps. It is made of two cast brass clamps with two good, heavy screws to hold them together. Now, with a long nipple, with anything as long as that entering the hose, you see you have the full length for clamping, and this is something all ought to have.

Question: Doesn't that have to be made with a special coupling?

MR. BASSETT: Yes, the coupling has a shoulder. Those are certainly, I consider, one of the most important things.

Another thing which any of you who hold the nozzle and hold the spray will appreciate, is one of these drip guards, a rubber attachment which you slide on your bamboo pole, for the purpose of catching any drip. There ought not to be any drip, but lots of things occur that ought not to occur, and sometimes you will get some drip from the attachment. One of the advantages of these nozzles lies in the fact that they have a large capacity, do not often clog, because the hole is quite good size, and they certainly answer the purpose better than anything else that I know of. The advantage in this aluminum one is not alone in its being aluminum. The wearing parts are steel. The disc is backed by a rubber gasket, but the interior part is hard rubber. This part which causes the whirling motion is on the same plan as a turbine water wheel. The importance of that is not only its lightness, which I think is exaggerated, because, as I say, the reaction of the pressure will readily lift it, but

it has this great advantage of having a large capacity and at the same time being an anti-clogger.

One other matter is the matter of hose. The importance of that you will appreciate. You will have to pay a good price for hose that will stand 200 to 250 pounds pressure. I believe it pays to have sufficient hose. That depends, of course, upon your trees and how far you wish to spray. If you have perfectly level land, you might get along with two leads of 50 feet, but you want sufficient so you have no trouble, especially with a rod that is eight or ten feet long, you have to have plenty of hose, in order to manipulate it without trouble and kinking. I don't believe in buying the heaviest hose. We buy about a five-ply hose.

Another thing that is very important in this matter of machinery is the keeping of your machinery in proper condition. Every farmer should realize the importance of keeping the machinery on the farm in good condition, particularly hose, but remember this, most of the materials that we use are caustic or acid, or have a corroding influence. We always plan to go over our machinery and never put it under cover without going over all the brass parts and oiling them thoroughly and cleaning out the hose, although often when we do, the next spring it will not be in shape to use, but under heavy pressure they will sometimes give way. But above all things, if you invest $150 to $250 in a power outfit, or even in a hand outfit, if you invest $25, it will pay you not only for the life of the machine, but the ease with which you can keep it working. It is important that those parts be carefully cleaned and oiled, and when it goes in after the season's work, we spend a rainy day going over that machine and thoroughly cleaning it in every way. As to what machine, I have nothing to say. We are using in our locality thousands of machines, some purchased from manufacturers, and a large number that are assembled right on our own farm. While a one and one-half horse power engine will do the work, I think two and one-half is far better, because you have sufficient power; you will have no trouble, and it is not working the machine to its full capacity, which means wearing out. So if you are going to buy and assemble your own, or buy one manufactured by anybody, I prefer a two and one-half horse power gasoline engine, and then having the proper attachments. Of course, capacity in gasoline engines is more or less of an unknown quantity. You can figure steam engines, but a gasoline engine will develop anything from nothing up to quite a little. You cannot tell exactly where that is going to land.

I have rambled over this field in a general way, because while, as I say, I would like to talk to the other fellow, I don't believe you people need this talk, but I want you to look this up. Possibly you will take home to your neighbors some of the features presented here. I am sorry it is necessary for me to leave before your sessions are over. I have to be in Detroit tomorrow. I have certainly enjoyed very much meeting these friends, as I have in the past, and I trust some of you will come to Michigan.

SOME FRUIT INSECT PESTS AND THEIR TREATMENT

By MR. FRED JOHNSON, *Bureau of Entomology, Washington, D. C.*

The investigation of grape insect pests in Erie county, Pennsylvania, was undertaken at the request of vineyardists of that section in the spring of 1907 and this work has continued without interruption to the present time. For the past five years the Bureau of Entomology has had three men in the field during the season of insect activity. A part of this work was carried on in co-operation with the Pennsylvania State Department of Agriculture at Harrisburg which during the seasons of 1908 and 1909 sent a man to assist in carry out field experiments and demonstration work on the grape-root-worm and in addition bearing a part of the expense involved in this field work.

The insect which was occasioning genuine alarm to the vineyardists at the outset of this investigation was the grape-root-worm, Fidia viticida. The feeling of apprehension with which the grape growers viewed the inroads of this pest upon their vineyards was not without warrant for within the 15 years preseding this date the injuries of the grape-root-worm had reduced several hundred acres of vineyard in Ohio to an almost unprofitable state of production. It had also wrought a great deal of damage to the vineyards of Chautauqua county, N. Y. Although a great deal of experimental work had been undertaken against this insect by Prof. F. M. Webster in Ohio, Prof. M. V. Slingerland and Dr. E. P. Felt in New York there was still considerable uncertainty as to the most desirable and practicable methods of control.

The investigation was taken up by the Bureau of Entomology with a view to making a thorough study of the life history and habits of the insect and to ascertain and to demonstrate, if possible, the most practical methods of control. In order to obtain this data the investigation was carried on for a period of three consecutive seasons. During this time studies were made of the habits and transformation of the larva in the soil to determine the date at which the transformation to the pupa takes place, the length of the pupal stage, and the position of the pupae in the soil, for it is in this stage that many individuals may be destroyed by stirring the soil about the base of the vines either with a horse hoe or by hand. It was also important to know the time at which the beetles emerge from the soil and commence to feed upon the foliage of the vine since at this stage the insect is susceptible to treatment by the application of a poison spray to the foliage. It was further desirable to know approximately how many days the beetles feed upon the foliage before the females commenced to deposit eggs since the object of the poison spray application is to rid the vine of the beetles before the eggs are deposited. Our observations indicate that the females feed on the average about ten days before depositing eggs so that there is ample time to spray the vines with a poison if the vineyardist has his spraying equipment in readiness to make the application immediately after the appearance of the first beetles upon the vines.

The female deposits the eggs under the loose bark of the vines, usually upon the canes of the previous years' growth. The larvae hatching from these eggs drop to the ground, enter the soil, and feed upon the roots of the vine. It is upon the roots of the vine that this insect does the greatest damage. Unfortunately, however, no practical means have as yet been devised for the destruction of the larvae in the soil. Our investigations indicate that many of the pupae can be destroyed by stirring the soil about the vines. By far the most effective results were obtained, however, by the application of a poison spray consisting of three pounds of arsenate of lead to 50 gallons of Bordeaux mixture. The Bordeaux mixture is not applied as an insecticide but for black rot and other fungus diseases of the grape vine.

Many acres of vineyards were treated in the course of this investigation and vineyards which had been reduced to a condition of unprofitable crop yield were brought up to a state of profitable production by the control of this pest in the manner just mentioned. The results of this investigation of the grape-root-worm are embodied in Bulletin 89, of the Bureau of Entomology, Department of Agriculture, Washington, D. C.

Other insects in addition to the grape-root-worm were found infesting the vineyards, notably at this time the grape-berry-moth, Polychrosis viteana. This insect is destructive in the larval stage to the fruit and produces what the vineyardist knows as "wormy" grapes.

Injury by this pest is not general throughout the vineyards of Erie county, nor is it uniformly destructive even in individual vineyards. Frequently, only a few vines on the ends of rows or, a few rows along one side of a vineyard will be badly infested. The infestation becoming lighter toward the centre of the block while the opposite side of the vineyard may be almost entirely free of the pest.

The adult of this pest is a moth similar in appearance to the codling moth, but much smaller. These moths commence to emerge in spring just previous to the blossoming of the grape and deposit eggs on the unopened blossom clusters. The larva hatching from these eggs feed upon the opening blossoms and small berries, spinning a silken thread as they travel over the cluster, thus binding together the petals and stamens in a weblike mass which furnishes a retreat and shelter for the "worm." Where this early infestation is heavy these webs are readily observed. A study of the habits of this insect has shown that probably less than 25 per cent. of the first brood eggs are laid on the blossoms clusters since the emergence of the moth spreads over a long period during the spring. After the blossoms have fallen from the clusters the eggs are deposited on the small berries and the hatching larva feeds upon them.

While the berries are small a single worm may destroy several of them. Sometimes a larva will attack the stem of the cluster and boring into it will destroy a part of the cluster. Later, as the berries become larger the larva on hatching enters the berry and two or three berries at most furnish sufficient food for its development. When the larva is full grown it leaves the fruit and forms a pupa case upon the leaves of the vine in which it transforms to the moth.

During late July, August, and early September there is frequently a heavy deposition of eggs of the second brood. It is the larvae from the second brood eggs that are mainly responsible for injury to grapes just previous to the ripening period. In some instances where the infestation is very heavy the crop may be almost a total loss. Most of the larvae escape from the berries before the fruit is picked. Instead of making their cocoons on the leaves attached to the vines they drop to the ground and make them upon the few leaves that have fallen prematurely and have been held beneath the trellis either by sticking to the moist earth or by being held by weeds. Sometimes a dozen to thirty pupa cases may be found upon a single leaf plastered to the damp soil. In these leaves the insects pass the winter and from the over-wintering cocoons the moth emerges in the spring and deposits eggs on the blossom clusters and berries as described.

This insect has proved to be one of the most difficult pests of the grape to control. In field experiments conducted at North East, Pa., the most effective treatment has been the heavy application of a spray consisting of three pounds of arsenate of lead to 50 gallons of water driven forcibly into the grape clusters just previous to and again a few days after the grapes have blossomed. It is very necessary to curtail the development of larvae of the first brood since, later in the season as the berries increase in size the clusters become compact and the spray cannot be driven between the individual berries. In addition to this objection to poison applications for the second brood larvae, the poison leaves the ripened fruit discolored and in an undesirable condition for table use. Hand picking berries infested by the first brood larvae where limited areas are attacked will greatly lessen the number of the second brood. Since it has been ascertained that practically all of the overwintering insects pupate on a small percentage of leaves which have dropped prematurely beneath the vines, it has been suggested that an attempt be made to destroy these leaves, either by gathering them before the rest of the leaves have fallen from the vines, or by covering them with soil by turning a couple of furrows under the trellis before the remainder of the leaves have dropped.

The Grape-Blossom-Bud-Gnat, Contaria johnsoni, is an insect infesting the blossoms of grapes which has attracted more or less attention during the past few years in the vineyards of Erie county. Although quite generally scattered through the vineyards of the eastern portion of the township of North East, Pa., no instances have come under our observations where it has greatly lessened the crop yield. In Chautauqua county, N. Y., in one instance it has been very destructive to the crop on a small block of Moore's Early vines for several seasons.

During the past season it was very destructive on a number of small Concord vineyards in the vicinity of Sandusky, Ohio.

The adult insect is a small gnat which deposits its eggs in the blossom bud of the grape. The larvae, of which they may be from a dozen to fifty in a single bud, get their full development before the grape blossoms unfold. Infested buds are readily recognized since they are much larger than the normal buds making a more fleshy growth, and taking on a yellow or reddish color. The maggots working inside the blossom bud injure the ovary, thus preventing

fertilization. When full grown the maggots escape from the blossom buds and drop to the ground and enter the soil, where they remain until the following spring when the gnats emerge and deposit eggs in the blossom buds.

When a large number of the blossom buds in a cluster are infested the result is a very ragged cluster of fruit. Where the infestation is moderate, or light, sufficient berries persist to mature a well-developed cluster, as yet no effective means of control have been devised for this pest. During the past five years its injurious effect upon the grape crop of Erie county has not been marked. Yet it is so thoroughly disseminated through the vineyards that should conditions favor a great increase in numbers it may readily develop into a very serious pest.

The "Rose Chafer" Macrodactylus subspinosus is quite injurious in limited areas of vineyard on sandy soils along the lake shore of the township of North East, Pa. This insect is especially injurious to the Concord grape crop since in attacking this variety the insect does more of its feeding upon the blossom clusters and small berries than upon the foliage. Hence, even a moderate number of beetles infesting a vine may do a great amount of injury in a short time. Observations indicate that by far the greater part of the injury done just before and during the blossoming period of the grape vine. Ordinarily the beetles are present on the vines for only a short period. This makes it necessary for the grape grower whose vineyard is subject to attack by this pest to have his equipment in readiness as soon as the first rose-chafers appear upon the vines, for it frequently happens that they will swarm into a vineyard in large number in the course of a few hours.

In the course of our investigations upon this pest spraying experiments have been conducted for the past four seasons using five pounds of arsenate of lead to 50 gallons of water or Bordeaux mixture. In several of these experiments the results have been quite satisfactory. Observations indicate that arsenical poison applications to be effective against this pest must be very thorough and should be applied just before the beetles appear upon the vines in large numbers.

If the beetles are very numerous it is sometimes necessary to make repeated applications every day or two until the beetles disappear. In our spraying experiments of the past season a very marked decrease in the number of beetles was observed on vines sprayed June 5th and 7th. A count made on 50 vines on the sprayed plat showed 96 beetles as against 865 beetles on 50 vines in adjacent unsprayed plat. The result in crop yield in this experiment showed an increase of half a ton of grapes per acre on the sprayed plat.

Since it is desirable and necessary to spray most vineyards at the time of appearance of the rose-chafer beetles for other insect and fungus troubles there is no doubt that it is more economical and effective to resort to the spray method of control than to hand-pick the beetles. Although on limited areas and where spray apparatus is not available the latter method will greatly reduce the destructiveness of this pest.

The Grape-Leaf-Hopper. Typhlocyba comes. is another grape insect pest that has greatly increased in numbers and destructiveness in Erie county during the past three or four years. It is now

the most injurious insect to be found in the vineyards of that section. This insect injuries the grape vine by sucking the juice from the foliage. The winged adult "hoppers" winter to some extent among trash and rubbish present in vineyards, but by far the greater number of them migrate from the vineyards in the fall and hibernate beneath leaves and dense grass in adjoining wood lots, sod lands, and fence rows. When the grape vines unfold their leaves in the spring these winged adults return to the grape vines and after feeding for a few weeks deposit their eggs beneath the pubescence on the underside of the leaves.

The nymphs or young "hoppers" commence to appear on the underside of the leaves about the middle of June. Usually by the end of June they are present in large numbers varying in size from those just hatched to those with fully developed wing pads. It is in this nymphal stage that this pest may be most successfully controlled by the application of a contact spray. Since the insect obtains its foods by inserting its proboscis into the tissue of the leaf and sucking the juices therefrom, poison applications to the surface of the foliage are of no avail. The nymphs must be actually hit and covered by some spray substance which will cause death by contact.

In a number of field experiments which have been conducted in the township of North East, Pa., during the past two years, the tobacco extracts, such as Black leaf extract and a more concentrated form of Black Leaf 40, have given very satisfactory results. The chief requisites for success being that the applications be made before nymphs have changed to the winged or adult form, and that the under side of practically all the infested leaves be made thoroughly wet by the spray.

The Black Leaf Extract was found to be effective at a dilution of 1 to 150 parts of water and the Black Leaf 40 at a dilution of 1 to 1,500 parts of water. All of the applications were made by the "trailer" method. That is, a man operates a nozzle by hand to apply the spray to the underside of the grape foliage. This nozzle throws the spray upward by being set at right angles to a short rod held by the operator and is connected to the spray pump by means of about 20 feet of trailing hose. The spray is applied to the underside of the leaves by thrusting the nozzle into the foliage upon the trellis by a series of rapid movements on the part of the operator.

Effective results have been obtained by several types of sprayer. For economy and expedition, however, a pressure of not less than 100 pounds should be available. Although effective work can be done at even a lower pressure. With high power outfits two leads of hose can be operated thus greatly expediting the work. With a single lead of hose from 2½ to 3 acres of vineyards per day can be covered. With two leads this area can be about doubled. The amount of liquid applied varies from 175 gallons to 275 gallons per acre depending on the density of the foliage to be sprayed.

The total cost of labor and material varied from about $3.00 to $5.00 per acre according to the amount of liquid applied and the efficiency of the machinery employed. The net benefit in several of these experiments varied from $9.00 to $17.00 per acre in the increased yield of grapes as the result of one application for a single season.

This, however, by no means represents the total benefit derived from the control of this pest. For where the insect is controlled by this spray method the foliage continues healthy and a thrifty and hardy cane growth results, which withstands the severity of the winter, and is thus in condition to produce a good, or even increased crop, the following season.

This is illustrated by the results secured in an experiment covering two consecutive seasons. A portion of a vineyard upon which this experiment was conducted had been badly infested for several years and the vines were much weakened as a result.

The yield on this block of vineyard was as follows: In 1909, before spraying commenced, 262 baskets per acre; 1910, after one spraying, 423 baskets per acre; 1911, after one spraying, 796 baskets per acre.

These results show a yield three times as great at the end of the experiment as at the beginning.

The favorable results obtained in this effort to control this pest by the tobacco spray has attracted considerable attention in the vicinity of North East, Pa., and should the insect appear in injurious numbers during the coming season a much greater number of vineyardists are planning to resort to this method of control.

SOME IMPORTANT DISEASES OF APPLES AND PEACHES

By H. R. FULTON

Out of the numerous diseases that affect these two important fruit crops, more or less seriously, we must, because of limited time, speak rather briefly of the most important only. Most of them are old and familiar foes. However, I shall take the risk of reintroducing them because they sometimes bob up unexpectedly and we ought to be able to recognize them, as well as know what to do to prevent them.

Apple Scab is best known on the fruit; but it may be found on upper and lower surfaces of leaves, producing indefinite, circular, sooty spots of large size, or on the fruit spurs, or on the flower or fruit stalks, in the latter case interfering with the proper setting of the crop. When leaves are much affected, they curl and dry and fall, and always then is the interference with proper leaf function ing. The fruit is disfigured, or deformed, according to the earliness and amount of scab infection, and is inferior in keeping quality.

The earliest infection is during a period of several weeks beginning at blossoming time, and is caused by a particular type of reproductive body or spore, produced in large numbers at this time of year in fallen leaves that were infested the previous season by the Scab fungus, it having survived the winter in such decaying leaves. These spores cause no harm unless they reach susceptible apple parts, and this means a susceptible variety, and usually a young stage in development of leaf or fruit. Furthermore, the spores after reaching susceptible parts of the apple do not cause infection unless the weather conditions are favorable to the germination and development of the scab fungus. Moist and somewhat cool weather favor this, and such conditions prevailing even in midseason may some-

times result in a considerable spread of Scab even after the apple is past its most susceptible stage of development. Such late infection comes from the new crop of summer spores formed on leaves or fruit infected earlier in the season. Fortunately in Pennsylvania we suffer less from Scab than do sections northward and westward. This is due, I surmise, to differences in climatic conditions, and to the fact that many of our commercial varieties, such as Grimes Golden, York Imperial, Ben Davis, Jonathan, etc., are naturally less susceptible to scab than certain varieties extensively grown elsewhere.

We thus see that for Scab to develop three general conditions must be met (1) There must be present the living spores or reproductive parts of the fungus; (2) these must reach susceptible parts of its proper host plant, the apple, and (3) the general environmental conditions must be favorable to the development of the fungus plant. These same general conditions must be met whenever any of our crop plants falls a victim to any fungus disease. Effective and economical control of any fungus disease must take into account the peculiarities of parasite and host with reference to these three conditions. The devising of particular methods, and their most successful application will depend on intimate knowledge of all these factors, which usually requires close study by the specialist.

In the case of Scab, it has proven possible, by burning the old leaves, or by turning them under before blossoming time, to eliminate the source of early infection thoroughly enough for the control of the disease; but this means is hardly practicable for general use. And so we resort to protecting the susceptible parts during the period when conditions are likely to be favorable to infection, with a spray mixture that is unfavorable to the development of such spores as may reach the parts. The life history of the fungus and experience shows that, on varieties highly susceptible to scab, in districts where scab prevails greatly, the first application should be made just before the blossoms open. In Pennsylvania, for most varieties and sections, and in an average season, it is sufficient to begin with the second application of the full treatment, made just after the petals fall, with the addition of arsenical poison for the codling moth. It is advisable to follow this with another application two weeks later. Lime-sulphur at a strength of 1.008 specific gravity, or Bordeaux mixture, 3-3-50, is a satisfactory material to use for this purpose. In considering fungicides, let us remember that the prime requisite is effectiveness for the intended purpose, which can be determined only after repeated trials under a variety of conditions and will vary for different fungi; closely second is non-injuriousness to the crop; and at a greater distance are such considerations as cost of materials and convenience, which, because they are apt to impress us more immediately, sometimes influence us too much. Bordeaux mixture is generally more effective than the lime-sulphur preparations, but it sometimes injures certain varieties of apples, while on others it is safe.

Apple Sooty Mold and Fly Speck, probably two stages of the same fungus, are characterized by irregular, sooty, black blotches that may run together, and by clusters of dots resembling fly specks. They develop superficially on the skin of the apple and may be

easily rubbed off, but the disfigurement detracts from the market value of the apples. They may develop at any time from June to the end of the season when moisture conditions favor. The best control is from spraying begun as directed for Scab, and repeated later in the season, during the first half of July. Thick tops and moist situations, by hindering the rapid drying of the surface of apples favor infection. Selection of a proper situation for the trees, and proper pruning are important control measures.

Apple Leaf Spots are of several different kinds, caused by as many distinct fungi. All of them interefere, in proportion to their abundance, with leaf activities, which means with proper nutrition, and affected trees suffer more or less from retarded twig and limb growth, poor development of fruit, and of fruit buds. The Scab Leaf Spot has been referred to. Another that attacks very young leaves early in the season, is the Orange Rust or Cedar Rust Leaf Spot. The fungus also infects the fruit, usually at the apex, producing rough areas with a yellowish cast. On the leaves the spots are also orange yellow to brownish yellow, and later develop a rough raised cushion on the under side. This fungus passes another stage of its existence on the red cedar, producing the swellings we know as "cedar-apples." Apple leaves and fruit are always infected by spores from such a source. Unless there is wet weather continuously for about three days at the time when the apple leaves and fruit are young and tender, there will be little or no infection even though neighboring cedars are affected with the fungus. But the safe precaution to take is to remove, in as far as may be possible, red cedar trees from the vicinity of the orchard. Here, again, varieties differ much in their susceptibility. Spraying may be effective if properly timed; but is difficult to predict, in this case, the times when conditions will favor infection, and spraying has often failed.

Probably the most widespread type of Leaf Spot is the type commonly known as Frog Eye Leaf Spot, caused by the fungus that produces Black Rot of fruit, as well as a common type of limb canker. Abundant leaf infection, usually accompanied by too early defoliation, causes poor nutrition with weakened growth and poor development of fruit buds. It should be guarded against in off years as well as in bearing years. It may develop after the protection afforded by the early scab sprayings has worn off, and to insure its control, a later application or two should be made early in July. It is important to keep the Black Rot Cankers, that serve as a source of contagion, cut out of the trees.

The July spraying will control the Fruit Spot of apple, which is caused by a fungus, and is characterized by rather definite, small, brown, dead areas in the skin, with the flesh discolored only a little way underneath. At first such spots are merely a more intense green or red than the normal skin. This particular trouble, which attacks Baldwin, Belleflower and a large variety of apples as well as the Quince, must not be confused with another trouble of Baldwin and others known distinctively as Fruit Pit, or perhaps more usually as Baldwin Spot, although this last name is sometimes used loosely for the Fruit Spot. This Fruit Pit is not caused by a fungus, but is probably due to deficiency in proper water suppy, or to sudden change from periods of rapid growth to periods of retarded growth

of the fruit. The spots here are larger and less definitely bounded than Fruit Spot, are more sunken, suggesting finger print bruises; the deadened tissue usually extends deeply into the flesh and is rather dry and spongy, and there may be discolored areas as well toward the interior of the flesh. It cannot be controlled by spraying, and the only suggestion that can be made is to practice a system of cultivation that will tend to equalize soil moisture conditions as much as may be.

Two other diseases that can be controlled by midsummer spraying are Bitter Rot and Blotch, both of which, fortunately, are as yet of rare occurence in Pennsylvania. But we must be on the alert, lest they gain a foothold unnoticed. Both require midsummer or later spray applications, and for them, Bordeaux mixture gives decidedly better results than lime-sulphur preparations, and should by all means be used where these diseases are to be combated.

There are several Ripe Rots of fruit that midsummer spraying tends to check, although control of insects and care in handling are of prime importance in their prevention. There is good evidence that the keeping quality of apples is increased by spray treatment in midsummer.

Several fungous diseases of limbs, twigs or trunk, such as Twig Blight and Blight Canker, Black Rot Canker, Collar Rot and Root Rot, cannot be directly controlled by spraying, although the use of these disinfecting materials, or other stronger ones, may be helpful. The most important thing for these is to watch closely and recognize the trouble early; to remove the affected parts promptly and thoroughly so that they may not spread farther on the same tree or to other trees; and to protect all wounds made in the operation against possibilities of later infection by swabbing them with a good disinfectant, such as 1 to 1,000 corrosive sublimate, and painting the larger ones with asphaltum or pure lead and raw oil paint. Large and valuable limbs may be lost from infection that has extended down a watersprout or fruit spur, when early removal of these last would have prevented the loss.

Last year I spoke to this Association about the trouble known as Apple Collar Rot. Continued attention has been given since then to the question of its causation and cure. I have seen cases of this sort of general trouble that could apparently be attributed to such causes as freezing, improper use of paint on trunks, borer attack, attack by the Blight bacterium, by the Black Rot fungus, by the Amillaria Root Rot fungus, and by the Schizophyllum Wood Rot fungus; but when all is said, there remain a majority of cases for which I have not yet been able to satisfactorily account. This work will be continued until we do reach some conclusion in the matter. Meanwhile, I am more than ever sure that these cases of Collar Rot require prompt and careful individual attention at an early stage, in the way of cutting away affected bark to a clean-cut, living edge, disinfecting the wound with corrosive sublimate or other good disinfectant, painting with asphaltum or coal tar or paint, and in severe cases covering the denuded area with a sheet of grafting wax to prevent drying and promote healing. The affected trees should be pruned to reduce leafage, and they should not be allowed to carry a full crop of fruit for a year or two, while the root-system is re-

establishing itself. Attention should be given to conservation of soil moisture in dry weather by shallow cultivation or by mulching; and the soil should be of the best possible texture and fertility.

I have left for the last the emphasizing of general sanitation in the apple orchard, because it enters more or less into the control of all these apple diseases. It means keeping at a minimum the sources of contagion, and at a maximum the general well-being of the trees. And this means such things as cleaning up waste fruit, cutting out useless limbs, making way with worthless wayside trees, avoiding injuries and bruises on roots or trunks or limbs, skill in pruning, and the constant practice of such general good care as will make for the vigor and healthfulness and fruitfulness of the orchard.

Spraying, we may think, is a necessary evil. The profitableness of any spray application will depend (1) on the presence in the particular locality of the disease or diseases which it is especially designed to combat; (2) on the susceptibility of the variety to the disease; (3) on the general seasonal and other conditions that influences infection; (4) on care in selection and application of the spray material. For example, it would be manifestly unwise to spray for Bitter Rot where it does not exist, or on a particular variety of apple that is immune to it, or with a material that will not give the protection desired; if we could only foresee the kind of season, and be able to predict the occurrence or non-occurrence of our enemies, fortunate indeed would we be.

Most of the disease I have discussed do occur throughout Pennsylvania. It is for the grower to study his varieties and local conditions with reference to adopting the most economical and profitable means of prevention; and it is in these days for specialists to cooperate with growers in devising and putting into practice the most effective measures.

The most important peach diseases are Yellows, Leaf Curl, Black Spot or Scab, and Brown Rot.

The symptoms of Yellows are ripening of fruit a few days to several weeks ahead of the normal time for the variety which premature fruit is insipid, with perhaps red splotches on the surface or streaks through the flesh; premature development of leaf buds, giving slender pale shoots, or branched broomlike growths and abnormal development of leaves so that they are narrow and yellowish green, inclined to curl. The disease develops slowly and is hard to diagnose from any one symptom. It must not be confused with yellowed foliage resulting from such things as poor drainage, thin soil, winter injury or borer attack. As soon as Yellows can be identified, the affected tree should be marked for early removal and destruction. It is worthless and may prove a menace to others. Peach trees may be reset in places from which affected trees have been removed. Care should be exercised to get nursery stock free from danger of Yellows infection.

In Peach Leaf Curl the growing leaves show very decided distortions in the form of puckerings, and the color of affected parts becomes reddish or yellowish. Affected leaves may fall in June. Trees suffer in wood growth and in fruit bearing from interference with leaf activities. The fungus seems to be carried over winter by spores that lodge between bud scales, or in other protected places,

and the very young leaves become infected, if weather favors, just as they are bursting from the leaf buds. The disease can be controlled by spraying the trees with a good fungicide before the buds swell. Where Scale is to be combated, the strong lime-sulphur, 1.03 specific gravity, used for this purpose will control the Leaf Curl if applied at the time indicated. If it is not necessary to spray for Scale, economy in materials, and as good results, can be secured by diluting to 1.02 sp. gr.; or Bordeaux mixture, 3-3-50 can be used.

Peach Scab or Black Spot is characterized by small dark spots on the fruit. When numerous, they coalesce to form a black area, under which the flesh is hard and insipid, and often traversed by cracks. The trouble is worse in moist than in dry situations and seasons, and on late than on early peaches.

Peach Brown Rot causes the familiar rot of peaches usually as they approach maturity; and at times it attacks new wood growth, producing Twig Blight. It is greatly favored by warm, moist weather. The old brown rotted peach mummies of the preceding year are the common source of new infection, although the ability of the fungus to attack cherries and plums and other fruits, gives a good chance for the spores to become widely distributed before the peach season begins. This rot and Peach Scab can be controlled best by using the self-boiled lime-sulphur preparation, devised by W. M. Scott and made by stirring in sifted sulphur with slaking lime so that the heat developed in slaking will do all the cooking. The proportion to use is 8 pounds of sulphur and 8 pounds of best stone lime to 50 gallons of water. Only enough water is added at first to cause even slaking, and the necessary cold water is added immediately afterwards, so that the cooking will not be too prolonged. No artificial heat is used. This self-boiled preparation is applied to medium maturing varieties of peach (1) four weeks after the petals fall, and (2) four or five weeks before the variety is expected to ripen. The first application should contain arsenate of lead, 2 pounds to 50 gallons, for curculio, and the second should be applied lightly and as a fine mist to avoid coating the fruit with a heavy sediment that may not weather off before marketing. Late varieties in seasons favorable for rot, may require an application between (1) and (2); and on early varieties (2) should be omitted. Concentrated lime-sulphur, diluted to 1.003 or 1.002, avoids the staining of fruit, but is less effective, and there is some risk of leaf injury from its use.

BERRIES

By MR. HORACE ROBERTS

Gentlemen of the Horticultural Society:—If yesterday morning you had me in the middle of the barrel, this morning I was booked to come between the Law and Gospel, Professor Surface and Mr. Hale. I will talk to you first about blackberries. I have raised them

somewhat, and I always had a desire to have more blackberries. Once in a while you see a patch thoroughly healthy, paying three or five hundred dollars an acre. You go home admiring that patch, and you think you want some. A few years ago I actually bought a poor, old farm, with the idea of planting it in blackberries, but after getting it, I started to put out a peach orchard, and when I got the peach orchard all out, there wasn't an acre left for blackberries. I haven't trusted myself since then to buy any more blackberry land.

Now, as for raspberries; that is a nice crop, a crop that pays well, and I hope to plant more of them. In our section we raise the Welsh. It is a productive, hardy variety that yields well and is a good shipper. It is a local variety, and our berry men are almost exclusively sticking to that one variety. It just satisfies us.

Now, for gooseberries. A few years ago they passed a pure food law that meant where they served a syrup in soda water fountains, it must be pure fruit juice, and the gooseberries being sour, are exactly the kind of fruit they wanted, and right away the price of gooseberries went up, and the men who were lucky enough to own a gooseberry patch of even a few acres, had a bonanza. The men of our neighborhood that had gooseberry patches were the first to own automobiles. Two or three years ago I got close enough to one of them to get him to tell me just what he got for his gooseberries. He had two acres, and they netted him $2,600. The future of the gooseberry is something we are not quite sure of. Our only market is the canners. They take the juice out. How soon they will be supplied we cannot tell. The price is still very high. Each year we expect it to drop a little, but it don't, and they are still reaping wonderful profits from gooseberries. It may be supplied next year or year after, but the rate they are returning per acre is simply astounding.

Question: How long does it take to raise them?

MR. ROBERTS: Oh, they get right to business; bear some second year; in three or four years get to their height. They are very easily raised, easily gathered. You have a couple of weeks to market them in. It is one of the ideal crops. The canners are the only market and when they get an oversupply, they will put the price down.

Question: What variety did you use?

MR. ROBERTS: Houghton and Downing. The canners want a sour berry. The Downing is not quite sour enough, but if you have the Houghton too, they will take a lot of them. The ones that bring in the dollars and cents are the Houghton and Downing. You can sell them by the car load as fast you can produce them. The canners have not been supplied. You could sell them if you had them in quantities.

Question: You would have to ship them away from these markets here?

MR. ROBERTS: It is no further from Pittsburg to Baltimore than it is from our section of Jersey. I cannot guarantee the future

of the gooseberry business, but I have just planted quite a patch of them. The prices we are getting is absolutely ridiculous, but if we had to put them on the market, a few would go a good ways. It takes a lot for the canners. How much it will take in the future, you don't know and I don't know. But anyhow, we have enough faith to keep on planting.

Now, I will take up the strawberry, and when I get to strawberries, I am right at home. We have 68 acres to pick this year, and will have more next year. As for planting, we plant them just as soon as we can in the spring. Early planting is an important matter. When I planted my berries last year, the ground would be frozen an inch or two in the morning. If it thawed at eight o'clock, we would start to plant, and plant for the rest of the day. Some of my neighbors laughed at me, but before the season was over, we had a dry spell and they had trouble getting their plants to live.

As for planting, the best method we have found is to make out the rows with a corn planter. It marks out two rows at once and the furrower leaves the ground in nice order to get the roots in well. We like to put a crop in between the rows of plants when we set them; for instance, a crop of peas. We put the berries five feet apart. The peas get out of the way, and it helps to pay the expense of farming the first year. One thing you must be careful of, the planting of those berries. It is not worth while to replant them. If you take the proper pains in setting, you won't lose one in a thousand. Get the roots down well, if it does take a little longer it is not waste time.

A word as to fertilization. I have tried various fertilization for berries at time of planting and whenever I put a commercial fertilizer on them, I get stuck. It is pretty sure to interfere with the berries. We take fairly good land and plant the berries. After we get them planted, we put half a ton of ground bone to the acre. That is the only place I use bone. There is nothing in it to hurt the berries, and it is on top of the ground, and we like it. A little later in the season, we put on 500 pounds of tankage.

Question: How do you raise them, in rows or in hills?

MR. ROBERTS: We set them in rows. We farm the berries well, keep them thoroughly tilled. A weeder we find is a big help. It saves hoeing. We take out a tooth, so we can keep the weeder close up to them without hurting them. About the first of June we plant tomatoes right in the berry rows, so by August I can tell people that is my strawberry patch, but it looks like a tomato patch. Between every other hill of strawberries we plant a tomato. That may look like vandalism, but it protects them during the hot weather of August. It keeps them from getting too thick, and we get the finest kind of tomatoes, often get a hundred dollars an acre for our tomatoes, and we don't find it interferes with the berries.

Another thing, any man that raises tomatoes for market, soon learns to make it pay, he must spray them thoroughly, and while spraying those tomatoes, we are spraying the strawberries, too. We do that two or three times, and our strawberries go into the winter quarters in fine shape.

Question: Do you never have to thin any?

MR. ROBERTS: Not very much; the tomatoes, in a measure, keep them from getting too thick. We are not bothered much with their getting too thick. The strawberries run under the tomato vines better than you think.

Question: What strength do you spray those tomatoes?

MR. ROBERTS: Just ordinary orchard strength, one gallon commercial lime-sulphur to thirty gallons water, two pounds arsenate of lead to fifty gallons of water.

Our best market for berries is the exchange, and in dealing with the exchange, we have learned a few things. All my neighbors raise them largely, as I do, and if all shipped to the Philadelphia market, we would glut the market. So we built up an exchange there. We have sold from Moorestown alone, $100,000 worth of berries outside of what went to Philadelphia. In raising for the exchange, we want to raise a good shipping berry. For instance, we use the Superior. That is not a big berry; not particularly a high-priced berry. It is a little the same as the Gandy. It is a wonderful grower, a good shipper, a little small, may not bring quite the price some of the others do, but it is a money maker. Then the Gandy is a standby, but it doesn't give us quite enough berries. The Stephen's Late Champion is a little soft. We are looking toward the Bethel as a good variety, but that is a new one. I will tell you why we stick to those three berries, the Superior, the Champion and the Gandy—those berries are sold by our manager and sold ahead. If he has a car of Superiors, see what nice shape he is in. It is a whole lot easier to sell it than if it is a mixed car. He can sell it and do it easier. When we send a shipment into the exchange and they are busy—they sell may be fifteen cans from ten o'clock in the morning to three in the afternoon,—if we send a mixed lot, three or four kinds of berries on one wagon, those busy men don't have time to separate them. They put them in the mixed car, and they are all consigned to New York. We get more money for the berries sold at our station than where they are consigned. So we are learning to plant a few varieties, study those and develop them up to their very best, it pays us better to specialize. We try experiments, but for a business proposition, we stick to a very few varieties.

THE FIRST FIVE YEARS IN THE ORCHARD

By PROF. H. A. SURFACE, *Economic Zoologist, Harrisburg, Pa.*

(This address was illustrated by Prof. Surface with illustrations from photographs taken chiefly in his own orchards, and the following article is not a verbatim report of his remarks, but an abstract giving some of the main points set forth by the illustrations and the address.)

The question is often asked "Is orchard planting being overdone?" In answer to this it must be said that it depends upon the planter. If he be a man who knows his subject and has proven that he is competent to produce first-class fruits and eliminate the culls and low grade fruit, and to place these fine fruits on the market in perfect condition, he can safely plant as much as he can care for,—which, however, will not be nearly as much as most persons now appear to think. It is undoubtedly true that there is, and will continue to be much more profit in a comparatively small orchard well kept and producing fancy fruits, which can be sold at a high price, than in a large orchard, poorly kept, producing only ordinary fruits, which must compete with many other fruits of the same kind and must be sold at a low and often losing price.

The great need of the orchardist of this country is to place quality before quantity, and no man's success should be measured by the number of trees he grows, nor by the number of bushels he produces, but by the quality of his fruit. Too many persons think that it is easy to put a tree in the ground and go to it in a few years and find it productive of fine fruit. This is the most serious mistake being made by the planters in this region. To produce good fruits at a profit demands proper care from the time the soil is selected until the fruit is placed on the market. There may be questions occasionally which the grower may need to ask of the expert, and in this capacity the expert consultant can render valuable service, but there is no man, however, expert, who can tell the inexperienced grower what to do in every detail to produce satisfactory results. The person who thinks he can depend entirely upon the instructions given him by some official or expert who may be willing to give all aid within his power, will find that there are many unexpected conditions or problems arising which must be mastered only by the person on the spot, who understands the situation and can handle it immediately.

Many persons apparently believe it possible to plant an orchard, hire a man to conduct it, and expect profits in the course of time. This is also a mistake. If a man is able to grow an orchard for another man he is able to do this for himself, and he will do so and have the benefits of it. If the land owner is not able to direct the details of his orchard management he will find that he was overplanted, even though he has planted but a few trees. The conditions for success are such that the owner must help with the work himself or let his shadow fall on those who do it. Stories of disastrous failure are already being told, and these will increase in the future by those who, at present, have the planting fever developed to such an extent. However, there is such a thing as "ague in horticulture." While planters have the heated head during one season they may get "cold feet" at another. This, of course, applies to the man who has not spent years in studying his subject and in practicing what he has learned. The man who knows the subject and knows that he can produce a good article, is justified in gradually planting as much as he can give proper attention but no more.

It would be far better for the quality of fruit produced in Pennsylvania, and consequently for the reputation and final price of our fruits, if the planting were done more slowly and gradually, and if

the planters would learn the art of producing fruits of quality by placing quality before quantity. The great need of the fruits of this country is a reputation, such as the best of them deserve. To obtain this, seconds and culls should be eliminated. To do this again requires expert knowledge skilfully applied. No man should plant extensively until he is satisfied that he has such knowledge or is determined to acquire it immediately by application in hard labor, both mental and physical. Fruit growing is no sinecure for either the head or the hand. A beautiful apple has demanded the application of both brains and muscle for its production, and "plenty of money" to put into the business cannot possibly be made to take the place of these.

For the production of such fruits as we should grow in this region several elements are necessary, but the first is a well grown tree of the proper variety. During the first five or ten years the orchardist should devote his attention to growing good, large, healthy trees rather than attempting to grow crops between his trees or forcing them to bear young. It is true that the more vigorously a tree grows the later will it come into bearing, but at the same time it is true that it will be forming a large top which will give a greater quantity of fruit, and within a few years will be yielding a far greater income than will be obtained from a stunted tree which commences to bear remarkably early. The more a tree is neglected and injured by borers, skinning with farm implements and otherwise, the earlier will it commence to bear; but bearing while young means limiting its growth, reducing its vitality, and shortening its life. There is no profit in attempting to produce large crops on very young trees. The purpose of the orchardist should be to grow good-sized, well-shaped trees before the time for them to commence to bear, and then change his methods of cultivating, fertilizing and pruning to such an extent that they will afterward devote their energy to bearing fruit instead of producing wood.

Keeping in mind that the purpose of orchard growing during the first five to ten years is to produce fruit, we may, however, at the same time grow certain crops between the trees without injury to them, and if the tree row itself is properly cultivated, and the intercrop receives the right kind of cultivation, this may really be the best treatment for the orchard and can give returns for helping to meet the expenses of tree-growing, which so few persons reckon with before planting. These annual expenses before the trees come into bearing are indeed heavy, as they include the cost of such operations as pruning, spraying, fertilizing and cultivating, and generally continued without income from the trees just about twice as long as most planters believe at the time of planting.

During the first three years in the orchard any cultivated crop can be grown between the trees (peach) with successful results if properly fed and cultivated. Between apple trees they can be continued twice as long. The best of such crops are those in which the cultivation ends by mid-summer and which can thus be followed by crimson clover to grow and remain on the ground as a winter cover crop, to be turned under the next spring. Among these are early cabbage, peas, beans, sweet corn, tomatoes, early potatoes, etc. One large orchardist in the State of New York makes a business of growing soup beans in his orchard and considers it very successful.

It must be remembered that the bean is a legume and has the power of enriching the soil. The more of any legume that is grown in the proper manner in any ground the richer in the fertilizing element of nitrogen does that soil become. This is one reason why beans, peas, cow peas, soy beans, etc., and clovers of different kinds are used in maintaining soil fertility.

One of the largest orchardists of this State regularly grows field corn between his trees the first year. It is a good plan to follow this with crimson clover sowed at the time of the last working of the corn. There are orchards in this vicinity that show the beneficial effects of this method.

Potatoes can be grown between the trees, but the chief objection that has been offered to the growing of potatoes is that it is often not until fall that they can be raised from the ground, and digging them results in the same conditions as late cultivation for the trees, which means increased growth of the trees in the late fall, after which they are more liable to be injured by winter freezing. Actual conditions of orchards in this region at the present time show that there is justifiable foundation for this theory. When potatoes are used as the intercrop it is advisable to harrow the ground immediately upon raising them and seed it with rye and winter vetch to remain as a cover crop on the soil during the winter, to be turned down in the spring as a fertilizer.

An apple orchard can be intercropped a greater number of years than a peach orchard. Crops should be grown between peach trees not more than three years, while between apple trees they can be continued for five or six years. Under certain conditions as to sufficient moisture and fertility a cereal crop can be drilled in strips between the trees if the tree row itself is kept cultivated. The speaker has done this successfully in some of his own orchards. If however, the season is dry and the trees reach fair size, there is danger that the cereal crop growing between the rows may take too much of the moisture from the ground and thus injure the trees. Just as soon as it is seen that this condition is approaching the cereal should be turned down and used as a soil fertilizing crop, and the moisture should be preserved by frequent cultivation.

After the orchard becomes sufficiently advanced that the owner does not grow crops between the trees it is best to cultivate by clean cultivation until mid-summer and then sow a cover crop of crimson clover, or some other cover crop containing or mixed with a legume, to remain during fall and winter growing fertility, preventing washing, covering the roots of the trees, and giving other benefits from such crop.

In plowing the ground in the spring it is best to use a one-horse turning plow, commonly called a "bar-share," for plowing two or three rounds nearest the trees. There are several advantages in a one-horse plow in turning the soil near the tree rows. For this purpose one can get nearer the tree without injuring them, and plow shallow, and can control the plow better than with a two-horse plow. Two or three rounds, turning the soil toward each tree row, will be sufficient. These should be followed with the heavy breaking plow or farm plow, drawn by two horses, and continuing to turn the soil toward the tree rows until the finishing furrow or dead furrow is

made in the middle. This furrow is best filled by using a disk or cutaway harrow, so set as to draw the soil from each side into the furrow. After it is well filled, by running about two rounds in each middle with this implement, the operator should harrow across the orchard with a spring-tooth harrow, going at right angles to the direction of the original plowing. He should next follow with a spike harrow or smoothing harrow, thus putting the ground in good condition for further cultivation or intercropping. If a cultivated crop is to be planted it should be across the direction of the original plowing, to thus further level any slight elevations and depressions that were made as ridges or furrows. When breaking the soil next year the plowing can be in a direction at right angles to that followed this year, and thus avoid constantly throwing higher ridges toward the trees. Even should the slope of the land prevent breaking across the direction of the previous year's the ridges can be drawn down by the use of the disk harrow or cutaway harrow, which will be found the most valuable implement in orchard work. By setting the disks of the two sides at different angles, such as must be learned by actual practice, the disk harrow can be used with good advantage, even on hillside cultivation.

It must be taken for granted that all young trees should be cultivated, excepting, perhaps, the cherry and pear. If one has any hillside land he wishes to put in fruit he should particularly avoid planting this in peaches or plums, as these need cultivation during their entire life. Apple trees need cultivation while young, but when older can be grown by the sod mulch system.

Mulching to a great extent takes the place of cultivation. If one has all the leaves, straw, straw and manure, or other litter that he can use he can get along without cultivation, especially on the hillside.

One plan of hillside cultivation that is very good is to bring down the soil with a hand implement so that it will be built up like a basin below the trees, with the lower edge higher than the upper, and let the rain water settle in it and bring fertility and water the tree, over this basin one can scatter straw or grow clover to prevent it washing away.

Spraying and pruning are subjects of special attention, which are fully discussed in the Bulletins of the Bureau of Zoology of the Department of Agriculture at Harrisburg. It is impossible at the present time to elaborate upon these features of orchard management further than to say that the young orchard is improved by spraying once every dormant season with strong lime-sulphur solution either commercial or home-boiled. Trees should be pruned from the beginning with a view of making the tops low and open. The successful orchardist of the future will be the man who grows his fruits on very low-headed open trees, learns the business for himself, and does the work or lets his shadow fall upon those who do it.

A RAMBLING ORCHARD TALK

By J. H. HALE

I haven't received your program, Mr. President, but I do remember that in some correspondence with your worthy secretary, it was hinted I would take that for one subject, because he knew I would ramble anyway, and might as well start the subject right, as well as for some others, and let me get away from it. I hardly know where to begin, and I am sure I shall hardly know where to leave off. The orchard subject is such a broad one, and it is coming so much more to the front within the last two or three years than at any time in the previous history of this country, that it is worthy pretty thoughtful consideration from a good many points of view.

The early settlers in our country all planted a few trees, plants and vines about their homes for the family supply, bringing seeds, and in some instances trees, from the old country. The Massachusetts colony and also the Jamestown colony in Virginia, offered premiums, prizes and relief from taxation to the settlers who would plant orchards and vineyards, but the whole purpose of those bounties, and the main purpose of the tree planting of our New England parents was for the purpose of growing fruit that they might make something to drink. The early orcharding in this country was based on a drink proposition, with a moderate home supply of food as incidental; and as the march of civilization spread out over our country, from the Atlantic coast towards the west, tree planting went along with the march of civilization and progress, but for the first two centuries, almost, there was little thought of orcharding as a commercial proposition. The growth of villages and cities in a small way created a demand for a little fruit as food, and where there was a surplus from the home planting, a certain portion was sold, but no thought of it as a great commercial proposition. Within the last seventy-five years there was some commercial planting of orchards in New England, in Western New York, a little in Michigan, in your own State and in New Jersey, but always as a side crop to the farm, just a side issue. Trees were planted and taken care of, if there was an opportunity, or not taken care of at all, but even the great commercial apple orchards of Western New York and Michigan were always, up to a few years ago, a side crop to the farmer, and it has only really been since the planting of the orange groves in Florida, which began forty years ago, and later, the deciduous fruits in California, that there has been any specializing in orcharding and any serious thought given to it as a business or a profession. Later the orange groves in California, and then the apple orchards of the Middle West, and within twenty or twenty-five years, the large commercial peach plantings in Georgia and Western Maryland, the lower counties of your State and New England and Western New York, and so on, have grown into a special business, and even then, when we started in at that, there was very little commercial orchard knowl-

edge. All the horticultural meetings I attended, Mr. President, in my early days, the whole talk—I was living in Connecticut, as I do, not far from Boston, and the old horticultural society there, one of the largest and best maintained in the early days—but the whole talk at those meetings was about varieties.

When I went to worship at the feet of Marshall P. Wilder, the first thing he did was to take me out to his home orchard, and show me with great pride his 813 *varieties* of pears; but he didn't know any more about commercial orchard culture than Surface does, not a bit; didn't talk about it. (Laughter.) The only thing in the early days, was simply *varieties*, and the knowledge of the fungus troubles and insect pests, the science of feeding the plant and the tree with the necessary plant food to build up the perfect tree and the perfect fruit, wasn't known or understood by the growers, and had hardly been touched upon by the scientists. I remember when the first talk in any public meeting in America about the establishment of an agriculture experiment station, to study the science of agriculture plant foods and the influence of the soil on the plants, and the gentlemen there, the few that were interested and talked about it, when they began to talk about nitrogen, phosphoric acid and potash, it was simply a drug store talk to us farmers who were there. We hadn't knowledge of it. But with the coming of the first agricultural station in my own State, and their later establishment in every state of the Union, the establishment of the agricultural colleges, the great number of studious men and women who have gone into the science of agriculture and horticulture, we have a knowledge that has come to the aid of orcharding, and it has come to be a profession within recent years, but even then we haven't lived up to our privileges; we are only just beginning to think around the edges of the great orchard opportunity there is in this country. Of course, a few progressive orchardists, following out their own practical ideas, and supplementing them with all the science they can get from the experiment stations and colleges and agriculture departments of State and National government, have gone farther ahead than some of the rest of us, and there is almost, I might say, a science in orchard practice today, but only in a very limited way. In the handling of our fruit for market, we had very little intelligent business idea about it, and it took our fellow fruit growers of the far west to turn the trick—they were stimulated in two ways,—first, by the scientists, to produce the most beautiful and attractive fruit possible; and being 3,000 miles away from the great markets, they must put their very best foot forward. They had to pay $250 or $300 a car to get into our markets. They couldn't afford to do that with inferior grown fruits, or crates or packing, and so within the last ten years, practically, has come about a show of fruit in our fruit stands and markets and upon our tables that has opened the eyes of the land owners of the east. We have to give credit to the far northwest for the great stimulus that has come into apple orchard life and management within the last few years. They are sending us very beautiful fruit, and to get anybody's pocketbook open, you have to get their eyes open first, and the northwestern people in their apples have done this. We in the far south—I say "we," because in my orchard ramblings I have gron 1,200 miles away and planted another peach orchard in Georgia—being so far away from the great markets, having

to pay such excessive freight rates, having other conditions to contend with, we have had to grow the best fruit possible, grade it, pack it in the best possible package, the Georgia peach and six basket carrier upon the market in June and July, has been the greatest stimulus to the peach growing in this country, and it is spreading out all over the country.

Question: Those wise men in the west, where do they come from?

MR. HALE: They came from Connecticut and Pennsylvania and New York. They went far away from home before they got their eyes open, and I am sorry for them, and yet it is necessary for men to get into trouble to help the rest of us out. The question of the brother on my right, where did those people come from—they were people who had no faith in the Pennsylvania soil, who had no faith in the New England soil, and so they went away off and bought land. They have been buying it the last few years at $300, $400, $500 and $1,000 an acre, and there is better land within ten miles of where they went away from, that can be had for $15 to $50 per acre.

To go back some years ago, a man in my neighborhood sold his farm land at $16 an acre, to go to Florida, to get rich growing oranges. He bought land in Florida at $200 an acre, and in the course of time, the man who bought the $16 an acre land from him sold it to me, and I bought it for $25 an acre, and I planted peaches and apples thereon, and last year I sold apples from his $16 an acre land, which he ran away from, they were retailing in the store of New England at 75 cents and a dollar a dozen, and his oranges from $200 an acre land were retailing in the same stores at 30 cents a dozen and had to pay ten times as much for transportation to reach the market. I say, God pity him. He is in a fix. That is just the story that has gone on all over this country. Measure it in dollars and cents, and his oranges, he had to pay 50 or 75 cents a box freight. His oranges sold by the box for $2.50. My apples sold at $4, and I paid ten cents freight to market. So that is the general story of the growth and development of this ample industry in the far west, the peach business in the south and middle west. There has grown up a feeling in this country that there is a tremendous lot of money in the orchard business. With this wonderful orchard development in the far south and far west, and the growth of cities and towns, and the wealth of the people and their understanding of the value of fruit as food and all the talk of high retail prices, there has grown up a tremendous atmosphere of the profitableness of orcharding, by western railroads and land boomers, and they were the ones that got your friends away from here and all the east. There has been a lot of yellow literature published in relation to orcharding in the west and south on certain plans, and it is being circulated all over this country today, and so there is a boom on in that direction, which has been going on for eight or ten years, and now we have just got it in the east, and the whole country is afire on orchard propositions, but some of us are so green we won't burn. The country is going wild on this orchard proposition. It has already sprouted. It is already planted in the hearts of western promoters, who have got to

the Pacific coast pretty well overworked. They are coming back, the western promoter, or a relative of his, the land boomer, the fellow looking for suckers, the promotor who is out for your money, this back to the land theory, these farm stories that are in all the magazines, and the beautiful yarns being told everywhere, have got the people crazy to go back to the land, but this back to the land idea that is in the minds of the people in the city, going back to get rich out of this business, going to get a piece of land and have an orchard and everything is lovely, I say this boom is coming on here in the east, and you will see a lot of yellow literature circulated in Pennsylvania and all over the northeastern section of the United States, it is started now, and in the next few years you are going to see much more. I say, gentlemen, watch out; hang out the red light, the sign of caution, there's danger ahead to the legitimate industry, danger ahead to the people who go into it unthinkingly, and danger ahead in so many ways. I, as one who have been interested in a large plantation, two thousand acres or more of peaches, have watched a lot of the large operations in the south, somewhat in the west, know something of the large plantings that are hinted of, at least, and attempted to be carried on in states south of you, and hinted at in New England. Those large orchard propositions are doomed to fail.

PROF. SURFACE: Some of them.

MR. HALE: Well, all except yours and mine. I say, beware of those things, and yet there is a legitimate field for the investment of capital in orchard propositions, and while these wildcat schemes are in the way and bound to be carried on, yet there will be some legitimate. Only yesterday morning in my mail was a letter from one of the most reputable and sound bankers in Wall Street, a man whose name is good for millions anywhere, and who can put his hand on it any time, through his association, sending a clipping from a Vermont country weekly, tell of Mr.—I don't know the name—a Mr. Somebody, Smith or Brown or Jones or Surface or Hale—I don't know—but that last year he had 125 apple trees, and they bore seven or eight barrels to the tree, and they had sold for four dollars a barrel at the station—I haven't the exact figures, but the net profit was something like $200 an acre, which looked good on paper to the banker, especially as in another column of the same paper the William C. Hill farm was for sale, 160 acres, of which 110 acres was clear and ready for immediate planting; the buildings on the place could not be duplicated for $8,000, and the farm was for sale for $5,000. The banker said, "Mr. Hale, isn't there an opportunity in this? See what this 125 trees brought the man. Here is the Hill farm for sale, and not only this, but there are others in that township, and so on through the next county. Won't you call on me next time you are in New York, and let us talk about your going up there and buying eight or ten or a dozen of these farms, or a hundred of them, and we will start capitalizing the scheme, and some they have partly planted, and we will catch the suckers, that have been going to the northwest." Now, there is a proposition from a legitimate banker. He believes he sees a great big opportunity there. Is it there? Yes and No. It is there in the land. It is there in his

Wall Street capital. The only other connection it needs is to get *the man*. Orcharding is a question of the individual man almost entirely. That is the big thing. Don't think, my friends, those of you who don't own orchards, and wish you did, and wish you had some of the wonderful "profits" that Surface and I are getting out of it—don't think you can simply buy a piece of land and you have money to buy trees, and money enough to pay for a spraying outfit, and so forth, don't think that will make you an orchard. It never will. There must be a man. I recollect when Cecil Rhodes died in South Africa, Rudyard Kipling wrote an ode to him, and I don't know what was said in it, except one single line, "Once on a time there was a man." That is what made South Africa. Cecil Rhodes made the great South Africa of today, one man with a knowledge and belief and faith and ability to handle other men; and so whenever you see any great business going on successfully in the country, don't think it is running itself, but back somewhere is the soul and spirit of a great man, or a great woman, and so in every orchard enterprise that is going to be successful in this sharp competition that is ahead of us, it means men and women who can stick, who have faith in the ultimate success, and who never know failure; men who can go out and see the frost kill their blossoms on the trees, and think, "It is only 365 days to another blooming time, when there won't be a frost, and that time can be hurried by putting notes in the bank to pay for fertilizers, spray fixtures, labor, etc. If that man is back of the orchard, he will finally arrive and make some. There are mighty few people who have that grit and knowledge and all the thing necessary, so I want to say, this great big orchard boom that is in the air now is going to spell failure to many people. Perhaps I ought not to predict that. The fellow who says, "I told you so," is despised, and I ought not to make any predictions, but from a life's work in fruit culture and a life looking over the horticultural interests of America, I feel that the present orchard boom that is now on, is a great big crazy mistake, which means loss to so many people, and especially where carried on in a larger way. It is going to be the individual man and woman who can know every tree on his place, who can learn to love it, who can say every individual tree is a personal friend and acquaintance, and every bug and fungi an enemy to be met and fought by the general in charge. That is just a general whack at the whole proposition. Yet mighty few of you will believe me now.

Now, assuming we are going on with orcharding. There are a good many things to be considered. The place most of us will take, the land that is at hand; that is, our own farms. Most of us succeed best right at home, where we are known, and know the land and know the condition, and the orchard lands on our own place, those will be the ones probably best for us to develop, but if we are foot loose and can go where we like, then the selection of location is of first importance. The elevation of the land in relation to that which surrounds it, is of importance; the character of the soil and its ease of tillage and natural fertility are to be considered, but of all things, what is our market going to be; the market conditions; are we going to market with our own wagons or auto truck to some nearby towns and villages within a radius we can reach? If so, the

question of good roads or the possibility of the development of high class roads is an important consideration. If we haven't within accessible distance what seems to be markets enough to take up the product we intend or hope to produce, then the matter of railway lines of transportation is important. I recollect some years ago at Washington the Agricultural Department recommended a certain gentleman to me for advice as to the handling of a product of an orchard in the south. It seems he was largely interested in the cotton goods trade in New York; a man that handled cotton goods by the millions of yards. When they began to establish cotton mills down in the Carolinas and through the south, his firm and others became interested in those mills, and it came about that he had to go to the Carolinas once a month, and on one trip he went hunting into the mountains of North Carolina. He thought, wouldn't it be a nice place to have a bungalow, and so in the broad way of doing business, he got an agent to buy him a tract of land, and then he built his bungalow, which you and I would call an elegant mansion, and as he loved to see the apple tree blossom, he decided he would have an apple orchard. And so he hired men to clear the land, and he hired a horticulturist to look after the planting, and got a nurseryman who was glad to sell trees, so he had his apple trees planted and by and by they came into bearing, like Surface trees do, but it wasn't but a little while until his orchard was filled with good red apples. What should he do with them? He asked the Agricultural Department at Washington, and finally somebody put him onto me, and he hired me to go and look the thing over. We got on the train and I went to bed and went to sleep, but the next morning in the dining car I broached the subject of his orchard, and he told me about it. We got to Salisbury, N. C., then off on a side line and got off at a little station and drove twenty-five miles up the hill. That was the first start off. I said, "How many trees have you?" I supposed he had three or four hundred. He said, "I have about thirty thousand trees loaded with apples." (Laughter.) Twenty-five miles up hill! We got off at the station, and we were met by an elegant pair of Kentucky horses and a buckboard, but the road was so rough that it took us four hours with that team to get up to that orchard. An ordinary farm wagon might take forty hours. Of course, to get material up there to pack your fruit in and haul to the station—It didn't take me long to tell him his only chance was to put up cider mills and build a pipe line and run his cider to the vinegar station at the railroad station. That is a true story, but it is an exaggeration in the orchard business. So a thing grows on us. Don't get very far away from the railroad station, or a good line that will carry you quickly to market, because while good Pennsylvania apples may be worth money in Pennsylvania today, they may be worth more in Chicago or Denver next week, or Boston week after, or Atlantic City or Minneapolis. The markets today are way out, possibly across thousands of miles of ocean.

Another big feature in this possible development of orchard business, has been the development of railroad lines, the development of the refrigerator car, co-operative work, so the location of the land for your orchard along right lines is one of the biggest elements. The preparation of soil, of course, means clearing off brush that may

be on it, and the best sort of plowing that can be done, sub-soiling where there is hard underlying soil; a thorough preparation of the land as for any garden crop.

PROF. SURFACE: Dynamiting in all cases?

MR. HALE: No, dynamiting only in cases of hard sub-soil. Dynamiting for each tree. There is another fact. The dynamite people are slick advertisers. Our friends, the Dupont's have got millions. They are glorious people, no higher class business people in America than the Duponts, of Wilmington, Del., and that big state road that Senator Dupont has given to the State of Delaware, and it is a blessed monument to leave behind, but it is going to take millions to build, and you cannot get those millions unless you sell powder, or dynamite, and you see it in all the papers now, rip up your land with dynamite. I told one of their managers the other day I had a certain tract of land I was going to plant next spring, and had expected to dynamite it. But this summer Mr. Woodchuck began to work down there, and as I went about I saw Mr. Woodchuck, Mrs. Woodchuck and all the little chucks had been bringing up some of the sub-soil, and they told me I didn't need to dynamite in that light underlying soil and Dupont's manager said "darn those woodchucks." Well, if there is a hard sub-soil, I would advise you to dynamite under every tree. I have carried on dynamiting in my Georgia farm. It wasn't a woodchuck; it was a nigger, taught me breaking up the soil under some particular tree, and I first tried fifty or a hundred trees, and then five hundred, and last year five thousand, and just at the present time we are planting 8,000 peach trees, and every one is being dynamited, because it is hard clay sub-soil.

PROF. SURFACE: Does dynamiting shatter or merely batter?

MR. HALE: I don't know the difference. I am not a "scientist." It breaks it up.

MR. ROBERTS: That is simply turning the sword into a ploughshare.

MR. HALE: You must be a Christian. There is the preparation of the soil first; then the laying off of the trees, for the distance, the planting and so forth, is a local question. There is a temptation to too close planting of the trees, the original trees, the trees that will stay there. There is a general tendency to too close planting, on account of this desire for a quick money crop, and the man in need of funds is tempted to do certain inter cropping, that perhaps he ought not to do. But the other thing more particularly, is the interplanting of other trees too closely; the planting of the original apple tree at 32 or 40 feet; so don't be led away into too close planting of the original trees, because if they grow as they ought to, they are going to take up a great deal of ground. The spraying machinery needs room; so be careful about close planting.

Do you think you will have an over production of apples? If any of you have gotten the apple orchards going, and have got good fair No. 1 apples, and expect to get any such price as apples have

brought in the last ten years, you are going to slip up. Take the average prices of the last ten years, and cut them right in two in the middle.

That is my belief. I may be mistaken about it, but I do think those who are going to invest money and are looking for dividends, should take the average apple price of the last ten years, and cut it in two. If you get any more than that, it will be extra dividends on the common stock. That is a cold blooded business proposition. It is easy enough to talk about four or five dollars a bushel for apples and so forth, but the average grower is not going to be able to sell his fruit at those prices.

Last week I went down to New York to the meeting of the National League of Commission Merchants. I met gentlemen I know from all over the United States, and sitting there in the Hotel Astor was a group of people, big apple operators, two or three dealers, and so forth, and one showed figures of a return he had received that very day from three shipments of apples he had made to Europe. I may not be accurate about the figures, but I think it was 3,200 barrels in all, the average returns 90 to $1.10. He said it would figure out a little better than a dollar. That was simply a business deal in a large way of eastern apples from old orchards poorly cared for. There has been a lot of over-planting. I wish I had stayed in the nursery business.

Question: Do you dip your roots in lime-sulphur before planting?

MR. HALE: No, I dip the tops, and I prune the roots off pretty close. I am a good deal of a crank in close root pruning in planting a tree. After a tree is planted, right then go in for cultivation real lively. Prof. Surface told you that cultivating along the line of the row the first two or three years was what the trees needed. I absolutely believed that myself once. But let me tell you, I believe that too, and I used to believe that the roots went out only a little ways the first year. I absolutely believed that until several years ago I planted an apple orchard. Some of you have heard me tell of it before. I bought a piece of rough, cheap woodland, chopped the wood down and burned it on the lot, and planted my orchard, the apple trees 36 feet apart. While we were planting the apples there, my Italian foreman asked me why I didn't plant peaches between the apples. I said the ground was too rough, and peaches required better tillage than we could give on that rough lot. He said that it was fine peach land, some of the best peach land I had, and he said, "You give me one interest in the crop, I plant the peaches and I make the peaches grow like hell." I knew Louis' hell meant like heaven. When he went out, my secretary, who is a close observer, said I had better listen to Louis; whatever he says about making trees grow goes. I made a contract and gave him an interest in it, and we did interplant with peaches in this apple orchard. Louis said, "I grow the olive in Italy in rough land; I grow the coffee tree in Brazil. I make the peach tree grow," so in planting he dug a good big hole where the dynamite wasn't used, and where dynamite was used, it dug it for him, and where the tree was planted, he grubbed around about four feet in diameter. He dug away down under and stirred it up and worked it up. I thought that ought to

be enough for first year, and I believed it was sufficient. The orchard was well started. I was down in Georgia till the middle of July. About the 20th of July I came home. On the opposite side of the street was land that had perfect tillage, plowed, harrowed and cultivated nicely, had new trees on it. The first day I drove up to this orchard and was going to point out to my Italian friend the difference between full tillage of the land and the grubbing around the tree, and as I drove up, I saw these trees, where Louis had been grubbing were growing as big as those in the cultivated land that grubbing close about the tree was all they needed around the tree, I thought. Then I looked; the first six rows, land between the tree, was all groubbed over; the balance was as I left it in the spring. I found Louis and asked what was the matter. He said, "Well, you see, I had two or three friends come from the old country. They to stay with me, to find a job. After the first day, I say, 'You take a pick and grub hoe; I give you something to do,' and I lead them myself." (And when Louis leads, he leads; he is a regular Maud S.) "I take one row and another man dig the next row, and I keep count of the time, and they dig these six rows clear across the lot." I asked him what he paid them for it, and he told me what he paid them. They soon got another job. I guess they got tired of visiting. I said, "You told me when you got me into this proposition you were just going to grub around them." "But, Mr. Hale, I didn't tell you how far I would grub around." I couldn't believe it until I saw it, you and I say the roots they only go out a little ways the first summer and so it matters not as to tillage for any but the little tree. This was in July. I don't know whether there were any roots out there or not, but on the land he tilled all over the trees were twice as big as where he had grubbed around them four feet. There was no growing crop there. They had the whole field to themselves. That taught me a lesson in tillage. I will never forget the wonder of it. So when I see your oat crop and your rye crop, I say, don't teach the people of Pennsylvania or anywhere there is even a possibility of their getting into the orchard heaven when they have a grain crop in the orchard. The trees may live and grow and be moderately satisfactory, when you haven't something better to compare them with.

Question: Is it necessary to prune early?

MR. HALE: I would prune while in a dormant condition, if possible. I am speaking as a large orchardist. We prune all the year around. We prune when we can. Of course, I would rather do all my pruning after the coldest weather of winter is over and before any growth begins in the spring. If you can do it before, if not, do it when you can. Vigorous, strong growth of trees in the early years, for peaches especially, when they have got to proper size, if they have been well fed, nourished and cultivated, growing rapidly, nothing will help fruitfulness like *summer pruning*. Cut out the extra branches in July and shorten in the others. It is a cruel thing to do to the tree, and any cruel thing you do to the tree shocks it. It is one of the greatest things to develop fruit buds. Some people say their orchards have got to full size and don't bear. Good sharp summer pruning of either tops or roots will cause greater development of fruit buds. Don't be afraid to thin the fruit from the trees.

Don't let a tree over bear, but thin it well—well as you think, and then do it over again. Thorough thinning of the fruit is essential. When the fruit begins to ripen, pick it. Take apples. Winter apples want at least four pickings over. The old way was to wait until the early ones fall on the ground. The average winter apple tree wants picking over at least four times over a period of practically a month. With me it takes a month to get apples off any one apple tree. Pick them as they mature. The same way with the peach. When there is a dozen, fifteen or twenty, come to maturity harvest them. In a week or ten days later, there are two or three hundred apples to nice maturity, and then a little later, 80 per cent. of the crop is mature. Get that, but leave all the green ones on the under side, and sometimes six weeks from the original picking, you will get a bushel or two that would have been green, if picked in the ordinary way. So the picking of fruit as it matures, and the careful handling of it, and the proper, honest grading of it into proper sizes, the packing of it in the best packages you can get, the most attractive packages, honestly packed from top to bottom,—if you have any poor specimens, put them on the top; then stand there and say, "There is the poorest in that package." Sell it on that as a basis. Stand for your price; let your commission man stand for price, because you guarantee it all the way down through, and make the public pay for that guarantee. They are willing and glad to do it. They have been humbugged too long with a few good ones on top and inferior ones on the bottom. Don't have any poor ones in the package if you can held it.

ASPARAGUS CULTURE

By PROF. R. L. WATTS, *Professor of Horticulture, State College, Pa.*

I think you might call this a succotash session. We had peaches and cream this morning, and apple pie and dumplings, and so on we have had all along the road. This afternoon we will have asparagus and cabbage. There is one very comforting thing about the vegetable industry. Mr. Hale said this morning that the apple industry would be over done. I heard him say at a meeting recently, beginning in five years and extending fifteen years more, there will be no money made in apples. That is very comforting to the man who has a young orchard just coming on. It is something for him to think about in the night when he is a little sleepless. The market gardener has the advantage over the fruit grower in this respect. The market gardener can switch around from one crop to another.

Now, seriously, the market gardener in Pennsylvania has not given the attention that the importance of the subject demands. I am certain when the census report is completed and you see copies, you will find out that the market gardener interest of Pennsylvania

represent more dollars than the fruit industry. I may be mistaken, but I will be surprised if the market gardening is not ahead of the fruit industry. But as Mr. Hale said this morning, people are wild on the planting of fruit. There is more poetry in it. Some way, the growing of onions and cabbages, and so on, does not sound quite as poetical as growing peaches and apples with red cheeks. This afternoon we are going to take up asparagus culture, and I am going to talk with a view of trying to give information to the beginner. I know some men in this audience are expert growers. I see on my right Mr. Horace Roberts. Really, he is the man who should have spoken on this subject this afternoon. And there is Mr. Garrahan back there. I don't expect to say anything this afternoon that will be helpful to them.

It affords me great pleasure to discuss the culture of a crop which ranks so high in the esteem of both grower and consumer. No vegetable is more appreciated in its season and few, if any, offers greater possibilities for field culture. There is a tremendous demand for this crop on our city markets and the demand is increasing annually. Very few of our markets, however, are well supplied with asparagus and it is hoped that our vegetable growers in various parts of the state will take a keener interest in the growing of the crop for commercial purposes. The most wonderful truckers of New Jersey are obtaining a gross income of from $300 to $500 to the acre and there is no reason why the progressive farmers of Pennsylvania should not realize just as large returns. This vegetable should also be much more generally grown for the home table. Every village garden should have a plot cultivated by the most intensive methods. The kitchen gardens of the 225,000 farms in the State should also contain a few rows of asparagus. It is ready for the table early in the spring, long before onions and other early vegetables in the open ground are large enough and cuttings may be made daily until about the first of July. No other vegetable will take its place at this season of the year.

Varieties.—While many varieties are cultivated, only a few are grown extensively. Palmetto is by far the most important variety. It is grown most extensively in all of the large producing districts. The shoots are of good size and of fine quality. This variety seems to be more resistant to rust than any other and this is perhaps the main reason for its popularity.

Argenteuil, a French variety, has attracted considerable attention in recent years. There are two strains of this variety, known as Early and Late Argenteuil. The varieties are not apparently well adapted to clay soil but they have been at least fairly successful in the sandy types of New Jersey and elsewhere.

Conover's Colossal is an old variety which has been grown extensively in Pennsylvania and other states in the Union. Because of the smaller shoots, the variety should not be recommended for general cultivation.

Barr's Mammoth, Reading Mammoth, Dreer's Eclipse and California Mammoth White are excellent varieties for either the home garden or commercial plantation.

Soil.—While a sandy loam is unquestionably the ideal soil for the growing of asparagus, this crop is grown successfully on a great variety of soil types. A sandy soil is especially desirable for grow-

ing white or blanched asparagus because the sandy soils offer no resistance to the stems and they make perfectly straight shoots. It is possible, then to reach several inches under the surface of the ground with a knife in cutting, thus securing long, white shoots. The largest plantations in the East are upon soils of this type, although there are many profitable fields on the heavier types of soils. Our markets are demanding green asparagus more and more every year and this may be grown with great success upon any moist, fertile soil. It has been said that any soil that will produce a good crop of corn will also grow good asparagus. While a field of average fertility will not produce maximum profits, it will return as large profits as any other garden crop which may be cultivated with a horse. As previously indicated, the most important factors in soil selection are the constant and abundant supply of moisture and the never failing supply of available plant food.

Seed Selection.—The selection of good seed is just as important in growing asparagus as any other garden or farm crop. This matter is too frequently neglected with the result that growers are realizing from twenty-five to seventy-five dollars less an acre than would be possible were seed selection practiced. Amateurs or beginners should procure the very best stock from specialists who have practiced seed selection for a number of years. Then, after the plantation is established, seed should be selected at home for any further planting that may be contemplated. The individual plants of the field should be carefully studied, marking those which are the largest and most vigorous and free from rust. It is exceedingly important to select plants that produce several large shoots rather than many small shoots. Our markets are demanding and paying for large shoots and this matter can be controlled to a great extent by intelligent selection of seed. The propagator should bear in mind that there are both male and female plants and that it is just as important to select strong male plants as the very best female plants. These must also be in close proximity to each other, so that the pollination of flowers will be perfect. After locating plants, most growers prefer to lift them from the plot and remove them to a special breeding plot at some distance from other plants. This is an excellent idea for the same plants may then be kept for many years to produce the seed required and there will be no interference with tillage operations in the commercial plantation. The seeds are ripe when the berries have turned red. The berries are then picked and the seed washed and dried. The seed may be preserved for several years under condition such as are found in ordinary living rooms.

Growing the Young Plants.—Young plants are so easily raised that every commercial grower should produce his own. Ground for this purpose should be highly manured and plowed in the fall. It should then receive a top dressing of a complete fertilizer as early as possible in the spring, be harrowed thoroughly, and the seeds drilled in rows not less than eighteen inches apart if to be worked with a hand wheel hoe or thirty inches if to be worked with a horse. If the seed is very choice and the grower is anxious to obtain the best plants, the seed should be dropped three inches apart. If a large number of plants are desired, the seed may be sown with a drill, although the hand method is preferred by some because it secures

equal space for the development of the roots and tops. Do not cover the seeds with more than one and a-half inches of soil. As the asparagus seed is very slow to germinate, it is desirable to sow a few radish seeds with the asparagus so that the young radish plants will mark the rows and cultivation may be begun a few days after sowing. If a radish plant grows every four or five feet in the row, they will be sufficient to enable the cultivator to keep between the rows and thus avoid disturbing the asparagus seeds or young plants which may be coming up. The asparagus nursery should receive thorough tillage until late in the fall. If the plants do not grow rapidly, nitrate of soda should be applied at intervals of about three weeks at the rate of one hundred pounds to the acre. In small nurseries an excellent plan is to top dress with fresh horse manure about the 25th of July. The mulch of manure should be heavy enough to prevent weed growth and conserve soil moisture.

Plant Selection.—Experiments at the Pennsylvania State College have shown that the strongest roots are very much the most profitable. In an experiment which has been in progress for several years, No. 1 roots have produced $100 more to the acre than No. 3 roots. Practical growers in many sections have had the same experience and this information shows how important it is for the commercial grower to produce probably twice as many plants as will be needed to plant his fields, and then to select and plant only the strongest. No information can be given in this talk which will count for larger profits than the proper selection of plants.

Soil Preparation.—A heavy clover sod provides the best conditions for the growing of a good crop of asparagus. The field should be heavily manured in the fall and also plowed in the fall, so that the vegetable matter will be partly decayed at planting time the following spring. It is necessary to plant at the earliest possible date in order to secure the greatest growth the first season. There should be no delay in harrowing the land and preparing it for setting the young roots. The grower should not lose sight of the fact that the field is to remain in this crop for not less than ten years and probably for twenty and that too great care cannot be exercised in plowing and harrowing.

Planting.—Most commercial growers in New Jersey and elsewhere allow not les than five and a-half feet of space between rows. The most successful and intensive growers of Pennsylvania are making the rows only four feet apart and setting the plants about two feet apart in the row. This is ample space to grow green asparagus and the returns per acre at these distances will be greater than when more liberal spacing is provided. The universal practice of the most successful growers is to plant one year roots. It has been clearly demonstrated by experiment stations and hundreds of practical growers that one year roots are more satisfactory than older roots. If two year plants could be lifted from the nursery row and transplanted to their new home with no interference with the roots they would produce just as good results. This, however, cannot be done so that the universal practice is to plant strong, vigorous one year roots.

The grower should bear in mind that the buds of the crowns come closer the surface every year. This is due to the fact that the new buds form slightly higher each year and it is therefore an

advantage to plant as deeply as the soil will permit. Under no circumstances, however, is it desirable to set the crowns or roots in the sub-soil because this will invariably interfere with root development for the roots grow laterally rather than downward. A safe rule is never to plant deeper than the land is plowed unless shallower plowing is practiced than is expedient considering the character of the land. Under conditions as found in most fields where this crop is grown, it is preferable to plant from six to eight inches deep. Because of the tendency of the crowns to get nearer the surface of the land every year it is an advantage to plant ten or twelve inches deep, providing the soil will permit planting at this depth.

Care of Plantation.—There has been much dispute upon methods of fertilizing asparagus, although some points have been well established. There is no question about the importance of maintaining the supply of vegetable matter. It is highly probable that not less than twelve tons of stable manure annually is necessary to provide the soil with the proper amount of humus. A common practice is to apply the manure any time after the tops are cut in the fall and the first tillage operation in the spring. This is a safe practice in light soils but on heavy soils the better plan is probably to apply the manure about the first of July or immediately after the cutting season. Heavy applications in the fall or winter may make it almost impossible to harrow the plantation early in the spring because heavy mulches of manure retain the moisture in the spring and thus prevent early tillage. Heavy applications of commercial fertilizer are undoubtedly essential to the best results. The most successful growers of the country are using from one-half to one ton of a complete fertilizer to the acre. It is possible that the largest returns cannot be realized with less than a ton to the acre of a fertilizer carrying four to six per cent. of nitrogen and eight to ten per cent. of potash and phosphoric acid. A safe practice is to apply one-half the commercial fertilizer early in the spring and the other half immediately after the cutting season. Some growers contend that it is better to apply all of the fertilizer after the cutting season. This plan is entirely satisfactory, provided there is abundant rainfall after the first of July, otherwise it is better to apply the mineral elements early in the spring so that they will be well distributed through the soil in case there is a light rainfall after the first of July. Nitrate of soda can often be applied to advantage as a top dressing, using from 75 to 150 pounds at each application. It is often profitable to use as much as four or five hundred pounds of nitrate of soda to the acre. The asparagus plantation should be kept free from weeds throughout the season. Rust is the only disease that gives very much trouble in growing asparagus. Although some spray materials have been more or less valuable in controlling the disease, it is generally conceded that the most practical means of control is to cut the tops in the fall as soon as the leaves begin to turn yellow and burn them. With good treatment, an asparagus plantation will last for twenty-five or more years but it is not considered desirable to retain the plantations more than fifteen years, and many growers destroy them when they are ten or twelve years of age. The shoots get smaller as the plantation become older and this is the reason for making new plantings at short intervals.

Marketing.—With soil of high fertility, careful seed and plant selection, and the very best treatment, it is possible to cut $50 worth of asparagus to the acre the second season from planting. The grower should be very careful to avoid heavy cutting the second season as this will cripple the plants during the following years. Even the third year the cuttings should not be too heavy, but the fourth and succeeding years it is permissible to cut until about the first of July. Asparagus is still regarded a luxury by many city consumers and it pays to place the product on the market in the most attractive form. Many growers have found it an advantage to tie the bunches with red tape. The tape can be secured at a very low cost and it certainly pays to use it. The bunches of asparagus are eight to ten inches in length and the average weight is two to two and a-half pounds. In warm, growing weather it is necessary to look over the plantation every other day and sometimes every day in order to catch the shoots before they break or become too long for marketing. In order to avoid cutting on Sunday, some growers remove the marketable shoots Saturday afternoon and after washing and bunching they are stood in trays with the butts standing in about one-half inch of water. This will keep the asparagus perfectly fresh until Monday morning when it may be sent to market.

EARLY CABBAGE

By R. H. GARRAHAN, *Kingston, Pa.*

In order to produce a good crop of Early Cabbage there are a few conditions with which the grower must comply:

1st. We *must use good seed.* And here the grower does not have to take any chances. He has no one to blame but himself if he uses poor seed.

2d. We *must have a supply of well-grown plants.* Here again the grower takes absolutely no chances. It's his own fault if he does not raise good plants.

3d. We *must have the soil in the best possible condition* in regard to fertility and mechanical condition. As a rule it's up to the grower to have his land in suitable condition.

4th. We should have *freedom from disease and insect pests.* Here we have to take our chances. We haven't yet been furnished with any sure panacea for all the ills that plant life is heir too.

5th. In order to have a successful crop *we must receive a good price for the finished product.* The fixing of prices is usually beyond the grower and here he sure does take a long chance.

I said that we had absolutely no excuse for using poor seed. You say there is lots of poor seed on the market and that the seedsman is liable to sell you some worthless stuff. I'll agree with you but don't buy such trash.

I was talking with a gentleman during the National Convention at Boston last fall. He said he had a contract to furnish a quantity of cabbage seed for a large dealer. I asked him if the dealer ever visited his farm and inspected the cabbages he had saved for seed purposes. He said he had never seen the dealer. His plan he said was to produce as much seed as possible, per acre, and as cheaply as possible.

We don't want such seed as that and there is no occasion for using it. In order to be dead sure of the strain of seed you are using the best plan is to grow your own.

Many of our agricultural writers have given us to understand that seed raising should be done by experts that the ordinary run of market gardeners don't know enough to raise their own seed. We have had this drilled into us so often that many of us have come to accept it as the truth. With the exception of *the Livingstons I cannot recall any really first-class varieties which have been developed by the so-called profession seed* growers. Practically all of our improved varieties have been developed by careful selections by the practical gardeners. We have also been given to understand that seeds can be grown in certain favored locations. There may be some truth to this statement but I know that just as good cabbage seed can be produced in Pennsylvania or any of the northern states as can be grown in Europe, California, Puget Sound, Long Island or any other out-of-the-way place.

Our plan of raising is to sow seed about the middle of July in hills where we want the plant to grow, thus avoiding transplanting. When a few inches high they are thinned out to one in a hill. The development of these plants is watched during the fall and only those marked for seed purposes, which show a *tendency to head early, a uniformity of type* and which *have a vigorous constitution,* about 1 in 100. *The health and vigor of a plant is one of the most important considerations.* It is just as important to have strong vigorous plants from which to raise seed as to use vigorous animals for stock breeding. On the approach of cold weather these selected cabbages are taken up carefully, placed in a trench, roots downward and covered to protect from severe freezing. The following spring they are planted in a well-prepared piece of ground and fertilized heavily with potash and phosphoric acid. When the seeds begin to ripen the seed stems are cut off, placed on sheets and if weather is favorable they are left in field for a few days. They are then hauled in, spread out on a tight floor and when thoroughly dried the seeds are pounded out and cleaned up with a fanning mill. The seeds are then screened and all small and immature seeds taken out.

Peter Henderson in his book, "Gardening for Profit," tells of an old German gardener who was always first on New York market with Early Cabbage. His neighbors couldn't understand how he managed to beat them out year after year. One day he confided his secret to a friend. His plan was to mark the stumps of the earliest cabbages which he cut—the suckers forming on these stumps were removed, rooted in sand as florists do soft cuttings. They were then wintered over in cold frames and the following spring set out for seed purposes.

If one does not care to go to the trouble of raising his own seed he should at least purchase a supply a year in advance and test in a small way before planting extensively. Cabbage seed is good for several years.

Raising the Plants.—There are several methods by which we may obtain a supply of early plants. The old-fashioned way was to sow seed in the open on the 15th of September. When the plants were two or three inches high they were transplanted into well-drained cold frames, about 200 plants per sash. When the weather became cold sash were placed on the frames and careful attention paid to ventilation. If the weather became very severe the plants were still further protected by covering the sash with mats or boards. The plan was to let the plant make the necessary development in the fall and keep them in a dormant condition during the winter. This method, however, is rather unsatisfactory in many respects. The plants need looking after almost every day during the winter, and often considerable number of the plants run to seed on being planted in the field. This was especially true if the seed was sown prior to September 15. If sown much later the plants did not have time enough to make the proper development before cold weather.

Spring sown plants have almost entirely taken the place of the wintered-over ones. They can be produced cheaper and if properly grown are much superior. If a green-house is not available the seed may be sown in hot-beds and when a few inches high the plants are set in cold-frame, just as with wintered-over plants. A somewhat better plan is to sow the seed in flats, place the flats in the hot-bed. When the rough leaf appears the seedlings are transplanted in similar flats $1\frac{1}{2}$ x $1\frac{1}{2}$ inches apart. These flats are then watered, placed in cold-frames and, if necessary, shaded a few days until the plants have struck root.

A green-house is much more desirable in every way. It need not necessarily be an expensive affair. A house 12 x 60 feet need not cost over $200, if one is handy with tools. Having a sufficient number of sash one could run through such a house 100,000 cabbages and the same amount of celery and tomato plants.

In our section we make the first showing of cabbage seed early in January, varieties used are Early Jersey, Charleston, Glory and Enkheisen, Succession, etc. We sow in flats rather than in solid beds as the moisture conditions are under better control. The seed is sown in drills $\frac{1}{4}$-inch deep and covered with sand. We prefer to transplant before the rough leaf appears as we get a more even stand of plants by using them when quite young. They are set in the flats $1\frac{1}{2}$-inches apart but for the very earliest it pays to plant them 2 inches apart. In order to get all the plants a uniform distance apart we use a spacing board. This consists of a $\frac{1}{2}$-inch board large enough to cover the entire flat, $\frac{1}{2}$-inch holes are bored the desired distance apart. The board is placed over the flat and a handy boy punches the holes with $\frac{3}{8}$-inch iron dibber. With a little practice the kid becomes mighty expert at the business. Other children then place plants in the holes and a careful man shoves a little dirt with a pointed peg around the roots to fasten them. They are then watered and placed in the green house. When the room is needed the first lot is shifted to cold frames.

A little *practical experience* is necessarry in order *to grow* good plants. it is *hard to say, without being on the job,* just when to ventilate, or how much water to apply and watering and ventilating are the two most important points in plant raising. As a rule the beginner is liable to coddle his plants too much and as a result his plants are liable to damp off on account of not having sufficient ventilation or too much water. The soil used should be of a loose porous nature to allow perfect drainage. If the soil is inclined to be too heavy it will be greatly improved by the addition of fine ashes (anthracite). The soil should be rather dry and not packed very tightly in the flats. The temperature in the house should not go above 50 degrees at night.

The greatest loss in plant raising is due to the "damping off" fungus. This disease usually attacks the young plants in the seedling box, causing the stem of the plant to turn black and rot off. It is due to too much heat, lack of ventilation, to heavy watering, cloudy weather, or the use of old soil. This trouble can be almost entirely eliminated by careful attention to watering and ventilation. Loosening the soil slightly between the rows of seedling is also very beneficial. We have had practically no trouble in this regard since using sterilized soil. The soil can be sterilized either with steam or with a solution of formaline, 2 pounds to 50 gallons water. It will take about 2 gallons of the solution to sterilize a cubic foot of soil.

The plants in the cold frames should be ventilated every day, the amount of ventilation depending upon the age of the plants and the condition of the weather. During warm days the sash are removed and the plants gradually hardened so as to stand a temperature of at least 20 degrees. A well-developed plant will be short and stalky, having 5 or 6 leaves of a reddish hue and having an abundance of fibrous roots. The soil for green-house purposes should be prepared at least a year in advance. Where sods are obtainable it is a good plan to pile up a layer of sods, say a foot deep, then add a foot of rotten manure, then another layer of sods and so proceed. Where sod is not obtainable select a good piece of land, manure it heavily, plow and harrow and roll again, continue this process until sufficient manure has been worked into the soil and the ground is in fine mechanical condition. Then screen the dirt and haul to green-house or store in protected place until needed.

The flats used are made by sawing in sections tomato cases or other second-hand canned goods boxes. We try to buy all tomato cases as this gives us a uniform sized flat and one which fits in nicely in the green-house, cold frame and wagon. Years ago we used the old "Armstrong" method for sawing the boxes, but now we hitch a gasoline engine to a circular saw which makes short work of the box business. Large-sized shoe cases are purchased, taken apart and used for bottoming the inner sections. For cabbage plants the flats are made $2\frac{1}{2}$ inches deep, for tomato plants and especially for re-transplanted plants we prefer to have the flats an inch deeper.

We use double cold frames in preference to the single frame. They are made deep enough to allow $\frac{1}{2}$ foot fresh horse manure in the bottom, this furnishes some bottom heat which is very desirable while the plants are young and the weather severe.

Instead of using mats to protect plants on cold nights we use steam-heated cold frames. These frames are built so as to pitch

4 inches in 100 feet. A 3-inch main feed pipe runs from the boiler across the ends of the frames and a 2-inch pipe carries the condensation back to the boiler. At the centre and lower end of the frame a 1½-inch raiser is taken off the main flow pipe and runs directly around the frame, and connects with the main return pipe. Valves are places on the flow and also on the return pipe and a pet cock placed on lower end of return pipe to allow escape of air. We first tried the automatic air cocks but found them to be unsatisfactory. Steam-heated frames have proven entirely satisfactory and much more economical than the use of mats.

Cabbage is not at all particular in regard to soil, it will do well on most any kind of land providing it is not wet and soggy. The ground should be well drained either naturally or artificially, land with a loose gravely sub-soil, however, is not desirable. Cabbage is a rank feeder and the main thing is to have the soil filled with available plant food. If sod land is used plow it early in the fall and during the winter apply 30 or 40 tons manure per acre. It is a good plan to "cut-away" the ground early in the spring. This allows the sun and air to dry the land and we are thus enabled to plow much earlier than we otherwise could. Most of us vegetable growers know the value of getting our crops in early and very often we get in too much of a hurry and as a consequence we often set out plants without first getting the soil in the proper condition. This is one of the worst mistakes we can make. If the land is not properly fitted before planting it never can be after the field is planted. Plow the ground just as soon as it is dry enough, then cut-a-way, harrow and roll, if necessary, until the land is in the best possible condition.

We then apply the following fertilizer, per acre, 600 pounds tankage, 600 pounds acid phosphate, 400 pounds potash; this is applied broadcast and worked into the soil with an Acme harrow. The ground is then smoothed and marked out 2½ x 1½ feet. The plants are dumped from the flats and separated very carefully so as to retain as many of the fibrous roots as possible. They are puddled in thin mud, stood upright in boxes and hauled to the field. Children are used to drop the plants and men and women armed with dibbers fasten them, care being taken to get the soil tight around the roots. The plants are set as deep as possible without covering the hearts; this is a great protection if the weather should turn cold before the plants have been established. The cabbages are cultivated and hoed as soon as they have struck root. A small handful of nitrate of soda is then applied around the plant, usually from 200 to 500 pounds per acre. All that is necessary from now on is to keep the cultivators going and hoed occassionally to keep the soil loose around the plants.

Some growers, where land is very valuable, will inter-crop their cabbage. The usual combination is to set lettuce between the plants and sow one or two rows of radishes between the rows of cabbage. To my mind this is a very questionable practice, it sounds fine to say, you are producing four or five crops per year on the same land, but we prefer one or two good crops to half a dozen poor ones. The constant tramping over the ground in order to pull the radishes

or cut the lettuce is very detrimental to the cabbage and does not allow the necessary cultivation for the best development of the plant.

The market gardener may not have a monopoly on all the bugs, blights and other diseases which attack plant life, but he has enough at least to make the job interesting.

(I am reminded of that famous quotation:

"The Chinch-Bug eats the farmer's grain
The Bee-Bug spoils his honey,
The Bed-Bug fills his nights with pain,
And the Hum-Bug gets his money.")

After the cabbage plants are set in the field they have to take their chances with the maggots, wire-worms, cut-worms and the like. Our experiment stations have experimented considerable along this line and have advocated the use of a number of different mixtures for the eradication of these pests. But as a rule the remedies so far advanced cost too much to apply, the game is hardly worth the powder. The supply of cut-worms can be somewhat diminished by the use of poisoned mashes.

Plowing as late in the fall as possible is often of some benefit as the worms or their larva are thrown up and killed by freezing. Anything that will promote growth will lessen the effect of those insects. Early planting, an application of nitrate of soda, plenty of cultivation and hoeing are about the best remedies. Club root often causes considerable loss, especially on poorly drained land, a heavy application of lime the fall previous to planting often proves very beneficial. Little or no trouble is to be feared from this disease if cabbage or any plants of the same family are not grown oftener than once in three or four years in the same piece of land.

Many growers imagine that when they have grown a good crop of cabbage they have done about all they can do. If cabbage is scarce and the price is high they are lucky and if the market is overstocked they are unfortunate. There is some truth to it, but the same principles which apply to packing apples are also true in regard to cabbage. There is such a thing as having a reputation even for growing ing cabbage and a good reputation is worth money. Nine times out of ten the man who is condemning the commission man the loudest is the one who is not familiar with the market requirement or who is not putting up an honest package. Most commission men are desirous of getting consignments from growers upon whom they can rely, not only for an honest pack, but one who can supply them year after year. It is to their advantage to give such a grower a square deal. For my part I cannot see how we could do business without the commission men. What we want is a strong organization which will weed out the unreliable ones.

GARDEN IRRIGATION

By PROF. J. W. GREGG, *State College, Pa.*

The experience of the farmer in every century and age has shown that the productiveness of the soil depends to a great extent upon an adequate supply of water; no water, no crops; no crops, no animals; and in the case of countries like India, oftentimes a loss of human life.

Some form of irrigation has been known and practiced in the older European countries for hundreds of years, and even in our own country the idea is not new and yet it is safe to say that sixty years ago the practice of irrigation on a commercial scale was practically new to the people of this country. Conditions are now rapidly changing and there are hundreds of market gardeners and greenhouse men that are making use of some form of irrigation to produce for them the maximum returns from a given area. With all this rapid progress that is being made by many up-to-date growers, there are those who still depend upon the natural rainfall to furnish enough water for their growing crops. These men are not awake to the improved methods now in use by successful truckers and still associate irrigation with that vast area of parched land west of the Mississippi, and little do they realize the importance of some form of irrigation in their own constantly varying climatic conditions. These same men may not be questioning the extensive use of manures and chemical fertilizers, neither do they undervalue the practice of thorough cultivation or drainage, yet with all their diligent culture and generous fertilization, they are annually incurring losses amounting to thousands of dollars because they are unable to supply water when needed by the growing crop. It is too often the case that the grower sees the returns for his year's labor and expenditures fade away in a few days or weeks of uncontrolled drought.

The question that naturally arises is why are so many growers neglecting the use of some method of irrigation? There seems to be three reasons: First, the prevalence of the old idea that irrigation is of value only in the arid sections of the west; second, the general ignorance of the ease and cheapness that some form of irrigation may be installed, used, and maintained as compared with the great annual loss without such practice; and, third, the failure to recognize or realize that a constant supply of water promotes in growing crops a more complete development of the crop, more luxuriant and uniform growth and early maturity to say nothing of increased quality or, in other words, many do not know the agricultural duty of water and fail to align the practice of irrigation with fertilization, cultivation, and drainage as a factor in intensive culture.

In order that we may fully appreciate the importance of some form of irrigation, let us consider briefly what has been called the agricultural duty of water as it is concerned with the growing plant. Soil water carries mineral and organic matter and is to the soil and plant as blood to the human body. A soil may become

aenemic, lacking in water, so may a plant and in both cases they become dry and many, many times the plants die. The soil loses its sub-organic character, but given a certain amount of water and it is at once alive or vitalized. We know that the great bulk of some plants is nothing but water and that much of the substance of a plant is taken from the soil water, yet many fail to appreciate the fact that for every pound of solid matter thus added to a plant in growth, it is necessary that several hundred pounds of water must be taken in by the plant. Many plants on hot days exhale their own weight in water in the course of a few hours, while others may exhale tons in a few days. In some cases it has been possible for scientists to measure such water and they tell us that there must be on an average of four hundred pounds of water pass through some plants for every pound of dry matter added and furthermore that there seems to be a direct relation between the quantity of water supplied to the soil and the quantity of the crop yielded. This fact is illustrated very plainly by comparing the cacti growth on the dry lands with the luxuriant forests in other sections where the soil is supplied with more water. It is still further noted in the variation in crops from season to season. This ratio can, of course, only be approximated as soils differ in composition and texture as do the yields of tender vegetables and fruits as compared with grains, nuts and dry forage. At present, however, it may be briefly stated that the agricultural duty of water may be to produce 1-1000 part of its weight in the average crop and 1-4000 of its weight in grains.

So far it has been inferred that water is needed only to bring crops to maturity and nothing has been said as to the need of water to promote even and rapid germination of the seed in the ground on the value of water at the time of setting plants in the open ground from green-house or cold frame. Uneven germination produces an uneven crop and how many thousands of plants are lost every year at transplanting time because of two or three hot days, when water cannot be supplied fast enough by the soil. It is appropriate at this point to present a few results that have been obtained by two or three of the state experiment stations.

RESULTS OF EXPERIMENTS

Experiments at the Michigan Station have shown that cabbage yields have been increased to the amount of $150 per acre, some varieties doing better than others.

Tomato yields were increased to an average amount of $100 per acre, while potatoes showed a gain of 150 bushels per acre.

The New Jersey Station reports the following results with beans: Non-irrigated plots, 17 pounds; irrigated plots, 45 pounds. Peppers, non-irrigated plots, 717 fruits; irrigated plots, 1,277 fruits; or at the rate of 80 pounds on the non-irrigated plots and 147 pounds on the irrigated plots. Celery, non-irrigated plots about 136 pounds; or 1 to 8 in "market" value of the crop, the irrigated plots yielding 329 pounds.

40—6—1911

Lettuce.	Each Row 25 Feet Long.				
	Date Harvested.				
	Date sown.	Irrigated.	Non-irrigated.	Irrigated weight.	Non-irrigated weight.
Leaf,	May 13	June 22	July 4	20 lbs. 5 oz.	11 lbs. 3 oz.
Head,	May 13	July 10	July 26	26 lbs. 15 oz.	9 lbs. 1 oz.
Cos,	May 13	June 28	July 10	16 lbs. 3 oz.	5 lbs. 9 oz.

The quality of the irrigated lettuce was excellent, while that of the non-irrigated was decidedly inferior owing to bitterness developed under the very hot and dry conditions. The non-irrigated plants remained in edible condition only a short time and began showing seed stalks at a very early date. The irrigated plants were not only ready for use considerably earlier (as will be noted by reference to the table above), but it seemed to be comparatively easy to hold them in good condition for a considerable time. These results go to show that in times of drought, artificial systems of irrigation may prove of the very greatest value to the market grower.

Greater results than these have been obtained by many practical growers but in all fairness to these results and to the practice it must be stated that in normal seasons the increase in pounds, bushels or tons may not seem worth the cost of irrigation, but if quality is considered worth anything today, the increase in that direction alone will always pay a profit on the investment. In dry or abnormal seasons greater differences are of course shown and then it is that prices are higher and the man who irrigates wins out.

It may be even now some of you are asking yourselves "where would I get the water to irrigate, supposing I wanted to." Many of you may be located near small rivers, or creeks where a lift of 20 to 25 feet by means of a windmill, gasoline or steam engine or if near an interurban trolley line an electric motor will do the work.

Many insignificant little brooks will often flow five gallons in two minutes or 3,600 gallons in twenty-four hours, 108,000 in one month or equal to four inches of rainfall on an acre.

There are many wells from 20 to 50 feet deep capable of furnishing 275 gallons per minute if we only knew it and at this rate it would take only a four-horse power engine 24 hours to cover four acres four inches. Suppose you don't have such a constant supply, then the question of storing the water in tanks or reservoirs becomes necessary, and in most cases it is not a difficult problem to solve, especially when one can make use of a low, boggy place where with a little excavating and the use of some concrete a first-class storage may be made to hold sufficient water to not only pull a crop through two or more weeks of dry weather but might prove of inestimable value to nearby buildings. Those who are trucking or who are in the green-house business in or near large cities or towns can easily afford to make use of the municipal supply at rates ranging from 4 to 10 cents per thousand gallons.

Having briefly disposed of the preceding question of supply, we are now confronted with the question as to what is the best method of applying the water to the growing crops. There are three methods being used here in the east, all more or less successful according to kind of soil, lay of the land and crops grown.

Around Boston we find many growers prefer the water through large mains and then apply with large hose. The objections to this method are, too much labor required, uneven watering and water liable to be applied too rapidly, thereby having a tendency to pack some soils and break down many tender plants.

The furrow method is open to the same objections with the addition that soils of uneven contour will not permit of its use. The overhead system seems to be the best and the one that is rapidly replacing other methods. With this method the water is applied in a fine mist-like spray from nozzles set in galvanized iron pipe arranged on posts in rows at given distances apart. These pipes are capable of being turned either by hand or automatically thus producing an even distribution of water over the entire space. These nozzles are usually placed four feet apart in the pipes and the pipes are about 40 or 50 feet apart according to the water pressure at the nozzle.

This system, known as the Skinner System of Irrigation, costs only from $90 to $150 per acre to install and will pay for itself in a single season.

When shall I irrigate and how much water shall I apply? are other questions to be answered and indeed in most cases they are the hardest ones of the whole practice. In order to determine just when crops need water and when to apply it so they will not suffer from drought or, on the other hand be damaged by too frequent or too generous applications requires practice and a knowledge of the needs of the plants under irrigation. Plants may suffer as much from having the soil kept too wet as too dry. Plants usually do not show the need of water until a great deal of damage has been done and therefore one should never wait for the plants to tell of their need. Frequent sprinkling of the surface soil at irregular intervals is not watering. The surface soil may look moist when the roots of the plant are drying up. The rule seems to be not to water too often but give a good soaking when you do water, if the surface looks dry, dig down to a level with the roots and get a handful of soil, squeeze it and if it holds together there is plenty of water present, but if it falls apart quickly water is usually needed. The amount of water to apply depends upon the kind of soil, crop and climatic conditions. It has been stated that about 3-5 of the volume of clay soils and 2-5 of sandy soils is open space, while good garden loams may range between these figures. There is in all soils free water and water around soil particles and as it is the free water that plants depend upon it is a question of how much free water should soils contain to produce vigorous growth in plants. An answer that has been given to this question states that one pound of water to ten pounds of soil as it is taken from the field will supply enough water for the average crop. We can only approximate this, however, and in practice must resort to other means of determining whether there is sufficient water in the soil for the growth of the plant. Cultivation must go hand in hand with irrigation in order to conserve all

the moisture possible and to prevent the soil from baking, forming a crust on the surface or becoming hard. We have been told that spraying is crop insurance, this is equally true of irrigation because it insures against drought and in thousands of cases has spelled profit where without it the word would have been loss.

MARKETING PROBLEMS

By PAUL WORK, *Ithaca, N. Y.*

(This lecture was fully illustrated.)

The successful marketing of horticultural products involves a multitude of problems. Beginning with the time the orchard site is chosen, or with the laying of the plan for the vegetable garden, the questions arise in unending array until the last check is received and the last freight claim is settled. With old-time conditions, when almost every householder was a gardener, and when wants were soon satisfied, the problems of marketing were simple and easily solved. But now the sky-scraper and the apartment house have banished the little garden plot, and at the same time the demand has grown, until a great variety of product must be supplied at every season and in every city. Thus we have been forced to deal with transportation and storage and refrigeration, and with the hundreds of considerations that make for success in these. We have been forced to meet new conditions of selling. The grower no longer meets the consumer, save in dealings on a small scale. Nor can it soon or ever again be so.

Of the dozens or scores of problems which arise, the solution of each one having its bearing upon the success or failure of the season, we can consider but three or four. One of the earliest to present itself is the package problem. This should be solved before the rush of the season is upon us. Take advantage of the slack time of the manufacturer in securing rock bottom prices for large quantities. Take advantage of your own slack time for hauling and nailing up and storing. Let us then consider the points that should be sought in our package, for upon this much depends. It is impossible to lay down absolute or even very definite rules, because every producer must meet his own conditions, and there are as many different conditions as there are growers.

In the first place, the package should be strong and should protect its contents well. In this respect, the Boston box, which is approximately 17 x 17 x 8 inches in dimension, and which is used for almost every form of produce, is good. However, the six-basket carrier is better. The small container within the large crate offers a great advantage, protecting from external shock and from internal pressure.

The second requirement is an attractive appearance. Almost any package looks well when it is new, but no package will long remain so. A moment on Washington Street, New York, or on

South Water Street, Chicago, is sufficient to emphasize this. The Jersey tomato box makes trip after trip to New York. It is handled and tumbled and broken and repaired until its appearance is more that of a wreck than of a package. Such a policy costs cents for every crate that is so shipped. If returnable boxes are used, as, for instance, on local market where the grower drives in, they should be substantially made, and should be kept painted. This reduces the cost of the packages, and aids greatly in keeping up the appearance of both package and load. Rochester is the one large market with which I am familiar where this is the regular practice.

In the third place, the produce should be displayed to advantage. The better it is presented, the better it sells and the higher the price. The Western New York cauliflower box, which, when the lid is removed, shows each snowy head surrounded by a border of green, is a splendid example of this. It is far better advertisement than the Long Island barrel. Handle packages attract buyers, and sell the product in larger quantities than would otherwise be the case. One who would ordinarily ask for two pounds or a quarter peck will often purchase a whole basket.

Fourth, it is ordinarily best to use a package that is standard on the market to be served, provided it is a good package. If it is not, try another. People soon recognize merit even in new array. This array then becomes your distinctive mark, and helps sell your goods.

Fifth, the package should be easily handled and should not invite abuse, as is true of the barrel. Crates and baskets are usually handled with a good deal of care.

Sixth, the first cost of the package should be carefully looked into. If possible, use a cheap one and make it a gift package. It is always fresh and bright and clean, and there is no trouble about its return. The use of returnable packages is always accompanied by a great deal of loss and annoyance.

The seventh requirement is that the measure shall be exact when the vessel is well filled. Few defects will turn away a buyer more quickly than slack measure.

Eighth, empties should be capable of compact storage. This makes easy hauling, and a good supply can be secured early in the season. In this connection, it should be suggested that it is never good policy to leave packages in the open for any considerable length of time. New wood loses its attractive whiteness within a very few days, and the selling value of the package is thereby decreased.

Finally, a high grade product must not be put in a package that is ordinarily used for low grade stuff. Some of our best lettuce growers are coming to use a box which carries two or three dozen heads of the best grade. These men put their lower grades in the ordinary bushel hamper. Producers of other sections use this same bushel hamper for their first grade, and neither of them uses a distinctive mark. As a result, the one who is packing good lettuce in the hampers is not getting the best results.

Every year sees the work of grading cutting a larger figure in the work of marketing than it did before. Grading was once unknown. Today the producer of fruits and vegetables is following close upon the trail of the manufacturer, who long ago realized the necessity of uniformity. The citrus people took the lead in this.

The western apple packers were next, with the vegetable shippers close on their heels. The progressive market gardeners are awake to the fact that two gnarled cucumbers cut the price of the whole bushel. Hundreds are still asleep.

Every community must make its own plan of grading. What suits one market does not suit another. Many are discouraged in setting the standard high, because the lower grades are becoming increasingly difficult to sell. During the last season we had to discard a considerable proportion of our second grade tomatoes at Cornell, but it paid. At one time, ordinary run-of-the-field fruit was bringing twenty-five cents a basket. Our primes sold at forty cents, and many of our seconds at twenty to twenty-five cents. However, seconds are not wanted in large quantity on most markets. Many hold that the moral of this is, "Don't grade. If the consumer doesn't want seconds, make him take them with the best." But the true moral is, "Don't grow seconds." Of course, there will be some inferior fruit, but if, by selecting a well bred strain of a good variety, and by giving the best culture, we can reduce the seconds to very low proportions, we will not object to leaving a few culls in the field, or to hauling a few loads to the evaporator.

One of the most common mistakes in grading is in reducing the standards when the price drops. When markets are glutted, the question ceases to be one of securing a high price, but it becomes a question of moving the crop, or letting it rot. People continue to use the product, and that in large quantities. They are willing to pay a price which will cover marketing cost and a good share of production, but the question is, which grower sells and which does not? Naturally, the one with the best sells. The following clipping, which is typical of a large number that appeared in our trade papers during the season just closing, furnishes good evidence on this point:

"Lettuce from State points has been in free receipt and much has been sold for less than charges. Fancy headed stocks is worth fifty to seventy-five cents per basket, but average grades are neglected at ten to twenty-five cents per package."

The time of over supply is just the time when grading counts. The grower has established his trade on a basis of quality, and by maintaining that basis, he is able to hold on while the other fellow drops out. Moreover, Mr. Grader still holds the trade when the market picks up.

It is by no means easy to maintain a standard of grading. One naturally desires a maximum of primes and a minimum of seconds, and he even unconsciously tends downward. With hired help the problem is much more difficult. The first essential is to form a mental image of the standard for each grade, working it out carefully and making it neither too high nor too low. Fix these standards as far as possible by the use of sizing boards and the like. Constant and rigid inspection is then necessary. If a large quantity is handled, each worker should have a number to be placed in each basket. Thus responsiblity is fixed. Just here is one of the greatest advantages of machine-grading. A machine is freer from the failings of human nature.

The problem of packing cannot be separated from the problem of grading. The requirements are two. The first is that the pack-

age shall be snug and firm. Every apple should rest tightly against each adjoining apple. This is secured in the barrel by jarring and by the use of the press; in the box the elasticity of the sides serves to keep the fruit firm. Failure to observe this results in bruises and in a slack pack. The other requirement is a pleasing finish. The buyer's first test is the test of the eye. If this results unfavorably (and the question is soon decided), no further test is made. Our illustration shows two baskets of tomatoes graded alike. Careful arrangement of the surface of the one basket adds to it attractiveness and to its salability. Nor does it increase the cost a half a cent. A tomato is as easily laid in place as out.

Thus we have raised the whole question of facing. The baskets of tomatoes which are shown in our illustration are both honestly packed, for the fruits that appear on the top are true samples of the entire contents of the package. Presentation of goods in attractive form is not a misrepresentation. In fact, the grower of asparagus who brings his product to the city untrimmed, irregularly bunched, and tied with untidy twine, is doing himself injustice. Such a product in Ithaca last year brought lower prices than the California asparagus, although the former was of higher quality. The Westerners had observed all the details of good preparation for sale, and had gone so far as to enclose each bunch in an attractive lithographed wrapper.

Turning from mere facing for a neat finish, we may glace at the other extreme, as illustrated in a practice that has grown up among the orchardists of some sections. As the barrel is being packed, very fine specimens are placed on the bottom. A metal stovepipe of perhaps ten or twelve-inch diameter is then set within, and is surrounded by very good fruit, while the interior is filled with culls. The stovepipe is lifted out, and the barrel is finished with good fruit. It was a wise (?) farmer who evolved such a scheme as this. We are all agreed as to the rank dishonestly of such a practice.

Having agreed upon our extremes, it might be well for us to describe the ordinary practice as a starting point. As the apples come to the grading table, a sufficient number of the very finest are selected out to make the upper layer. These are placed in the head of the barrel, neatly arranged. Upon these are placed perhaps half a bushel of specimens that are considerably better than average. Care is taken that a brightly colored cheek is opposite each opening in the top layer. The rest of the barrel is filled with fruit that is just barely within the legal requirement for the grade. Double facing is occasionally practiced.

What is to be the attitude of the good grower—the man who thinks—the man who does things for reasons better than "It was always thus?" In the first place, we cannot dismiss the method just described without a hearing. Many good growers use it, men who have given the matter careful thought. While the practice certainly originated in the desire to deceive, these men have dismissed the moral question, the question of honesty, because the buyer understands fully the plan of packing, and there is absolutely no misrepresentation so far as he is concerned. Two chief reasons are given for its use. First, "The trade demands it," and second, "A barrel on the open market is considered as containing fruit averaging about

twenty-five per cent. poorer than the face." In dealing with the first statement, we must probe deeper into the reasons underlying this undoubted fact. Why do the dealers demand overfaced packages? Can we find any reason other than the hope that it may enable them to sell it for better fruit than it is? What other possible gain might there be? On the other hand, does the grower gain anything? He has gone to the labor and trouble of sorting out a half bushel of the very finest from three bushels. The barrel is judged and priced according to the other two and one-half bushels. Thus he loses the difference between ordinary No. 1's and apples that are good enough for box packing or for barreling for the finest of trade, plus the extra labor. As to the other point, ordinary apples packed straight would be discounted fifteen to twenty-five per cent. below the face value. This is true of the open market under ordinary method. The difficulty can be met by observing two factors. First, grow good fruit. A letter from a New York producer includes this sentence: "I think it would be inexcusable in a farmer who sprays thoroughly, cultivates, trims, and fertilizes, to put out anything but good apples." If the producer follows the methods that have been so widely preached and so successfully practiced, he will be able to pack barrels that are as good from head to head as are the ordinary facers and packers of the ordinary grower. As stated before, if sold through the ordinary channels in the ordinary way, the package will be discounted fifteen to twenty-five per cent. from the face, and the other fellow will come out just as well. That we may avoid this difficulty, we must observe our second factor, namely, to be sure that there is an adequate distinguishing mark. A catchy label is effective; it inspires confidence. The prospective buyer feels that if the producer thinks enough of his product to put it up well, and mark it well, it must be better than the average. A guarantee is of especial value. If the label does no more than attract attention, it does much. Some months ago, I stood upon a railroad platform, waiting for a train. My attention fell upon a box of celery that was different from anything I had seen before. It was about half the size of an ordinary crate, and the end was printed with a neat legend. I took the address, and when I was engaged in preparing an exhibit on marketing methods a few weeks later, I sent for a crate of this same celery, confident that the quality would be there. I was not disappointed. You may be sure that a grower does not care to put his name upon a product that is not good.

Of course, one must choose well his selling agent, and must use sound business judgment in his dealing. Good produce well packed will not bring results if dumped on the market, and the grower who will ship to any Tom, Dick or Harry who presents a big card and wears a checkbook in his pocket, must expect to be swindled.

Before we leave this subject of facing, let us look at it in another light. Suppose you enter a store with the idea of purchasing a half dozen shirts. A box is placed before you, and you examine the upper garment, finding it to be about what you want. Is it at all probable that you would purchase the box without examining all the others? The only circumstance under which you might do this would be that you know the dealer and have full confidence in

him. At any rate, you would make yourself very sure as to what you were getting. Now, to turn to the fruit question. You may be just as sure that the buyer is not going to take a risk as to what he is purchasing. Particularly when the reputation of growers is no higher than it is. Mr. W. H. Underwood, an exceedingly extensive orchardist in Kansas, puts it this way:

"We have got over believing that all the stuff we sell goes to suckers, in fact, we give the buyer the benefit of being just as bright as we are, and we haven't yet found a buyer who will not look in the centre of the package if he is going to invest $5,000 to $20,000 of his own money."

Another fruit man states it thus: "The age of the wooden nutmeg is past. We must give value and stand behind it." These remarks come from actual and thoroughly successful growers. Now, to return to the shirts. Suppose upon lifting the first garment, you found that the others were of a much lower grade and distinctly inferior in quality and workmanship. What would you do? The chances are you would be outside the door in ten seconds and you go to another store where you hope another attempt to swindle you will not be made. Is not this just exactly what the fruit dealers have done? As evidence, witness the following clipping:

"DEALERS HANDLE WESTERN APPLES

Complaint of Dishonest Packing in the East

ORDINANCE IS SUGGESTED

City law to go with proposed federal statute compelling honest packing urged. Cold storage full of eastern fruit."

With thousands of barrels of eastern apples in cold storage, the big retail dealers in Rochester are handling western fruit, if not exclusively, then nearly so. They have frankly admitted that this is true, and they are not backward in saying why it seems likely to remain true.

Men thoroughly in touch with the situation say that an honest barrel of apples from New York packers is rare. There are honest packers, of course, but they are in the minority. Barrels that look faultless in the facing show up anything but faultless in the middle, say retail dealers. No. 2 quality is allowed to partially fill No. 1 barrels. Disgust over this condition has grown so great that many dealers along the main thoroughfares of this city will not buy a barrel of fruit grown in New York as long as the western apples can be purchased, notwithstanding that the price of western fruit is considerably higher.

However, the progressive grower need not conclude that all is ruined. Correspondence with one of the best known retailers in Philadelphia has brought the information that eastern fruit of really first class quality and high grade pack will bring just as high prices as the western fruit. Nor does the individual need to hold back until the whole fruit industry is reformed. A man will very soon gain a reputation and will receive the reward of his prudence and foresight.

Are we not then ready to conclude that when the producers of the east pack straight, face for a neat finish, sell seconds as seconds, and feed the culls to the pigs, that it will speedily regain its place in the markets of our cities?

Much has been said during the past few years regarding efficiency and scientific management. The cry of the factory manager has been for the increased use of machinery, for the elimination of unnecessary motions in handwork, and for the saving of time and energy at every turn. This means nothing more nor less than the lowering of the cost of production, particularly in respect to labor. There is no field in which a little attention to the principles of scientific management will yield greater returns than in the marketing of produce. The preparation for market is the greatest single item in the cost of any of our commodities. Time, that factor in crop production which is every year becoming costlier, may be gained or lost at a hundred points, many of them insignificant, but in the season amounting to hundreds of dollars.

To illustrate this, let us glance at some of the ideas that have been worked out by a Western New York grower, in handling his spinach crop. His operations are in no way unusual, and schemes similar to his can be developed for practically all conditions. In the first place, the labor force which is used in cutting is well organized. A large gang works back and forth across the field, keeping together and leaving a swath of baskets. The baskets that are used for cutting are cheap, and a very large number are employed. If a wagon is delayed for a few moments, there is no halting in the work. The wagons that are used for hauling from the field are of the low-wheeled type, equipped with a broad, flat bed, and built for short turns, a type that should be used almost universally for work on the farm itself. The spinach is hauled to market in large cubical crates, holding about 500 pounds each. Four of these boxes are placed on a wagon which goes into the field. They are filled, and the wagon is driven off the muck to a position beneath a large trestle. The team is hitched to another wagon, and another four boxes are similarly loaded and brought to a place beside the first wagon. The trestle carries a chain hoist similar to that which is used in the litter carriers of the dairy barn, and in this way the boxes from one wagon are transferred to the other. A two-ton load is then ready to go to the cannery. Formerly, celery crates were used to handle the crop, but the present method is found to mean a very appreciable saving, not many cents on each load, but amounting to a great deal in the course of a season. One notable feature of this place is the excellent farm road. It is not a fancy road, it is not paved or macadamized, but it is always good. The secret of it is good grading at first, the use of a scraper at the beginning of the season to give it

proper form, and the use of wide-wheeled wagons, which are highly efficient in maintaining it in good shape. The farm road is often used as much or more than the public road, and if it is in poor shape, every load that is hauled over it is limited. A large load over a good road can be hauled just as cheaply as a small load on a poor road. By the use of these ideas, all of them quite simple and within reach of anyone, this grower saves literally hundreds of dollars each year.

The importance of good public roads in reducing the cost of marketing cannot be over-emphasized. The producers to the south of Buffalo have the advantage of brick pavement in two directions for eight and twelve miles, respectively. The growers in other sections that do not enjoy these advantages should make their demands heard, and in course of time the problem is sure to be solved. Another factor of great importance in making possible satisfactory marketing conditions is the market wagon itself. It should, in the first place, be well planned. It should accommodate the different types of packages that are used without waste of space. This renders the determining of measurements somewhat of a puzzle, but can usually be worked out to good advantage. Convenience in loading and unloading should be very carefully considered. Time is precious when sales are being made, and the salesman-driver cannot afford to use many minutes in rummaging around among his load or in re-adjusting it every time anything is taken out. The wagon should be very substantially built. It will be called upon to stand a great deal of rough usuage. The market gardener, with his load of perishable produce worth anywhere from fifty to two hundred dollars, cannot afford a wreck, and a single accident may cost more than enough to secure the very highest grade of wagon. The auto truck is now thoroughly established as a practical form of equipment for the large producer. It requires feed only when it is working, and has been developed until it is thoroughly reliable. Market gardeners and fruit men are using the trucks in increasing numbers each year.

The packing house is an important factor in the economical preperation of produce for market. It may be simple, consisting of no more than an open air shed, or it may be large and complex, providing facilities for washing, grading, packing, loading and storing In any case, the straight line principle of operation should be observed, that is, produce should come in at one side or end, and should progress through the house as it is worked over. You cannot afford to have your workmen sorting out the graded from the ungraded, and climbing over a stack of empty packages to take the finished ones to the loading platform. This is very well illustrated in the celery house which is represented in the diagram.

The packing house of the market gardener should be light, and very careful provision should be made for sanitation. Much water is ordinarily used, and the floor should be of cement with adequate drainage facilities. Light should be abundant, as it is often necessary to work late, and it is not desirable to have recourse to artificial lighting.

In the preparation of most crops for market, it is necessary to handle individual fruits or vegetables. This work offers opportun-

ity for gain or loss at every turn. If a laborer insists on taking four motions to an act that should be accomplished in three, that laborer is costing just thirty-three per cent. more than he should. You would not stand for such in increase in the interest on a loan. It is no more logical that you should accept such a loss from a laborer. A study of the most effective motions by which a given piece of work can be done almost invariably yields returns in time saved. This principal can well be illustrated by the method in handling tomatoes. One who knows how to pick up a fruit with the left hand, will give it a quick rub with the right hand, while the third or fourth finger of the left hand removes the stem. It is then placed in the basket in less time than it takes to tell it. An inexperienced one will take up the fruit, will turn it over two or three times, rubbing it in several directions, and will perhaps use the thumb and finger of the right hand to remove the stem. In this way, time is lost.

Equipment should be carefully arranged for convenience and comfort. If workers can be seated and do their work well, benches or stools should by all means be provided. Anything that makes for the contentment of the help is a good investment.

The last few years have seen the introduction of a great many mechanical devices to aid in the work of preparing for market. The citrus people of California were the pioneers in this, and the visitor in the west finds in an orange packing house a most complicated array of belts and pulleys and tanks and conveyer. Just as little as possible is left for the hand to do. One of the favorite devices is the rope sizer. This consists of two ropes moving over pulleys at the same rate of speed, and spreading a little further apart as the fruit passes along. Separate receivers are placed under the ropes at proper spacing, and each size thus drops to its place. The same principle is worked out in a grader which is used for peaches in Western New York with a high degree of success. With fruit that is not adapted to mechanical sorting, much is gained by the use of sorting belts. Unsorted fruits pass along a central belt, and the different grades are removed by skilled hands and placed on other belts, which carry them to their respective places. These are mere examples, and there are dozens of others, such as the different washers for bunched stuff, the bean cleaners and the onion topper. Finally, under the head of efficiency, I would call your attention to the importance of large scale marketing in making workable the many economies that may be devised. Labor may be much more readily secured, and the force may be much more thoroughly and efficiently organized. Individual helpers are given the kind of work at which they are most expert. To illustrate, in a cucumber packing house in New York State, it has been found that certain girls are very quick at cleaning the fruits, but do not seem to have the type of judgment which makes good graders. Others, while not quite so nimble, are experts at the sorting. Where a large amount of work is to be done, these two processes can be carried through separately, and full advantage can be take of individual differences. Large scale production makes possible the use of the larger and more complex machines that would otherwise be out of the question. It also involves great advantage in securing favorable transportation facilities. A man or

an organization that is using twenty or fifty cars a week has far less trouble in securing them than one only using an occasional car. He also has great advantage in pressing claims, and in securing adequate service all along the line.

Thus far we have considered distinct ideas and phases of marketing. I wish now to bring to your attention two exceptionally good examples of systems of marketing, worked out in accordance with the principles I have suggested. Both have proved successful in the first degree.

Ionia, New York, has for a number of years been an important centre in the production of cucumbers for market. Until two years ago, each grower did his own marketing, either by shipment on commission or through local buyers. It is needless to detail the difficulties and dissatisfaction of this system. Many of us are still laboring under it. All of us have so labored at some time or other. Two years ago the growers of this section were brought together under the leadership of Mr. C. R. White in the Ionia Growers' Association. Mr. White has worked out a plan of marketing that has proved nearly ideal.

Baskets of the ordinary type are bought in large lots at unusually reasonable figures. These are issued to growers, and a record is kept by means of punch marks on a duplex ticket. The baskets are used for picking, and the grower brings his load directly to the packing house of the Association in Ionia. His load is tallied on another set of duplex tickets, the punch indicating the number of baskets, run-of-the-field, which he has brought. They are then ready to be graded and packed. The equipment for this work consists of four tables, each accommodating eight workers. They consist of frames bearing two sheets of canvas. The upper sheet is fastened only at one edge to permit of the easy removal of dirt. Two tables stand in each of two rooms, which are managed as separate units.

The cucumbers of a single grower are brought and emptied upon the tables, and the work of wiping and grading begins. Each worker wears a fleece mitt with which the fruits are quickly rubbed, and dropped into the proper one of six baskets, of which there is a set for every two graders. The grades are designated as No. 1, Fancy, Dills, Extras, and No. 2's, while the sixth grade is discarded. No. 1's and Fancys are perfect cubes, differing only in size. Extras are over size, and are not held to so rigid a standard of perfection. No. 2's or Choice are of the same size as No. 1's and Fancys, but are slightly off in form, or perhaps are slightly blemished. Dills are perfect, but smaller than Fancys. The discard receives all misshapen and otherwise blemished specimens.

As the baskets are filled, they are removed to piles, according to grade, and are covered and labeled. After all of a given grower's lot has been placed upon the tables, the grading is completed, parts of baskets are filled, and a tally is taken of the number of each grade. This is also made by means of a slip and punch. The full baskets are then removed to the shipping platform, and another lot begun. Parts of baskets over a half are tallied as one, while minor fractions are discarded.

Careful record is kept of each car shipped. These records are filed in the office of the Association, where they are typewritten on three duplicate sheets. The white one is kept at the office. The

other two, pink and yellow in color, are forwarded to the consignee, with the request that fill out both and return the pink, securing the signature of the freight agent. This sheet, with the white one, is filed for permanent record, and is invaluable in dealing with claims.

The bookkeeping in the office is necessarily rather complex. Yet the system of duplex tickets has done much to simplify it, and to insure accuracy. Baskets drawn are charged against the grower, while those returned are credited. Baskets shipped are finally charged at actual cost. The pooling is based on the third ticket mentioned, and is carried out each week. A special book is used for this purpose. It has at the left a space for the initial and number of the car, and this followed by a space for the number of baskets of each grade, the net price received for this grade, and the total. In this way, the actual net return is calculated, and is entered on the ledger account of each grower who shipped that week. Checks are then made out and handed to the grower. The actual cost of packing, usually from two to two and one-half cents per basket, is deducted together with a small commission. The salaries of the manager, bookkeeper, and foreman are not included in the cost of packing, and these, with other expenses, are paid from the commission. Each year's surplus of commission over expenses has been used in improvements. The Association is organized as a stock company with $10 shares. As to results, this Association shipped last season nearly 150 cars. Good prices have been received much of the time, and fair prices all the time, including one or two periods of glut, when other shippers were moving none.

I have now to present a plan of marketing which is decidedly original, and which is being worked out by a Western New York grower. This producer was a city business man, who has given an increasing amount of his time to his gardens, until a year ago, when he left the city entirely. His home being in East Aurora, he chose the name "Sun-Rise Gardens," and with the help of a home-made manure green-house, he undertook the task of furnishing vegetables of quality to the housewife before that quality has departed from them. His leading crop is Golden Bantam sweet corn. It is gathered in the afternoon, and is brought to the packing house. If the day is hot, it is placed on tables, over which play the sprays of several sprinklers. After it is thoroughly cooled, it is closely graded, and the best is packed in dozens in neat cardboard cartons, bearing the following legend:

"ABSOLTELY RELIABLE
Away from Dust and Dirt
No Handling
Fresh from the Gardens
Sun-Rise Gardens
Golden Bantam Sweet Corn"

It also shows the date of shipping and the signature of the proprietor. The packages are placed in crates, and shipped direct to grocers who handle the product regularly. The price received throughout the season is twenty cents per dozen. The seconds are consigned to commission merchants to be sold in the ordinary way, while thirds are fed to the hogs.

During the past season, Mr. Tyler marketed the produce of thirty acres of Golden Bantam corn. At the time of my visit to his place about the first of September, he had already marketed 12,000 dozen. In carrying out this work, Mr. Tyler has had some interesting experiences. When he was about to make his first shipment, he called a grocer by 'phone, and told him he meant to forward some corn which was to be sold at twenty-five cents per dozen. The ruling price at the time was nearer fifteen cents, and the grocer hooted at the idea. Mr. Tyler forwarded the corn in spite of objection, instructing the grocer not to sell any for less than twenty-five cents, and to keep none over until the second day. At the same time, he assumed the risk, agreeing that the dealer would owe him nothing for corn unsold. Only a few boxes were forwarded. The next day, the order came for fifteen, and the next for an increased quantity. Thus was the trade first established. Ever since the hardest struggle has been with the retail dealers, to convince them of the merit of the idea, and to induce them to give it a fair show. During the present season, a retailer said to Mr. Tyler, "The corn is fine, but the price is too high. You sell to me at fifteen cents, and I will move double the quantity." Mr. Tyler agreed to try it for two weeks. Sales actually fell off, and back went the price to twenty cents.

We might have taken up many other questions, such as those that arise in connection with weights and measures, those pertaining to the planning and management of local markets, the use of advertising, commission sales, and the difficulties that are involved, and an indefinite number of others; but these we must pass by for the present. Leaving them behind, we must conclude that he who plants well, grades well, packs well, and who conducts his operations on a scale such that he may practice economy in detail and that he may command both labor and markets, will surely win. If he must labor on a small scale and cannot work with his neighbors to secure these advantages, he will certainly be crowded out by those who can. Indeed, we see pointers here and there that indicate that he is even now beginning his retreat.

THE GOOD SEED QUESTION

C. E. MYERS, *State College, Pa.*

(Note: This address was profusely illustrated with lantern slides).

There is probably no question confronting the farmer today that is more worthy of study than that of good seed. We may fertilize, cultivate, spray and irrigate, but if we do not plant good seeds we cannot secure a good crop. We are too much inclined to believe that seed is seed and disregard the fact that enclosed within the seed coat are the potentialities of the future plant. If the seed

has not been produced by a good plant we cannot expect it to produce anything other than what has been bred into it. It is doubtless true that it is impossible to discriminate between good and poor seed by looking at it, but by growing the crop we can readily see important differences. During the past four years the Department of Horticulture of the Pennsylvania State College has been making a study of the importance of seed in the profitable production of cabbage and tomatoes. The work includes both variety and strain tests. In the strain tests the seeds of certain varieties are secured from a large number of seedsmen in various parts of the country. A germination test is made soon after the seed is received in order that we may regulate the thickness of sowing. In a lot of seeds of one variety secured in the spring of 1909, the germination ranged from 2 to 99 per cent. A high percentage of germination is not especially important, yet it should not fall below 65 for cabbage and in any event it is highly desirable that the percentage of germination be known because of the reason just stated.

After the germination test has been made the strains of the variety to be tested are sown in flats in the green-house. As germination proceeds, notable differences will be seen in the relative vigor of the various strains as will be seen by some of the slides which follow.

This slide shows a flat of well grown plants ready for the field planting. By careful control of temperature and watering vigorous stocky plants may be grown. These are much superior to the leggy, weak plants which develop where the temperature is too high and watering too frequent. While the plants are in cold frames they are gradually accustomed to cold temperature so that in case severe weather follows the field planting the plants will not be injured.

During the past three years we have been making a variety test of early varieties. These are of interest and value since sometimes new varieties of merit are produced. At the present time we have fifty so-called early varieties in the test but it is doubtful if there is sufficient difference between many of the varieties to identify them.

In a slide which follows the variety Early Race Horse is shown in comparison with a good strain of Jersey Wakefield. From the illustration it will be seen that Race Horse matures several days earlier than Jersey Wakefield. A test of other varieties shows that Race Horse, Extra Early and First Early are identical. The tests have shown that in several instances a well known variety has been sent out under a new name.

The next slide shows a field of Volga. This is a rather new variety which appears to be well suited to a limestone soil. It is midseason in time of maturity. The heads are round, solid, and desirable, except that the head leaves do not fold across as much as might be desired.

As previously stated, the strain tests are perhaps the most important of the experiments we have been conducting during the past three years. In a strain test of Jersey Wakefield secured in 1908, which included twenty-five strains, notable differences were observed in the uniformity to type, and the time of maturing. Of the twenty-five strains in the test several matured more than 90 per cent. of the crop within thirteen weeks of the time it was planted in the field.

The plants of these strains were quite uniform and desirable. On the other hand, four strains were very irregular, leafy and matured few if any remarkable heads. The slide shows these poor strains as well as the strains that matured early.

The work of 1908 showed that the question of strains was worthy of investigation. The next year a new lot of seed was secured of the varieties Jersey Wakefield, Charleston Wakefield, Early Spring and Early Summer, as well as several late varieties.

Of the thirty-one strains secured at this time only one is as poor as the four previously mentioned of the test secured the year previous. The slide which follows shows a typical plant of this strain, while the next slide shows an excellent plant of the Jersey Wakefield variety.

This year at the time of making the first cutting the heads were piled at the end of the row of each strain and photographed. The series of slides which follow shows the variation in earliness of the respective strains. The slide showing this table of yields is interesting.

TABLE I.—Harvesting Record of Jersey Wakefield.

Record No. of Strain.	Yield per acre. First cutting—tons.	Value per acre.	Per cent. of crop harvested. First cutting.	Total yield per acre—tons.
1,	3.79	189.50	56.15	6.75
2,	2.21	110.50	32.26	6.85
3,	2.71	135.50	34.43	7.87
4,	2.36	118 00	31.47	7.50
5,	3.64	182.00	45.11	8.07
6,	2.21	110.50	33.08	6.68
7,	3.60	180.00	41.28	8.72
8,	2.50	125.00	31.41	7.96
9,	2.60	130.00	28.41	9.15
10,	1.42	71.00	17.13	8.29
11,	2.43	121.50	27.36	8.88
12,	2.50	125.00	28.34	8.82
13,	1.63	81.50	22.21	7.34
14,	0.54	27.00	6.55	8.25
15,	1.70	80.50	24.42	7.33
16,	4.36	218.00	63.16	6.91
17,	3.00	150.00	35.71	8.40
18,	0.29	14.50	7.02	4.13
19,	3.93	196.50	49.56	7.93
20,	2.43	121.50	32.40	7.50
21,	2.00	100.00	27.78	7.20
22,	3.64	182.00	42.72	8.52
23,	3.00	150.00	38.76	7.74
24,	3.43	171.50	51.81	6.62
25,	3.37	168.50	43.48	7.75
26,	3.04	152.00	44.90	6.77
27,	2.72	136.00	45.33	6.00
28,	2.73	136.50	31.67	8.62
29,	2.74	137.00	32.46	8.44
32,	2.76	138.00	34.12	8.09
33,	2.77	138.50	38.47	7.20

In this table we have compiled the yield per acre of each strain for the first as well as the total cutting. From it we see that the yield per acre at the first cutting varies from .29 to 4.36 tons. At the time this cutting was made the market price of cabbage was $50 a ton. Thus in the one case the money value was $14.50 and in the other case $218. This difference will readily be appreciated

by all who grow this crop commercially. The total yield per acre ranged from 4.13 tons to 9.15 tons, or a difference of 5.02 tons. We have every reason to believe that this difference was solely due to the difference in seed.

From what has been said some may feel that we have been making an attack of the seedsmen. Nothing could be further from the truth. On the other hand, the work has been examined and heartily approved by some of the best seedsmen of the country who are very glad to secure any information as to how they can better serve their customers.

During the past season while one of these seedsmen was visiting the experiments he remarked that as a whole few of the tests showed the uniformity that is desirable. He pointed to one strain which was very undesirable and commented on its inferiority. When I told him that it was his strain he was very much surprised and said although it was a great disappointment to him, yet he wanted to know the facts He said that he had paid an extra price for this seed with the request that the seed grower give him the best that could be produced. Naturally he would be chagrined when the seed produced the plants grown in this test. In justice to this seedsman I may say that strains of other varieties secured from him have been very good and his strain of Early Spring was next to the best in the test. I have every reason to believe that he used his best efforts to secure good seed in each case but in the one instance he was disappointed.

The test of Charleston Wakefield has been interesting in that in many instances there is little if any noticeable difference between it and the same strain of Jersey Wakefield. This is not especially important since the Charleston Wakefield is of the same general type, the chief difference being that of size (as it is a little later in maturing) a difference which apparently is not always present.

The test of the variety Early Spring shows several strains that are materially lacking in uniformity. This may be seen from the slide.

The next slide shows a plant typical of one of these poorly bred strains, while the next slide shows a well bred plant such as may be found in some of the best strains. Several of the strains are a mixture of one or more varieties. One is Jersey Wakefield, and two are Early Summer. It is possible that some of these are due to error, but in one case Early Summer is known to have been sold for Early Spring. Errors may be pardoned, but the seedsman who deliberately substitutes without informing his customer of the fact is deserving of but little sympathy.

The slides which follow show the relative earliness and yield of the various strains. We see that in some cases only a few of the fifty plants have yet matured heads, while in another case 49 of the fifty heads were cut at the first cutting. The yield per acre of the first cutting varied from 1.53 tons, as represented by the poorest strain to 14.58 tons as represented by the best. The total yield varied from 6 to 15 tons. The test of the late varieties has shown less variation than is found in the varieties just discussed. A fact of interest, however, is that there is considerable difference between strains and varieties as regards resistence to disease. Of the varieties we have tested, Houser seems to be the most resistant.

The work with tomatoes follows the same general plan as that with cabbage. When the plants are transplanted the last time, they are planted in three-inch paper pots. These pots are cheap, easily made and have given very satisfactory results. The slide shows the tools used in making them as well as a well grown plant. When plants are grown by this method, they may be transplanted without suffering any severe shock because of broken roots, or unavoidable moisture condition in the soil. The pots are also desirable for use in starting melons and cucumbers.

In the next slide we have a comparison of the yield and general character of a test of 21 strains of Chalks Jewel tomato.

TABLE II. SUMMARY OF TEST OF CHALK JEWEL TOMATO—1910-1911

Record number of strain.	Average size of fruit.	Yield per acre.	General Character.
1	.25 lb.	15.3 tons.	Good.
2	.25	14.7	Good.
3	.21	14.0	Fair.
4	.27	14.6	Fair.
5	.29	14.5	Fair.
6	.24	12.9	Good.
7	.24	13.6	Good.
8	.27	12.2	Are Matchless.
9	.29	14.0	Fair.
10	.28	15.4	Mixed with Matchless.
11	.28	15.0	Fair.
12	.25	17.8	Mixed with Beauty and Matchless.
13	.26	14.2	Fair.
14	.23	14.0	Good.
15	.22	15.2	Fair.
16	.23	15.4	Fair.
17	.25	19.3	Good.
18	.29	20.5	Are Matchless.
19	.26	21.3	Mixed with Beauty.
20	.26	19.6	Good.
21	.25	20.6	Mixed with Matchless.

From the table we see that there is considerable irregularity as regards the general character of fruit and vine as well as the mixing with other varieties and substitution or errors. Of the twenty-one strains in the test it will be seen that two are of the variety other than what was desired, while four others are mixed.

Considering the yield of marketable fruit, we see that it varies from 12.9 to 19.6 tons per acre. Here again, we have a difference of 6.7 tons per acre due to seed.

As with the cabbage tests, the strains were grown under uniform conditions and the differences noted are apparently due to the heredity of the particular strain in question to produce well.

It is probable that some growers may find it desirable to grow their own seed. Where this is done, care should be used in making the selection of fruits. In making this selection, the character of

the entire plant as well as the individual fruit should be considered. The selection should be made only of fruits that are desirable and which were grown on a plant which produced a large number of these fruits.

To summarize briefly, we may say that the farmer may do much to aid the movement for the production of better seeds. To do this we must abandon the practice of trying to get seeds at the lowest possible price. It requires considerable expense to produce high grade seeds, and furthermore, well bred seed plants frequently produce fewer seeds than less desirable ones, hence the cost of production is thereby increased. In the past the seedsmen have done much in placing the seed business on a basis where it serves the farmer well. If they are to maintain and improve this standard, they should receive the support of every farmer and gardener.

The experiments have shown the desirability of securing seed of a variety from more than one source. By securing from several sources a sufficient amount for the next year's planting and making a test a year in advance, we may do much toward overcoming disappointments which frequently accompany crop failures.

PEACHES

By J. H. HALE

You don't really care to know how I got started. I don't know how much time you will want to devote to this subject, yet the question my brother on the left asks is an interesting one. How did any of us get started; what has kept up the faith in us; what has made it possible for us in Pennsylvania, New England or any other state, to develop a successful peach orchard.

I was born in comparative poverty, and my father died when I was only a year and a-half old, and left my mother with four children and a mortgaged farm. When I was fourteen years old I was at work, out by the month on a neighboring farm, at $12.50 a month and board. Guess it was more than I was worth. It was a small one-horse farm, and along in September I was sent more than a mile from home, back in a clearing in the woods to cut and stack up corn in an eighteen-acre field, which I own now, and have in a peach orchard. They were lonesome days, working out there alone. Eating my dinner one day on the sunny side of an old Virginia fence, there was a scrub peach tree, and on that tree there were ripening and had dropped on the ground among the bushes, a lot of peaches, bright red little fellows, an inch or so in diameter, and to a hungry boy, delicious in quality, and as I lay on the ground

taking my noon hour under that tree, stomach full of those peaches, a dream or a picture came into my mind—If the God of nature and some careless man dropping a seed there, and it started and grew into that tree, if there were peaches in that ground, why wasn't it possible for me some time in the future to get money enough to buy a few trees of choice varieties and plant them in more congenial soil, and wasn't there an opportunity and promise there, and from the savings of that $12.50, I bought the first 200 peach trees I ever owned, planted them in a poor sandy side hill of mother's little farm and thus started my peach orchards that now hold, nearly one-fourth million trees. That is my start, and if that statement is any inspiration to any boy or girl that is seeking a chance, I can say while at that time it was believed that commercial peach growing was limited to a few favored regions in Delaware, New Jersey and Michigan, and outside of that there was no hope for any thing but occasional growth of trees—I can say since that time, from that inspiration that came to me, the inspiration that has come to hundreds of others and the scientific knowledge that has come to us, it has gone out so you may be almost in any corner of any state of this Union, and yet can grow peaches and grow them successfully under certain conditions; not in every field on every farm, but somewhere almost in every county. This peach growing country is wonderfully broadened out, so there are no more "peach regions," no more peach "seasons." I remember when I first thought of increasing my plantings and going south, I thought we might get peaches on the market in June or July, I talked with dealers who thought they were wise, and they said people wouldn't buy peaches any time; that the time when people buy peaches is the last of August and early in September; that is the only time. They said, "You might sell a few, but to sell them in any quantity, it is nonsense," and when I asked them to take a little stock in the orchard to make it possible for me to develop it, they shook their heads and said it couldn't be done, and yet today the great commercial peach months are June and July, And yet we sell quantities of them in May; many in August, September and many in October. So the peach season of late August and early September of years ago is now extended from May to November, and it is possible by growing peaches in different sections in the United States, by the change of varieties and change of methods of culture and methods of transportation, all those are factors that count. Perhaps the greatest factor in this enlarged peach culture in America has been the bringing to this country of the North China type of peaches, and of their seedlings that have been developed within the last twenty-five years, a type of peaches that are somewhat hardier, considerably hardier in fruit bud than the old Persian type we grew prior to that. I think perhaps that has been the greatest factor in broadening out.

The next factor has been the consolidation of great railway lines of transportation. We talk about the monopoly of consolidation, but if it hadn't been for that, it wouldn't have been possible to feed the great American nation today. And then the building of the refrigerator car. Some of you here present probably remember the time when there wasn't a refrigerator car line in America; when there wasn't a refrigerator car that you could have loaded your per-

ishable products into if you had wanted to. Mr. Parker Earl, the strawberry grower of Cobden, Illinois, was the first man to grow strawberries by fifty, seventy-five or one hundred cars, and to reach out into markets further than Chicago, he developed the first refrigerator car for transporting his strawberries. The first refrigerator car was from Cabden, Illinois, to Detroit, Michigan. So that has added very much to the possibilities of a wider distribution.

I don't know what you want me to say about peaches. I could talk for a week and tell you some things, and not tell many others, but there are so many phases of the question, I hardly know what to touch upon, and I think perhaps after I ramble on a little while, questions that may come from you will be of more value than anything I might say. I have made some notes here, but I don't know whether I will use them or not.

Like all other products manufactured and cultivated and grown and developed, there has grown up with the greater production of peaches, and the greater consumption also, the demand for better peaches, for those of finer appearance, those of large size and those of better carrying quality. But there is still a demand, and a growing one, for fruits of higher quality. I grow, as I say, on a large scale; perhaps larger than anybody in America. I can tell the character almost of a community as to its culture and refinement and its appreciation of high grade things if you will tell me whether they buy white or yellow peaches. The demand for yellow peaches comes from a low grade desire, and that for the more beautiful, delicate, and more delicious peaches from a greater appreciation of the refinements of life. If you are ever going to send any peaches to your best girl, never send her yellow peaches. Send her white ones. There is quality and character there that is worth considering.

To bring about high grade fruit means the selection of the right varieties; means the selection of as good a soil as you can get. The question of early culture in the spring, and thorough culture, and no other crops growing between, are essential; and getting the trees started at the word go. The question of the tree is an important one. I don't know but I spoke yesterday a little slightingly of the nurserymen. I didn't mean to because they are essential in our business. The idea that we can grow our trees as well as the nurseryman can, is a mistake. In depending on the nurseryman for our trees, we have gone to the extent of looking for cheap trees, and one of the foundations of failure in many an orchard planting is attempting to buy cheap trees, regardless of who grew them, where they were grown, or how they were grown, so the question of the cost of the tree shouldn't enter into it at all, if we get the right kind of a tree. The nurseryman, to meet the cheap trees we have demanded, have had to grow trees as cheaply as they could. The honest nursery-man has been distributing a great many mixed trees, without knowing it himself, and because you and I have wanted cheap trees. The time is coming, it is here now, when some of the nurserymen are selecting their buds from the best bearing trees, and there is a great difference in the value of the trees. I am having it tested now in some of my orchards, taking a block of some of the best Carmen trees, counting the blossoms, the buds, the fruit, measuring them by weight. If you could see those figures and see the productive value of one Carmen tree over another, or all the different varieties we

have, it is simply astonishing. Some of the nurserymen are doing it in a small way, and others who will do it in the future will simply want the buds from the best bearing trees they can find. There will be a greater loss in propagation, but it will be a better tree, and the man that is willing to pay for that tree will get his money's worth, and the man who thinks he can get off by buying lower priced trees, will make a mistake. You cannot get too good a tree for the foundation of a peach orchard. I used to be in the nursery business, and I am onto their curves. I am an orchardist now. A lot of us are careless in handling our trees. I have shipped out in years gone by a thousand good trees, five hundred to John Smith, five hundred to Jones, all grown in the same lot, and in a few months time I have a glorious letter from John Smith, praising me for the quality of the tree, vigor of growth, and so forth, and a fault-finding letter from the other fellow; he never was so stuck in his life; yet he filled the holes full of good rich manure when he planted them, but they had failed. Get the best trees you can get; pay what it costs to grow them and a profit on top, but don't expect the nurseryman to replace them, because you have been careless and they don't live. If he can prove they were properly packed and handled, it is up to you to make them grow if you can. The culture of peach trees, the thorough culture, the frequent culture of all the land in the orchard, is more important to the peach than any trees that grow. There is no tree that responds so quickly to a thorough cultivation or feeding, or none that goes back so quickly for lack of it, as the peach; therefore, the early months of the season are the months to cultivate the peach orchard. And the growth of any other crops, everything after the second season, is dangerous. I know there are men who are good gardeners; who are able to grow clover liberally and plow under, and by intensive cultivation can grow garden crops for a series of years, but as a general peach orchard cultivation, give the harrow, cultivator and plow and horse and mule an opportunity to keep the ground stirred, and you will make the best orchard without any question whatever. The question of feeding the orchards well, we have had various notions about. At one time we thought nothing but bone and potash would make a solid, substantial tree, and high grade fruit, and no stable manure whatsoever. We have learned in later years that some varieties need a liberal amount of nitrogenous food. Take, for instance, the Waddell, Hills Chili and Crosby, inclined to overbear, at all times hardy in bud, setting an enormous amount of fruit, thin them as much as you may, and the chance is, they won't be thin enough. Those trees are rather weak in tree growth, and a liberal amount of nitrogen or stable manure will benefit them, but a vigorous growing variety, the Belle of Georgia, the Carmen and Champion, would be ruined under the same conditions, on the same soil, by a liberal use of stable manure, but as a broad, general proposition, heavy applications of potash and phosphate fertilizer in one form or the other, give the best results. For many years, I depended on fine ground bone as a source of phosphorous. The last few years we are getting some wonderful results from the use of basic slag, but I am not prepared to tell you today to use basic slag on your orchard. I am not sure but what it is the

lime in the slag from which we are getting better development of buds, better foliage through the growing season, where we have used basic slag frequently, than where we have used any other form of phosphorus, and I am satisfied phosphorus, potash and a moderate amount of nitrogen are essential elements of building up good, strong tree growth.

Again, the pruning is an important matter. Very close pruning at time of planting; in fact, down to a single stalk, a well headed tree with three or more branches to it, no forks, growing it to its full limit the first year; after one year's growth a cutting of two-thirds or three-fourths, thinning out of crowding branches first, and then shortening in the others, two-thirds or three-fourths the first year, and then away she goes. Next year proper thinning out to make broad, spreading head, a much less shortening process, one-third to one-half. The third summer, if you have got the healthy tree you should have, and feed and culture you should have, you will get an enormous growth, and if you will go in there in your latitude, which is similar to ours in Connecticut, about the middle of July or towards the first of August, just as vigorous growth has about ceased, but before growth has ceased entirely, and cut out all your crowding branches, shorten in the stronger branches—this is done just before the fruit buds begin to form,—you will cause the formation of an enormous amount of fruit buds on those trees. That summer pruning is a shocking process, but it is a splendid process to bring a peach orchard into bearing when it is able to bear. Some of my scientific friends tell me that summer pruning is all wrong, but we take the risk of winning out on it, and I have always won out, since I began to practice the summer pruning of peaches. I don't know whether I want you to go and say, Hale tells you to prune the third summer, but I have done it and made it very profitable.

The question of varieties perhaps you will touch by asking some questions. The growing of fruit, as touched upon by the professor this morning, applies perhaps better to the peach than anything else. We all have some things we pat ourselves on the back for, and I am weak like the rest of you. I have done some things in the way of marketing, I think I have done better than anybody else, so far as I know, and I am not telling this because I am any more honest than any of the rest of you, but when my first orchards came up to bearing, with borrowed money I went to New Jersey and Delaware and Maryland as the peach centres and the commercial centres, and studied their methods of picking, packing and marketing of peaches. I went home with the lesson, and I don't wonder that their peaches didn't pay some of them; they sold too low in price. Whatever attempt at grading there was, simply to bring a few of the largest and best to the top always, and generally one grade of fruit as it came from the orchard, except a few of the inferior ones thrown out, and if there were any big ones, those were on the top. I went home convinced—I was hard up then; there was a big mortgage on the place at that time, more than the thing was worth—but desperate to get money, mean skinning Yankee as I was, desperate to get money; it seemed to me the only way to get money was to take those peaches and carefully grade

them into size, and then I though if they were to be graded, how wicked and crooked men are, and the only way to get it done was to hire some girls. Women are more honest than men. So we hired some of the best girls we could get in the neighborhood to grade those peaches into proper sizes, so that every package should be honestly graded from top to bottom, and put up rounding full. Then to print a label and put it on the basket. So far as I know, I was the first man in America to properly, honestly grade peaches all the way through and put a label on them, but here was the result,—I have bought labels which cost me 42 cents a thousand, and as soon as I stuck them on a peach basket, I got 50 cents a piece for them. So if Hale ever made any money in the peach business, he made more of it at the start selling labels rather than peaches.

We have had our troubles in peach growing. The borers are always with us, and probably ever will be, and perhaps the brown rot and the yellows, and the only way to get rid of that is to pull the tree out and burn it, and the borers, to dig them out and smash their heads. Fungus troubles until a few years ago we couldn't control, and the brown rot finally became so serious that Prof. Scott spent years in its study, and in the different seasons when he was studying in our orchards and propagating those cultures in my house in Georgia, it seemed almost a useless task he had undertaken, how year after year he patiently plodded on, and finally discovered how to prepare the self boiled lime and sulphur which we now use so successfully, makes it possible to grow some of the commercial peaches in a large way, in sections of the United States where they were driven out of business by the rot, and since his discovery there has been a wonderful forward march in producing firm, better keeping and better colored fruit. Some late varieties are better in color. That rot is now gone, and in going has taken with it a lot of other troubles and brought us profit. The marketing of fruits, the marketing of peaches—in the olden days they were shipped to a few large central markets, and from there distributed within a reasonable distance to other markets, the smaller towns and villages being almost without peaches. There are towns, I suppose, in Pennsylvania, of three and five and eight thousand inhabitants, that haven't a peach orchard in driving distance of it. But there is a great opening there for the sale of fruit, direct to the consumer, in a small way. There is a wonderful opening all over the country. I live in a farming community, a town of less than 5,000 inhabitants, but they are tobacco farmers, and buy our peaches and we don't have any cost for transportation, and they take the over-ripes, and when we come to figure up at the end of the year, there has been three or four thousand dollars worth of fruit sold at the packing shed. So in every community there are people who will come and take your fruit away. And no expenses of marketing.

Then as I said in regard to this small hamper business, when we get the parcels post, we are going to be able to send small packages direct to families and get one package into the house today and another tomorrow, and double the consumption by that method. After we get beyond reaching the consumer direct from our small orchard, the next thing is to reach a little further and sell to the re-

tail dealer, so far as we can, and make a reputation for our goods, so his customers will come day after day and call for our particular brand, and while you may never get the extreme high prices as in some big markets, you will never get the extreme low ones, and there will be a high level of profitable prices which you can draw upon from that retail grocer. I have one orchard in Connecticut off to one side, where they are not used to paying high prices; they will stand about so much. So when I am getting 50 per cent. more in a far away market, I give the fruit to them at their price, then when the drop came in the big markets we held the home. We supplied them from it last year. I think we started selling at same old price to the grocers at 75 cents per one-half bushel basket. We are going to make them this year 80 cents a basket, while in the big outside markets we have to take 35 cents to $1. So you can make most money in the home market, the moderate-sized grower, who will take care of the market that is nearest, and always remember your neighbors and friends are the best people to deal with. When you have to go to a distant market, ship by rail a long distance away, besides paying the freight, you must use the commission man and pay well for his services. I have often been tired and hurt in horticultural meetings to hear the wholesale condemnation of the commission men. There are a lot of crooks, not high-class commission men, who go out about the country with pretty stories, soliciting, promising you that they will do so much better for you, and the man who is a little green sends a few to Jones and some to Smith, and so on; a mistake always. Never ship to a commission man until you have investigated him. Make up your mind certain markets you intend to utilize, go there and look up the commission man. You will have no trouble finding honorable men. Mean men show it in their faces. So from a business standpoint, go and get into direct contact with the commission man you want to deal with. Find out what you want to about him; tell him who you are. Say to him, "Mr. Commission Man, come out with me and see the orchard." He is too busy to go or it costs too much. No matter what it costs, tell him you will stick by him if he sticks by you, and if he won't go this 200 or 500 miles, more or less, to your orchard, ask him to please recommend you to some other fellow down the street who has more courage. Ten chances to one, he won't recommend anybody else. He will go himself. Take him to your orchard, let him see how you cultivate your trees; how fine the fruit is; and show him the nice new white packages you have, all regardless of the cost. When you can buy one grade of package for ten cents a piece, or something of cleaner, better and whiter wood for twelve cents, don't hesitate for the two cents. Show him those packages under cover in the fall. Show him the details of your business, how you grade and pack, etc., and say, "Do you think you can sell those goods if I get them to you in good order?" He goes home feeling he has a personal interest in that orchard, and thus when the fruit comes to market, and some one says that another dealer has some as good, he says, "I don't know, I have seen that orchard, I have seen how that fruit grows and is packed, and I am going to get a quarter more;" and finally he gets the quarter more. Get in close touch with the man you do business with. The meanest man you

ever knew, if you get close to him and treat him right, will grow to be a better man all the time, and will also help you to be a better man. And the whole business is a mutual uplift. You cannot do business any other way profitably and for a long time. Don't discourage the buyer who comes out to buy in the orchard. Encourage F. O. B. sales as far as possible. Now, I am speaking of the large growers; those who ship by the carload or quantity. If you are shipping to market and getting 50 cents a package, and some man wants to buy them at the orchard and offers you 45 cents, encourage him to come there with his money. That will encourage others to come. Encourage the F. O. B. buyer as much as possible. You know where you stand, and when you go to bed at night, you will sleep like a Christian.

PEACHES FOR PENNSYLVANIA

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In commercial importance the peach is next to the apple at the present time in this State. Its relative quickness of returns makes it an especially desirable fruit crop. The industry is now best developed in the southern part of the State, where exist especially the conditions of climate, elevation and soil that makes this fruit unusually regular and profitable in bearing. As a result, in certain sections it has shown some remarkable values, $2,000 per acre in gross returns having been obtained from considerable acreages within ten years from planting. Some attention to peach production is also given in the more northern sections of the State, though the crop there is, of course, less certain and only the hardier varieties are likely to succeed.

SOIL, PURCHASING OF TREES, PLANTING AND OTHER CARE

The soil for peaches in general should be somewhat lighter (sandier) than that for apples, though with proper moisture conditions, air-drainage and care, satisfactory results may be obtained with certain varieties even on the heavier soils. The soil should be thoroughly prepared before planting, at least as well as for corn.

In the purchase of trees, it is well to guard especially against yellows, since it is apparently often transmitted in nursery stock. This is probably best done by dealing only with nurserymen who are thoroughly acquainted with the disease and who take proper care to exclude it. This precaution is necessary, since the presence of the disease on the young trees can often not be detected until one or two years after planting. The trees on receipt should also be carefully examined for borers. One-year-old trees, of about five-eighths-inch "caliper," are best to buy,—better than "June buds,"—and the height is of relatively little importance.

The other precautions in the purchase and handling of stock on receipt are essentially as described for apples, pages 6 and 7 of my Bulletin 106, though the root-pruning may be more severe with peaches.

Peaches are planted 16 to 20 feet apart. Deep dead furrows and a wire marked with the desired distances and long enough to reach throughout the row are most convenient and satisfactory. Three men, one to drop the trees and the others to plant, will thus set from 50 to 75 trees per hour in good soil. The soil should be well firmed about the roots, and the trees set slightly deeper than they grew in the nursery. If soil "cups" develop about the trees, they should not be permitted to remain, as they are conductive to winter injury, especially on exposed western slopes. Peach trees should be headed at about 18 to 24 inches, and from three to five limbs may be used in forming the framework for the tops. In later pruning, the main objects are to keep the annual growth well headed back, thus avoiding undue increase in height, and to keep the tops fairly open in order to secure light and ventilation for the fruit.

CULTURE, THINNING AND PICKING

As to cultural methods, peaches are generally considered to require more thorough and continuous tillage than apples. The tillage and cropping methods described for the latter in Bulletin 106, however, if thoroughly carried out, will generally prove satisfactory.

The proper use of fertilizers on peaches is a matter of some debate. Judging from analyses, peaches are more exhaustive on the land than any other fruit crop. But in spite of this, the value of fertilization is questioned by some growers, especially if they are making good use of cover crops. It is an interesting fact, however, that in Niagara county, N. Y., on nearly 3,000 acres of peaches it was found that over 87 per cent. of the acreage was receiving fertilizer of some kind. Also the average return for five years from those orchards receiving manure was $26 per acre higher than that from the unfertilized orchards and the return from those receiving both manure and commercial fertilizer was $46 per acre higher than from the unfertilized. This would indicate that a judicious use of fertilization should prove profitable in many cases. Care should be taken, however, not to stimulate growth unduly and especially not to prolong the seasonal growth so much as to prevent the entrance upon winter with well-seasoned wood.

Thinning is essential whenever the trees are unduly loaded. It is regularly practiced by all commercial growers. It enables the fruit to attain proper size, aids in the control of rot and avoids unnecessary exhaustion of the tree. Over-production and starvation are among the leading causes of failure and early decline in the average peach orchard. The thinning is done usually in the latter part of June, after the "June drop," leaving no peaches less than 4 to 6 inches apart, and removing especially those that are defective.

The proper time for picking depends largely upon the time required in reaching market. It also naturally depends much upon the carrying qualities of the variety and the cooling and shipping facilities available. The best color, quality and size are undoubtedly attained by permitting the fruit to ripen on the tree. When con-

siderable time must elapse before reaching market, however, this is impracticable. In such cases, the fruit should be picked enough in advance to enable it to ripen in transit and approximately reach its prime when it arrives at the market. The softening of occasional specimens will aid in determining the right time for picking, but more detailed directions can hardly be given.

IMPORTANT DIFFICULTIES

Important obstacles to success with peaches are yellows, brown rot, and borers. Regular mounding and cutting-out is probably the surest method of control for the latter and is most generally practiced, though a safe and efficient covering would be most welcome and may be found in the sediment or sludge formed in making lime-sulphur. It should be renewed whenever any important breaks occur in the coating, however.

The mound or cover should be in place during the egg-laying period, which extends from about the middle of June to the middle of September in this State. The "mound" is formed by dragging up the earth all around the base of the tree to a height of 8 or 10 inches. Any protective covering should extend from about two or three inches below the general surface of the ground to a height of 15 to 20 inches. It is also well to remember that most of those that have been recommended are decidedly worthless.

In hunting the borers, which may be done either before or after the egg-laying period, it is well to have cheap labor go ahead and remove the soil, with hoes or other appropriate tools, and reliable men to follow and remove the "worms" after the bark has dried and their discolorations become more evident.

YELLOWS

Peach yellows is an apparently contagious disease of unknown cause, for true cases of which there is now no remedy. It is important that one be able to recognize its symptoms, however, in order to remove the affected trees at the earliest opportunity and thus prevent its spread to those adjacent, with the resulting rapid destruction of the orchard. The most prominent works of the disease are *premature ripening of red-spotted fruit, and tufts of vertical, willowly shoots*, which appear on the branches or main limbs. Earlier and less evident symptoms are as follows: In a well-cultivated orchard, part of an apparently healthy tree stops growing, the leaves at the bases of its twigs *droop*, roll at the edges, and turn yellow or reddish-green. Also leaf buds and blossoms may be prematured, —the acceleration amounting in some cases to a few days only, while in others it may even cause them to start in the fall.

The disease is reported as likely to appear first in wet and poorly-drained areas; and most of the symptoms are apparently likely to be aggravated by winter-injury or other checks, especially checks to the transfer of food or starch. The recognition and treatment of the disease would be relatively easy if it were not for the fact that the same influences which aggravate the symptoms of yellows seem able to produce a good imitation of the disease.

These imitations are usually curable by good orchard practice, especially by heavy pruning and judicious nitrogen application. But

the true cases are apparently only covered up temporarily by such treatment and in the meantime are menacing the general health of the orchard. The best procedure, therefore, is to eliminate so far as possible, the influences that tend to develop the "imitation yellows" by maintaining the best possible orchard practice and then destroying on sight all cases that do appear, on the assumption that they are true cases of yellows.

BROWN ROT, SCAB, AND CURCULIO TREATMENT

The control of brown rot also involves that of the curculio and incidentally secures the control of peach scab or black spot which usually mars or destroys so much unsprayed fruit. A very satisfactory plan for this purpose is the one advised by Scott, of the Bureau of Plant Industry. It is rapidly becoming the regular practice of commercial peach growers. With slight modifications, the plan is as follows:

(1) About the time the calyces (or shucks) are shedding, spray with arsenate of lead at the rate of two pounds to 50 gallons of water. In order to reduce the caustic properties of the poison, add milk of lime made from slaking two pounds of stone lime.

(2) About three or four weeks after the calyces drop, spray with 8-8-50 self boiled lime-sulphur and two pounds of arsenate of lead.

(3) About one month before the fruit ripens, spray with 8-8-50 self-boiled lime-sulphur or with 1.003 lime-sulphur solution, omitting the poison.

The use of the clear solution in the third spray is handier, cheaper and avoids any important staining of the fruit, which may be quite serious with the self-boiled lime-sulphur in the last spray. The self-boiled is the only safe material to use in combination with commercial lead arsenate in the second spray, however. Our present experiments indicate that a strictly neutral ortho-arsenate of lead, Ph3 (AsO4)2, is safest with lime-sulphur solutions, but even this combination cannot be recommended unconditionally on peaches as yet.

VARIETIES

The following list gives the principal varieties now in cultivation in the State, so far as the writer has been able to learn. It also includes some varieties that, judging by their behavior elsewhere, are of probable value here, and some that are widely known but are rather undesirable, as indicated by the accompanying descriptions. Further selection should, of course, be made on the basis of local experience and market. Six or eight varieties well distributed through the season are usually ample for the commercial orchard. These may well be selected from the following group of varieties, with the aid of our descriptions given later, supplemented by local inquiry: Greensboro, St. John, Waddell, Carman, Hiley, Champion, Belle, Ede, Elberta, Stump, Crosby, Fox, Smock, Iron Mountain, Stevens and Salway. This group gives a succession from early July to October, and the varieties are named approximately in order of ripening.

The relative commercial value of the varieties is indicated by stars. Two stars (**) indicate those considered fully commercial;

one star, those considered limited commercial. The others may be valuable commercially in some place when they are better known or they may be useful in home orchards.

The indications are intended especially for the location in which peaches are known to thrive. But even for them, local experience and especially the season of ripening with reference to market conditions may often require some modifications. Thus a variety may do well in a certain locality, but not be profitable because the market, at its season of ripening, is supplied with better fruit of another variety, possibly from another locality. This accounts for the fact that in some localities only those peaches ripening with Elberta or later are reported profitable, while in others many of the earlier sorts are very satisfactory. Study your market and fill the gaps is a good general rule.

In the list, the hardier varieties,—those apparently adapted to the more rigorous sections,—are marked with a dagger. All varieties are named approximately in order of ripening, with the exceptions that the varieties in each of the following groups seem from available data to be of practically the same seasons. St. John and Bishop; Waddell, Lewis and Connet; Mountain Rose, Champion and Oldmixon Free; Niagara and Reeves; Ede, Bokhara and Engle; Crosby and Chairs; Geary, McCollister and Smock; Stevens and Salway. There is also more or less overlapping in season with many of the other adjacent varieties.

Sneed. Early July. White, cling. Tree has broad leaves; usually a heavy bearer and small unless thinned, low quality and not valuable commercially.

Victor. White, semi-cling. Rather resistant to rot. Much better than Sneed in quality; entirely red when ripe.

Triumph. Yellowish-red, free. One of the extra early peaches, of medium size and quality, probably suitable for home use or local market, but usually not desirable commercially because of great susceptibility to rot.

Greensboro. White, semi-cling. Tree very hardy and prolific; probably the earliest peach of any material commercial value. Fruit large, reported resistant to rot, but rather delicate textured for distant shipment and only medium quality. Pick when apex begins to soften.

St. John. Yellow, free. One of the standards in Ontario and also reported very satisfactory in Delaware. Quality good. Often quite subject to rot, but this can be controlled by proper spraying.

Bishop. White, free. Reported one of the most satisfactory early peaches in the mountain orchards of West Virginia. Fruit large and very good. Worthy of trial in southern Pennsylvania.

Waddell. White, free. Rather poor grower, but very prolific. Long blooming period and hence said to be less susceptible to frost injury. Medium in size and quality. Ripens too near Carman for best success.

Lewis. Yellowish-white, free. One of the hardiest peaches and much valued generally for commercial use. Fruit medium to large and very good. Of Michigan origin.

Connet. White, semi-cling. Another hardy variety which is reported unusually satisfactory in the mountain orchards of West

Virginia. It ripens with Lewis and is said to be fully as productive, finer looking, and much freer from rot. Fruit large and very good. Apparently worthy of extensive trial in this state. A seedling of Chinese cling.

Carman. White semi-cling. Probably best of its season for market. Fruit large and of good quality. Ripens early in August. Tree very hardy and productive, one of the latest in blossoming.

Hiley. (Early Belle). White, free. Regular, but not prolific. Good shipper, uneven ripener. Much grown in Georgia.

Mt. Rose. White, free. High quality, often irregular in size and subject to rot; good for home use and local market, if picked while firm.

Champion (Illinois). Creamy white, free or often semi-cling. Among the highest in quality, excellent for canning, moderate bearer, medium shipper. Somewhat susceptible to rot, but preventable by proper spraying.

Oldmixon Free. White, free. One of the old favorites, but apparently losing in favor in some parts of this State. High quality and prolific, but reported as often dropping before attaining full color.

Early Crawford. Yellow, free. A standard peach in many regions, but apparently losing favor in this State on account of shy bearing.

Niagara. Yellow, free. Supposed to be a seedling or possibly a bud-spot of Early Crawford and reported a heavier bearer. Fruit equal to it in quality and of larger size. Considered promising, though not sufficiently tried to warrant unqualified recommendation.

Reeves (Favorite). Yellow, free. Excellent quality, and one of the old favorites, but often shy bearer; especially so on heavy soils.

Thurber. White, free. Prolific, good shipper; valuable where a white peach is acceptable.

Belle (of Georgia). White, free. Early and heavy bearer; reported best of its season. Hardy in bud and very high quality; Ripens in late August or early September and must be watched as picking time approaches, as it ripens quickly.

Engle (Mammoth). Yellow, free. One of the best commercial peaches in Michigan, being reported preferable to Elberta for profit. Not sufficiently tried for recommendation.

Ede (Captain Ede). Yellow, free. Very productive and uniform in fruit. Early in bearing. Excellent for canning; quality very good.

Bokhara. Yellow, free. Said to be the hardiest desirable peach in Iowa. Quality fair. Value in Pennsylvania unknown, though apparently worthy of limited trial in the more rigorous sections.

Elberta. Yellow, free. The standard commercial peach and the variety most widely planted throughout the country, though distinctly less valuable than some others in certain localities of this State. Fruit very large and excellent carrier, but quality is only medium. Quality, as well as appearance, is much improved by proper maturing on the tree.

Chairs (Choice). Yellow, free. Another strong grower and often tardy in bearing, but very satisfactory with increasing age in certain orchards of southern Pennsylvania. Fruit large and good, tapering to apex.

Crosby. Yellow, free or occasionally semi-cling. One of the hardiest in bud, and of high quality. Fruit tends to run a trifle small for market, unless heavily thinned. Very heavy and regular bearer.

Late Crawford. Yellow, free. An old favorite, grown across the continent. Reported among the most prolific varieties in certain orchards of the State, while considered rather shy in others. The successes are in dry, airy locations, with rather light soil and thorough cultivation and other care. Said to be less satisfactory than Early Crawford in New Jersey.

Ray. White, free. A relatively new peach of Mississippi origin, that is doing very well in Eastern Pennsylvania, especially with H. S. Snavely near Lebanon. Tree stocky, good grower and very productive. Fruit larger than Belle and about equal to Oldmixon. Flesh white to the pit, good quality, though not quite as good as Oldmixon. Apt to ripen up quickly like Belle.

Stump. White, free. Very widely planted, and reported fine in some places in the State, while in others it seems to be less successful.

Fox (Seedling). White, free. Apparently one of the most desirable for its season. Growth vigorous and somewhat tardy in bearing. Fruit of medium size and quality.

Mathews (Beauty). Yellow, free. A strong grower, rather tardy in bearing. Fruit very large and good seller, but reported shy and generally unprofitable in the mountain orchards of West Virginia. Has done well with Dr. Funk in eastern Pennsylvania. Said to be difficult to get true to name and is reported by some to ripen after Smock.

Geary (Hold on). Yellow, free. Among the most profitable in the orchards of D. M. Wertz, Franklin county. The soil there is light, well elevated and has a good moisture supply. Fruit is firm and of good quality. Closely resembles Smock in tree and fruit.

McCollister. Yellow, free. Another of the leaders in Wertz's orchard; closely resembles the next variety in character of fruit and season.

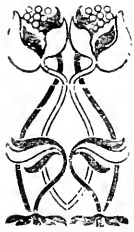
Smock. Yellow, free. This variety and Salway have done best in the orchards named above, and both are very highly recommended by other growers in our leading peach sections. They apparently do best in the conditions described for Geary.

Iron Mountain. White, semi-cling. Considered desirable in some of the more rigorous sections, on account of hardiness. Quality medium.

Stevens (Rareripe). Creamy white, free. Tree vigorous and upright grower, and rather tardy but good bearer. Fruit large, good quality, and profitable because of lateness.

Salway. Yellow, free. One of the very best under proper conditions, but not good on low or heavy soil. See discussion under Smock. A very sure cropper and excellent market peach. Season about same as Stevens, early to mid-October.

APPENDIX



APPENDIX

LIST OF PUBLICATIONS OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE

ANNUAL REPORTS

*Report of the State Board of Agriculture, 336 pages, 1877.
*Repore of the State Board of Agriculture, 625 pages, 1878.
*Report of the State Board of Agriculture, 560 pages, 1879.
*Report of the State Board of Agriculture, 557 pages, 1880.
*Report of the State Board of Agriculture, 646 pages, 1881.
*Report of the State Board of Agriculture, 645 pages, 1882.
*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, 648 pages, 1888.
*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, 640 pages, 1892.
*Report of the State Board of Agriculture, 713 pages, 1893.
*Report of the State Board of Agriculture, 646 pages, 1894.
*Report of the Department of Agriculture, 878 pages, 1895.
*Report of the Department of Agriculture, Part 1, 820 pages, 1896.
*Report of the Department of Agriculture, Part 2, 444 pages, 1896.
*Report of the Department of Agriculture, Part 1, 897 pages, 1897.
*Report of the Department of Agriculture, Part 2, 309 pages, 1897.
*Report of the Department of Agriculture, 894 pages, 1898.
*Report of the Department of Agriculture, Part 1, 1082 pages, 1899.
*Report of the Department of Agriculture, Part 2, 368 pages, 1899.
*Report of the Department of Agriculture, Part 1, 1010 pages, 1900.
*Report of the Department of Agriculture, Part 2, 348 pages, 1900.
*Report of the Department of Agriculture, Part 1, 1040 pages, 1901.
*Report of the Department of Agriculture, Part 2, 464 pages, 1901.
*Report of the Department of Agriculture, Part 1, 1030 pages, 1902.
*Report of the Department of Agriculture, Part 2, 324 pages, 1902.
*Report of the Department of Agriculture, 958 pages, 1903.
*Report of the Department of Agriculture, 790 pages, 1904.
*Report of the Department of Agriculture, 846 pages, 1905.
*Report of the Department of Agriculture, 690 pages, 1906.
*Report of the Department of Agriculture, 565 pages, 1907.
*Report of the Department of Agriculture, 690 pages, 1908.
Report of the Department of Agriculture, 806 pages, 1909.
Report of the Department of Agriculture, 714 pages, 1910.
Report of the Department of Agriculture, 694 pages, 1911.

BULLETINS

No. 1.* Tabulated Analyses of Commercial Fertilizers, 24 pages, 1895.
No. 2.* List of Lectures 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.

*Note.—Edition exhausted.

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. 8.* Report of State Horticultural Association, 108 pages, 1896.
No. 9.* Report of Dairymen's Association, 96 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. 13.* Report of Butter Colors, 8 pages, 1896.
No. 14.* Farmers' Institutes in Pennsylvania, 92 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.
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 Fungons Foes of the Farmer, 19 pages, 1897.
No. 29.* Investigations in the Bark of Trees, 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, 73 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. 42.* List of Creameries in Pennsylvania, 88 pages, 1899.
No. 43.* The San Jose 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, 163 pages, 1899.
No. 55.* The Composition and Use of Fertilizers, 126 pages, 1899.
No. 56. Nursery Fumigation and the Construction and Management of the Fumigating House, 24 pages, 1899.
No. 57. The Application of Acetylene Illumination to Country Homes, 85 pages, 1899.
No. 58. The Chemical Study of the Apple and its Products, 44 pages, 1899.
No. 59. Fungous Foes of Vegetable Fruits, 39 pages, 1899.
No. 60.* List of Creameries in Pennsylvania, 33 pages, 1899.
No. 61.* The Use of Lime in Pennsylvania Soils, 170 pages, 1900.
No. 62. A Summer's Work Abroad in School Grounds, Home Grounds, Play Grounds, Parks and Forests, 34 pages, 1900.
No. 63. A Course in Nature Study for Use in the Public Schools, 119 pages, 1900.
No. 64. Nature Study Reference Library for Use in the Public Schools, 22 pages, 1900.
No. 65. Farmers' Library List, 29 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.

*Note.—Edition not for general distribution.

No. 71. Consolidation of Country Schools and the Transportation of 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 Repression, 263 pages, 1901.
No. 76. 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. 80.* Decisions of the Department of Agriculture on the Pure Food Act of 1895, 29 pages, 1901.
No. 81. Concentrated Commercial Feeding Stuffs in Pennsylvania, 136 pages, 1901.
No. 82.* Containing the Law Creating a Department of Agriculture in Pennsylvania, and giving the Various Acts of Assembly 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 of San Jose Scale in Orchard and Nursery, 33 pages, 1902.
No. 91. Canning of Fruits and Vegetables, 57 pages, 1902.
No. 92.* List of Licenses Granted by the Dairy and Food Commissioner, 193 pages, 1902.
No. 93.* The Fundamentals of Spraying, 35 pages, 1902.
No. 94. Phosphates—Phosphatic or Phosphoric Acid Fertilizers, 87 pages, 1902.
No. 95.* County and Local Agricultural Societies, 12 pages, 1902.
No. 96. Insects Injurious to Cucurbitaceous Plants, 31 pages, 1903.
No. 97. The Management of Greenhouses, 41 pages, 1902.
No. 98. Bacteria of the Soil in Relation to Agriculture, 88 pages, 1902.
No. 99. Some Common Insect Pests of the Farmer, 32 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. 104. Modern Dairy Science and Practice, 127 pages, 1902.
No. 105.* Potato Culture, 9 pages, 1902.
No. 106.* The Varieties of Fruit that can be Profitably Grown in Pennsylvania, 50 pages, 1902.
No. 107.* Analyses of Concentrated Commercial Feeding Stuffs, 62 pages, 1903.
No. 108. The Hessian Fly (never printed).
No. 109.* Tabulated Analyses of Commercial Fertilizers, 208 pages, 1903.
No. 110.* Containing Statement of Work of Dairy and Food Division from July 1, to December 31, 1903, 248 pages, 1903.
No. 111.* Small Fruits, their Origin, Culture and Marketing, 66 pages, 1903.
No. 112.* List of County and Local Agricultural Societies, 10 pages, 1903.
No. 113. Methods of Milking, 96 pages, 1903.
No. 114.* Tabulated Analyses of Commercial Fertilizers, 116 pages, 1903.
No. 115. Proceedings of Annual Meeting of Farmers' Institute Managers and Lectures, 210 pages, 1903.
No. 116.* Farmers' Institutes in Pennsylvania, Season 1903-1904, 64 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, 62 pages, 1903.
No. 119.* Tabulated Analyses of Commercial Fertilizers, 115 pages, 1903.
No. 120. The Apple-tree Tent-caterpillar, 46 pages, 1903.

*Note.—Edition not for general distribution.

No. 121. Address of Hon. Joseph W. Hunter, State Highway Commissioner, Delivered at Annual Meeting of State Board of Agriculture, January 28, 1904, 16 pages, 1903.
No. 122.* Analyses of Concentrated Commercial Feeding Stuffs, 52 pages, 1904.
No. 123. Chestnut Culture, 50 pages, 1904.
No. 124.* County and Local Agricultural Fairs, 10 pages, 1904.
No. 125. The Source and Nature of Bacteria in Milk, 41 pages, 1904.
No. 126.* Tabulated Analyses of Commercial Fertilizers, January 1, to August 1. 140 pages, 1904.
No. 127.* Farmers' Institutes in Pennsylvania, 71 pages, 1904.
No. 128. Grape Culture, 62 pages, 1904.
No. 129. Alfalfa Culture in Humid Land, 64 pages, 1904.
No. 130. The Cow-pea in the North, 41 pages, 1904.
No. 131. Proceedings, State Board of Agriculture and Farmers' Normal Institute, 260 pages, 1904.
No. 132.* Analyses of Commercial Fertilizers, August 1, to December 31, 70 pages, 1904.
No. 133. The Improvement of Corn in Pennsylvania, 76 pages, 1904.
No. 134. Proceedings of the Twenty-eighth Annual Meeting of the State Board of Agriculture, 152 pages, 1905.
No. 135.* Analyses of Concentrated Feeding Stuffs, 41 pages, 1905.
No. 136.* List of County and Local Agricultural Societies, 8 pages, 1905.
No. 137. Proceedings, Spring Meeting State Board of Agriculture and Farmers' Annual Normal Institute, 216 pages, 1905.
No. 138.* Analyses Concentrated Commercial Fertilizers, January 1, to August 1, 106 pages, 1905.
No. 139.* Farmers' Institutes in Pennsylvania, 1905-1906, 93 pages, 1905.
No. 140. Sheep Husbandry, 69 pages, 1905.
No. 141.* Laws Relating to the Dairy and Food Division, 47 pages, 1905.
No. 142.* Analyses Concentrated Commercial Fertilizers, August 1, to December 31, 61 pages, 1905.
No. 143. Poultry in Pennsylvania, 36 pages, 1906.
No. 144. Proceedings of 29th Annual Meeting State Board of Agriculture, 191 pages, 1906.
No. 145.* Commercial Feeding Stuffs in Pennsylvania, 51 pages, 1906.
No. 146.* List of County and Local Agricultural Societies, 10 pages, 1906.
No. 147. Market Gardening, 53 pages, 1906.
No. 148. Report of Bee-Keepers' Association of Pennsylvania, 57 pages, 1906.
No. 149.* Analyses Commercial Fertilizers, January 1, August 1, 1906, 80 pages, 1906.
No. 150.* Farmers' Institutes in Pennsylvania, for the year 1906-1907, 73 pages, 1906.
No. 151. Proceedings Spring Meeting of State Board of Agriculture and Farmers' Annual Normal Institute, 190 pages, 1906.
No. 152. Fruits of Pennsylvania, 330 pages, 1906.
No. 153.* Analyses Commercial Fertilizers, August 1, December 31, 1906, 60 pages, 1906.
No. 154. Proceedings State Board of Agriculture for 1907, 158 pages, 1907.
No. 155.* Commercial Feeding Stuffs of Pennsylvania for 1906, 47 pages, 1907.
No. 156.* List of County and Agricultural Fairs for 1907, 10 pages, 1907.
No. 157. Proceedings of Farmers' Normal Institute and State Board of Agriculture, 210 pages, 1907.
No. 158.* Farmers' Institutes for year 1907-1908, 78 pages, 1907.
No. 159.* Analyses of Commercial Fertilizers of Spring Samples, 69 pages, 1907.
No. 160.* Laws Relating to Dairy and Food Division, 69 pages, 1907.
No. 161. Papers Read at Farmers' Institutes, 1906-1907, 124 pages, 1907.
No. 162. Breakfast Foods, 40 pages, 1907.
No. 163.* Analyses of Commercial Fertilizers from Fall Samples, 51 pages, 1907.
No. 164. Proceedings State Board of Agriculture, 1908, 210 pages, 1908.
No. 165.* List of County and Agricultural Fairs, 1908, 10 pages, 1908.
No. 166. Results of the Analyses of Paris Green, 6 pages, 1908.
No. 167.* Analyses of Commercial Feeding Stuffs, for 1907, 98 pages, 1908.
No. 168.* Preliminary Report Dairy and Food Commissioner, 50 pages, 1908.
No. 169. Proceedings Spring Meeting State Board of Agriculture and Annual Farmers' Normal Institute, 214 pages, 1908.
No. 170. Farmers' Institutes for Season of 1908, 84 pages, 1908.
No. 171.* Analyses of Commercial Fertilizers, January 1, to August 1, 1908, 74 pages, 1908.
No. 172. The Bang Method for the Repression of Tuberculosis in Cattle, 28 pages, 1908.

*Note.—Edition not for general distribution.

No. 173.* Analyses of Commercial Fertilizers, August 1, to December 31, 1908, 58 pages, 1908.
No. 174. List of Fertilizer Manufacturers, 1909, 32 pages, 1909.
No. 175. Analyses of Commercial Feeding Stuffs, 1908, 148 pages, 1909.
No. 176. Analyses of Paris Green, 1908, 31 pages, 1909.
No. 177. Proceedings State Board of Agriculture, 180 pages, 1909.
No. 178. List of County and Local Agricultural Fairs, 10 pages, 1909.
No. 179. Papers Read at Farmers' Institutes, 1907-1908, 105 pages, 1909.
No. 180.* Laws Dairy and Food Bureau, 69 pages, 1909.
No. 181. Timely Hints to Horsebreeders, 23 pages, 1909.
No. 182. Proceedings Farmers' Annual Normal Institute and Spring Meeting State Board of Agriculture, 231 pages, 1909.
No. 183.* Report of Dairy and Food Bureau, 57 pages, 1909.
No. 184. Farmers' Institutes for Pennsylvania, 1909, 79 pages, 1909.
No. 185.* Analyses of Commercial Fertilizers, January 1, to August 1, 1909, 87 pages, 1909.
No. 186. Swine Husbandry, 127 pages, 1909.
No. 187. Directory of Stallions Registered with Pennsylvania Livestock Sanitary Board, for 1909, 86 pages, 1909.
No. 188. Principles of Domestic Science, 42 pages, 1909.
No. 189. Analyses of Commercial Fertilizers, August 1, to December 31, 1909, 71 pages, 1909.
No. 190. The Potato: Selection of Seed and Cultivation, 62 pages, 1910.
No. 191. List of Fertilizer Manufacturers and Brands Licensed for 1910, 38 pages, 1910.
No. 192. Analyses of Paris Green for 1909, 38 pages, 1910.
No. 193. Proceedings Thirty-third Annual Meeting State Board of Agriculture, 192 pages, 1910.
No. 194. Preliminary Report, Dairy and Food Commissioner, 40 pages, 1910.
No. 195. List of Agricultural Fairs for 1910, 10 pages, 1910.
No. 196. Commercial Feeding Stuffs of Pennsylvania for 1909, 186 pages, 1910.
No. 197. Proceedings Farmers' Annual Normal Institute and Spring Meeting of Board of Agriculture, 260 pages, 1910.
No. 198. Farmers' Institutes in Pennsylvania, Season 1910-1911, 84 pages, 1910.
No. 199. Tabulated Analyses of Commercial Fertilizers, Spring Samples, 72 pages, 1910.
No. 200. Skim-milk Cheese, 16 pages, 1910.
No. 201. Market Gardening, No. 2, 86 pages, 1910.
No. 202. Marketing Horticultural Products, 86 pages, 1910.
No. 203. Tabulated Analyses of Commercial Fertilizers, Fall Samples, 76 pages, 1910.
No. 204. Analyses of Paris Green, 1910, 34 pages, 1910.
No. 205. List Fertilizer Manufacturers, 37 pages, 1911.
No. 206. Preliminary Report Dairy and Food Bureau, 37 pages, 1911.
No. 207. List County Fairs, 10 pages, 1911.
No. 208. Analyses Commercial Feeding Stuffs, 213 pages, 1911.
No. 209. Laws, Dairy and Food Bureau, 72 pages, 1911.
No. 210. Proceedings State Board of Agriculture, 208 pages, 1911.
No. 211. Report of Foot-and-Mouth Disease, (Aptheus Fever), 72 pages, 1911.
No. 212. Analyses Commercial Fertilizers, (Spring), 111 pages, 1911.
No. 213. Proceedings Annual Normal Institute, 235 pages, 1911.
No. 214. Schedule Farmers' Institutes, 1911-1912, 82 pages, 1911.
No. 215. List of Publications on Fruit Growing, 23 pages, 1911.
No. 216. Cheap Candy, 21 pages, 1911.
No. 217. Grape Culture for Pennsylvania, 66 pages, 1911.
No. 218.* Analyses Commercial Fertilizers, (Fall), 77 pages, 1911.

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*Note.—Edition not for general distribution.

FERTILIZER ANALYSES JANUARY 1 TO AUGUST 1, 1911

Since January 1, 1911, there have been received from authorized sampling agents nineteen hundred and sixty-two fertilizer samples, of which seven hundred and thirty-one were subjected to analysis. Preference is given to those which have not been recently analyzed. In cases where two or more samples representing the same brand were received, equal portions from several samples were united, and the composite sample was subjected to analysis.

The samples analyzed group themselves as follows: 485 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 6 dissolved bones, furnishing phosphoric acid and nitrogen; 129 rock-and potash fertilizers, furnishing phosphoric acid and potash; 51 acidulated rock phosphates, furnishing phosphoric acid only; 23 ground bones, furnish phosphoric acid and nitrogen, and 37 miscellaneous samples, which group includes 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 and insoluble; that is, that portion not soluble in water nor 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 "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 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 depend very largely on the fineness of its particles, the finer being much more quickly useful to the plant.

The preceding paragraph sets forth the nature of the examinations given to the several classes of fertilizers under the laws in force prior to the present year. The legislation of 1909 has made needful, however, some additional tests. Sec. 4, of the Act of May 1, 1909, pro-

hibits the sale of "pulverized leather, hair, ground hoofs, horns, or wool waste, raw, steamed, roasted, or in any form, as a fertilizer, or as an ingredient of a fertilizer or manure, without an explicit statement of the fact." All nitrogenous fertilizers have, therefore, been submitted to a careful microscopic examination, at the time of preparing the sample for analysis, to detect the presence of the tissues characteristic of the several materials above named. The act of April 23, 1909, makes it unlawful to use the word "bone" in connection with, or as part of the name of any fertilizer, or any brand of the same, unless the prosphoric acid contained in such fertilizer shall be the product of pure animal bone. All fertilizers in whose name the word "bone" appears, were therefore examined by microscopic and chemical methods to determine, so far as possible with present knowledge, the nature of the ingredient or ingredients supplying the phosphoric acid. It is a fact, however, well known to fertilizer manufacturers and which should be equally understood by the consumer, that it is, in certain cases, practically impossible to determine the source of the phosphoric acid by an examination of the finished fertilizer. The microscope shows clearly the structure of raw bone, but does not make it possible to discriminate between thoroughly acidulated bone and acidulated rock. The ration of nitrogen to phosphoric acid in a raw bone—and only such bone as has not been deprived of any considerable proportion of its nitrogenous material by some manufacturing process can properly be called "pure animal bone"—is about 1:8; in cases where the ratio of nitrogen to phosphoric acid exceeds 8, it is clear that part, at least, of the phosphoric acid has been supplied by something else than pure animal bone; but, inasmuch as nitrogen may have been introduced in some material other than bone and no longer detectible by the microscope, the presence of nitrogen and phosphoric acid in the proportions corresponding to those of bone is not proof positive that they have been supplied by bone. Finally, the differences in the iron and silica content of bone and rock respectively, afford means of distinction useful in some cases; the usefulness of this distinction is limited, however, by the facts that kitchen bone frequently contains earthy impurities rich in iron and silica, and that earthly fillers can legally be used in fertilizers and are in fact considerably used therein both as "make-weights" and as "conditioners" or materials introduced to improve the drilling qualities of the goods. The fact that the phosphoric acid in bone and rock are identical in character is probably so well known as to require no detailed consideration in this connection.

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 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 laws of 1901 and 1909 abolished this alternative and required that the quantity 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:

SUMMARY OF ANALYSES MADE THIS SEASON

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of analyses,	485	129	6	51	23
Moisture, per cent.,	9.46	7.30	9.05	9.21	5.50
Phosphoric acid:					
Total, per cent.,	9.86	10.86	13.00	15.93	22.86
Available, per cent.,	8.31	9.86	10.24	14.66	----------
Insoluble, per cent.,	1.55	1.00	2.76	1.27	----------
Potash, per cent.,	4.97	3.97	----------	----------	----------
Nitrogen, per cent.,	1.53	----------	1.68	----------	3.10
Mechanical analyses of bone:					
Fine,	----------	----------	----------	----------	50
Coarse,	----------	----------	----------	----------	50
Commercial valuation,	25.95	15.99	23.82	14.26	31.47
Average selling price,	24.97	17.05	20.33	15.83	30.93
Commercial value of samples whose selling price is ascertained,	25.89	15.97	23.82	14.25	31.47

SUMMARY OF INSTANCES OF DEFICIENCY FROM GUARANTY

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Deficient in four constituents,	1				
Deficient in three constituents,	12	1			
Deficient in two constituents,	59	6		2	
Deficient in one constitutent,	147	28	1	1	11
Total number of samples in which deficiencies occur,	219	35	1	3	11

The cases of deficiency noted during the past eleven seasons in the composition of 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 1906-1911

	Spring, 1906.	Fall, 1906.	Spring, 1907.	Fall, 1907.	Spring, 1908.	Fall, 1908.	Spring, 1909.	Fall, 1909.	Spring, 1910.	Fall, 1910.	Spring, 1911.
Complete fertilizers,	45.4	39.5	39.4	39.3	40.0	40.0	39.5	46.3	28.9	35.9	45.1
Dissolved bone,	50.0	28.5	16.6	25.0	‡50.0	16.6	25.0	*	37.5	25.0	16.6
Rock and potash,	42.4	40.0	43.7	49.0	39.0	38.8	36.2	30.4	25.2	37.0	27.1
Dissolved rock,	28.8	25.6	19.5	27.0	21.2	28.5	33.3	19.5	4.3	6.3	5.9
Ground bone,	49.0	14.7	18.5	27.8	38.0	40.0	20.8	38.4	29.17	27.6	47.8
All classes except miscellaneous,	43.8	35.8	36.1	38.9	38.8	38.3	37.6	39.6	26.5	33.5	38.7

*Only two samples analyzed for which no guarantees are reported.
‡Only four samples analyzed.

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

	Average composition. Per cent.	Average guarantee. Per cent.
Spring, 1906.		
Phosphoric acid:		
Total,	9.73	9.21
Available,	7.88	7.77
Potash,	4.21	3.95
Nitrogen,	1.57	1.53

AVERAGE COMPOSITION AND GUARANTY COMPARED—Continued.

	Average guaranty. Per cent.	Average guaranty. Per cent.
Fall, 1906.		
Phosphoric acid:		
Total,	10.45	9.70
Available,	8.23	8.16
Potash,	3.12	2.95
Nitrogen,	1.32	1.31
Spring, 1907.		
Phosphoric acid:		
Total,	9.21	8.50
Available,	8.13	7.83
Potash,	4.55	4.31
Nitrogen,	1.52	1.47
Fall, 1907.		
Phosphoric acid:		
Total,	10.39	9.42
Available,	8.34	8.07
Potash,	3.18	2.72
Nitrogen,	1.39	1.29
Spring, 1908.		
Phosphoric acid:		
Total,	10.07	8.91
Available,	8.29	7.61
Potash,	5.04	4.51
Nitrogen,	1.64	1.59
Fall, 1908.		
Phosphoric acid:		
Total,	10.29	9.31
Available,	8.29	7.96
Potash,	3.24	2.94
Nitrogen,	1.24	1.23
Spring, 1909.		
Phosphoric acid:		
Total,	9.83	8.98
Available,	8.07	7.66
Potash,	5.07	4.89
Nitrogen,	1.67	1.60
Fall, 1909.		
Phosphoric acid:		
Total,	10.13	9.34
Available,	8.27	8.08
Nitrogen,	1.33	1.26
Potash,	3.41	3.12
Spring, 1910.		
Phosphoric acid:		
Total,	9.80	8.80
Available,	8.26	7.62
Potash,	5.20	4.68
Nitrogen,	1.63	1.60
Fall, 1910.		
Phosphoric acid:		
Total,	9.72	8.80
Available,	8.26	7.62
Potash,	5.20	4.68
Nitrogen,	1.63	1.60
Spring, 1911.		
Phosphoric acid:		
Total,	9.86	8.96
Available,	8.31	7.86
Potash,	4.97	4.65
Nitrogen,	1.53	1.54

It is of itnereste to note how closely the series of valuations based upon the wholesale price of raw materials in the principal markets during the most important buying season and upon certain average allowances for expenses and profits 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, 1906-1911.

	Selling price.	Valuation.	Excess of valuation over selling price.
Complete fertilizers:			
1906, Spring,	23.55	24.76	1.21
Fall,	21.87	22.99	1.12
1907, Spring,	24.60	26.84	2.24
Fall,	22.71	24.59	1.88
1908, Spring,	25.69	26.23	.54
Fall,	22.34	23.88	1.54
1909, Spring,	24.88	25.31	.43
Fall,	22.07	22.25	.14
1910, Spring,	25.26	26.63	1.43
Fall,	21.76	22.24	.48
1911, Spring,	24.97	25.95	.98
Dissolved bone:			
1905, Spring,	23.83	22.70	—1.13
Fall,	24.78	25.85	1.11
1906, Spring,	24.40	22.65	—1.75
Fall,	22.06	25.33	3.27
1907, Spring,	22.28	25.08	2.80
Fall,	22.09	27.01	4.92
1908, Spring,	21.11	23.09	1.98
Fall,	22.48	26.05	3.57
1909, Spring,	22.25	21.57	—.68
Fall,	24.50	22.85	—1.65
1910, Spring,	22.17	21.47	—.70
Fall,	25.80	25.70	—.10
1911, Spring,	20.33	23.82	3.49
Rock and potash:			
1905, Spring,	16.11	15.49	—.62
Fall,	15.97	15.04	—.97
1906, Spring,	16.17	15.19	—.98
Fall,	15.76	15.06	—.70
1907, Spring,	16.94	16.53	—.41
Fall,	16.58	15.82	—.76
1908, Spring,	16.86	16.24	—.62
Fall,	16.43	16.17	—.26
1909, Spring,	16.98	15.94	1.04
Fall,	16.10	15.50	—.60
1910, Spring,	17.16	16.08	—1.08
Fall,	16.38	16.34	—.04
1911, Spring,	17.05	15.99	—1.06
Dissolved rock:			
1905, Spring,	13.64	13.86	.22
Fall,	12.21	13.51	1.30
1906, Spring,	13.75	12.98	—.77
Fall,	13.45	12.09	—.46
1907, Spring,	14.04	14.72	.68
Fall,	14.16	14.67	.51
1908, Spring,	14.72	14.92	.20
Fall,	14.31	14.86	.55
1909, Spring,	14.76	13.62	—1.41
Fall,	13.86	14.02	.16
1910, Spring,	14.56	14.00	—.56
Fall,	14.01	14.15	.14
1911, Spring,	15.83	14.26	—1.58

COMPARISON OF SELLING PRICE AND VALUATION, 1906-1911—Continued

	Selling price.	Valuation.	Excess of valuation over selling price.
Ground bone:			
1905, Spring,	29.08	26.72	—2.36
Fall,	27.70	28.70	1.00
1906, Spring,	29.02	28.23	—.79
Fall,	27.80	29.12	1.32
1907, Spring,	31.55	29.64	—1.91
Fall,	28.92	28.80	—.12
1908, Spring,	29.04	28.96	—.08
Fall,	28.18	27.90	—1.28
1909, Spring,	30.70	30.28	—.42
Fall,	29.39	28.71	—.68
1910, Spring,	30.19	30.27	.08
Fall,	29.98	31.10	1.12
1911, Spring,	30.93	31.47	.54
Fall,	31.17	31.18	.01

FERTILIZER ANALYSES AUGUST 1 TO DECEMBER 31, 1911

Since August 1, 1911, there have been received from authorized sampling agents twelve hundred and eighty fertilizer samples, of which four hundred and ninety-eight were subject to analysis. Preference is given to those which have not been recently analyzed. In cases where two or more samples representing the same brand were received, equal portions from several samples were united, and the composite sample was subjected to analysis.

The samples analyzed group themselves as follows: 292 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 3 dissolved bones, furnishing phosphoric acid and nitrogen; 129 rock and-potash fertilizers, furnishing phosphoric acid and potash; 42 acidulated rock phosphates, furnishing phosphoric acid only; 25 ground bones, furnishing phosphoric acid and nitrogen, and 7 micellaneous samples, which group includes 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 and insoluble; that is, that portion not soluble in water nor 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 "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 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 depend very largely on the fitness of its particles, the finer being much more quickly useful to the plant.

The preceding praagraph sets forth the nature of the examinations given to the several classes of fertilizers under the laws in force prior to 1909. The legislation of 1909 has made needful, however, some additional tests. Sec. 4, of the Act of May 1, 1909, prohibits the sale of "pulverized leather, hair, ground hoofs, horns, or wool waste, raw, steamed, roasted, or in any form, as a fertilizer, or as an ingredient of a fertilizer or manure, without an explicit statement of the fact." All nitrogenous fertilizers have, therefore, been submitted to a careful microscopic examination, at the time of preparing the sample for analysis, to detect the presence of the tissues characteristic of the several materials above named. The act of April 23, 1909, makes it unlawful to use the word "bone" in connection with, or as part of the name of any fertilizer, or any brand of the same, unless the phosphoric acid contained in such fertilizer shall be the product of pure animal bone. All fertilizers in whose name the word "bone" appears, were therefore examined by microscopic and chemical methods to determine, so far as possible with present knowledge, the nature of the ingredient or ingredients supplying the phosphoric acid. It is a fact, however, well known to fertilizer manufacturers and which should be equally understood by the consumer, that it is, in certain cases, practically impossible to determine the source of the phosphoric acid by an examination of the finished fertilizer. The microscope shows clearly the structure of raw bone, but does not make it possible to discriminate between thoroughly acidulated bone and acidulated rock. The ratio of nitrogen to phosphoric acid in a raw bone—and only such bone as has not been deprived of any considerable proportion of its nitrogenous material by some manufacturing process can properly be called "pure animal bone"—is about 1:8; in cases where the ratio of nitrogen to phosphoric acid exceeds 8, it is clear that part, at least, of the phosphoric acid has been supplied by something else than pure animal bone; but, inasmuch as nitrogen may have been introduced in some material other than bone and no longer detectible by the microscope,

the presence of nitrogen and phosphoric acid in the proportions corresponding to those of bone is not proof positive that they have been supplied by bone. Finally, the differences in the iron and silica content of bone and rock respectively, afford means of distinction useful 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 1910 were modified for use during 1911 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 1906 to 1910:

Fertilizers.	Number of samples.	Valuation.	Selling price.	Difference of valuation from selling price.
Spring, 1906.				
Complete,	412	24.76	23.55	1.21
Rock-and-potash,	99	15.19	16.17	—.98
Dissolved bone,	4	22.65	24.40	—1.75
Ground bone,	34	28.23	29.02	—.79
Dissolved rock,	45	12.98	13.75	—.77
Fall, 1906.				
Complete,	266	22.99	21.87	1.12
Rock-and-potash,	71	15.06	15.76	—.70
Dissolved bone,	7	25.33	22.06	8.27
Ground bone,	34	29.12	27.80	1.32
Dissolved rock,	43	12.99	13.45	—.46
Spring, 1907.				
Complete,	424	26.84	24.60	2.24
Rock-and-potash,	103	16.63	16.94	—.31
Dissolved bone,	6	25.08	22.28	2.80
Ground bone,	27	29.64	31.55	—1.91
Dissolved rock,	41	14.72	14.64	.08
Fall, 1907.				
Complete,	280	24.59	22.71	1.88
Rock-and-potash,	96	15.82	16.58	—.76
Dissolved bone,	8	27.61	22.09	5.52
Ground bone,	36	28.80	28.92	.12
Dissolved rock,	48	14.67	14.76	.09

Fertilizers.	Number of samples.	Valuation.	Selling price.	Difference from selling price. of valuation
Spring, 1908.				
Complete,	455	26.23	25.69	.54
Rock-and-potash,	108	16.24	16.96	—.62
Dissolved bone,	4	23.09	21.11	1.98
Ground bone,	21	28.96	29.04	—.08
Dissolved rock,	33	14.92	14.72	.20
Fall, 1908.				
Complete,	287	23.88	22.34	1.54
Rock-and-potash,	104	16.17	16.43	—.26
Dissolved bone,	6	26.05	22.48	3.57
Ground bone,	30	27.90	29.18	—1.28
Dissolved rock,	49	14.86	14.31	.55
Spring, 1909.				
Complete,	426	25.31	24.88	—.43
Rock-and-potash,	111	15.94	16.98	—1.40
Dissolved bone,	8	21.57	22.25	—.68
Ground bone,	24	30.28	30.70	—.42
Dissolved rock,	33	13.62	14.76	—1.14
Fall, 1909.				
Complete,	255	22.25	22.07	.14
Rock-and-potash,	92	15.50	16.10	—.60
Dissolved bone,	3	22.85	24.50	—1.65
Ground bone,	26	28.71	29.39	—.68
Dissolved rock,	41	14.02	13.86	.16
Spring, 1910.				
Complete,	456	26.63	25.26	1.37
Rock-and-potash,	123	16.08	17.16	—1.08
Dissolved bone,	8	21.47	22.17	—.70
Ground bone,	24	30.27	30.19	.08
Dissolved rock,	47	14.00	14.56	—.56
Fall, 1910.				
Complete,	294	22.24	21.76	.48
Rock-and-potash,	109	16.34	16.38	—.04
Dissolved bone,	4	25.70	25.80	—.10
Ground bone,	29	31.10	29.98	1.12
Dissolved rock,	32	14.15	14.01	.14

The following statement from the weekly reports of the Oil, Paint and Drug Reporter, of New York City, shows the average wholesale prices of fertilizer raw materials from September 1, 1909, to March 1, 1910, and from September 1, 1910, to March 1, 1911:

SUMMARY OF INSTANCES OF DEFICIENCY FROM GUARANTY

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Deficient in four constituents,	1				
Deficiencies in three constituents,	11	1			
Deficient in two constituents,	32	12	2	3	1
Deficient in one constituent,	93	43	1	2	4
Total number of samples in which deficiencies occur,	137	56	3	5	5

The cases of deficiency noted during the past twelve seasons in the composition of 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 1906-1911

	Spring, 1906.	Fall, 1906.	Spring, 1907.	Fall, 1907.	Spring, 1908.	Fall, 1908.	Spring, 1909.	Fall, 1909.	Spring, 1910.	Fall, 1910.	Spring, 1911.	Fall, 1911.
Complete fertilizers,	45.4	39.5	39.4	39.3	40.0	†40.0	39.5	46.3	28.9	35.9	45.1	†46.9
Dissolved bone,	50.0	28.5	16.6	25.0	‡50.0	16.6	25.0	*	37.5	25.0	16.6	100.00
Rock and potash,	42.4	40.0	43.7	49.0	39.0	38.8	36.2	30.4	25.2	37.0	27.1	43.4
Dissolved rock,	28.8	25.6	19.5	27.0	21.2	28.5	33.3	19.5	4.3	6.3	5.9	11.9
Ground bone,	49.0	14.7	18.5	27.8	38.0	40.0	20.8	38.4	29.17	27.6	47.8	20.0
All classes except miscellaneous,	43.8	35.8	36.1	38.9	38.8	38.3	37.6	39.6	26.5	33.5	38.7	46.0

*Only two samples analyzed for which no guarantees are reported.
†Only three samples analyzed.
‡Only four samples analyzed.

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

	Average composition. Per cent.	Average guaranty. Per cent.
Spring, 1906.		
Phosphoric acid:		
Total,	9.73	9.21
Available,	7.88	7.77
Potash,	4.21	3.95
Nitrogen,	1.57	1.53

AVERAGE COMPOSITION AND GUARANTY COMPARED—Continued

	Average composition. Per cent.	Average guaranty. Per cent.
Fall, 1906.		
Phosphoric acid:		
Total,	10.45	9.70
Available,	8.23	8.16
Potash,	3.12	2.95
Nitrogen,	1.32	1.31
Spring, 1907.		
Phosphoric acid:		
Total,	9.21	8.50
Available,	8.13	7.83
Potash,	4.55	4.31
Nitrogen,	1.52	1.47
Fall, 1907.		
Phosphoric acid:		
Total,	10.39	9.42
Available,	8.34	8.07
Potash,	3.18	2.72
Nitrogen,	1.39	1.29
Spring, 1908.		
Phosphoric acid:		
Total,	10.07	8.91
Available,	8.29	7.61
Potash,	5.04	4.51
Nitrogen,	1.64	1.59
Fall, 1908.		
Phosphoric acid:		
Total,	10.29	9.31
Available,	8.29	7.96
Potash,	3.24	2.94
Nitrogen,	1.24	1.23
Spring, 1909.		
Phosphoric acid:		
Total,	9.83	8.98
Available,	8.07	7.66
Potash,	5.07	4.89
Nitrogen,	1.67	1.60
Fall, 1909.		
Phosphoric acid:		
Total,	10.13	9.34
Available,	8.27	8.08
Nitrogen,	1.33	1.26
Potash,	3.41	3.12
Spring, 1910.		
Phosphoric acid:		
Total,	9.80	8.80
Available,	8.26	7.62
Potash,	5.20	4.68
Nitrogen,	1.63	1.60
Fall, 1910.		
Phosphoric acid:		
Total,	9.72	8.80
Available,	8.26	7.62
Potash,	5.20	4.68
Nitrogen,	1.63	1.60
Spring, 1911.		
Phosphoric acid:		
Total,	9.86	8.96
Available,	8.31	7.86
Potash,	4.97	4.65
Nitrogen,	1.53	1.54

AVERAGE COMPOSITION AND GUARANTY COMPARED—Continued

	Average composition. Per cent.	Average guaranty. Per cent.
Fall, 1911.		
Phosphoric acid:		
Total,	9.59	9.09
Available,	8.20	7.87
Potash,	3.63	3.39
Nitrogen,	1.12	1.19

It is of interest to note how closely the series of valuations based upon the wholesale price of raw materials in the principal markets during the most important buying season and upon certain average allowances for expenses and profits 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, 1906-1911

	Selling price.	Valuation.	Excess of valuation over selling price.
Complete fertilizers:			
1906, Spring,	23.55	24.76	1.21
Fall,	21.87	22.99	1.12
1907, Spring,	24.60	26.84	2.24
Fall,	22.71	24.59	1.88
1908, Spring,	25.69	26.23	.54
Fall,	22.34	23.88	1.54
1909, Spring,	24.88	25.31	.43
Fall,	22.07	22.25	.14
1910, Spring,	25.26	26.63	1.43
Fall,	21.76	22.24	.48
1911, Spring,	24.97	25.95	.98
Fall,	21.73	22.33	.61
Dissolved bone:			
1905, Spring,	23.83	22.70	—1.13
Fall,	24.78	25.85	1.11
1906, Spring,	24.40	22.65	—1.75
Fall,	22.06	25.33	3.27
1907, Spring,	22.28	25.08	2.80
Fall,	22.09	27.01	4.92
1908, Spring,	21.11	23.09	1.98
Fall,	22.48	26.05	3.57
1909, Spring,	22.25	21.57	—.68
Fall,	24.50	22.85	—1.65
1910, Spring,	22.17	21.47	—.70
Fall,	25.80	25.70	—.10
1911, Spring,	20.33	23.82	3.49
Fall,	24.88	21.51	—3.37

COMPARISON OF SELLING PRICE AND VALUATION, 1906-1911—Continued.

	Selling price.	Valuation.	Excess of valuation over selling price.
Rock and potash:			
1905, Spring,	16.11	15.49	—.62
Fall,	15.97	15.04	—.97
1906, Spring,	16.17	15.19	—.98
Fall,	15.76	15.06	—.70
1907, Spring,	16.94	16.53	—.41
Fall,	16.58	15.82	—.76
1908, Spring,	16.86	16.24	—.62
Fall,	16.43	16.17	—.26
1909, Spring,	16.98	15.94	1.04
Fall,	16.10	15.50	—.60
1910, Spring,	17.16	16.08	—1.08
Fall,	16.38	16.34	—.04
1911, Spring,	17.05	15.99	—1.06
Fall,	16.25	16.07	—.18
Dissolved rock:			
1905, Spring,	13.64	13.86	.22
Fall,	12.21	13.51	1.30
1906, Spring,	13.75	12.98	—.77
Fall,	13.45	12.99	—.46
1907, Spring,	14.04	14.72	.68
Fall,	14.16	14.67	.51
1908, Spring,	14.72	14.92	.20
Fall,	14.31	14.86	.55
1909, Spring,	14.76	13.62	—1.41
Fall,	13.86	14.02	.16
1910, Spring,	14.56	14.00	—.56
Fall,	14.01	14.15	.14
1911, Spring,	15.83	14.26	—1.58
Fall,	14.00	13.78	.22
Ground bone:			
1905, Spring,	29.08	26.72	—2.36
Fall,	27.70	28.70	1.00
1906, Spring,	29.02	28.23	—.79
Fall,	27.80	29.12	1.32
1907, Spring,	31.55	29.64	—1.91
Fall,	28.92	28.80	—.12
1908, Spring,	29.04	28.96	—.08
Fall,	28.18	27.90	—1.28
1909, Spring,	30.70	30.28	—.42
Fall,	29.89	28.71	—.68
1910, Spring,	30.19	30.27	.08
Fall,	29.98	31.10	1.12
1911, Spring,	30.93	31.47	.54
Fall,	31.17	31.18	.01

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