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1909

THE
Fruit Growers Association
of Adams County
Pennsylvania

ORGANIZED DECEMBER 18, 1903

PROCEEDINGS

of the

FIFTH ANNUAL CONVENTION

held in

FRUIT GROWERS HALL, BENDERSVILLE, PA.

WEDNESDAY, THURSDAY AND FRIDAY

DEC. 15, 16, 17, 1909

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Mr. Joshua F. Crowell, West Yarmouth, Barnstable Co., Mass., writes: "I used Pyrox very successfully last season on apple and pear trees for fungous diseases and had a fine yield of good solid fruit, especially apples, which are in fine hard condition at the present time (February 12th) and keeping better than ever before. I also used Pyrox judiciously on strawberries, raspberries, grapes, plum trees, melons, squashes, cucumbers, beans and tomatoes, and also found it very effective on asters and nicotiana. In seasons before I have used it on elm and other shade trees with excellent results. I find it a safe, convenient and thorough insecticide and fungicide for fruit and for the family garden."

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in Fine Drilling Condition and Sci-
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CONSTITUTION

PREAMBLE.

Being interested in fruit growing and believing that, by organization, we may materially advance our common interests, we hereby adopt the following Constitution and By-Laws:

ARTICLE I.—Name.

This Association shall be known as The Fruit Growers' Association of Adams County.

ARTICLE II.—Object.

The object of this Association shall be to encourage the co-operation of the fruit growers of Adams County for the protection and advancement of their common interests.

1st. By securing and disseminating such scientific and practical information as shall promote the general advancement of the fruit growing interests in this county, and shall tend to the improvement of the quality and quantity of our products.

2d. By securing such legislation as may be advantageous, and preventing that which may be detrimental.

3d. By securing such improved facilities in transportation as shall tend to give us more expeditious and economical distribution.

4th. By endeavoring to secure a better and more uniform system of packing and package.

5th. By devising some system of marketing our products which will open up and develop the markets and give to the grower a fair and remunerative return.

6th. And by endeavoring to obtain such improved systems of crop reporting as shall furnish, through co-operation with other similar Associations, accurate information concerning production; thereby enabling the fruit grower to know the exact situation.

ARTICLE III.—Membership.

1st. Candidates for membership may be elected by a majority vote of the members present, and upon the payment of \$1.00 into the treasury shall be entitled to membership until the next Annual Meeting.

2d. Any member may renew his membership by the payment of annual dues, but upon failure to pay dues within three months after Annual Meeting, shall require re-election.

3d. No member shall receive the benefit of commissions or of co-operative buying by the Association, to an amount greater than \$1.00 for the term of one year after election to membership.

ARTICLE IV.—Dues.

The annual dues of this Association shall be One Dollar (\$1.00) payable to the treasurer at the meeting immediately preceding the annual meeting, for which the treasurer shall issue a receipt, this receipt to constitute a certificate of membership for the succeeding year.

ARTICLE V.—Officers.

Its officers shall consist of a President, one Vice President, a Recording Secretary, a Corresponding Secretary, a Treasurer, and an Executive Committee of five (5) members, consisting of the President, Recording Secretary and three others, all of whom shall be elected by ballot at each annual meeting for the term of one year or until their successors shall be chosen.

ARTICLE VI.—Quorum.

Five (5) members shall constitute a quorum for the transaction of business.

ARTICLE VII.—Amendments.

The Constitution and By-Laws of this Association may be amended at any regular meeting by a two-thirds vote of the members present, a notice of the proposed amendment having been presented in writing at a previous regular meeting.

GRASSELLI'S SPRAYING PRODUCTS

FOR THE CONTROL OF



The Codling Moth

AND



The Potato Beetle

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**GRASSELLI'S ARSENATE OF LEAD--
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San Jose
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The San Jose Scale

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BY-LAWS

ARTICLE I.—*Duties of President.*

The President shall preside at all meetings of the Association and have a general supervision of its affairs.

ARTICLE II.—*Duties of Vice President.*

The Vice President shall preside at any meeting in the absence of the President, and may act on the Executive Committee in case of the President's absence.

ARTICLE III.—*Duties of Recording Secretary.*

The Recording Secretary shall write the minutes of the meetings of the Association and have charge of its Records and Reports.

ARTICLE IV.—*Duties of Corresponding Secretary.*

The Corresponding Secretary shall conduct the correspondence of the Association and shall receive for so doing his necessary expenses for stationery, postage, etc. He shall also act as Recording Secretary in the absence of that officer.

ARTICLE V.—*Duties of Treasurer.*

The Treasurer shall receive and keep an accurate account of all moneys belonging to the Association, paying out same on an order of the Association, signed by the President. He shall make a report of all receipts and disbursements at the annual meeting or at any time at the request of the Association. He shall mail a notice of dues to all members one week prior to the November meeting, at which time all dues are payable, and shall issue certificates of membership in exchange for all dues received. He shall also keep a roll of members who have complied with Article IV. of the Constitution and embody same in his annual report.

ARTICLE VI.—*Duties of the Executive Committee.*

The Executive Committee shall have general supervision of the affairs of the Association, auditing all bills and accounts and carrying out the purposes of the Association. They shall also prepare a program for each meeting, same to be announced at the preceding meeting.

ARTICLE VII.—*Meetings.*

There shall be a regular meeting of the Association on the second Saturday of each month at 7:30 P. M., unless otherwise ordered. The meeting held in December to be regarded as the Annual Meeting. Special meetings may be convened by the Executive Committee at such time as they may appoint.

ARTICLE VIII.—*Initiation of Officers.*

All new officers shall assume the duties of office at the opening of the meeting immediately following the one at which they were elected. Except that the newly appointed Executive Committee shall prepare and announce at the January meeting the program for the February meeting.

ARTICLE IX.—*Order of Business.*

- 1st. Reading of minutes of previous meeting.
- 2d. Nominations and elections.
- 3d. Reports of committees.
- 4th. Deferred business.
- 5th. Communications.
- 6th. New business.
- 7th. Discussion of questions.

INTELLIGENT SPRAYING

The Rural New Yorker stated editorially, Sept. 19th 1908:—"The Rural Grounds now appear to be free from scale for the first time in 12 years. * * * It has been a long fight, excessively discouraging until the soluble oils came to the rescue three years ago. The prospect brightened at the first trial of these handy preparations, and repeated use seems to have resulted in victory." Spraying was omitted this year.

"SCALECIDE"

alone did more in three years than Lime-Sulphur and other "dopes" did in nine. Are you still in the Lime-Sulphur ranks?

Send for Booklet "Orchard Insurance."

If you want cheap oils, our "CARBOLEINE" at 30c. per gallon is the equal of anything else.

"I HAVE SO LITTLE FUNGUS

that I cannot afford to mark my fruit with Bordeaux," says Mr. Geo. T. Powell of Ghent, N. Y., a grower of fancy apples. "I have less scale and finer foliage than ever before." REASON: Five years consecutive use of Scalecide.

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50 gal. bbl. \$25, 30 gal. tin \$15, 10 gal. can \$6, 5 gal. can \$3.25, 1 gal. can \$1. F. O. B. New York or Guernsey, Pa., cash with order. Freight paid on cash orders for 50 gals. and over to one address.

Three gallons added to water makes a barrel of spray.

"SULFOCIDE"

Soluble Sulphur Summer Spray.

A new Substitute for Bordeaux Mixture

Far surpassing it in effectiveness, durability and ease of application, at one-half the cost or less.

The most powerful, non-poisonous fungicide for plant life—for rust, mildew, scab, canker, brown rot, etc.

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FLORA DALE, PA.

PROCEEDINGS

OF THE

FIFTH ANNUAL CONVENTION

OF THE

FRUIT GROWERS ASSOCIATION

OF

ADAMS COUNTY, PA.

The Fifth Annual Convention of the Fruit Growers' Association of Adams County was called to order by Chester J. Tyson, acting chairman, at 2:00 p. m., Wednesday, December 15, 1909, in Fruit Growers' Hall, Bendersville, Pa.

The convention was opened with prayer by the Rev. B. P. S. Busey.

Mr. Tyson. I regret very much to announce that our President, Mr. Eldon, is prevented from attending the opening session by a very severe cold. We hope to have him with us later and his annual address will appear in our "Proceedings" just as if he were here.

PRESIDENT'S ADDRESS.

ROBERT M. ELDON.

The announcement of the Fruit Growers' Association of Adams County states that this is to be the fifth annual convention. If habits are fixed by the repetition of actions, I have a notion that we are acquiring the convention habit. However, we are not pioneers in this respect. The newspapers are full of the announcements of conventions of all kinds.

Before our ancestors became individually independent, and veritable ambidexterous jacks of all trades, they belonged to some corporation, following from father to son and grandson some definite occupation or trade. A man was born, lived and died a carpenter, a weaver, or a mason. And now after a period of strenuous activity as individuals, we are swinging back towards that former way. Not to follow our father's trade, but to follow one trade. We do not expect to lose the desire or right to choose what we shall do, but

having chosen one thing, will probably merge ourselves as individuals into the mass of those who do that thing; will be willing to sacrifice part of our individual independence for the sake of the influence of the mass.

As individuals we recognize the fact that we are not sufficient of ourselves. That only in combination are we able to meet the demands made upon us in the business of growing fruit. No one man has time to investigate all its phases. No one man is able to investigate them all. The men who come here as instructors or lecturers are brought here because they have investigated but one part of the subject, and they are careful to say that many of their deductions have not been certainly established or proven.

In a discussion of the subject matter of what is now the Lafean Bill in Washington last winter, two of our members represented the Pennsylvania State Horticultural Society and the Fruit Growers' Association of Adams County. The discussion had not progressed very far when it became evident that very divergent views were held by the delegates from the different parts of the country represented at the conference. Generally speaking, the very Far West in one camp, and the East and the Middle West in the other.

The Far West satisfied with present conditions and insisting that if change were to be made, and packing and packages standardized and legalized, that the methods of packing the crop of the coast states, California, Oregon and Washington, were the best in existence, and that their packages should be adopted as standard. They want their present apple boxes standardized as bushel boxes, although they hold but 2,150 cubic inches, or the volume of the Winchester bushel. The Winchester bushel is our stricken measure and would not be accepted in the East as the measure of a bushel of produce, such as apples or potatoes or other vegetables. We couldn't sell our crops were they measured in that way, and were we the purchasers we wouldn't take that kind of measure.

The Winchester bushel measured level full is naturally the measure of small grain, which is now almost universally weighed, and which could not be conveniently handled if heaped in a measure. Why should the Winchester bushel be the standard measure for apples in boxes? Because it is the same in capacity as the Western apple-box, and the delegate from Washington says that our box suits us; we have been using it and we intend to keep on using it. In like manner, and in the same vein, while the conference was discussing the capacity for a barrel: "We don't care what is the capacity of a barrel, we do not use barrels for our fruit."

The Lafean Bill proposes to make the standard barrel for apples the same as the New York barrel, a package of certain stated dimensions and holding 7,026 cubic inches. As it is the practice in many sections to call a barrel of apples three bushels, it was finally decided in the convention, the delegate from Washington always and all the time dissenting, to recommend one-third of the capacity of the standard barrel as the capacity of the standard bushel box, namely, 2,342 cubic inches. This was distinctly in a spirit of compromise, as many of the delegates were in favor of a larger package, even as large as 2,550 cubic inches.

It seems to me that there would be gain rather than loss in

making a bushel to hold as much as 2,550 cubic inches, a generous heaping of the measure makes a pleased customer whether he be the retailer or the consumer. Part of the price of our fruit is to be spent in advertising at any rate and it is better to give this part to the purchaser of our fruits than to invest it in the public prints, and it is better advertising, too.

An important section of the Lafean Bill requires that the name of the grower, his address, and the name of the packer shall be put on the package, and that if the box or barrel is repacked, the person who repacks the fruit shall substitute his name for that of the original packer. Thus, if contents of package are not as represented, the person responsible can be readily ascertained.

Poor packing is such short-sighted policy, that nothing in the way of legislation ought to be necessary to correct it; but there are in the fruit-growing business, as in every other business, persons who are natural cheats, and legislation is as necessary to suppress them as to protect the honest grower. The aim of this section is also to protect the buyer of closed packages, as it is impossible to open every package of fruit every time it changes ownership.

I think it is good practice to give a well-heaped measure, and I would not want to indorse any bill that has as one of its features the restriction of the size of the measure. Give good measure and good fruit and you have a satisfied customer; one who will come back. You cannot lose him if you wanted to. He will take time and trouble to find you. What is more, he will tell his friends of your good fruit, your well-filled package, good down to the bottom.

Mr. Lafean has been criticised as a man who knows nothing about apples. It was claimed that Mr. Porter knew nothing about the Porter Bill. Congress is not composed of experts in all subjects and we do not expect any member to know all about apples. Some representative body must legislate. We cannot wait for experts. I think the bill should receive our hearty support. No one thinks the present bill is perfect, but all legislation begins in imperfection. It must first be passed, then tried, and if necessary be remodeled. Finally it will be found to reach the end desired, and to accomplish the desired result.

One characteristic of the Association is the good fellowship existing among its members, and I believe that they try to extend it to the stranger. We try to make him one of us. Several times at least we have been able to have a man repeat his visit. I extend the welcome of the society to all who are with us or coming to later sessions. We expect to enjoy your presence. We have had a number of visitors and we have yet to hear the unfriendly or unkind word.

A pleasing incident of the apple harvest time was the visit to the Adams County orchards of a part of the Horticultural section of the School of Agriculture of the Pennsylvania State College. About twenty students accompanied by Professors Ralph L. Watts and W. J. Wright of the Department of Horticulture. This visit was good for us and I am as certainly sure that it was good for the young men. Professor Watts is a rattling good instructor and kept the wits of his boys constantly on the jump to observe the different phases of the fruit-growing business as they presented themselves.

They spent two days in the orchards and the included evening in the Hall at Bendersville. When leaving us at McKnightstown, all declared themselves as having had a good time from all points of view. I believe that those of our membership who made the trip were equally repaid. It was good advertising and our business needs that as much as does any other.

Our apple crop was the usual full year crop. Entire returns are not at hand, but what we have would indicate that the crop was somewhat heavier than that of 1907. Its quality was superior also to that of the 1907 crop. During May much apprehension was felt for the crop on account of the cold weather, and there is no doubt that there was a considerable injury to the blossoms. On the trip through the county at picking time many trees were observed that bore fruit only on the south and southeast sides, showing very conclusively that the opposite or stormward side had been injured, the fruit-bearing side having been saved by the protection which the branches and leaves afforded. The apples were very highly colored. The buyer of the bulk of the crop declared they were the handsomest east of the Mississippi. Many of the plantings which have been made since it was discovered that our county was good for apples are now approaching bearing age, so that the returns of the near future are expected to show a large increase of fruit.

Some of our growers report unexpected outbreaks of scale, which they attribute not so much to the agent used to kill the scale, as to the impossibility of doing a good spraying job in the windy spraying season. These reports come mostly from those who have done most of their spraying in the spring. Spraying for codling moth seemed to be more uniformly successful. Taking it as a whole I think we are making satisfactory progress in the use of spray materials. The remedies themselves seem to be too prominent in the list of orchard charges, but perhaps in the near future with the increasing demand that our growing orchards will create, some one may be induced to erect in our midst a plant for the manufacture of spray material.

We believe that this convention will be better than our former good ones. Our instructors have been selected with the usual care and we expect them to be as good as those of other years, plus the added year. I need not take the time to set out their good points. A glance at the program will be all that is necessary, to excite your attention and interest. After that the various instructors will speak for themselves.

Dessert follows the meat. After the serious business of the day we offer you a lighter character of pleasurable entertainment for the evenings. A combination of work and play that will leave you at the conclusion of these meetings in a state of satisfaction; at peace with yourselves and with us. Perhaps if you are not already a member you will have a firm determination to become one at the first opportunity. We expect to greatly increase our membership during this week, and opportunity to join us will be freely given. A pleasant thing about the membership of this Association is, that having once embraced its privileges and duties, members seldom quit. Membership is not expensive, and our meetings are as necessary to our members as is a clearing house to a chain of banks.

Mr. Tyson. In Mr. Eldon's place I desire to welcome all who have come to our convention, whether members or not, and to invite your active participation in the proceedings. I want you to feel free to ask questions and to enter into the discussions at any time during the meetings.

Three years ago, Dr. Hunt, then a new director of our Experiment Station at State College, requested this Association to appoint a delegation to meet with other delegates at the annual meeting of the State Horticultural Association at Harrisburg, to designate what line of work the fruit growing and horticultural interests in general would like to have carried out by the Experiment Station. At that conference it was suggested that the Station undertake experiments on Orchard Fertilization with respect to its effect on the yield and quality of the fruit. Prof. J. P. Stewart, of the Experiment Station, was at once put in charge of this work and has followed it continuously ever since. Prof. Stewart is with us and will address you on his results to date.

ORCHARD FERTILIZATION.¹

PROF. J. P. STEWART, *Department of Experimental Horticulture,
School of Agriculture, Pennsylvania State College,
State College, Pa.*

The problem of successful orcharding is to secure and maintain a balanced treatment. Many factors are involved,—moisture, plant food, light, protection (from enemies, frost and disease), correct varieties and location, and correct business management. None can be neglected without danger of loss, and it is the weakest factor that limits the crop. The limiters, therefore, must be found and corrected. Money and energy spent on factors already relatively strong are likely to be wasted, while on the other hand, the weak factors will respond to care. Hence, the finding and lifting of limiting factors, coupled with the maintenance thereafter of a balanced orchard treatment, is the correct policy and the keynote to success.

You are already acquainted with the scope and general character of our experiments along this line. But I would recall the facts that we have under experiment in various parts of the state 91 acres of orchard, 49 of which (including 2,219 trees) are in partial or full bearing. The yields from these experimental orchards in 1908 were somewhat over 164,000 pounds of fruit, and in 1909, the third year, they were 256,000 pounds. The data for the tables and conclusions which follow, therefore, cover a period of three years and are derived from something over 420,000 pounds of fruit. The exact locations, soil types and varieties involved are shown in Table I.

¹Abstract of address given at meeting of Adams County Fruit Growers' Association, December 15, 1909.

TABLE I.

Location, Soil, and Other Data on Experiments Away from the College.

Expt. No.	County	Owner of Orchard	Soil	Varieties	Age 1909	No. of Trees
215	Adams	Tyson Bros.	Porter's Loam	York Imperial and Stayman Winesap	Yr. 10	160
216	Franklin	D. M. Wertz	Mont Alto Fine Sandy Loam*	York Imperial and Jonathan	10	160
220	Bedford	Mrs. S. B. Brown	DeKalb Stony Loam*	York Imperial and Baldwin	11 & 21	160
217	Franklin	J. H. Ledy	Mont Alto Loam*	York Imperial and Gano	16	358
218	Franklin	J. A. Nicodemus	Hagerstown Clay Loam*	York Imperial and Albemarle	10 & 14	400
219	Bedford	J. R. Sleek	DeKalb Shale Loam*	York Imp., Jonathan Ben Davis and Gano	7	320
221	Wyoming	F. H. Fassett	Fine Sandy Loam†	Northern Spy and Baldwin	37	115
336	Chester	A. D. Strode	Chester Loam	Grimes, Smokehouse and Stayman Winesap	7 - 9	120 105‡
337§	Mercer	St. Paul's Orphans' Home	Volusia Silt Loam*	Northern Spy, Baldwin and Rome	2	180&180
338	Lawrence	J. B. Johnston	Volusia Silt Loam*	Baldwin	21	80 & 105
339	Bradford	F. T. Mynard	Upshur Loam*	Baldwin and Fallawater	15	120 & 1

The first three experiments, 215, 216 and 220, comprise what we call our straight fertilizer experiments; the next four are experiments on cultural methods, with and without manures; and the last four are a combination of fertilizer and cultural methods experiments. Each of the fertilizer experiments contains sixteen plots of ten trees each. The treatments are shown in Table II. The symbols N, P and K refer to nitrogen, phosphates and potash; and they are applied at the rates of 50 lb. N., 100 lb. P₂O₅ and 150 lb. K₂O per acre in all cases. Plots 5 and 6 compare the muriate and sulphate as a carrier of potash. Plots 11 and 12 compare acid phosphate and "floats" as a carrier of phosphoric acid (phosphorus pentoxid, more correctly). The manure is applied at the rate of 12 tons per acre and the lime at 1,000 lb. per acre. All applications are made annually.

The combined results to date of the first three experiments are shown in Table II.

*Soils un-mapped as yet, but probably closest to the types indicated according to the observations of C. F. Shaw and H. J. Wilder.

†This soil has received no series name but it is one that has been deposited in a lake bed formed by the temporary stoppage of the Susquehanna in cutting through the mountains.

‡In the two sets of figures in this and the following experiments, the first gives the number of trees under fertilizer treatment, the second those under differing cultural methods. In experiments 339, the latter includes only a sod mulch plot.

§Trees set out in connection with these experiments, hence, not yet in bearing.

TABLE II.

Influence of Fertilizers on Yield, Color and Growth.

Epts. 215, 216, 220.

Plot.	Treatment.	Yields 1908-9. Lb.	Per cent. Benefit.	Yields 1909 Third Yr. Lb.	Per cent. Benefit.	Per ct. of apples colored ½ or more, 1908-9.	Per cent. Benefit.	Ave. increase per tree in trunk girth, in inches, 1907-9.	Per cent. Benefit.
1	Check	4643	....	1306	....	69.2	....	3.29	....
2	N P	6887	78.1	1770	51.2	47.9	-22.5	3.54	8.9
3	N K	5653	82.8	1409	36.4	57.	-14.5	3.63	19.1
4	Check	2313	....	897	....	72.7	....	3.18	....
5	P K	3577	62.5	1441	56.5	69.8	1.7	3.34	3.8
6	PK ₂ SO ₄	2773	32.	1664	76.3	67.2	3.6	3.43	5.1
7	Check	1998	....	1067	....	59.	....	3.29	....
8	N P K	3847	67.4	1561	31.3	41.6	-20.3	3.97	18.2
9	N	4709	81.2	2675	104.2	43.8	-21.1	4.08	19.4
10	Check	2898	....	1431	....	67.8	....	3.48	....
11	Acid P.	2833	6.26	2126	52.2	69.3	3.3	3.49	-1.7
12	Raw P.	1548	-36.6	1073	-21.3	75.3	11.	3.29	-8.9
13	Check	2209	....	1327	....	62.5	....	3.68	....
14	Manure	4793	138.3	3423	178.5	56.0	-9.1	4.30	21.6
15	Lime	1538	-21.7	895	-21.	66.7	-.9	3.73	9.6
16	Check	1843	....	1034	....	70.2	....	3.26	....

Striking things shown here are the strong beneficial effect of manure and of nitrogen on yield and growth, with an accompanying harmful influence on color. Plots 6 and 11 show surprising gains in the yields of the third year. Raw phosphate and lime continue to show deficits in every way except in color for the former and in growth for the latter. We can hardly see any reason for this harmful effect in the case of the "floats" and suspect that it is due to some temporary condition which will disappear later. The same may be true of the lime effect, though the reports of "Lime poisoning" made by Dr. Headdon in Colorado Bulletin 131 are worthy of consideration in this connection. It is also worthy of note that the plots which have made the best yield have also made the best growth, thus showing that reasonable amounts of yield and growth are not antagonistic but rather are associated.

A puzzling condition appears in the fact that wherever nitrogen has been applied in combination with other elements, the benefit decreases in a third year, while in plot 9 where it was applied alone the benefit in the third year increases distinctly. This is partly explainable in the larger yields of the former plots last year, thus bringing them more strongly under the operation of the biennial bearing habit.

¶In all these tables, the effects on color and size of the fruit were obtained from random samples, taken from the fruit of each tree as it was weighed, the aggregate sample from each plot amounting usually to one or two bushels.

Also the difference in yield between 8 and 9 may be traced directly to a deficit of at least 1,000 lb. that occurred this year in plot 8 of Experiment 220. This deficit was not due to the absence of apples on the trees. On the contrary an excessive number of fruits were started on this plot, despite its heavy crop of last year, and this very fact, coupled with the excessive foliage and extreme drought of the current season, almost prevented development in the apples. Plot 9 of course was subjected to similar conditions, but to a lessened degree in every way. Its original set of fruit and its foliage were less and its moisture situation is hardly as severe as that of plot 8. Thus, while some of the present results are undoubtedly entitled to the rank of "posers," yet they are not entirely beyond partial explanation at least; and at any rate they should not be permitted to cloud the main facts, which are given in the paragraph above.

In Table III we have another set of results from the fertilizer portions of Experiments 336, 338 and 339, which have been running for two years only. The applications are the same as in the experiments above.

TABLE III.

Influence of Fertilizers on Yield and Color.

Expts. 336, 338, 339. (a) Yields in Pounds, 1908-9.

	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
1908, 1st yr.	562	860	748	1118	846	2178	1067	2338	3111	2748
Per cent. Benefit ¹		15.1	-19.8		-23.2	100.9		46.7	42.1	
1909 Totals.	1087	6435	6367	2502	3803	7212	2436	4600	2349	1720
Per cent. Benefit.		312.7	213.6		53.3	193.4		109.7	19.9	

(b) Color per cent. of apples colored $\frac{1}{2}$ or more.

Ave. per cent. Color,	57.2	40.-	39.8	49.4	46.5	38.0	49.7	49.0	50.3	54.8
Per cent. Benefit,		-14.6	-12.2		-3.	-11.6		-2.4	-2.8	

In Tables II and III we have had results from various combinations of fertilizer elements, as well as some from certain materials used singly. Those results being direct from the trees may be considered a close expression of the values thus far of the various combinations used. In many cases, however, we may wish to know which is the more active element in a given combination and approximately what values are to be assigned to each of the elements in it. For example, in plot 2 of Table II we find a benefit of 78.1 per cent. resulting from an application of nitrogen and phosphate.

¹The results of the first year were obviously unaffected by the fertilizer treatments, but they are included for the light they throw on some of the results of the second year, notably those in plots 2, 3 and 6.

Here the question arises as to how much of this effect was due to nitrogen and how much to phosphate. Any answer to this can be of course only an approximation of the truth and hence the values obtained and shown in the following table are not to be taken too literally. They are the nearest approach to the correct values, however, that we are able to obtain at this time and they were derived in the manner indicated in the footnote to the table.

TABLE IV.

Influence of Fertilizer Elements on Yield, Color and Growth.¹

Estimated Per Cent. of Benefit.

Expts. 215, 216, 220.	YIELD.		COLOR.	GROWTH ²
	1908-9.	1909	1908-9.	1907-9.
Nitrogen, In Combination,	49.2%	15.55%	-19.35%	12.1%
Nitrogen, Alone,	81.1	104.2	-21.1	19.4
Ave. Influence of Nitrogen, ..	65.2	59.9	-20.23	15.8-
Phosphate, In Combination, ...	28.9	35.65	-3.13	-3.2
Phosphate, Alone,	6.2	52.2	3.3	-1.7
Potash, In Combination,	33.6	20.85	4.85	7.0
Manure, Alone,	138.3	178.5	-9.1	21.6
Lime, Alone,	-21.7	-21.	-.9	9.6

Expts. 336, 338, 339.	YIELD.	COLOR.
	1909 (2nd year).	1909.
Nitrogen, In Combination,	236.5%	-11.9%
Phosphate, In Combination, ...	76.2	-2.7
Potash, In Combination,	-22.9	-.3
Manure, Alone,	109.7	-2.4
Lime, Alone,	19.9	-2.8

These results, being derived from those in tables II and III, are naturally not materially different, as a whole, but the values of the individual elements stand out more sharply.

Nitrogen and stable manure show striking beneficial effects on both yield and growth and characteristically harmful effects on color. The effect of the manure is greatest in the third year of the first three experiments, while that of the nitrogen is astonishingly great in the second year of the three later experiments.

Phosphates are showing considerable value on yield, especially when used in combination with other materials. Their effect on

¹The results here given are calculated or taken from Tables II and III. For example, the value of nitrogen in combination was obtained by following the formula $\frac{NP+NK-PK}{2}$.

In other words, the per cents of benefit obtained in plots two and three were added, from this sum was deducted the per cent of benefit in plot 5, and the remainder, divided by 2, is considered to be the value of nitrogen in the combination. The other values in combination were obtained similarly.

²Per cent of increase in trunk girth.

color and growth is apparently undecided, as 3 per cent. variations from the normal are readily attributable to limitations in our methods of determining values. Potash, in combination, has shown fairly good effects on yield and growth in the first experiments, but has apparently proved rather distinctly harmful in the second three; and considering the results in all six experiments its value in improving color is very questionable.

Lime in the first three experiments shows a distinct deficit in yield, and no advantage in color, but apparently a fair increase in growth. In the other experiments an apparent benefit in yield is shown. This, however, is due to an unusual increase on the lime plot of experiment 339, an increase which was due probably more to a favorable moisture situation this year than to any effect of the lime. It is surely a significant fact that in five out of six places thus far, lime shows either no effect or a distinct deficit in yield.

It will be noted that practically none of the treatments have materially improved color while a number of them have distinctly decreased it. This reduction in color is undoubtedly associated with *delayed maturity* and a *diminished light supply to the fruit*, the latter being due to an increase in the density of foliage following the application of the fertilizers. The value of sunlight in developing redness in apples is scarcely appreciated. In a test conducted during the fall on York Imperial apples it was found that exposure to sunlight after picking increased redness by over 35 per cent, while apples confined in the dark, or exposed to electric light and under identical conditions otherwise, showed practically no increase in redness. *Maturity in sunlight* on the trees is undoubtedly the great influence affecting redness in fruit, and when soil ingredients apparently affect it, their effect is produced indirectly through a modification in the main influence.

In table V, we have the financial value of fertilization as shown in some of our most striking results of this year.

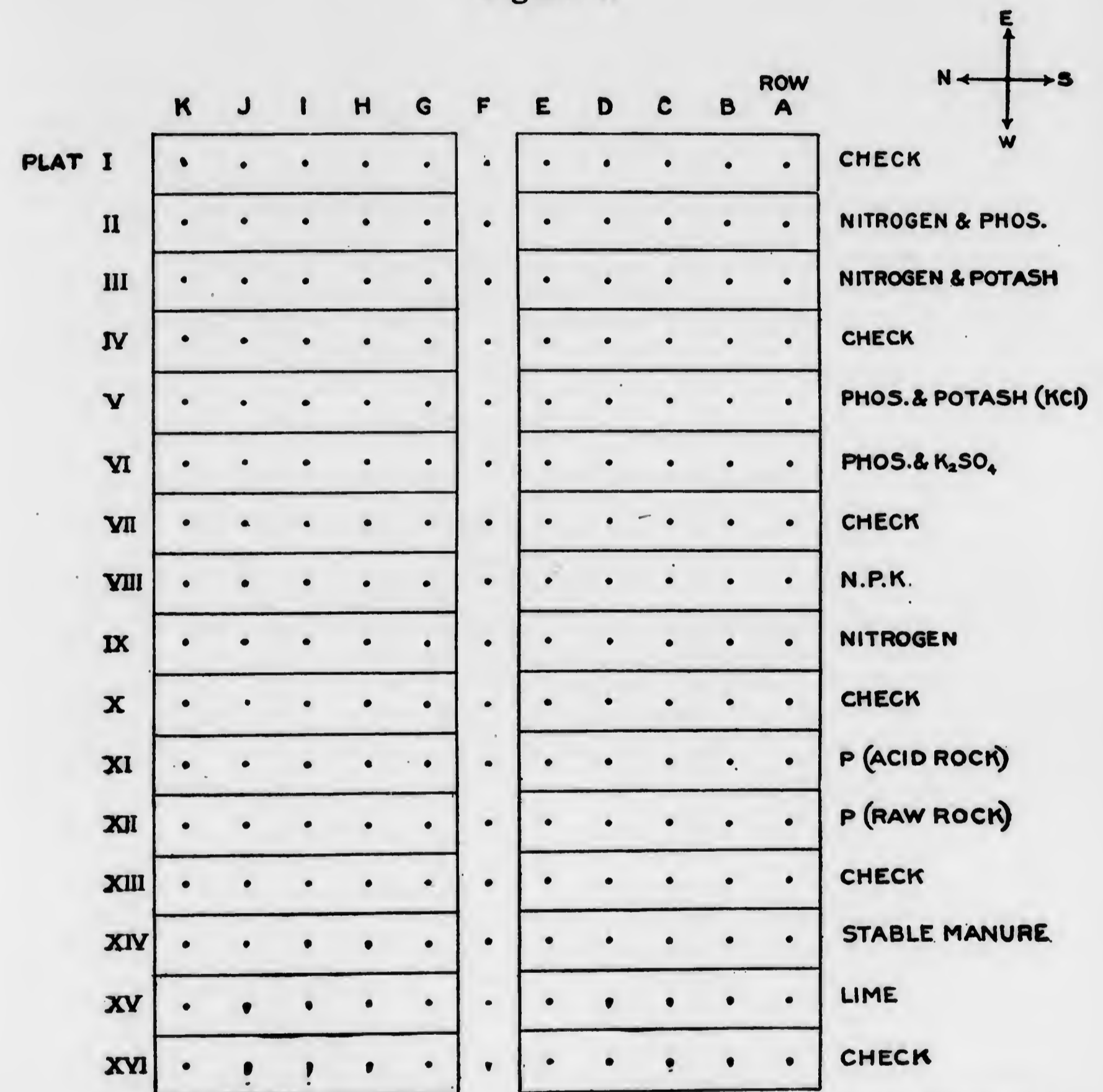
TABLE V.

Financial Value of Fertilization.

Expt. 221, 1909 (3rd Yr.)	Yield Lb.	Bushels per A.	Value at 50c.	Cost of Fertilizer	Net Gain per Acre.
Unfertilized, plots 4 and 7,	19448	194.5	\$ 97.25	\$	\$
Com. Fertilizer, plots 6 and 9,	47028	470.0	235.00	13.00	124.75
Manure, plots 5 and 8,	48550	485.5	242.75	15.00	130.50
Expt. 220, 1909, (3rd year).					
Unfertilized, plots, 13 and 16,	291	27.9	\$ 13.95	\$	\$
Manure, plot 14,	1947	373.8	186.90	15.00	157.95
Expt. 338, 1909, (2nd year).					
Unfertilized, plots 1 and 4,	2607	156.4	\$ 78.20	\$	\$
Com. Fertilizer, plots 2 and 3,	12026	721.5	360.75	15.00	267.55

It is to be noted that the net gains are obtained after deducting both the cost of the fertilizer and the value of the unfertilized crop, also the fruit here is valued at 50 cents per bushel, while the actual prices obtained for it varied from 50 cents to \$1.25 per bushel; and any increase in the appraisalment of the fruit of course will proportionately increase the net gain. It is also to be noted that variations in the factors of tillage, spraying and pruning produced no material effect on the size of the crop, since the treatment of all plots in these respects was uniform.

Figure 1.



Such striking results as these of course are not to be expected everywhere. They evidently occurred here because plant food was the crop limiter in these orchards. For any given case this can only be determined by experiment. These orchards are on three diverse soil types. The soil in one case was evidently "run down"; in another case it was in average condition; and in the third the soil condition was apparently above the average. These orchards are from 21 to 37 years of age, and they are the only ones under experiment above 20 years old. Age, however, is not a sure index of the need

of plant food, as one of our youngest orchards, a seven-year old, is responding strongly to fertilization, while some older ones have proved unresponsive. The big fact is that when such results as these are obtainable anywhere, it raises a strong suspicion that similar benefits may be obtained in many other orchards. And these results show beyond peradventure that in some orchards apple trees, like other plants, respond strongly and directly to applications of plant food.

Experiments on Cultural Methods.

Closely associated with the question of plant-food, is that of soil moisture. It is the available moisture that determines in a large measure whether or not apples shall attain their proper size; and it is largely to modify moisture supply that the various cultural methods are followed. The plan of our experiments comparing these methods is shown in Figure I.

Plan of Experiment on Cultural Methods and Manures.

As shown in the figure, this experiment tests four methods of soil management, viz.: clean tillage, tillage and cover crop, sod mulch, and sod. Each treatment occurs both without fertilization and with it. The stable manure is applied annually at the rate of 12 tons per acre; and the commercial fertilizer at the rate of 30 lb. of nitrogen (NO), 60 lb. phosphorus pentoxid (P_2O_5), and 100 lb. of potash (K_2O).

On the mulch plot all herbage remains in the orchard, the first cutting being raked to the trees as a mulch, and an additional mulch of old straw, swamp hay or buckwheat straw at the rate of about three tons per acre is applied annually. In this latter respect it differs from the so-called "Hitchings plan," and as a conserver of moisture it is undoubtedly very much better than that plan. On the sod plot, the first cutting of herbage is removed from the orchard and the second is left where it falls. The tillage plots are all cultivated until early in July, when those receiving the cover crop are seeded to crimson clover, hairy vetch or medium red clover and alsike, either singly or in combination. The results to date are from the unfertilized plots of the young orchards, and are shown in Table V. These results and those in later tables on young orchards have been obtained by combining the results from three orchards, whose age as noted in Table I ranges from seven to sixteen years.

TABLE VI.

Effect of Cultural Methods on Yield, Color, Size and Growth, Without Fertilization.

Expts. 217, 218 and 219. Young orchards. (a) Yield.

1907-9.	I. Clean Tillage.	IV. Tillage and Cover Crop.	VII. Sod Mulch.	X. Sod.
Totals, 3 years,	15048 lb	16057 lb	17776 lb	13880 lb
Ratios,	108.4 100.	115.7 106.7 100.	128.1 118.1 110.7	100.

1909 (b) Color. Per cent. Apples colored $\frac{1}{2}$ or more.

Average per cent.,	75.4	81.	81.5	85.6
Ratios,	100.	107.4	108.1	113.5

1908-9. (c) Size. Average weight of Apples.

Average weight,	4.5 oz	4.74 oz	4.91 oz	4.69 oz
Ratios,	100.	105.3 100.	109. 103.6	104.2

1907-9. (d) Growth. Increase in Trunk-girth.

Average increase,	4.38 in	4.14 in	4.29 in	3.58 in
Ratios,	122.3	115.6 100.	119.8 103.6	100.

In these results, the mulch system is first in yield and size of apples, second to sod on color, and second to clean tillage by a slight margin on growth.¹ It has surpassed the cover crop method on every phase and in total ranking is plainly first thus far in the combined results of this group of experiments. Reserving judgment on the relative merits of these systems for the present we will turn to consider the data from a similar experiment in an older orchard,—that of Mr. Fassett, in which the trees are now 37 years old. The results from the unfertilized plots in this orchard are shown in Table VII.

¹The margin is really slighter than appears in the table, as the 1909 measurements in the mulch plot of experiment 218 were taken a little higher on the trunks than those of 1907, owing to the presence of screens on the trees at the later date.

TABLE VII.

Effect of Cultural Methods on Yield, Color, Size and Growth Without Fertilization.

Expt. 221, Mature Orchard. (a) Yield.

1907-9.	IV. Tillage and Cover Crop.	VII. Sod Mulch.
Totals, 3 years,	34269 lb	23294 lb
Ratios,	147.1	100.

1908-9 (b) Color. Per cent. Apples colored $\frac{1}{2}$ or more.

Ave. per cent. of color,	57.4 %	87.5 %
Ratios,	100.	152.4

1908-9 (c) Size, average weight of apples.

Average weight,	4.75 oz	5.04 oz
Ratios,	100.	106.1

1907-9 (d) Growth, Increase in Trunk-girth.

Average increase,	2.9 in	1.32 in
Ratios,	219.7	100.

From the above results it will be noted that, in the mature orchard, tillage with a cover crop for three years has been far superior to sod mulch in yield and growth, having borne nearly one

and a half times as much fruit and showing more than double the increase in growth. In color, the mulched fruit excels by more than 30 per cent.,¹ and in average size of apples it excels by about 6 per cent. This last fact is undoubtedly connected with the smaller crop on the mulched trees.

The results of Tables VI and VII are apparently contradictory. They are all explainable, however, on the bases of soil moisture and age of trees. In the young orchards, with the herbage and three-ton addition of straw, an effective mulch of sufficient extent was maintained, while in the old orchard we were unable thus to cover more than probably half the root area. In the latter case the term *sod* mulch was distinctly appropriate since at least the outer half of the roots was under a typical sod and often in dust-dry condition.

The results in Table VI indicate that, even in trying seasons, such as the last two have been, the moisture in orchard soils may be conserved more effectively by a good mulch than by tillage. This conclusion is corroborated by moisture determinations made by Shutt, of Ottawa, Canada, in 1905 and 1906.² He also has found that leguminous plants, particularly those of dense and matted growth like hairy vetch, are much less severe in their drain on soil moisture than the grasses; and that the shade of the growing vetch is a better moisture conserver than the mulch formed by cutting and leaving it in place. In other words, the loss by capillarity and surface evaporation from the practically bare ground was greater, under the conditions at Ottawa, than the transpiration through the legume.³

The cover on our mature orchard is grass only, while on the young orchards a scattering growth of alsike or medium red clover has been maintained in addition.

In further explanation of the difference in effectiveness of the mulch and cover-crop methods in Tables VI and VII, we may call attention to the hastening influence on bearing, which sod undoubtedly exerts under favorable conditions. This was shown in our results of last year,⁴ where sod on these same three orchards surpassed clean tillage in yield by 13 per cent. It is also shown here later, especially in the sod-manure plot of Table IX. But the fact that this sod influence can be easily overdone and made to disappear under unfavorable conditions, is clearly shown in our results from the unfertilized sod plots of Table VI.

The next table is introduced to show the effect of adding fertilizers to the four cultural methods. All unfertilized plots are excluded from this table, and the yields given include both the manured and commercially fertilized plots under each method.

¹Really the mulch excels in color by 52.4 per cent, using the amount of color on the cover crop area as a base.

²Central Experimental Farm. Report of the Chemist, p. 151, 1906.

³Ibid, 1904, p. 158.

⁴Pa. Bul. 91: 15. 1909.

TABLE VIII.

Influence of Cultural Method on Yield, With Fertilization.

Expts. 217, 218, 219. Young Orchards.

	2 & 3. Clean Tillage	5 & 6. Tillage and Cover Crop.	8 & 9. Sod Mulch.	11 & 12. Sod.
1908 Yields,	9193 lb	9512 lb	11203 lb	10351 lb
1909 Yields,	14554	12443	12571	12823
Totals,	23747	21955	23774	23174
Ratios,	108.2	100.	108.3	105.6

Expt. 221, Mature Orchard.

1908 Yields,		6684	10351	
1909 Yields,		28297	22545	
Totals,		34981	32896	
Ratios,		106.3	100.	

As compared with Tables VI and VII, these results show a marked leveling effect from addition of fertilizers. In other words, the applications of plant food have tended strongly to reduce or even nullify the differences due to cultural methods. This effect was also very distinct in the appearance of the trees in the field.

A consecutive increase in productiveness following the addition of plant food has been very marked in some cases. For example, the mulched plots of Experiment 221, receiving manure and commercial fertilizer, in 1907 produced 3,050 pounds of fruit; in 1908, as seen in the table, they produced 10,351 pounds; and in 1909, 22,545 pounds. And this occurred on plots receiving no tillage.

Fertilization for Different Cultural Methods.

The question often arises as to what is the best form of fertilizer to accompany different cultural methods. This question is partially answered by the data in Table IX.

TABLE IX.

Effect of Manures on Yield.

Expts. 217, 218, 219.

Season 1908-9 (2nd & 3rd Yr.)	Unfertilized.	Stable Manure 12 T. per Acre.	Com. Fertilizer, 30-60-100 Lb. per Acre.
Clean tillage,	13698 lb	21605 lb	23022 lb
Tillage and Cover Crop,	14550	20582	20681
Sod Mulch,	15702	23678	20408
Sod,	11706	24772	17929
Totals,	55656	90637	82040
Ratios,	100	162.8	147.4
		110.5	100.

Expt. 221.

Tillage and Cover Crop,	33119	31924	35502
Sod Mulch,	21091	35396	28370
Totals,	54210	67320	63872
Ratios,	100.	124.3	117.8
		105.4	100.

This table shows the influence of manures¹ on yield when used in connection with different cultural methods. It will be observed that in every case except one, the yields from the fertilized plots have surpassed those from the unfertilized. And in the one exception the yields on the corresponding fertilized plots this past year were more than double the yield on it. In total effect, considering all treatments, the fertilized plots show a nice per cent of increase over the unfertilized; and the stable manure at the rates applied shows a small gain over the commercial.²

Examining the data still more closely, we see that in every case on the tilled plots commercial fertilizer has surpassed the manure, while on the untilled plots the reverse is true. In other words, the present data indicates that, from equal values of manure and a proper commercial fertilizer the best results are obtained by using the manure on sod or mulch areas, and reserving the fertilizer for use in connection with tillage. Either material, however, may be used satisfactorily and it is very probable that in any case a more or less regular alternation can be made more successful than any thing else.

¹The complete commercial fertilizer is here included under the term "manure."

²Twelve tons of average stable manure are estimated to contain about 120 pounds each of nitrogen and potash (K₂O), and about 80 pounds of phosphorus pentoid (P₂O₅). The relative cost per acre, as applied, is about \$15 for the manure and \$13 for the commercial fertilizer.

TABLE X.

Effect of Manures on Color, Size and Growth.

A. Expts. 217, 218 and 219. (a) Color. Per cent. Apples colored ½ or more.

	Unfertilized.	Stable Manure.	Com. Fertilizer.
Average per cent.,	71.2	61.9	62.4
Per cent. benefit,		-9.3	-8.8

(b) Size. Average weight of apples.

	Unfertilized.	Stable Manure.	Com. Fertilizer.
Average weight, ounces,	4.71	4.99	5.25
Ratios,	100.	106.	111.5
		100.	105.2

(c) Growth. Increase in Trunk-girth.

	Unfertilized.	Stable Manure.	Com. Fertilizer.
Average Increase, inches,	4.12	4.3	4.43
Ratios,	100.	104.1	107.5
		100.	103.

B. Expt. 221. 1908-9. (a) Color. Per cent. Apples colored ½ or more.

	Unfertilized.	Stable Manure.	Com. Fertilizer.
Average, Per cent.,	72.5	68.1	73.5
Per cent. Benefit,		-4.4	1.

(b) Size. Average weight of apples.

	Unfertilized.	Stable Manure.	Com. Fertilizer.
Average weight, ounces,	4.89	5.42	5.33
Ratios,	100.	110.8	109.

(c) Growth. Average Increase in Trunk-girth.

	Unfertilized.	Stable Manure.	Com. Fertilizer.
Average increase, inches,	4.22	5.86	4.92
Ratios,	100.	139	116.6
		119.1	100.

Table X shows the effect of manures in both young and old orchards on color and size of fruit and on growth of trees. The effects have been fairly distinct in all cases,—reducing the color with one exception, and apparently increasing size of fruit and tree-growth.¹ In all cases, the color is least on the plots receiving stable manure. In the old orchard, manure shows some advantage over commercial fertilizer in wood growth and in size of apples, with effects reversed in the young orchards. The greater effect of commercial fertilizer in the young orchards is probably connected with the smaller area over which it is distributed, thus giving relatively stronger applications.

The above data are obtained from extensive work through a short period. In Table XI, we have data from the reverse conditions,—one experiment continued over 21 years.

¹We say "apparently" increased the size of fruit, since the matter of size is undoubtedly primarily dependent on soil moisture and number of fruits on the tree. Thus any fertilizer effect must necessarily be indirect, as in the case of color.

TABLE XI.

Massachusetts Experiment on Apples, 1889-1910.¹

Treatments and Total Yields per A., to Date.

Plot.	1	2	3	4	5
Annual Treatment.	Manure, 10 Tons.	Wood Ashes, 1 Ton.	Check.	Bone & K Cr 600 & 200	Bone & Low G. Sulfate, 600 & 400.
Average Girth, Ratios, - - -	38.25 in. 136.7	33.23 in. 118.8	27.98 in. 100	32.27 in. 115.3	37.02 in. 132.3
Yields, lb., - - - Ratios, - - -	24934 632.8	12841 325.9	3940 100	14453 366.8	21863 554.9
Color and Size.	4	1	5	3	2

These results are similar to those recorded in the preceding tables with the differences in some cases even more distinct. In every respect the treated plots have proved superior to the untreated. Manure leads in yield and growth but falls next to the check in quality. It is closely followed in yield and growth and much surpassed in quality by plot 5, which received ground bone and low grade sulphate of potash. The superiority of 5 over 4, which differs only in the carrier of the potash is very interesting. Whether it is due to the magnesia in the sulphate or to a harmful effect of the chlorine accumulating from the muriate, or to a soil difference, cannot yet be stated. It will be recalled that our results of the third year corroborate it, in plots which compare only sulphate and muriate.

¹Data furnished by Dir. Wm. P. Brooks, of the Mass. Expt. Sta., December, 1909.

The practical point, however, is that with such differences as these existing, even though unexplained, the safer policy is to apply potash in the sulphate form. The difference in cost is small, and if so desired it can be readily met by a reduction in the amount of potash applied. This would be justified by our present results, which indicate that the usual recommendations of this material for orchard use may be reduced to advantage.

Summary and Practical Suggestions.

From a general view of the results as a whole, we see that there is more than one way of securing good results in orcharding. In other words, there is more than one way of varying the limiters after they are found. For example, we can conserve moisture either with tillage or mulch, or we may secure apparently the same net results by proper fertilization. This gives opportunity for choice and permits the grower within certain bounds to determine his course on the bases of relative expense and practicability.

In most cases and especially in bearing orchards, this choice will result in tillage, either every year or one year in every two or three. The tillage will be supplemented by leguminous or other proper crops, and will receive additions of plant food when needed. But the relative cost of labor, mulching material, and manures, varies with the locality. And where labor is scarce or costly, or the land too sloping or stony for tillage, the grower need not lose heart. But with a good mulch properly supplemented with plant food, he may grow apples equal to the best,—apples in many cases more satisfactory than those of the man who depends entirely on tillage.

When we come to the application of fertilizers, the best test for their need is in actual trial or experiment. The appearance of the trees after all other factors are apparently right, may afford some evidence, as may also soil analyses. But the only sure evidence comes from careful trials, remembering that fertilizers can have little if any effect on the current year's crop.

Pending actual results, if it is desired to use fertilizer, our present general advice is to apply one carrying about 30 lb. nitrogen, 60 lb. phosphorus pentoxid (P_2O_5), and about 50 lb. potash (K_2O) per acre.¹ This should be accompanied by green cover crops or alternated with stable manure, ten tons per acre, at least once in three or four years.

The time of application is important. For soluble and transient materials like nitrate of soda, the best time is when the need is greatest, which is probably immediately after the supply of stored food is exhausted, or some time after petal-fall and before the first of July. The other more permanent material may be applied at the same time, or like stable manure they may be applied in early spring or in late winter.

¹Such amounts could be obtained by mixing either of the following combinations of high grade materials. (A) 100 pounds each of nitrate of soda, dried blood, and sulphate or muriate of potash (former safer); and 250 lbs. steamed bone meal. (B) 100 pounds each of nitrate of soda and sulphate or muriate of potash; 120 pounds dried blood, and 400 pounds acid phosphate.

For either temporary or permanent covers, leguminous plants are best both because of their nitrogen product and their lessened drain on soil moisture, especially the matted and dense growing kinds, such as hairy vetch.

Q. What kind of lime did you use in your experiments?

A. I used the ordinary agricultural lime—plain lime, fine, but not necessarily ground, sometimes air-slaked—anything to make it fine.

Q. In what form was the Nitrogen that you used?

A. It was in the form of Nitrate of Soda and Dried Blood—half Nitrate of Soda and half Dried Blood.

Q. Why is it applied in that form?

A. It is put on in that way in order to prolong the action. I can secure the same results by applying Nitrate of Soda twice—half soon after petals fall, and half later. I think Dried Blood is a very desirable carrier for Nitrogen as a tree fertilizer, though there is no objection to obtaining it in other ways.

Q. Is the fertilizer that applies 30 pounds of Nitrogen, 60 pounds of phosphoric acid, and 100 pounds of potash to the acre, a perfect fertilizer?

A. Yes; if by that you mean a complete fertilizer. If I were recommending a fertilizer for apples, however, I should prefer now to make it 30—60—50.

Q. Are those actual amounts?

A. Yes; they are the amounts of actual Nitrogen, Phosphoric Acid and Potash to be applied per acre.

Q. Is Muriate just as good as Sulphate?

A. I do not know whether it is or not. I am using Muriate in my 30—60—100; but right now I think the safest thing you can do would be to use Sulphate. It costs a little more; but present results seem to me to justify it. I do not know how they will look seven or eight years from now.

Q. In view of its action in other tests, would you not be afraid of its making the ground acid?

A. The Sulphate is not so likely to do this as the Muriate. In some cases, especially in the case of tobacco, Muriate cannot be used at all. Also in certain tests on small fruits, if I recall correctly, the sulphate proved best. A similar condition may be found to hold in the case of apples. Our third year results point that way rather distinctly.

Q. It looks to you then, as if the sod mulch is about the best?

A. It certainly does on the growing orchards. Clean tillage has it beaten just a little on growth; but when it comes to yield, color and size of the fruit, the mulch is thus far evidently preferable on the young trees.

Q. Do I understand you that you attribute this difference to the amount of moisture?

A. Yes.

Q. You said that there were two years of severe drought. Would not years when you had plenty of moisture, plenty of rain, change the conditions somewhat; might you not have to alter your figures somewhat in that case?

A. Not these figures, though of course, our future results may be different. I cannot predict what is going to happen in the future; but you know most people tell you that the main reason for tillage is to conserve moisture. The mulch in the most trying season, has conserved moisture better than tillage; and when I say mulch did it, I mean a real mulch, not an imitation of one.

Q. How many tons of straw did it require to cover an acre?

A. Three tons to the acre annually is the amount we are using.

Q. How old are those trees?

A. Seven to sixteen years of age—one orchard seven, one twelve to fifteen, one sixteen. The age of the trees is to be considered, as well as the amount of mulch and its extent from the trees.

Prof. Stewart. Notice here, that even on the mature orchard, where the mulch did not completely cover the roots of the trees, we have the size of the apples averaging a little greater than on the tilled portions. Can you explain this?

C. J. Tyson. How about the relative yield of fruit?

Prof. Stewart. Yes, that's it. The much larger crop on the tilled part kept down the size of the individual fruits.

Q. What effect has sod mulch on the bearing of fruit?

A. It seems to hasten the bearing habit.

Q. How do you know how to strike a limiter?

A. It demands experiment—actual trial. There is no other way that I know to do it. If you have to hire a man and pay him double wages for the time required to carefully experiment in one corner of your orchard, you will profit by it in the long run. You have to ask the trees themselves. The limiter is different in different places. No question about it, it must be found and corrected to get the best results.

Q. Will any fertilizer reach the growing crop?

A. No; you may be able to affect the crop of the following year. Nothing will reach the growing crop.

Q. Nitrogen will, won't it?

A. Of course it will affect the foliage, but not the amount of fruit.

ESSENTIAL ELEMENTS OF SUCCESS IN FRUIT GROWING.

MR. ALBERT T. REPP, President New Jersey State Horticultural Society, Glassboro, N. J.

Mr. President, Ladies and Gentlemen, and Members of the Adams County Horticultural Society: I see that I am on the program for "Essential Elements of Success in Fruit Growing." One of our successes in New Jersey is the fighting of insects of the apple. In a practical way, we may talk on different methods used in different sections. When I attended a meeting last winter I visited a fruit farm where I saw the fruit grower trimming his trees in a way which looked very much to me as if he was ruining his orchard by his hard trimming. Some time ago I received a letter from him stating that he had received as high as six dollars per tree from a

four year old orchard. So I think we have to be a little conservative about judging methods from other sections. But insects are the same in one section as in another—you have the same scale, same codling moth, same curculio and lice as we do, and the same methods will kill them. I am aware of the fact that Pennsylvania is a lime and sulphur state, and I feel a little timid about mentioning the material that we use for killing scale, which is crude oil. We start to spray about the middle of February with oil, after heating it to about one hundred degrees with live steam, agitated as it is used, so as to keep the heavier oils and light oils together, using as high a pressure as we can get, and after spraying for the scale, we begin to spray for lice. We will go over the trees with a light spray of oil when the leaves are as small as a mouse's ear, or smaller; the next thing that we spray for is the codling moth and the curculio, following immediately after spraying for the lice. We used four pounds of arsenate of lead to fifty gallons of water. This year we will use five pounds. Except where we had scab on our Wine Sap last year, we will omit the arsenate of lead and use instead one-half pound of paris green, three pounds of sulphate of copper with ten pounds of lime to fifty gallons of water. The reason we do not use the arsenate of lead in the Bordeaux mixture is because we use an excess of lime, which would make it too pasty to spray with. After the blossoms drop we use the Bordeaux, and immediately after the Bordeaux we use the lead. We used to count how many times we were going to spray the trees. We can now spray as many times as we please, until all danger of the codling moth and fungus is past. After the first spraying of the Bordeaux we put in two and a half pounds of sulphate of copper instead of three pounds to fifty gallons of water.

We use other methods of catching and destroying the codling moth by scraping the bark of the older trees before we spray with oil. About July 1st we begin to put old burlap around the trunk of trees, and as soon as we see the sign of the worm coming out of the apple, we remove the burlap, destroy the worm and place the burlap back and repeat this about every ten days, until they stop coming from the apple. With all our spraying we find as high as fifty worms to a tree.

I have brought one of these bands to show you how it works (Shows burlap band with codling moth cocoons attached). We place one of these bands around the butt of the tree. We used one last year, and are going to use two next year—one at the bottom of the tree and one at the beginning of the limbs.

Q. At what season of the year do you apply these?

A. About the first of July—just as you see them coming out. Each moth lays about 200 eggs for the next year. These bands are put on after spraying, and are changed frequently. This one was taken off day before yesterday.

There are three brothers of us in the John Repp Estate. I have charge of four hundred and fifty acres all set in fruit that consists of Pears, Apples and Grapes, with 14,500 Wine Sap alone,—seven thousand just coming into bearing. Charles F. Repp has charge of the Cold Storage and Ice Plant, with a capacity for storing 10,000 barrels of fruit, and a capacity for making thirty-five tons of ice per day. Joseph P. Repp, who is in the commission

business at No. 154 Dock Street, Philadelphia, Pa., has charge of selling all of the fruit from the farm. I thank you for your kind attention.

The Chairman. You are invited to ask Mr. Repp any questions desired.

Member. What fertilizer do you use, and when applied?

Mr. Repp. In the spring of the year we put on two or three handfuls to the tree—2½ per cent ammonia from fish and blood; 8 per cent phosphoric acid from rock; 10 per cent potash from muriate. We have been using muriate for 15 or 20 years. We plow that down and keep our orchards clear until the first of July; and then let the weeds go. We use 100 tons of basic slag (used 40 last year) and we get good results. If you want to give the fruit a better color, you can put the color in with a chemical of your own make, or some other. I use lime stone dust. I used 250 tons last year (about one ton to the acre).

Member. Is that ground lime stone?

Mr. Repp. Yes.

Member. Do you see any difference from the use of the lime stone?

Mr. Repp. Yes; it runs right to the roots. We get color and size, and crops, too.

Member. How much slag to the acre?

Mr. Repp. Six hundred (600) pounds.

Member. When ought it to be put on?

Mr. Repp. It ought to be put on now; but I cannot get it until March.

Member. How do you prune your apples?

Mr. Repp. The apples we set out from the nursery, cutting off a few bottom limbs. We thin at four or five years.

Member. I mean on your bearing orchards.

Mr. Repp. My father, years ago, used to trim very heavily. We are trimming less and less every year.

Member. What makes color but sunlight? How about giving the trees sunlight instead of chemical?

Mr. Repp. You get a crop with my methods—lower limb lying on the ground—and that is somewhat of an item, is it not, when apples are bringing a good price?

Member. What variety of Pears do you grow?

Mr. Repp. We grow Bartletts, Sickle and Kieffers; but Pears will not produce enough to the tree. They do not grow wide enough.

Member. How far apart do you set your trees?

Mr. Repp. About twenty feet apart.

Member. Is this Wine Sap, that you showed us, an early bearer?

Mr. Repp. Bears in about five or six years.

Member. What varieties of apples do you grow?

Mr. Repp. Wine Sap, Maiden Blush, Star, Early Ripe, Ben Davis—most of them; York Imperials won't bear at all.

Member. How old are your Wine Saps when they bear?

Mr. Repp. Four years.

Member. Do you attribute your color largely to the lime stone dust?

Mr. Repp. I can see where I put it—the color has never been better than this year.

Member. Do you think that brings the color on?

Mr. Repp. It brings the size. It is hard work to tell as to color. I thought so; and the man that worked for me did also.

Member. What does it cost per ton?

Mr. Repp. We get it delivered for \$3.50 per ton.

Member. What is the actual fertilizer application per acre?

Mr. Repp. Two or three handfuls per tree the first year, and keep it up. Old trees as high as a ton an acre.

Member. What time do you apply?

Mr. Repp. In the spring of the year.

Member. Is ground lime better than air-slaked lime?

Mr. Repp. It lasts longer. Air-slaked is quicker, but it is gone sooner; the ground lime will act for years until it is used up.

Member. Is this Wine Sap that you have here anything like the Stayman Wine Sap?

Mr. Repp. Nothing like it.

Member. It is not so large?

Mr. Repp. No, it is not so large as the Stayman, but we get the quantity.

Member. What tools do you use for your orchard cultivation?

Mr. Repp. Bateman's Riding Cultivator.

Member. Can you give us any figures as to cost of erecting a cold storage of say, 10,000 barrels capacity, and operating cost of same per diem?

Mr. Repp. Impossible for me to answer this question correctly, but about \$20,000.

Member. Do you grade fruit before or after storage?

Mr. Repp. After storage.

Member. What have you found the best picking basket?

Mr. Repp. We use a bag.

Member. What is the best package for apples while in storage?

Mr. Repp. Hampers.

Member. What ladder, if any, do you use?

Mr. Repp. Tilley's Orchard Ladder.

Member. You doubtless have a regular rule of procedure in picking and transferring apples to storage. Will you kindly describe it?

Mr. Repp. Apples picked and placed on sorting table and then placed in hampers and then loaded on a platform wagon made especially that hold 74 hampers. We do not have any bruised fruit. All culls are thrown out by the sorters at the tables.

Member. What sprayer do you use?

Mr. Repp. Demming Gasoline Sprayer.

The Chairman. As a committee to look over our fruit and report at a later session, I will appoint Mr. Bassett, Mr. Repp and Mr. Anderson. We do not offer any premiums; but we shall be very glad to have you look over the exhibit, and make any suggestions that you think may be to our benefit.

"GETTING TOGETHER."

C. E. BASSETT, *Fennville, Mich., President Fennville Fruit Shippers' Association.*

In the words of the old colored preacher, "Before I begin my talk I want to say something." I do not presume to come to you with an idea that I can present any new or startling facts. I have frequently noted that the value of gatherings of this kind lies not so much in the new ideas received as in the inspiration or enthusiasm, which results from an exchange of experiences. To any wide awake man the spirit of enthusiasm is contagious and, noting the successes of a friend or rival, is sufficient to arouse in him the determination to excel in a similar line. Nine-tenths of life's failures are due, not so much to an ignorance of methods, as they are to a want of the proper energy to do as well as we know how. So, if I may be able to add my mite in making this an "inspiration meeting," I shall feel amply repaid.

The fruit grower, like the grower of any commodity, is chiefly concerned with two factors, viz., the art of production and the art of selling. Both of these factors must be given due attention if the grower is to attain that degree of success which he should. He may know the fundamental principles of fruit growing and be able to put into the fruit package a strictly No. 1 or fancy article. This, however, does not always insure a return to the grower in keeping with the grade and quality of the product. It is true that high class fruit properly graded and properly packed will often take care of itself and net handsome returns to the grower when placed in the hands of the commission man, or even when placed upon the general market. Unfortunately, however, this cannot always be relied upon, and so we have come to realize that the producer must give serious attention to the art of selling. It is certainly to his advantage that this business end of things be no longer left with speculators who are yearly securing larger returns for their labors than are the growers of the product. It is as much our business to market what we grow as it is to grow it. It is not enough for us as fruit growers to produce fancy fruit; we should see to it that that fruit goes into the hands of the consumer and that the prices paid us are entirely in keeping with those high prices usually paid the commission man or the speculator. That this can be successfully done needs no argument before such an intelligent body of horticultural people as I see assembled here this afternoon. Many of our best fruit growers throughout the country are attending to the business side of their affairs in a business-like way, and as a result of these additional efforts are reaping handsome returns.

The reason why most fruit growers have hitherto given little attention to the selling of their products is because of the fact that their entire energy has been given to the production of the fruit and its preparation for market. Their product is perishable, and where sales cannot be made for spot cash it is often necessary to make consignment to commission firms. Probably no class of business men are more thoroughly condemned or more fully trusted. Millions of dollars worth of produce are sold by them upon honor with

scarcely a restraint or check upon their actions except such as may be dictated by policy or their own conscience. It is little wonder then that selfish and dishonest men enter this field of business to the constant annoyance of decent men and that such suspicion as may be engendered by rascality will often attach to the best firms in the same line of business. Good, strong, honest firms may be found in most all cities by inquiry in the proper channels. Let the best be selected for patronage, and then make them your partners.

This is an age of co-operation. Competition has been so sharp and the desire for increased profits is so great that we find nearly every class of business well organized for mutual profit. The world never saw such combinations of capital as have lately been formed, under what we are pleased to call the "trust" system. In some lines of business competition had destroyed profits and a combination was necessary to cheapen the cost of production or increase the selling price of their products, or both.

Let us look at the horticultural situation and see if our present methods are not in need of improvement. As a result of careful investigation, I am convinced that a bushel of peaches for which the consumer pays \$1.50, does not net the average Michigan grower over fifty cents! This means that the grower pays twice as much for getting his fruit to the consumer as he receives for his own labor in producing that fruit. Is such a condition fair? What ordinary business is there which will stand such a constant drain and profitably exist?

These facts are probably well known to you all, so that it is very simple to diagnose the disease from which our business suffers. What is the remedy? There's the rub. The threadbare saying, "In union there is strength," has become an axiom, but these abstract propositions are not enough to solve the problem. We want to know *how* to apply the remedy to the disease, so as to get practical results. I know of no better way of showing how co-operation can help us than by telling you of some ways in which it has aided us in the fruit belt of western Allegan County.

One of the first drawbacks that we had to contend with in the Michigan fruit belt was the cost of transportation. The location of our orchards is such that we can patronize either the railroad or the boat lines, but there has been no competition between them. An express company operated over the fruit train for about fourteen years, furnishing very poor service and stubbornly maintaining a six-and-one-half-cent rate on small baskets to Chicago. We had no organization, and the efforts of individuals to get better or cheaper service were of no effect.

The season of 1888 brought such low prices for fruit that it was evident that something must be done, and co-operation was resorted to. The Fennville Fruit Shippers' Association was organized in 1891 and the "Granger System" of shipping fruit was adopted. The success of our association under this plan has been wonderful. We have a local agent of the association who receipts for and loads the fruit into ventilated cars, holding about 2,500 small baskets each, for which he receives \$2.50 per car. A special fast fruit train starts from Fennville at six o'clock every evening, Saturdays excepted, for Chicago. The cars are all billed to our Chicago consignee, who does

the unloading and attends to the freight, shortages, etc., receiving for this service \$5.00 per car.

As a result of this co-operation, we have been able to secure the general adoption of a more or less standard climax package, which has resulted in a saving in their cost of more than one-half. The freight rate has been lowered from the express rate of six and one-half cents to two and one-half cents, and the boat lines having to meet this competition, every shipper in our fruit belt has been equally benefited by the operation of our association, whichever way he shipped. All shortages have been promptly paid, which is quite a different experience from that we had with the express company. The association has actually reduced the cost of packages and transportation to about one-third of what it was under the old plan. It is impossible to estimate the actual amount of money saved by the work of this association, but some idea can be imagined when I tell you that the very first year the association did business it saved one large grower fully \$1,000. In one year our fruit section shipped 6,000,000 small baskets of peaches, and the saving to the growers that year was over \$200,000.

Not only have we obtained better service at much less cost, but it has been done with a cash profit to the association. This profit, amounting to many thousands of dollars, has been expended in the grading and graveling of our public highways, until we now have reconstructed several miles of first class gravel roads. Before our association undertook this work, 200 or 250 baskets were considered a good load, while now our teams handle more easily 500 to 700 baskets. By our unity of action we have also gotten the railroad to donate 300 cars of gravel for this road building. We find that where a single individual has trouble in getting the ear of the railway officials, the representatives of an organization of 400 shippers receive a most respectful and gracious hearing.

So much for what we have been able to do in reducing the cost of transportation. There is another feature I desire to refer to and that is the way in which our growers have co-operated in the manner of packing and selling our fruit. It is generally conceded that the old method of consigning fruit, to be sold on commission, is entirely wrong and our local horticultural society has been working for some time, trying to establish a local fruit market and get outside dealers to come there and buy. Advertising booklets have been sent out, with the result that we have buyers with us all through the season, and their competition has kept prices fairly good. During the past four years, from eighty acres of fruit, I have not consigned to the amount of \$25, but have sold at home at very satisfactory prices.

But there is another form of co-operation which, with us, promises to be of permanent benefit—the central packing house system. We have five of these packing houses in Fennville and although the system is not fully perfected, it has already demonstrated its efficiency in handling and marketing the products of large orchards. Usually six or eight growers combine and erect a packing house beside the railroad. Their fruit is brought direct from the orchards to this central packing house, where it is carefully graded and packed, each grower receiving credit for the number of baskets of each grade. The foreman and packers, having no interest in the fruit,

pack top and bottom alike and every basket can thus be guaranteed. Solid cars of one straight grade can thus be purchased any day during the season, and we find that buyers will pay more for this fruit than where they have to drive around the country and pick up a load, of as many grades as there were packers.

The obstacles in the way of this central packing house plan may be mentioned as: First, what may be termed the natural conservatism of the average grower; second, the lack of confidence in his fellows and of the results to be obtained by association and combination of interest; third, some expense in putting up and equipping a plant; and, fourth, enterprise and confidence in the outcome to carry on the undertaking. A rather high order of ability and good judgment, combined with some experience, is necessary in managing such an undertaking, and the manager must command the confidence of his associates and patrons.

The principal advantage is the application of modern and systematic business methods to the fruit industry. Organization is the basis of modern successful business operations, and only those lines of business that are well organized are successful in a marked degree. The statement is often made that an organization among farmers is sure to fail, that farmers will not hang together, etc., *ad nauseam*. I think that the experiment among our packing houses disproves this statement, and I believe that the tendency among progressive fruit growers is toward such organizations. I believe that these separate packing houses will eventually grow into a federation, with a central head, that shall keep in touch with all of the principal markets and keep the units of the federation informed regarding markets and prices,—a fruitgrowers' "trust," if you please.

The packing houses furnish a more reliable and desirable quality of fruit and Chicago prices are obtained for the fruit at the point of shipment, thus effecting a saving of nearly half the expense, as noted above. It is evident that the dealer in Buffalo, who would be willing to pay 75 cents per bushel for a car of peaches in Chicago, of the uncertain and damaged quality that he would get there, would willingly pay the same price for fresh, straight-packed fruit here, as the expense of shipping is no more; and so the grower receives 75 cents at the packing-house for fruit for which the commission man returns the consignor 50 cents. Experience has abundantly proven this self-evident assertion.

I trust that you will pardon me for speaking so at length about what we have done at Fennville, but our successes have opened our eyes to the possibilities of what may be accomplished by a unity of action. If agriculturists could be brought to realize what co-operation might do for them, who could live without paying them tribute? In my experience among growers, I have found among them *parasites* who would oppose co-operation in every form, for no other reason than that the less his neighbors know, the greater his opportunity to profit by their ignorance.

Co-operation is the beacon light of emancipation to the farmer and the only means by which that traditional fear and suspicion, born of wrongs and injustices as far back as Jacob and Esau, can be dispelled. Where co-operation is the watchword, the community is immune from the adventurer, who figures farmers generally as his legitimate prey.

Member. How do you sell your apples?

Mr. Bassett. We make contracts. Many of our apples were sold this year in July, at from \$3.50 to \$3.65 per barrel, and I furnished the barrel.

Member. I would like to ask Mr. Bassett if he knows of any successful operation of a central packing house for apples.

Mr. Bassett. No sir, only in the West. Of course, there they have the system in fine shape,—in Washington and Oregon.

Member. Are the orchards pretty closely located?

Mr. Bassett. Yes, they are. The people are simply driven to co-operate. It costs them more to get a package of apples from the Hood River Valley to Chicago market than it costs me to produce our apples. It's this Western co-operation that sets us to thinking, wondering what it's all going to mean. Do not be afraid of their gobbling you up. I believe we have a future; I do not believe they will ever get it away from us, unless we allow them. It will depend on us whether we shall have this business or whether we shall not. They are raising a fancy apple—an apple they can not put upon the market at a cheap price; but you must remember that the large consuming public demand a cheaper apple. They cannot afford to pay the high price; and if my friend Mr. Repp can sell Wine Saps for eight dollars a barrel, I glory in his ability. I am not so sectional, however, as to believe that what is so in Michigan is so everywhere else. But let us all be proud of our country. I am proud of Michigan; I think it is one of the best sections in the country. The lack of transportation facilities and the extremely high price of land out West makes it impossible for them to compete for the cheaper demand. A man who goes out there from here, will have to be satisfied with ten acres where it was customary for him to have a hundred and twenty. He puts all the energy on those ten acres that he previously had put on the hundred and twenty—intensive farming against extensive farming. Could you not get better fruit if you were to concentrate on ten acres the energy you are now expending on say your hundred and sixty acres?

Member. Your road-building; is that independent of the State?

Mr. Bassett. Yes; this road-building is simply a local proposition. If we build a stone road we get some state aid.

Member. How do your fruit growers generally procure their barrels up there?

Mr. Bassett. We have to buy them from the local coopers. A good many growers buy the stock—a car load or two—and have their own cooper shops right on the farm. They make their own barrels in the odd seasons, when they can have them made cheap. When they sell their orchards, they sell the barrels with them.

Member. Does the Fruit Growers' Association help in buying barrels?

Mr. Bassett. Yes, we ship in a great many car loads of barrels when they are shy.

Member. Do you advertise for bids to supply barrels?

Mr. Bassett. No; we go out on the open market and buy outright. We get propositions nearly every day for barrels, and everything else.

Member. Do you box any apples?

Mr. Bassett. We are trying the experiment in a small way.

Member. If you hold that the Michigan Northern Spy has as good a flavor as the apple grown in the Northwest, why should it not pay to buy and box them and market them as boxed apples?

Mr. Bassett. We think it would, but we have not demonstrated it. We have not gotten to the point where we can make a report.

Member. You spoke of pruning and letting the sunlight in; do you prune hard every year?

Mr. Bassett. Yes.

Member. Is that just apple, or peach and apple?

Mr. Bassett. All kinds of fruit.

DISCUSSION OF VARIOUS NURSERY METHODS OF PROPAGATION FOR BEST ORCHARD RESULTS.

BY PROF. W. J. WRIGHT, *Assistant in Horticulture, Pennsylvania State College, State College, Pa.*

It is unfortunate that there exists among farmers and fruit growers a general feeling of distrust of the nurseryman. It is still more unfortunate that this feeling is not always without foundation. In fact so general has been the dissatisfaction among buyers of nursery stock that the "tree agent" and the nurseryman have often become the butt of ridicule at horticultural meetings and in the local press, and are tolerated only as a necessary evil. Every farm paper and Experiment Station in the country has probably been the confidant of those who feel themselves aggrieved at the hands of some nursery firm. Sometimes they have a just grievance but more often it is the fault of the buyer or of the "tree agent," for whom the nurseryman is justly held responsible.

A careful inquiry into the cause of this feeling of distrust shows that it is most largely due to trees not being true to name and that a large part of this trouble comes from the careless habit of buying from unreliable firms or of unscrupulous or careless agents without first inquiring into the standing of the business firm or the personal responsibility of the agent. Well established firms having a reputation to maintain, seldom distribute misnamed varieties. The business system of a well regulated nursery is such that mistakes are well nigh impossible and it would be poor business policy, to say the least, for a well established firm with a large investment to willfully send out misnamed trees. On the other hand, there are constantly springing up throughout the country so called nursery firms who are in reality only dealers, and who buy every tree they sell. Such firms have but little invested and do not feel so keenly the need of an unsullied reputation, nor can they be so well assured of the quality of the stock they sell or its trueness to name as can those who grow their own stock or have it grown on contract. The guarantee that stock is true to name, backed up only by the promise to replace trees not found so, is of little value to the buyer who must wait until they come into bearing to make sure.

The danger of getting diseased trees is now reduced to the minimum by an effective nursery inspection. It forms, however, a strong basis of complaint by buyers against nurserymen. In most cases diseases are probably introduced in some other way. Though there is no doubt some danger, it is one of the lesser of the tree buyer's troubles.

Another cause of complaint is that trees received from the nursery are improperly headed. Nurserymen it is true have been slow to accept the idea of low headed trees for very good business reasons on their part. Nursery stock is planted close. The tendency is therefore for trees to head high. Low headed trees require more room, thus fewer trees per acre. Most nurserymen can supply low headed trees if desired. The trouble too often is that the buyer neglects to specify his preference in the order. Yearling trees are always to be had and present the advantage of allowing the buyer to form the head as he chooses.

The substitution of varieties is a practice indulged in even with some of our most reliable nursery firms and is the cause of much dissatisfaction. It is not to be expected that a firm will carry every variety of fruit grown, but they should carry every variety they catalogue. If the order is placed early and no notice is sent that the order cannot be filled to the letter, the buyer supposes that no varieties will be substituted. If, when the order is received, it is found that substitutions have been made the firm should be wired at once and a settlement demanded. In case it is too late or it is otherwise impossible to obtain the desired variety that season, damages could probably be collected.

On the other hand the buyer may delay his order until late in the planting season and then order his trees shipped at once. Under such conditions the nurserymen cannot do justice to the order and the buyer can have but little cause for complaint if the trees are not satisfactory.

In ordering trees the following directions, if observed, will go far toward eliminating many unpleasant experiences:

- (1) Order direct from a firm of good standing which grows its own stock or has it grown on contract.
 - (2) Buy of your local nurseryman if he fulfills these conditions.
 - (3) Place your orders early.
 - (4) State specifically just what you want both as to the varieties, and style and class of stock. Don't leave any room for supposition.
 - (5) Give explicit shipping directions, and state just when you wish stock delivered.
 - (6) Remember that the purchase price of trees is a small part of the orchard cost. A few dollars extra spent for trees, if it will purchase just what you want, will be well spent.
 - (7) Make it your business to see that trees are not delayed in transit.
 - (8) Carry out your part of the contract by seeing that the trees are well cared for on arrival and that they are properly planted.
- That there is dissatisfaction with ordinary grown nursery stock cannot be denied and many growers are casting about for a means of overcoming these troubles. Then, too, there is a growing desire

among orchardists for so-called pedigree stock—stock of known parentage. Many have tried the experiment of having their stock grown to order by experienced nurserymen. Thus grown, it costs slightly more than common stock, but has not always given satisfaction. In fact there is a growing tendency among orchardists to grow their own trees.

It is not the policy of the writer to advocate this plan in all cases. The operations of plant propagation are simple in the extreme, though not all who attempt it on a commercial scale are successful. In fact the determining factor of a successful grower of nursery stock is a knowledge of plants and their needs. Almost any orchardist who is capable of caring for an orchard and bringing it into bearing should possess that knowledge. Of the two accomplishments, the latter probably requires the greater skill, but the orchardist who attempts to grow his own trees should not be surprised if each specimen which subscribes to his ideal costs him considerably more than would ordinary stock bought from a nursery. The cost price of trees, however, as has already been pointed out, is but a small part of the orchard cost, and if satisfaction is secured by this means it may be overlooked.

The writer supposes that those who may be interested in growing their own stock are familiar with the processes of root-grafting and budding and the methods of securing seedling stocks. If not, they are referred to the Nursery Book by Bailey, probably the best book on the subject, or to Plant Propagation by Fuller, or to various Experiment Station and Farmer's Bulletins on the subject. There are, however, a few points which have been discussed pro and con in horticultural papers for the past few years which might be briefly touched upon at this time.

One of these points is the relative merits of budded, whole root grafted, and piece root grafted apples. Briefly the advantages claimed for each are as follows:

(1) Budded trees are upon stocks which are already growing and firmly established in the soil. They therefore make a stronger growth, they have a stronger, healthier root system and the union of stock and bud is stronger than in the root-grafted trees.

(2) On the other hand the devotees of the root-grafted method claim cheapness because the operation can be performed indoors during the winter instead of outdoors during the summer when labor is higher, and point to the fact that salable trees can be produced one year quicker. Those favoring the use of whole roots claim to secure a stronger tree from the fact that it receives more nourishment than the one grown from a piece root graft. Those favoring the piece root system contend that the only object of the root is to start the scion growing and keep it alive until it can send out roots for itself and that the real object should be to induce the scion to send out roots by giving it only a small stock in order that the tree may essentially be on its own roots. The fact that either system produces good trees is sufficient argument that all are good.

For extremely cold climates where roots are liable to winter injury it is probably the best plan to have trees on their own roots instead of some seedling stock root whose hardiness is not known. In this case the piece root system seems to be best adapted.

Another topic of considerable importance is the relative hardiness of seedling stocks grown from seeds of hardy varieties. There are those who claim that stocks grown from Northern Spy seeds, for example, are resistant to attacks of woolly aphis. This point has not been distinctly proven. From the fact, however, that the seedling rarely reproduces the qualities of the parent variety to any marked extent, so far as fruit and manner of growth is concerned, it can hardly be expected that it will retain this important characteristic of hardiness with any greater degree of certainty. When relatively small numbers of stocks are to be raised, however, it might pay to grow them from seeds of such hardy varieties as Northern Spy, Ben Davis, etc. (Such stocks can sometimes be bought.)

Pedigreed trees, or trees of known parentage, have already been referred to. The idea that stock propagated from trees which are especially fruitful or which bear fruit of exceptional quality will reproduce these desirable characteristics has been gaining much popularity in the past few years, though it has been practiced unconsciously for centuries in the selection of seeds. In graftage, however, sex does not count, which makes of it a different problem. That this characteristic may or may not be transmitted depends probably upon many circumstances, two important ones of which are: (1) Is this particular tree notably fruitful because it is especially favored by external conditions, such as food, moisture, etc.? or, (2) Is this tendency to fruitfulness a reproduction of a characteristic of its parent? If the former, we should expect no transference of the characteristic. If the latter, it is reasonable to expect that the characteristic will be transmitted. In the vegetable kingdom the bud and not the plant is the unit. Every bud is different from every other bud, and if detached is capable of reproducing a similar plant if given the proper environment. Every tree of any one variety is the asexual offspring of a single bud or tree. Occasionally a certain bud or branch on a tree or plant is entirely different from its fellows. The tree sports, as the horticulturists say. Many new varieties arise in this way. The nectarine is simply a smooth skinned peach, the result of a sporting bud. The King grape is a bud sport of the Concord. Both are propagated by budding or by cuttings, and reproduce their kind. If then, the more fruitful tree is the result of a bud variation, we may expect it to transmit that characteristic to its asexual posterity. If its fruitfulness is due to external influences, such as food, moisture, etc., then it can not be expected to transmit these characteristics to its asexual offspring. In other words, we must know the history of the parent before we can determine whether or not it will transmit such a characteristic as extraordinary fruitfulness to nursery stock propagated from it.

Such questions, the would-be grower of fruit trees for his own use, must take into consideration and decide for himself until more definite proofs are at hand.

Member. How about the insect troubles?

Prof. Wright. The orchardist has as many insect troubles to look after as the nurseryman. It can be sprayed with the same spraying machine as we use in the orchard.

Member. How about growing in a block?

Prof. Wright. Unless we leave out several rows, we have to have a special spraying apparatus.

Member. Have you had an opportunity to see how the French Apple Stock is working out?

Prof. Wright. I know there is a great deal of French Stock being used, and I believe it is good.

Member. Do you prefer trees root-grafted or budded?

Prof. Wright. I prefer them root-grafted.

Member. Why?

Prof. Wright. I was brought up in a country where the winters were pretty severe, and we were pretty particular about using the Long Scion and the short root, so that the trees would be on their own roots. In your climate it is not so necessary.

Member. Will a budded tree come into bearing sooner?

Prof. Wright. I think not.

Member. Do you know of any nurseryman who is producing his own Peach seeds?

Prof. Wright. No, I do not happen to know any.

Member. How many cuts would you make of one seedling?

Prof. Wright. That would depend entirely upon the length of the root.

Member. Do you think the third and fourth would be as good as the first?

Prof. Wright. It would not make as strong growing a tree the first season.

Member. Would you think it any advantage in growing peach seeds in orchard where they are to stay, and budding afterward?

Prof. Wright. It would be an advantage; but there would be the disadvantage of having that ground lying practically idle while the seedling is growing.

Member. Would there be any advantage to the life of the orchard?

Prof. Wright. The tree would not have to be dug up and re-set. If it were grown in the nursery it would lose a half or two-thirds of its roots in the process of transplanting.

Member. In the case of the two roots you showed last, I think I should prefer even the fourth cut on the large root, to the first on the small one.

Member. Is it not evident that the parent of the seedling affects its strength?

Prof. Wright. It probably has a great deal to do with it. It is one of the reasons for one to grow his own seedlings.

Member. Do you not think you would get a better root system from the budded stock than from root grafting?

Prof. Wright. Yes, you probably would.

Member. Do you consider it a very great disadvantage to have any of the roots taken off of the tree?

Prof. Wright. No, I do not; provided the top is pruned to correspond.

Member. If the farmer is to grow his own stock for planting, why would it not be better to develop his seedling before making the union with the variety he wants to inoculate. If you develop the

seedling three or four years, you know the character of the root on which you are grafting.

Prof. Wright. It may be a good plan to do that way; but there would be the disadvantage, if you grew the seedling three or four years, that the root system would be difficult to dig and transplant.

Member. What are the fungus diseases of nursery stock?

Prof. Wright. I am unable to answer. I have been in this state only four or five months. Think Mr. Tyson can answer that very well; think he has grown some nursery stock.

Chester J. Tyson. I do not think there are any serious ones except the root gall.

Member. How about Pear Blight?

Mr. Tyson. I have never seen it in nursery stock.

Member. Would you recommend growing Pear Seedlings?

Prof. Wright. I should hesitate to grow my own Pear Seedlings; I would buy pear stock.

Prof. Watts. Mr. Chairman, I should like to say just a little on this subject. There seems to be a great deal of theorizing on the propagation of trees. As the result of experiments made by the Department of Agriculture, it was found by actual measurement of the height of trees planted eleven or twelve years, and measurement of the diameter of the trunks of these trees, that the piece root is just as good as the whole root. The more vigorous the root, the more vigorous the tree will be. If you graft on the smaller piece root, or on the smaller whole root, the probabilities are that you will have a smaller tree.

You have men here in this convention who have had experience in bud selection. Bud selection will be given a great deal more attention in the future than it has received in the past.

Member. There is nothing in bud selection as far as I am concerned.

Prof. Watts. I should a great deal rather take chances in planting an orchard from stock I know something about than from trees I know nothing at all about. Mr. Powell claims that he has a special strain of the Rhode Island Greening, as well as two or three other varieties; and it is held by Mr. Powell and others, that they are superior to others. There is more in bud selection than we think; we have neglected to get it out.

Member. How about root selection?

Prof. Watts. I do not know anything about it.

Mr. Earl Peters. Mr. President: I think this is one of the most important things in Adams County. I do not know anything of seedlings. I have grown some nursery stock. I have watched the conditions in the orchard very closely, and we find something there that has not been answered yet. Whether we can ever answer it is a problem; but I have been thinking about it very seriously for more than a year—the method of selection of apple seedlings. These methods most certainly affect our interests. In a ten-year-old orchard, for instance, we have a certain diameter of tree that we look upon as a standard for that age of trees; but we find, say three-tenths of the trees, standing here and there, with a smaller diameter,

far less vigorous, and not yielding nearly so much fruit as the other trees. It is a pretty hard problem to solve.

I would rather have the fourth cut from the seedling of a good, vigorous variety; I would rather develop a seedling for three or four years to find out what it is, than to have the whole root of that other little fellow, and especially when I do not know what it is. I would rather have the fourth cut of a seedling of some good, strong growing red winter sort, than to have the whole root of the other, and more so, if it chanced to be a seedling of a Yellow Transparent and I wanted to top work it to Stark, Stayman, or other winter sort. I have seen tests by top grafting in this section. I have known cases where winter varieties were grafted on early kinds; and when the season for the early variety arrived, the apples top-worked began to drop.

The nurseryman has not been able to command sufficient prices to enable him to handle his goods in this expensive way. If the farmer is to grow his trees and to do his own propagating, let him develop his seedlings for two or three years. If he would grow a hundred for four years, and then were to only get twenty-five that exactly suited him, out of the lot, he could afford to discard all the others and it would pay him.

There are several points to be considered in the selection of seedlings for our orchards here in Adams County—and we are beginning to learn something of the tendencies of trees and growth. We should heed foliage, condition of growth, the nature of the growth, that is, the characteristics of the tree, whether they are strong and vigorous, or whether they are weak and slow growing; whether the foliage is subject to scab and fungus diseases, and whether it is upright in its habits, or whether it is knotty.

Member. Would you regard the vigor of the tree as the most essential thing?

Mr. Peters. Yes; however, it would be better also to discover something of its variety than to select the seeds promiscuously. If the orchardist is to use apple seedlings at all, he is justified in growing his own seedlings. He should not use Summer Rambo and Early Ripe seedlings, if he is going to grow Baldwins, and later winter varieties. If he wants to have an apple with good red cheeks, I do not see how he is going to get it by grafting on Rambo or Baltzley. Live stock is not produced that way.

Member. Doesn't this raise the question of the effects of the stock on the scion?

Mr. Bassett. Now you have gotten into deep water again. Professor Gulley, of Connecticut, carried on experiments there that proved to him, and to others that saw the work, that the actual result of the work on the scion was nil. In regard to this root-graft he said that the root system is simply a feeder for the bud or scion. If the cook in my kitchen is a colored lady, it doesn't necessarily follow that I must develop into a colored man, does it?

Member. If it is sufficient to effect that bud or that scion, is that not sufficient to effect the fruit?

Mr. Bassett. I do not understand that it partakes of the nature of the root; and if you graft on Grime's Golden, I do not think you will get any less color. I know George T. Powell, of New

York, argues that he has a strain of fruit he thinks is affected by the stock on which it is grafted; but the experiments carried on by Mr. Gulley does not sustain that.

E. C. Tyson. Is it not Mr. Powell's plan to set his trees deeply enough to get roots from the scion?

Mr. Bassett. I think so.

Mr. Anderson. Mr. Chairman: I have been listening to the discussion of raising our own trees. I do not think it would be wise for us to undertake it. I believe the average nurseryman is honest. I have faith in him. I believe raising nursery stock should be a special business; I think he can raise better trees at much less expense than the farmer can. Rabbits and mice will get into the little nursery patch and eat it right up. The nurseryman can afford to have a nursery better protected against such enemies; and he can afford to have the best soil adapted to his business. We haven't all got that. I was in a nursery lately where the nurseryman grew his own orchards in order to get his buds and I was much pleased with all I saw. He did not take any grafts or buds from a tree that was not true to its type and a perfect specimen. Trees in the same orchard of the same variety are not always equal in quality. When the nurseryman has his fruit orchards, he can select his buds and grafts from special trees. You see, he is right onto the job, and he can grow that tree better and cheaper than we can do it.

Now, about grafts not coming true to type. I have done considerable grafting, and in only one case was it not true to type.

In these days we must be specialists; and the man who has an orchard and studies his business, is the man who will come out best.

Mr. M. G. Kaines, Associate Editor of the "American Agriculturist." Mr. President: There is one thing that has not been brought out yet. It seems to me there is no question about getting just what you want in the way of selection. If you have, we will say, a Northern Spy tree, or if your neighbor has a Northern Spy, that is better than any Northern Spy with which you are acquainted, you can get buds from his tree at a very small expense. You can present them to your nurseryman, and have him grow the trees for you on the kind of stocks you stipulate. Any nurseryman will agree to raise trees on contract. I happen to know of one nurseryman in western New York who is doing that. He did not at first want to undertake the work himself as a speculation; and so the man who wanted to have a certain class of stock produced, made his contract with this man to produce it. The fruit grower supplied the buds and the nurseryman produced the trees; and so far as I know, every detail of that transaction was agreed to before the work was undertaken. The last report I have had on the subject is that they have been satisfactory to both the nurseryman and the fruit grower. Some of the stock has been planted in the orchard, and is doing well. It happens to be dwarf stock, now in bearing at Mr. George T. Powell's, at Ghent, N. Y. As I said, they are dwarfs—Red Astrachan trees, not quite so high as I am, which have produced a box of fine specimens to the tree,—and they are only three years old.

As to bud selection, I know of Mr. Powell's experiment in growing King trees of particular types. Mr. Powell went all over western

New York to find a King tree better than any other King tree. I do not remember how long he was at that, but for some years. At last he found just the type of tree he wanted; and as he was afraid there would be sun scald or injury to the trunks—the King is subject to that in northern New York—Mr. Powell top-worked the King buds on either Northern Spy or Tolman Sweet bodies; I think the former. The trees have now been in bearing for several years, and the character of the fruit in that orchard is practically uniform. Each package, you may say, is like every other package; every apple like every other apple; and that has a great influence on the sale of his fruit. The fruit is graded before the blossoms appear. You understand what I mean by that? The buds are all from the same individual tree. He has good, sturdy, healthy trunks in his King orchard. The trees are almost alike. They, of course, have been well-trained from the beginning. Now, whether it will pay to top-work on an extensive scale I am not prepared to say. It seems to me there would be a needless check to growth and loss of time. This is shown by the work of Mr. Samuel Fraser, of Geneseo, N. Y. What appears to me as most practical is the selection of buds from specially useful trees of desirable varieties for the locality, and putting these at once upon vigorous roots in the nursery. Mr. Fraser has done this with several thousand trees now two or three years old, I believe, and is well pleased with the looks of his orchard.

INTER-CROPPING OF YOUNG ORCHARDS WITH SPECIAL REFERENCE TO ADAMS COUNTY.

PROF. R. L. WATTS, *Department of Horticulture, State College, Pa.*

The development of young orchards is a business proposition. There is an æsthetic side to the enterprise, but primarily orchards are planted for profit and not for pleasure.

The paramount question in the minds of most prospective fruit growers is, What investment is required to bring an orchard into profitable bearing? Hundreds of people do not plant orchards because of the financial burden in caring for them before they begin to yield returns. On the other hand, a host of men in this state have planted trees with the full intention of giving them the proper care, but have failed largely because the necessary funds were lacking. I am personally acquainted with young men who would like to engage in fruit culture, but the expenditures demanded before there is any return is a serious barrier. The capitalist is just as much interested in this question. Three men from a Pennsylvania city visited State College recently and said they had \$25,000 to invest in the development of a great commercial orchard, but they much preferred a plan and policy which would not call for the spending of the entire sum.

Planters should bear in mind that every year added to the age of a well-cared-for orchard of approved varieties enhances its value. There is an increasing number of men who are willing to pay a liberal price for young orchards that have not reached a bearing age,

and with this knowledge, growers should not hesitate to plant trees and follow approved methods in their care. Any plan, however, which will reduce the cash outlay in growing a young orchard will be welcomed by all classes of fruit growers.

The Aim.

In the development of young orchards, the aim should be to grow the very best trees at a minimum cost. Any plan of culture which does not have this high purpose should be condemned. The growing of crops between the trees is a secondary matter and should not at any time interfere with such treatment as will result in perfectly healthy and properly grown trees.

Inter-cropping in orchards has not been popular with the rank and file of orchardists, mainly for three reasons. First, it has been claimed that the trees need all the plant food naturally furnished by the soil and any additional amount that the grower might be able to supply, and that the cultivation of companion crops necessarily robs the trees. This is a weak argument and many instances might be cited where ample food has been supplied for both trees and companion crops, which of course is absolutely essential to success, both from the standpoint of the orchard and of the inter-tillage crops. Second, it has been claimed that tillage is interfered with when crops are grown between the trees. This may or may not be true. It depends upon the character of the crop selected and also upon the method and frequency of cultivation. By choosing the right crop and by giving it the right kind of tillage the trees will not suffer from lack of cultivation. Third, the most justifiable reason for not inter-cropping is that it places additional irons in the fire, some of which are likely to be burned. To engage in market gardening or potato culture on a large scale in connection with orcharding requires considerable executive ability. Not all men can succeed in handling garden crops on a large scale and at the same time give the trees proper attention.

Inter-Cropping Becoming More Popular.

In recent years, however, inter-cropping is becoming more popular. It is not difficult to cite instances where the plan has been worked out with entire success. One of the best examples is that of the well known horticulturist, Mr. H. C. Snavely, Lebanon, Pa. Mr. Snavely was formerly chairman of the General Fruit Committee of the Pennsylvania Horticultural Society, and he is recognized as one of the most intelligent and successful orchardists in the state. In 1907 Mr. Snavely planted four rows of potatoes thirty-four inches apart, using the variety known as Carman No. 3, between the peach trees which were set at standard distances. The land previous to the setting of trees was plowed very deep and thoroughly harrowed. No fertilizer was used for the trees at the time of planting, but 1,000 pounds of 2-8-7 mixture was applied in drills for the potatoes. Thorough tillage was given during the season. The potatoes were planted April 5th. From twelve acres, 2,000 bushels of potatoes were harvested and the trees made a most satisfactory growth. The trees for this orchard were the largest that could be

secured, some measuring eight feet in height at the time of planting. In 1908 potatoes were again planted, but on account of severe drouth, only 860 bushels were harvested. The growth of the peach trees the second season was also satisfactory. I have not heard directly from Mr. Snavely this year, but I understand that he harvested a fine crop of peaches. Mr. Snavely has told me repeatedly that he never saw a finer young orchard.

It is a pleasure to call attention to inter-cropping as practiced by Horace Roberts, Moorestown, N. J. Mr. Roberts purchased his first farm some years ago and was unable to make a single payment on the place. He had barely enough capital to stock the farm with tools and a few animals. The success of his operations is almost phenomenal for he now owns nine farms and he is a comparatively young man. Mr. Roberts is known as an orchardist as well as a market gardener and his success must be attributed largely to inter-cropping in the orchards. The general policy is to buy a farm when the price is right and to plant all or part of it with fruit trees. Peaches, apples, pears, plums and cherries are grown extensively on the Roberts' farm, and inter-tillage crops are used in all the plantations. In a number of instances it has been possible to pay for the places from the profits of two seasons. Expenses of the young orchards as well as of the entire farm are more than paid from the outset, and it should also be noted that the farms become more valuable because of the starting of young orchards and of the improvement in soil fertility. Many other growers within easy reach of Philadelphia markets have been practicing companion cropping with success. The most common practice on the Roberts farms is to plant peas as early as possible in the spring, following with such crops as tomatoes, sweet corn, muskmelons, cucumbers, watermelons, potatoes and other crops that may be sold to advantage in Philadelphia. Most of the farms are about eleven miles from the city and nearly all produce is marketed by wagon.

Principles Involved.

In deciding as to the kind of crop which is best adapted to any particular location, the following points should be considered:

- (1) The equipment and capital required. The growing of such crops as peas, sweet corn and potatoes would require a very much smaller outlay for equipment than early cabbage and early tomatoes which must be started under glass. Practically all farms have the tools necessary for the growing of potatoes, although if undertaken on a large scale it would be necessary to secure planters and harvesters, while one could not expect to grow early cabbage and early tomatoes on a large scale without extensive areas devoted to hotbeds, cold frames and perhaps greenhouses.
- (2) The natural bent or inclination of the grower should be taken into account. Many people who are very fond of fruit culture would not make a success in growing vegetables because these crops do not appeal to them. This is a most important factor and should not be ignored by the individual or the community.
- (3) Inter-cropping requires more labor than when no crops are grown between the trees. This may or may not be a serious

factor. If the grower possesses sufficient skill to make a success in the growing of vegetables or other companion crops he can well afford to pay for labor in competition with other classes of producers.

(4) A most important factor to be carefully considered is the question of markets and marketing. On account of easy access to a large market, the growers of Moorestown possess special advantages over persons operating remote from large centers of population. Although these men are within easy driving distances of Philadelphia, much time of the men and horses is required to cart the produce to market. If a good shipping trade is developed it possesses special advantage in requiring very little time for the delivery of vegetables at the railroad siding.

(5) Some crops which might be grown between fruit trees require more skillful management than others. This factor is well worth the consideration of the orchardist. His time and thought are needed in caring for the trees and if inter-tillage crops can be selected which are simple to cultivate, it will be a decided advantage.

(6) When the growers of a given community desire to engage in the growing of inter-crops, it would be a great advantage to decide upon a few crops that best meet the requirements of the locality. To make such an enterprise a success, those crops should be selected which require the least skill unless there is assurance that more difficult crops can be grown successfully.

(7) Crops should be grown for which there is a large demand. Potatoes are especially desirable because this vegetable is consumed in very large quantities. From the standpoint of demand, cabbage probably ranks second, and tomatoes third.

(8) It is an advantage to select crops that have the fewest enemies to combat and which may be controlled without great difficulty. Looking at the matter from this standpoint, the tomato is one of our best crops, especially if rotation is practiced.

(9) Other things being equal, it is important to select crops which will interfere the least with spraying. Crops with erect habit of growth will permit the use of spray machinery, while those of a straggling nature would not allow the use of carts or wagons without damage to the companion crop.

(10) The location is a most important factor in deciding the crops which should be grown between the trees. It is especially important to select those which are adapted to your soil type. Some crops, as cabbage, have a much wider adaptation than others. The quality of the companion crop will depend largely upon the character of the soil. A large crop of potatoes might be grown successfully on limestone soils, but they lack quality as compared with tubers grown on sandstone. Early tomatoes are smoother and more regular when grown on the lighter soils. The question of exposure should be considered with reference to this problem. In orchards having trees on sunny slopes, the growing of early crops as peas, cabbage and tomatoes might well be considered, while it would probably be futile for fruit growers on northern slopes to attempt the culture of these crops. The steepness of the land must also be considered. It is impracticable to grow on steep hillsides crops requiring frequent tillage.

(11) It is desirable to select crops which have the same fertilizer and tillage requirements as the trees under culture. Cabbage, for example, is not a desirable crop to grow in peach orchards, because it requires more nitrogen than is required by peach trees. On the other hand, there could be little objection to the growing of this crop in apple orchards, provided the soil is well filled with humus. The moisture requirements for certain inter-tillage crops is perhaps the most serious objection to their use. Cabbage, for example, contains ninety-eight and a half pounds of water, and unless the water absorbing and holding power of the soil is great the trees may suffer on account of lack of moisture. This difficulty, however, can be overcome by supplying humus in sufficient quantity and by early and frequent tillage.

(12) Companion crops which make their growth and require tillage early in the season are the most suitable for the orchard.

(13) The duration of growth or time of harvesting is also important. The successful management of orchards requires the maintenance of vegetable matter and those crops which can be harvested and sold before the proper time to sow cover crops are, other points being equal, the most desirable. Peas, early cabbage and early potatoes meet this requirement.

(14) Companion crops should be selected if possible which permit thorough tillage and as late in the season as may be best for the welfare of the trees. This matter can be controlled to a considerable extent by allowing a liberal amount of space between the rows.

15. The net profits from companion cropping should be the main factor in deciding as to what crops should be grown provided the cultivation of such crops is entirely favorable to the growth of the trees. The skillful management of crops which require starting under glass, as early cabbage and early tomatoes would certainly return larger profits per acre than potatoes although the growing and harvesting of the crops would require much more attention.

Directions For Growing Companion Crops.

Sweet Corn, and especially the early varieties may be grown with entire success in young orchards without detriment to the trees. By planting the early varieties in thoroughly drained soils which have been well enriched by the plowing down of clover sods and the application of manure along with high grade fertilizer, the crop would be harvested in ample time to start cover crops. Some of the best varieties for this purpose are Crosby, White Cob Corry, Premo, Fordhook First and Golden Bantam. Later varieties may be grown with entire success, but the crop is harvested rather late for sowing cover crops.

Small Fruits may be used as companion crops in orchards, but are undesirable because they require tillage later in the season than is favorable to starting cover crops. I see no reason, however, why the bush fruits could not be grown in the orchards of Adams County, using each year a legume as cow peas which would be killed by frost and which add materially to the supply of vegetable matter. Soy beans are better adapted to clay soils. They made a much larger

growth at State College in Hagerstown clay loam than cow peas. None of the small fruits, however, are generally regarded as good inter-tillage crops for the orchard.

Peas meet the requirements so far as the trees are concerned, better than any other vegetable. They add nitrogen and vegetable matter to the soil when the vines are plowed down and do not draw heavily upon the supply of mineral elements. The earliest varieties should be used and planted just as soon as the ground can be prepared. The largest yields are procured by the free use of seed and thorough cultivation.

Tomatoes, when the bulk of the crop is off before the middle of August or the first of September, is a desirable crop. It is important to use an early variety such as Earliana and grow strong, stocky plants, carrying a cluster or two of flowers, which are set in the field as early in the season as the locality will permit. This is important because yields are larger from early set plants and the profits are certainly larger from the earliest crop. If necessary, nitrate of soda may be used soon after planting to stimulate growth and it may also be an advantage to the trees.

Early Cabbage may be grown without detriment to the trees, provided the crop is manured and fertilized as liberally as possible, to make it a success as well as to furnish the trees with needed plant food. The best variety is Jersey Wakefield, securing seed from a house which has an improved strain. If a larger variety is wanted, use Charleston Wakefield. In Adams County the seed should be sown not later than the middle of January, transplanting to the cold frames when the plants are four or five weeks old, and setting the well hardened plants in the field as soon as the weather will permit. The profits from this crop are large when it is properly handled.

Early Potatoes are exceedingly desirable for this purpose. All points considered, we probably have no crop which is so valuable for companion cropping. The advantages are the small cost of equipment for growing the crop; soil and fertilizer requirements are very much the same as for most fruits; it must have the same amount and the same kind of tillage as is favorable to tree growth; there is a large demand for this product; it is a simple crop to grow as well as to harvest and market; and the crop matures in ample time to follow with crimson clover or other hardy legume. To make the crop a full success, great care should be exercised in preparing the soil and firm seed should be planted as early as possible in the spring. There should be no delay in harvesting the crop after it has reached marketable size.

Chester J. Tyson. Do you think early sweet corn well adapted to the shipping trade?

Prof. Watts. I see no reason why it is not. It is shipped in large quantities to most of our cities before the local crop is ready for market. Our most successful growers count on one hundred dollars gross receipts per acre. The fodder is often utilized for feed, and it is of greatest value perhaps when used as silage. As high as three hundred dollars per acre is realized sometimes when the plants

are started under glass and transplanted to the open. So far as the trees are concerned, I see no reason why early sweet corn should not be grown.

Mr. Tyson. Where would you look for a market?

Prof. Watts. Cities in northern districts should furnish a market for a considerable quantity.

Member. Give us a few pointers if you know.

Prof. Watts. The growing of this or any other crop on a large scale in your orchards would probably necessitate organization. It is important for your men to get together and then ship your produce in car load lots, being careful not to flood any particular market.

Member. How is corn shipped?

Prof. Watts. It is best handled in iced cars. If not packed too closely, however, and if the shipping facilities are good, the corn may be packed in crates and ventilated barrels and reach the destination in good condition.

Member. Would you plant raspberries in peach orchards?

Prof. Watts. I am glad you asked me that question. I would not; because the raspberries would give practically no return before the peach trees should need all of the ground.

Member. We were not successful in planting these two crops together.

Prof. Watts. Did the berries thrive?

Member. The raspberries did fairly well, but the peaches did not. The peaches got the yellows.

Prof. Watts. I do not think the raspberries should be blamed for the yellows, but I do not advocate the planting of raspberries in peach orchards. It makes cultivation more difficult, and unless tillage is thorough the peach trees might be come weakened and more subject to yellows. I had apples in mind rather than peaches when speaking of inter-cropping.

Member. Could late potatoes be harvested in time to start a cover crop?

Prof. Watts. If the potatoes are out by the first of September you would have time to start cover crop, especially if rye is used. This crop could be started much later than the first of September and get sufficient growth for safe wintering.

Member. Would the first of September be time enough to sow soja beans?

Prof. Watts. It would be too late, and also too late for crimson clover.

Member. How about rye?

Prof. Watts. This crop could be sown with success as late as the 10th of October and probably later, but there would not be much growth before winter. As the land should be plowed as soon as dry enough in the spring, it is important to secure a large growth in the fall.

C. J. Tyson. Do you think you could grow early cabbage plants to correspond with the ones you buy much cheaper than three-dollars per thousand?

Prof. Watts. I do not think so. I would not like to grow them for much less.

C. J. Tyson. In a community where a dozen growers get together, which would be the most profitable, early cabbage or early sweet corn, either 100 acres of cabbage or 100 acres of sweet corn?

Prof. Watts. I think the early cabbage would be more profitable. It offers greater possibilities, although the sweet corn would probably meet all expenses in developing the orchard. I do not think it necessary to care for an orchard ten years without making a profit on the cultivation of such land. With skillful management, I believe it is possible to buy a farm, plant it with trees and pay for this farm and all expenses incidental to this orchard by the time it comes into bearing. Some men have done this.

Member. In case you plant sweet corn, potatoes or cabbage, how much fertilizer would you use?

Prof. Watts. Sweet corn and cabbage require more nitrogen than potatoes. It is not usual to apply more than 4 or 5 per cent of nitrogen for any of these crops. For early cabbage and sweet corn, a ton of fertilizer carrying four per cent nitrogen, eight per cent phosphoric acid and 10 per cent potash should give satisfactory results.

Member. How should a fertilizer be applied.

Prof. Watts. Most of it should be used broadcast before planting. If the soil is thin, one-fourth of the amount can be used to advantage in the furrows before planting.

Member. How about hillsides and rocky land for inter-cropping?

Prof. Watts. Inter-cropping should not be practiced on such land.

Member. Should you mulch?

Prof. Watts. Yes, I should mulch land that is hard to cultivate, but it is doubtful whether mulching is effective in growing peaches.

Mr. Anderson. The orchard should be cultivated both ways.

Prof. Watts. This could be done by planting in check rows.

Mr. Anderson. How far apart would you plant potatoes?

Prof. Watts. They could be planted 30 x 30, with careful marking and a steady horse to cultivate. Several pieces should be planted in each hill.

Member. You cannot use a machine in planting if you put several in a hill.

Prof. Watts. This is true, but hand planting is not such a tedious operation as some suppose. It is not many years since practically all our potatoes were planted by hand and a few highly successful growers of to-day prefer hand planting.

Member. What kind of fertilizer do you recommend, especially for large trees?

Prof. Watts. I think you have some orchard men here. Professor Wright, will you answer that question?

Prof. Wright. As a matter of fact, if I were fertilizing an orchard, especially a cultivated one, I should try to use a leguminous crop every other year in preference to buying nitrogen. Of course a fruit crop does not require as much nitrogen as a grain crop, but most of our soils are deficient in phosphorous and potash. If I were growing an orchard of my own, I should not put on much fer-

tilizer in the form of nitrogen, but should expect to get that from cover crops. I would supply the phosphates and potash in about equal quantities. I do not think you can afford to buy nitrogen when you can buy it in the form of leguminous crops.

Member. What does our Michigan friend say about that?

Mr. Bassett. In our orchard management there is one thing about this leguminous crop that appeals to us more than any other. We have tried to get results from Clover in one year, but have failed in this. The trouble is that it does not mature sufficiently in a season to take up and store very much nitrogen. It would not do to put the clover in in the fall and plow under the next spring,—the little nodules that secrete the nitrogen have not matured sufficiently to contain much of it. We give the clover an extra season to mature, and then turn it under. This we do about one year in five. The others we have clean tillage. We usually use phosphate also, in the form of bone; and these are the most satisfactory; but, as the professor says, we cannot afford to buy nitrogen at the present price, when we can grow cover. We usually try to grow clover in our Baldwin orchard the year of its non-fruited, and this sometimes interferes with the setting of the fruit buds.

Member. Do you use Mammoth or Red Clover?

Mr. Bassett. We use both.

Member. Did you ever try the crimson clover as a cover crop?

Mr. Bassett. It is the crimson we use.

Member. Do you get plenty of nitrogen from the Mammoth?

Mr. Bassett. We get nitrogen; but they do not mature sufficiently to be turned under the first season.

J. W. Anderson. Mr. Chairman: I would like to say a word about Crimson Clover. We are considerably farther south than our Michigan friend. In our section (York County) we are not much farther south than you, in Adams County, and in this latitude Crimson Clover will make such a growth in one season that it will be a great benefit to the land. A good many farmers sow Crimson Clover in their corn at the last working. I have seen circular patches in the oats the following season where the straw was much shorter than that surrounding it, caused by the Crimson Clover being smothered, in the fall, by the corn shocks. I am afraid Crimson Clover has been greatly neglected. It will do you a lot of good to grow it. I know this by actual experience, and there are many others who think as I do on this subject.

Prof. Watts. I would like to make one point in connection with Crimson Clover. It should be started early.

Mr. Anderson. The last working of corn does well with us.

Mr. Repp. It is the practice in Freehold, N. J., to follow the potato crop with Crimson Clover.

SOME EXPERIMENTS WITH COMMERCIAL LIME SULPHUR AS A SPRAY FOR FRUIT DISEASES.

BY H. H. WHETZEL, *Professor of Plant Pathology, New York State College of Agriculture.*

During the winter of 1908-'09 there was much demand from fruit growers for recommendations regarding the use of lime sulphur solutions as a summer spray. Plant Pathologists generally, particularly here in the East, advised growers to go slowly. If they desired to try these solutions experimentally on a few trees, good and well; but all were advised against the general use of this on the foliage of their trees, until pathologists had time to determine whether this could be done with safety and efficiency. The experiments of Cordely in Oregon using the home boiled concentrated mixture, and the work of Scott of the U. S. Department of Agriculture with his self boiled lime sulphur, had been reported in the Horticultural press and our Eastern growers wanted to know why it wouldn't work here. This demand for information on the subject was the more pressing for the reason that many growers had experienced heavy losses from burning or russetting of the fruit by the Bordeaux. Naturally they were interested in a substitute that appeared to be equally effective and at the same time free from the faults that condemned the Bordeaux.

In order to get some data on the value of lime sulphur as a substitute for Bordeaux when used under our conditions in the State of New York, we undertook a series of experiments in an orchard near Ithaca, in the spring of this year (1909). Mr. Wallace, a Fellow in the Department of Plant Pathology, had charge of this work and to him belongs all the credit of the remarkable progress we have made on this problem this season. What I shall here report is chiefly the results of his work.

The work was conducted in two orchards containing several varieties of apples, trees about 15 years old, with peach trees as fillers. Work on three diseases only were undertaken, namely, Peach Leaf Curl, Apple Scab, and Brown Rot of the Peaches. A field laboratory was established at Mr. Frear's place, in whose orchards the work was to be done. Commercial Lime Sulphur (Niagara Brand, heavy grade) was used as this was what Mr. Frear had already purchased for his winter spraying. Mr. Frear furnished all materials, gasoline power sprayer, etc., and Mr. Wallace assisted in all the application made. The work was very thoroughly done.

Results on the Peach Leaf Curl.

In these experiments comparisons were made between Bordeaux 3-3-50 and different dilutions of the Commercial Lime Sulphur. On account of heavy winds that blew constantly it was impossible to spray the trees from but one direction. However as thorough a job as possible under the circumstances, was done. The applications were all made before the buds had swollen to any appreciable extent. Unsprayed check trees were left in every series of experiments. The results showed that the Lime Sulphur at any dilution

from 1 to 9 to 1 to 20 was more effective than the Bordeaux. The curled leaves on the unsprayed trees averaged from about 35 to 60 per cent, while on those sprayed with lime sulphur they averaged from 1 to 6 per cent only. On the trees sprayed with the Bordeaux an average of about 8 per cent of the leaves showed curl. More copper in the Bordeaux might have been more effective. These results are not especially new or striking, as it has long been known that lime sulphur as applied for scale will also effectively control the curl. They serve, however, to again confirm the results of earlier investigators and to demonstrate to the grower the value of lime sulphur for the control of this disease. This is particularly important, as most growers are now compelled to spray for the scale and any solution that will answer both purposes at the same time means a great saving in time and money. Reports from a large number of peach growers all over the state, last spring, indicate that any of the brands of commercial lime sulphur or the home boiled mixtures used as for scale will successfully prevent the leaf curl.

Results on Apple Scab.

The trees selected for these experiments were Rhode Island Greenings. The lime sulphur was used at a dilution of 1-30. The Bordeaux was made to the formula 3-4-50. In each case arsenate of lead was used at the rate of three pounds to 50 gallons of the mixture. Six trees were left unsprayed as checks; six were sprayed with the Bordeaux and arsenate of lead; five were sprayed with the Lime Sulphur and arsenate of lead. The two mixtures were applied in each case on the same day, with the same pressure (about 125 pounds) and with equal thoroughness. Some of the trees were



FIG. 1. Greenings from the unsprayed check trees showing the fruit just as it run on the trees. All of these apples were taken from a single limb. All of the injury is not due to apple scab. Insects were responsible for much of the injury. 42 per cent. of the apples on the check trees were affected with the scab.

sprayed once, just before the blossoms opened. Some were sprayed twice, just before the blossoms opened, and again just after they had fallen. Some were sprayed but once, just after the blossoms had fallen. The results showed that in this orchard this season, the one spraying just after the blossoms fell was the all important one. The trees sprayed only just before the blossoms opened showed nearly as much scab as the checks. This does not indicate, however, that this spraying, just before the blossoms open may not often be

very necessary. The apples on the table there indicate very well the average run of the fruit on the checks, the Bordeaux sprayed and the Lime Sulphur sprayed trees. Careful counts of all the apples on all the trees in the experiment showed at picking time that 42 per cent of the apples on the check trees were scabbed (See Fig. 1), on the Bordeaux trees this was reduced to 3 per cent, and on the Lime Sulphur



FIG. 2. Greenings from the trees sprayed with Bordeaux and arsenate of lead. In the same orchard with the check trees shown in Fig. 1. Scab reduced to about 3 per cent., but about 82 per cent. of the fruit badly russeted. All the fruit in this basket taken from one limb of the tree and shows the fruit about as it runs on the trees.

trees to 3.6 per cent. The Lime Sulphur was practically as effective in preventing the scab as was the Bordeaux. However, 82 per cent. of the apples on the trees sprayed with Bordeaux were russeted, i. e., injured by the mixture, and to so severe an extent as to much reduce their market value (See Fig. 2). The apples sprayed with the Lime Sulphur showed less than 4 per cent of russeting of any kind, in striking contrast not only to the Bordeaux injured fruit, but also



FIG. 3. Greenings sprayed with Lime Sulphur and arsenate of lead. From a tree planted in the row next to those sprayed with Bordeaux and arsenate of lead. Scab reduced to about 3 per cent. Less than 4 per cent. showing traces of russeting of any kind. All the apples from one limb just as they run on the trees.

to the apples from the check trees, which showed 29 per cent of russeting, due perhaps to certain weather conditions. Why the Lime Sulphur sprayed fruit should have been so free from this natural russeting is not clear. No injury of any kind either to fruit or foliage resulted from the applications of the Lime Sulphur at the dilution of 1 to 30 (See Fig. 3). The experiments showed that no addition of

arsenate of lead to the Lime Sulphur not only did not cause injury to the foliage, but was as effective in controlling codling moth as when used with the Bordeaux. The check trees showed 25 per cent wormy apples, while those sprayed with the Lime Sulphur and arsenate of lead showed but 1.3 per cent as compared with 3.3 per cent on Bordeaux sprayed trees.

Both Cordley and Scott report good results with Commercial Lime Sulphur for apple scab this past season. Cordley used the Niagara Brand, and Scott used three brands in his work,—the Grasselli, Thomsen Chemical Co., and Rex. Scott used arsenate of lead with the Lime Sulphur with safety, but had burning of the foliage where Paris Green was used with the Lime Sulphur. Scott's Self Boiled Lime Sulphur also gave excellent results for apple scab.

Results on Brown Rot of Peaches.

The results with the Lime Sulphur for Brown Rot have not yet been gotten together so as to give definite figures. Mr. Wallace found early in the season that a dilution of the Commercial Lime Sulphur of 1-100 seriously burned peach foliage. Later he tried a dilution of 1-200 with no injury to the foliage and with a marked reduction in the amount of rot in the fruit. Three sprayings reduced the rot from three to five times. The applications were made about ten days apart, the last being applied shortly before picking. The commercial solution at this dilution has the advantage over the self-boiled mixture of Scott in that it is much less expensive and will not stain the fruit. It can be applied the day before the fruit is picked.

We are not recommending the general substitution of Lime Sulphur in place of the Bordeaux. We give you the results of one season's work. If you use the Lime Sulphur on your trees this coming summer it is with the risks involved in using a solution not yet thoroughly tested out, and whose peculiarities under different weather conditions is yet to be determined. That the Lime Sulphur has powerful fungicidal properties is certain. That it will not injure apples (when properly diluted) under conditions that produces russeting by the Bordeaux is shown by Mr. Wallace's experiments. That it is very probably the coming spray is not to be disputed in the light of the favorable reports from experimenters in the different fruit sections of the United States this season.

Member. Is it just as safe to mix arsenate of lead with the self-boiled mixture as with the Commercial Lime Sulphur?

Prof. Whetzel. Yes.

Member. Do you know what time Scott makes his application for Peach Rot?

Prof. Whetzel. No, I do not. I think he sprays from three to five times, beginning at the time the fruit is about the size of a hickory nut.

Member. Professor, do you think, if you had an orchard of 40 or 50 acres of peaches, you would spray with the self-boiled or with the Commercial Lime Sulphur?

Prof. Whetzel. I would spray with Scott's self-boiled—he has used it three years. With the Commercial I would risk enough of

my trees to see what would happen. I do not recommend that you use Commercial Lime Sulphur on any of your trees, because, if anything went wrong, you would say, "Whetzel got me into that trouble."

Member. What can you tell us about this fire-blight on Apples and Pears?

Prof. Whetzel. I cannot tell you anything, except what has been told hundreds of times. As I told a man this morning, I will guarantee to deliver a hundred acres of Pears or Apples without the loss of any trees, or large limbs; and I will do nothing except to inspect the trees regularly and take the blight out as fast as it appears.

Mr. Repp. I do not believe in warm weather this can be done; the thing is, your infections come together; they are there before you can see them.

Prof. Whetzel. Yes; but it can be seen in time to save the trees.

Mr. Repp. In this warm section here, the bacteria works fast. I can see how it can be done in New York State; it does not work as fast in that section as in this.

Prof. Whetzel. The people in New York wouldn't believe it could work faster anywhere else.

Mr. Bassett. I agree with Professor Whetzel that it can be controlled in this way.

Mr. Vincent. I know of a case in Southern Oregon where the fire blight attacked a large orchard. The owner said it could not be controlled by cutting it out, consequently he did not fight it. His neighbors fought it, cutting it out wherever it appeared. They conquered it; he lost 15,000 trees.

Mr. Repp. Your method may be all right in your State; in this and New Jersey the trouble is that it starts in the bloom.

Prof. Whetzel. That's where it always starts.

Mr. Repp. How many men would you put on the work?

Prof. Whetzel. How many men could you put in your orchard?

Mr. Repp. Five or ten.

Prof. Whetzel. You could put in twenty if you had to, couldn't you?

Mr. Repp. But, Professor, you go over the trees, and think you have cleaned them all up; the next day you go out, and they seem to be as bad as they were the day before. You have to go back every day; you get discouraged, you lose faith.

Prof. Whetzel. You have to go back every day until it is cut out. I know how you feel when the blight's been after you. They all feel that way.

Mr. Fenstermacher. Professor Whetzel says his boys can tell the blight before the grower would see it; will he kindly give us some information, so that we could guard ourselves and protect ourselves?

Prof. Whetzel. If you will go with the boys and learn the trick, you can do it. There are certain early symptoms. As a matter of fact, an ordinary grower would not be likely to see it until the tree was half dead. The careful grower cannot see it much

sooner than from seven to ten days after infection. An expert—a blight chaser—can tell it in from five to six days. He could tell it in its very early stages. It causes a slight wilting of the tip. I know that Mr. Repp is skeptical. We would like to show him. I know I am safe. He is in New Jersey and I in New York, you see.

Member. How would you treat canker?

Prof. Whetzel. It depends on the kind of canker.

Member. The kind that makes a spot rough and black on the limb.

Prof. Whetzel. Is it particularly black and rough before the bark peels?

Member. Yes, the bark itself runs a circle.

Prof. Whetzel. That's almost certainly the New York Apple Tree Canker, caused by a fungus. Black Rot Canker, or New York Canker, is common in Western New York, the Northeastern United States, and West as far as Iowa. It is very common. It is started by the fungus getting into some wound. It very frequently follows fire blight. The general opinion of the fruit growers in Western New York is that where they soak the limbs and body of the tree with Bordeaux Mixture, they are not particularly troubled.

Member. Would Lime and Sulphur control it?

Prof. Whetzel. I do not know.

Member. What treatment do you advise for the Collar Rot?

Prof. Whetzel. I would advise that you go over your trees carefully and frequently, and inspect the base of the trees. If you find there are spots in the bark, cut them out, disinfect and paint until they heal.

Member. What disinfectant do you use?

Prof. Whetzel. Mercuric chloride—corrosive sublimate.

Prof. Whetzel. Perhaps you people would be interested in the methods we are now using in the Department of Plant Pathology to solve the plant disease problems in the State of New York. All of the investigation work during the growing season is now being done in Field Laboratories in different parts of the State. We had seven of these Field Laboratories last season. Each man in the department who has a piece of investigation on hand (and every man in our department has his problem) goes into the particular locality where the disease he is studying is most apt to be abundant. He takes with him a full equipment of laboratory apparatus, microscopes and materials, so that he can do everything that could be done in the laboratories at the college. And there he is right in the midst of the enemy, where he can see the disease in its various stages of development every day during the growing season. He learns to know the disease in its natural relations to the crop and the weather conditions which affect it so markedly. He also learns the crop, the diseases of which he is studying. He gets the grower's point of view. He at once sees that measures which he proposes for controlling this malady must be not only theoretically correct, but practically possible and profitable. He puts on his overalls, and blue shirt; he rolls up his sleeves; he tramps the orchard or fields in rain and blistering sun; he learns to live and deal with men, the men whose problems he is to solve; he learns to respect the grower's experience. And the grower, what of him? Four of our seven field

laboratories were supported last season by the growers, financially supported by them, you understand. One was maintained by a fellowship established by the Niagara Sprayer Company. If a grower puts money into a proposition of this kind he expects to get it out. He takes interest in the work which the young fellow is doing. He too gets a better acquaintance with this fungus that is giving him trouble. He sees it through the microscope. He understands now the necessity for all these bottles, tubes and trinkets which the young plant doctor uses daily. He studies the weather forecasts and recording instruments with as much zeal as the doctor himself. In short, he feels that this is his problem and he wants to know how it is solved. Better still he learns to respect and value the skill and training of the college man. He sees the many difficulties and obstacles that stand between the plant doctor and the solution of the problem. He learns to be patient with the slow progress and to make the most of every small gain. I believe that the Field Laboratory is the best means of working out the cause and control of the diseases of our crops. It brings together in sympathetic co-operation the two men, plant doctor and grower, who together must meet and solve the problems. That this financial co-operation has met with the approval of the growers is evidenced by the fact that in every case they have arranged to continue and increase their support for another season. The Department of Plant Pathology is thus training a fine corps of men, specialists on the diseases of the particular crops, who will thus be able to quickly and effectively work out practical methods of control. These men will become invaluable to the growers of the State and will well deserve their share of the prosperity that comes to the growers whom they serve.

Member. Mr. President: I should like to have you read question eight, and have Professor Whetzel bring out the difference between Bacterial Collar Rot and Fungus Collar Rot, and to give the authority for calling it by that name.

Prof. Whetzel. I do not know; no one has ever determined but what they are one and the same.

Member. Will Mr. Bassett kindly answer the first question on the program—How to Hurry a Young Apple Orchard?

Mr. Bassett. I am sorry I cannot do that; I shall be unable to answer that. Hurry in bearing, I suppose you mean?

President. Mr. Bassett declines to speak on this question; would Mr. Vincent kindly take up the topic—What is the Best Way to Hurry an Apple Orchard?

Mr. Vincent. My advice would be not to hurry slow-bearing varieties. You should grow varieties that come into bearing early—Wagner or Duchess—one you know will come into bearing early.

Josiah Prickett. Will some one kindly answer question twelve—Would It Pay a Man with a Ten Acre Orchard to Purchase a Power Sprayer?

Member. Josiah Prickett, I think, can answer that question best himself.

Mr. Prickett. I do not think it is customary for the man that asks the question to answer it. I have been interested in power sprayers. I am about changing off—getting another sprayer. I am interested in the subject, and would like to have some information

on the subject. I am following up the Compressed Air Sprayer and am just young in that business. If anyone has a Compressed Air Sprayer, I should like to have it discussed.

Mr. Bassett. I notice the question refers to a 10-acre orchard—presumably a 10-acre bearing orchard. I have seen excellent work done with a hand sprayer; but I believe that a man who has a 10-acre orchard can afford a power sprayer. The nature of the sprayer is open to a big line of argument. We have a gas sprayer, in which the power is furnished by liquid carbonic acid gas with pressure. That has been very satisfactory. The only trouble has been that when we came to use the Lime Sulphur Spray, the carbonic acid has broken down the solution. Gasoline engine outfits are also satisfactory. Sometimes they get mulish; you can't tell just what you are going to get out of a gasoline engine. They have better ones to-day. There are a number of good outfits on the market. As to air compression, of course it is the same principle as the Niagara Gas Sprayer, using compressed air, instead of gas.

In Ohio they have a large number of power sprayers, and the growers work together very nicely. They have central power stations, where a number of people go with tanks. They have two tanks—one for the liquid to spray, and one to contain compressed air, just the same as carrying grist to the mill. They have a powerful engine. They can buy their compressed air cheaper than they can make it. You go to the central station; there you will find a man in charge, who has it in readiness. You simply drive up and get your compressed air. You have your other tank filled with the spray material; and you are all equipped to go to work. Where a man has his own individual plant, he has a central station on his own place.

You have your engine to run your compressor, your compressor to run the sprayer, and your tank to hold the spray material. The one objection to a power sprayer in an orchard, is that the machine weighs considerable. When the frost is just coming out of the ground, this is quite an item. You have quite a load to carry, especially where the engines are heavy and you have large tanks. We have changed our notion as to tanks. Where we formerly had 250 gallon tanks, we now prefer tanks not over 150. We have our stations not so far from our orchards, so we can go back easily. This plan is a much better one than to carry such an immense load. My opinion is that the power sprayer has come to stay. If men want to raise fruit successfully they need a power sprayer. We need more power in applying our spray materials. The proper time to spray is when the blossoms stand up straight. If we stand underneath and shoot the spray upward, we are failing to hit the vital point. We use elevated platforms and nozzles set at an angle to the spray rod. In this way we are able to throw the spray down into the calyx, taking care of fungus diseases, and also making our first fight against the coddling moth. When the calyx is partly closed, it is too late to try to squirt poison into it for your coddling moth. We are going to use more power than we can get from a hand sprayer, and we must apply our spray from above, so as to get the poison into the calyx.

Member. What pressure do you use?

Mr. Bassett. About 200 pounds, where we were formerly satisfied with 125. The old hand machine never gave over 85 pounds, and that under the manipulation of a good, strong, healthy man; more frequently than not you got less than 40 pounds. Another thing, if you will use a hand machine, for goodness sakes don't use only the middle inch of the plunger. Hump yourself a little, or get your man to do it, and use the whole cylinder.

Member. What nozzle do you use to apply the poison?

Mr. Bassett. We used to use the Vermorel. We now use a nozzle something like the Friend. There are a number on the market. It is a heavy nozzle with several discs, which can be inserted easily. The type is the same as the Friend nozzle. It is called The Scientific; has been liked very well this year.

E. C. Tyson. Do you think that will take the place of several Vermorels?

Mr. Bassett. Yes, we formerly used four in a cluster of Vermorels. This one would do the work of several, and do it better.

Member. How about the amount of power required for that nozzle?

Mr. Bassett. We put on just as much power. You can generally tell by the hiss of the spray.

Member. Would it be satisfactory used with a hand pump?

Mr. Bassett. Yes; with a good, strong man pumping.

Member. Do you think a hand pump will work one Scientific nozzle all right?

Mr. Bassett. Yes; but you have to have a *MAN* at the end of the handle. The old Vermorel is likely to clog; the Scientific does not clog as much.

W. C. Tyson. I should like to know in the case of compressed air, how agitation is provided. When you have two closed tanks,—one for compressed air and the other for material, how would you agitate any material, Lime Sulphur, for instance?

Mr. Bassett. The Martinsburg people put an agitator in them; some are provided with power agitators, some with hand agitators. Some machines are provided with an exhaust, so that part of the material returns to the tank and keeps it stirred up.

Member. I would like to hear from Eli Garrettson as to how his power sprayer works.

Mr. Garrettson. I have had it in use only one season and a half. It has been very satisfactory. I used it on lime and sulphur this fall with good results, and the expense was trifling. I used up a good pint of gasoline to a hundred gallons. I had no trouble with the engine; it has never balked on me; it has been very satisfactory.

Member. I have heard that scale can be removed from the fruit by spraying; has anyone had that experience? The insect marks the fruit; before the fruit is ripe you can see it. Can that be removed by spraying?

A.—Member. I used Scalecide.

Member. What time of the year did you use it?

A.—Member. About a month before picking.

Member. Did it leave any bad effects on the fruit?

A.—Member. No.

Member. What strength did you use?

A.—Member. 1 to 25.

Member. I would like to have Professor Whetzel answer Number 5.

Chairman. What is the cause and remedy for the irregular hard spots in apples, causing them to be irregular in outline, and often rendering the fruit worthless?

Prof. Whetzel. This injury is supposed to be caused by a small, red, sucking insect, which Prof. Slingerland called the "Red Bug." Prof. Slingerland was engaged in investigating the Red Bug just before his death; in fact, he died before he concluded his work. The Red Bug punctures the fruit when it is quite small. In some sections the damage it has done has been considerable, especially to Greenings. Many of the knotty apples, according to Prof. Slingerland, are caused by this insect. The small red bug, as it grows larger, becomes very lively. We have not had very good success in controlling it.

Mr. C. J. Tyson. Does that cause a discoloration of the skin on the outside?

Prof. Whetzel. It simply depresses it; if you cut the apple, you will find it more or less woody down under the flesh.

Member. The skin is comparatively perfect on the outside?

Prof. Whetzel. Except for the small puncture.

Member. Has the skin a similar color to the rest of the apple?

Prof. Whetzel. I do not know.

Member. Do you find it on the Ben Davis?

Prof. Whetzel. Yes.

Member. Smith Cider has the trouble this year.

Member. Is the damage caused early in the season?

Prof. Whetzel. Yes; when the apples are quite small.

Member. Did Prof. Slingerland work out any remedy?

Prof. Whetzel. No; he had only completed—not quite completed the life history at the time of his death. The insect must be killed by contact spray. Even when quite small they will jump off of the tree to the ground, and come back after spraying is over; when they get older they fly. We have not been very successful in controlling this bug.

C. J. Tyson. There is another trouble—we have a great deal of it here, especially have we had it during the past two or three years. It occurs like a bruise or welt, rather a depression than a welt, the skin of the apple not being broken, and it having a red color, redder than the rest of the apple, and the flesh underneath is a dry corky rot.

Prof. Whetzel. Yes; it is a disease, commonly called the Baldwin Spot; it occurs commonly in New York. It attacks also other fruits than the apple. It looks like a dent in the apple. The flesh is dry and spongy.

C. J. Tyson. Now, I do not believe that is the trouble I am referring to. The one I referred to affects the whole side of the apple; and so far as I have seen it, the apple never gets dark on the outside, like the Baldwin Spot.

Prof. Whetzel. I am not familiar with it.

C. J. Tyson. It looks like a limb bruise.

Prof. Whetzel. No, I am not familiar with that at all.

Member. Is there a remedy for the Baldwin Spot?

Prof. Whetzel. Not so far as I know. A lot of work has been done on it all over the world. Nobody has a remedy for it.

Member. (Shows apple.) What is this on the outside of the apple—small dents like this.

Prof. Whetzel. That looks like the Fruit Spot. This disease has recently been worked upon by Dr. Brooks, of New Hampshire. In order to distinguish it from the Baldwin Spot, it has been given the name of Fruit Spot. It is a fungus disease. You can peel back the skin and take out a piece of it, and get the fungus to grow in cultures. It can be controlled by spraying with Bordeaux mixture, making the spraying about July. It depends upon the weather. And right here, a great many of you have developed the habit of spraying according to spraying calendars. You must remember that conditions in different parts of the country, and even in different parts of a state, vary considerably. More damage has been done by spraying calendars than the pathologists can correct in a long time. Spray according to the condition of your fruit at a given time, and the weather conditions. Spray according to the stage of development of your fruit. Some people begin spraying, for instance, on the south side of the orchard, or on the east side, without stopping to think that some apples blossom earlier than others. As regards the weather, spray *before* rains, *not after*. Rain will not wash Bordeaux Mixture or Lime Sulphur off of our trees. Every fungus that causes disease, is scattered *during* rains, and infests the fruit. It gets into the fruit *during* rain, and *not before*. We want the poison on the fruit or leaves when the rain comes.

PRACTICAL DEMONSTRATION IN THE BOXING OF APPLES.

BY C. C. VINCENT, *Asst. Horticulturist Oregon Agricultural College and Experiment Station, Corvallis, Oregon.*

The box apple trade has been given more attention in the great distributing territory, east of the Rocky Mountains, this year, than ever before. For several years commission men in all the large cities pursued an attitude of indifference in regard to the bushel boxes, which are so much in evidence in the Pacific Northwest. But so much fruit has appeared in the eastern markets in boxes, that eastern dealers are obliged to recognize it.

Mr. E. P. Loomis, a prominent dealer in New York City, says: "The tendency of our association is too much an association of barreled apples." "I believe packing apples in boxes is an advance in the industry." I honestly believe that if the boxing of fruit was resorted to, it would do away with the fraud and deception that is practiced with barreled fruit. It would necessitate the handling of number 2 apples as number 2's. The time is not far distant when many of the most progressive growers in the East will market their fancy fruit in boxes.

The recent New England fruit show, held in Boston, has been a step in the right direction. It has demonstrated the fact that

eastern fruit when placed in boxes, compares very favorably with the western boxed fruit.

The sales indicate a growing demand for boxed fruit. While on the demonstration fruit train, which ran through the fruit growing sections of New York, a commercial orchardist stated to me that he had received \$2 per box for his Dutchess apples this season. A commercial grower in the Hudson Valley sold some fancy apples for \$3 per box (f. o. b.), local railway station. What these men have done, others can do, if proper care and attention is given the selection of the fruit.

Those who are unfamiliar with western methods wonder why it is that the growers are able to receive such large prices for their fruit each year. It is a well known fact that they have been and are receiving as much per bushel box as the eastern growers are receiving per barrel—3 bushels. This fact is especially true in the London and Liverpool markets.

The reasons are obvious. The English buyers know that every apple is uniform in size and shape. They can depend upon the western boxed fruit as to quality. Thus they can afford to handle this fruit at a much narrower margin of profit than apples in barrels.

What has been done in the West can be done here in the East. Right here in this locality, if the progressive growers will band together. This organization is a step in the right direction.

From what observations I have made in New York and also in Pennsylvania, I find that you *can* grow the fruit. Your exhibition has demonstrated that fact. The color of your fruit is excellent. The next problem is the placing of this fruit on the market in the most profitable way. The solution to this question, I believe, will be the adoption of the bushel box.

This morning I will give a practical demonstration in the boxing of fruit, as is practiced on the Pacific Coast. Such points as picking and grading will also be briefly discussed.

When to Pick.

The time to pick the Spitzenburg, or any red apple is usually ascertained by its color. Many growers make the mistake in picking their fruit too green. Fruit lacking in color is usually a drug on the market. With flesh colored apples, like the Newtown, etc., the time of picking is regulated by the coloring of the seeds. In general though, any variety is ready to be picked when the stem separates readily from the spur. The breaking off of the spurs should never be tolerated.

Orchard Boxes.

Just before the harvest begins the orchard boxes are scattered along the rows. This avoids unnecessary delay in the operations.

Member. What is the shape of those orchard boxes?

Answer. Similar to the box the fruit is packed in. They hold about a bushel, and are made of a little heavier material than the packing box. Cleats are placed on the ends, so that the boxes can be piled one upon the other. I do not advocate the use of the packing box for orchard purposes; new clean boxes are preferable for the marketing of the fruit. Put a dirty box, filled with apples

on the market, and notice the effect. The crew of men who are under an orchard foreman are supplied with the necessary picking receptacles, ladders, etc., and then the work begins.

Member. What do you pick the apples into?

Answer. Many of the growers use galvanized iron pails. They are of such a size (10 in. x 10 in.) that they can be lowered into the box, thus eliminating the bruising of the fruit to a very great extent.

Member. How about a bag?

Answer. Personally, I am not in favor of the bag; for in climbing up and down the ladder, and in stooping over, the fruit is very likely to get more or less bruised.

Chester Tyson. It is customary here to use the half-bushel drop handle basket.

Member. Is the pail round?

Answer. Yes.

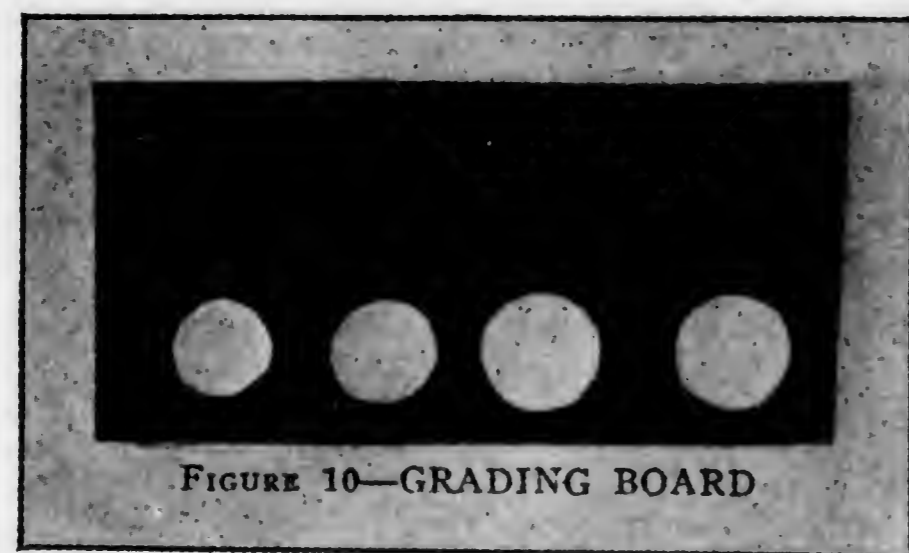
As soon as the orchard boxes are filled with fruit, they are taken immediately to the packing house. The fruit is never allowed to remain exposed to the sun's rays for any length of time.

Packing Houses.

These vary in size and shape, according to the whims of the orchardist. In some instances I have known men to use large tents for this purpose. In the construction of packing houses there are a few points well worth mentioning: One requisite is light; by all means have plenty of windows in your building. Another is plenty of room. Build a large, roomy house.

Grading.

The apples, on their arrival at the packing house, are placed at the ends or in the center of the building. A crew of men begin im-



(Courtesy of "Better Fruit.")

mediately to sort the apples. I have here a sizing board (Shows board about 6 inches wide and 2 feet long, with a row of holes through the center, varying in diameter from $2\frac{3}{8}$ inches to $3\frac{3}{8}$ inches in regular sequence), which represents the different sized apples that are put up in boxes. This board (See Figure 10) is placed up in a convenient place, before the sorters. As soon as the grader has trained his eye, and this it will not take him long to do, he will be able to

discard the grading board for the most part, and can tell at a glance if a certain apple is going to fit in a certain pack. If in doubt, he holds the apple up to the hole, but never drops it through. Some men, the grower finds, soon adapt themselves to this method and become very proficient graders. But, just as you have found in barreling, some men will never learn how.

Packing Table.

The packing table, which stands before you (See Figure 1), represents a style of table that is used quite



Fig. 1. Packing Table in General Use. (Courtesy Better Fruit.)

extensively throughout the West. The table is about three feet high, three feet wide, and three feet long. The uprights are made of 2 inch x 4 inch material; sides, 1 inch x 6 inch. The legs are beveled off so as to leave no sharp edges to bruise the fruit. The top is covered with canvas, which is allowed to sag or hang rather loosely. To serve as a double protection to the fruit, rubber hose is nailed around the top of the table. A board nailed across the end and one on the side of the table, serve to support the box, which is placed on an angle.

Box Material.

Pine or spruce appears to be the best material for boxes. This material is delivered to the grower in shooks. He makes his own boxes. An expert can put up from 200 to 300 per day. Cleats are placed on the tops and bottoms of the boxes. Cement coated or barbed nails are used. We have two sized boxes in general use in Oregon; one is known as the California Special—this box that is before you,—having inside measurements 10 in. x 11 in. x 20 in.; the other is the Standard, having inside measurements of $10\frac{1}{2}$ in. x $11\frac{1}{2}$ in. x 18 in.

Details of Packing.

Uniform sized apples are brought to the packing table. The packer now begins his first operation, i. e., the lining of the sides of the box with lining paper. This is nothing more or less than com-

mon white wrapping paper, which is just a trifle smaller than the length of the box, and about 26 inches in width. The ends are very seldom lined. The next step is to put in the layering paper. A sheet of paper is placed between each layer of apples, and also on the bottom of the box and on the top before the lid is nailed on. If the California Special Box is used this paper would be $10\frac{3}{4}$ in. x $19\frac{3}{4}$ in. in size. It serves a purpose, as it has a tendency to hold the apples more firmly in place.

The hood is now hooked over the side of the box to hold the paper. The wrapping paper varies according to the size of the apple. For three tier and three and one-half tier apples, 10 in. x 10 in. paper is large enough. Smaller sized apples will wrap up very nicely in 8 in. x 10 in. paper.

A monogram is stamped in the center of each paper. This usually contains the grower's name. The paper is prepared by a certain process; one side is smooth and the other side is left a little rough. This rough side is placed next to the apple.

Wrapping the Apple.

Every packer has his own way of wrapping an apple. I pick up the paper with my left hand, thus, with the corners diagonal, and with my right place the apple in the center, bringing the outer edge of the paper over the apple, then turning it, thus bringing the smooth surface up and the bunch on the bottom. This serves as a cushion. The apple is now placed in the bottom of the box. Repeat the performance until the layer is finished. Then place in the layering paper. Continue the operation until the box is filled. Every apple in the box is wrapped. To aid the packer in the picking up of the paper, a rubber band is placed over the thumb or fore-finger. An expert can put up from 50 to 100 boxes per day. His ability of course will vary with his practice and training in that line.

Styles of Packs.

At the present time there are two styles of packs, known as the square or straight and diagonal pack. In the square pack the apples are placed one upon the other. In the diagonal pack (See Fig. 2), there is less danger of the apples bruising in transit, as no one apple rests upon another, but fits in between the four apples below. Undoubtedly before many seasons pass, the diagonal pack will be the one most largely used. If only the two sized boxes were used, all apples could be packed diagonally. For instance, all the apples that would pack square in the California box, could be packed diagonally in the Standard box. The 3 tier, 4 tier, and 5 tier apples will pack up in the square pack. The $3\frac{1}{2}$ tier, $4\frac{1}{2}$ tier, can be placed in the diagonal pack.

The classification of the apples contained in each box, as is designated by the tin labeling, is as follows:

- 3 Tier Apples in the Standard box, 45 to the box.
- 3 Tier Apples in the Special box, 54, 63.
- $3\frac{1}{2}$ Tier Apples in the Standard box, 64, 72, 80, 88.
- $3\frac{1}{2}$ Tier Apples in the Special box, 96, 104, 112, 120.
- 4 Tier Apples in the Standard box, 96, 104, 112, 120.

- 4 Tier Apples in the Special box, 128, 144.
- $4\frac{1}{2}$ Tier Apples in the Standard box, 150, 163, 175.
- $4\frac{1}{2}$ Tier Apples in the Special box, 185, 200.
- 5 Tier Apples in the Special box, 200, 225.

Unless the apples have been properly graded beforehand, no such system of classification can be obtained. Probably the best place for the 5 Tier Apples, is at the evaporator or cider factory.



Fig. 2. Celebrated Diagonal Pack.
(Courtesy of "Better Fruit.")

Mr. Bassett. In the diagonal pack, are you not selling a lot of empty spaces, instead of apples?

Answer. No; if the apples are properly graded, the spaces are confined to each end of the box.

Starting the Packs.

Very little trouble will be experienced in starting the square pack, i. e., if the apples have been properly graded. With the 3 Tier Apple, which is $3\frac{3}{8}$ inches in diameter, it requires 3 apples to fill up the space across the bottom of the box, or in other words there will be 3 rows in width and 3 layers in depth. The 4 Tier Apples require 4 rows in width and 4 layers in depth.

The diagonal $3\frac{1}{2}$ Tier pack (See Fig. 3) is started differently. In this style one gets $3\frac{1}{2}$ rows in width and 4 layers in depth. The first apple is placed in the lower left hand corner of the box, another apple is placed in the center. The following two apples are pressed firmly in the places which are left. This is sometimes called the 2-2 pack.

To start the $4\frac{1}{2}$ Tier pack, place the first apple in the lower left hand corner of the box, another in the lower right hand corner, and another in the center. Two apples are then pushed down, as far as



Fig. 3. Method of Starting $3\frac{1}{2}$ Tier Diagonal Pack.
(Courtesy of "Better Fruit.")

possible in the spaces that are left vacant. The $4\frac{1}{2}$ Tier pack is also known as the 3-2 pack.

The Bulge.

Inexperienced packers will have some little difficulty in getting the proper bulge to the box. Practice, however, will obviate this. When the fruit is packed, the apples at both ends should come up flush with the top. In the center they should extend a little higher.



Fig. 4. Left Box Too Flat, Middle Just Right, Right Too High.
(Courtesy of "Better Fruit.")

(See Fig. 4). There is more or less of a gradation between one sized apple and another. For instance between the 3 Tier and $3\frac{1}{2}$ Tier. To obtain the proper bulge, which should be from 1 to $1\frac{1}{2}$ inches, the packer selects apples that are a trifle smaller for the ends, working those that are a trifle larger to the center. In case the apples are of the same size and are being packed on the cheek, in order to obtain the proper bulge, the end apples are turned with the stem ends up. Every box of fruit should have a swell (See Fig. 5). As soon as the box has been filled it is taken to the nailing press (See Fig. 6) and the cover placed on.

Lithographs.

On every box is placed a neat, attractive lithograph. This adds very much to the appearance of the box, and aids materially in selling the fruit. A cheap, gaudy label detracts rather than adds to the appearance. A lithograph should contain the grower's name, the

name of the locality, and also the name of the state where the fruit is grown. For instance, "Bendersville, Pa." Let "Pennsylvania" stand out in bold relief. If this is done and the box contains fancy fruit, the grower will soon establish a reputation for himself.

On the other end of the box is stamped the number of apples in the box, the packer's number, the grower's name, and the word

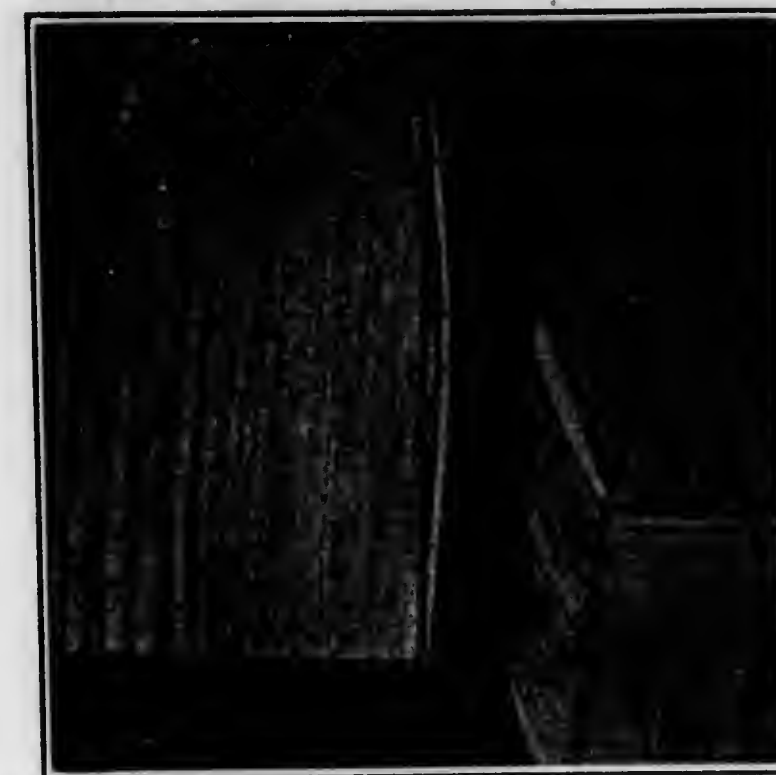


Fig. 5. Side View of Boxes After Nailing, Showing Proper Bulge in Top and Bottom.
(Courtesy of "Better Fruit.")

"fancy." Every consumer on buying a box of apples knows that he is getting a definite number.

Question. How are boxed apples going to be placed in the car without bruising?

Answer. The boxes are placed on their sides. Cleats are laid



Fig. 6. Nailing Press. (Courtesy of "Better Fruit.")

between the layers, thus allowing for the spring of the car.

Question. Is there any difference in carrying, whether the fruit is packed on the end or on the cheek?

Answer. There may be, but it can hardly be avoided if the proper bulge is to be secured. Certain varieties, like the Spitzenburg, pack up better on the cheek.

Question. How do you make the layers come out?

Answer. Each style of pack has a definite number of layers. Examples: The 3 Tier pack always has 3 layers; 3½ Tier 4 layers; 4 Tier 4 layers; 4½ Tier 5 layers.

Question. Would you not have to pack some tiers both ways, a couple of tiers on the calyx end, and several on the cheek?

Answer. Yes, that is done. If the fruit is being packed on the cheek, and the packer finds he is not going to get the proper swell, the middle layer is turned.

Question.—Mr. Bassett. Does the man who does the packing, do the grading?

Answer. No.

Question. What does the grading cost?

Answer. The graders are paid by the day.

Question. Do the graders use tables?

Answer. The fruit is usually graded from one box to another. This avoids unnecessary handling.

Question. About what is the net cost of putting up a box of apples?

Answer. Packing costs 5 cents; box material, from 10 to 12 cents; wrapping, lining and layering paper, 1 cent. Probably 18 or 20 cents would cover the cost.

Question. The York Imperial has two rather distinct forms we find running together; a flat apple and one quite the reverse. The apples might caliper the same, yet be difficult to pack. How could this be managed?

Answer. You would probably have to make separate grades of the two forms. The long type would pack up nicely on the cheek, while the flat type could be packed better with the stems up.

Question. Those individuals who have adopted the box system out there, have they eliminated the barrel system altogether?

Answer. Yes.

Question. Do the men out there ever get any good sized apples that do not have color enough to put up in boxes?

Answer. Everything is packed in boxes. If the fruit is a little off color, a large L is stamped on the end of the box.

Question.—Mr. Bassett. What constitutes a number two?

Answer. Blemished to some extent.

Question. What do you mean by blemished?

Answer. An apple affected by hail; small scabby spots, worm punctures, etc.

Mr. Bassett. One trouble about the adoption of the package in the East seems to be that the commission men discourage it.

Answer. This has been done largely in the past, but I believe the commission men are now forced to recognize the box package here in the East.

W. E. Grove. What kind of wood do they use for the boxes?

Answer. Pine or spruce. Soft wood. I do not think the growers will have any trouble in getting the material. Maine, I understand, has from 21 to 22 billion feet of standing spruce.

Mr. Bassett. Do you buy the material knocked down? That is, buy the shooks and make the boxes yourself?

Answer. Yes. The material costs from 10 to 12 cents, knocked down.

C. J. Tyson. A grower in New York told me he could bring box wood from the Pacific Coast as cheaply as he could buy in New York, and get more satisfactory material.

Question. How do you keep posted on market conditions?

Answer. Through the Association. Some days telegraphic communications at the Hood River Valley Association would amount to \$100. An individual could not afford that expense; but to an association having 200 to 300 members, the expense is very slight. Mr. Paulhamus, President of the Puyallup Fruit Growers' Association of Washington, stated that just before they began to market their fruit, one man was stationed in Seattle, one in Spokane, one at Boise, Idaho, etc. All these men make daily reports as to market and climatic conditions. If it was found that a car of small fruit was going to Boise, Idaho, and that it was very cold at Boise, and very warm at Spokane, the destination of the car would be changed and be sent to Spokane instead. The destination of the car is changed according to climatic conditions, slumped markets, etc.

Question. Is it possible to grade apples into different sizes by machines, and if so, describe the machine and operation.

Answer. I do not know of any machine that is offered for sale that would be applicable for the grading of apples.

The orange graders I hardly believe would answer the purpose, as there would be too much bruising of the fruit.

SPRAYING FOR SAN JOSE SCALE AND CODLING MOTH.

(STENOGRAPHIC REPORT.)

PROF. THOMAS B. SYMONS, *State Entomologist, College Park, Md.*

Mr. Chairman, Ladies and Gentlemen: I congratulate the members of this association on having such an active county organization. I indeed consider it a great privilege to be with you this morning. As Lincoln, not far from this spot, urged his fellow countrymen to save the Union, so I urge you to wage relentless war against injurious insects.

I gave your secretary the subject for this morning's talk rather hurriedly, and I would ask the chairman not to hold me strictly to the title of the address, as I wish to mention at least one other insect that is of considerable importance at this time.

As to the San Jose Scale and the Codling Moth, I shall simply try to supplement the work that your most efficient entomologist, Prof. Surface, is doing in this State. I congratulate the growers of Pennsylvania that they have been able to get the State to sufficiently appreciate the importance of this work to appropriate at least \$40,000 for the control of injurious insects and plant diseases. The State is really up-to-date in that respect; and I hope that other Eastern States will appreciate the importance of the control of these pests. From the standpoint of co-operation, I tell you men, individually,

we are a mighty small proposition among 90,000,000 of people. It is only by combining, as you gentlemen are doing, that you can get the results you desire; and in order for the farmers to get their just results, it will be necessary to combine to compete successfully with those interests that also combine. And the sooner the farmers of the East and West appreciate that point, the sooner they will get a more just reward for their efforts.

In discussing the San Jose Scale, I recognize that you men are up-to-date, and have been spraying for San Jose Scale for many years past. I believe that the men whose faces I am looking into, have long since appreciated the fact that they are not afraid of the San Jose Scale; that it can be controlled. We have learned that. The only point, and the prevailing question that is asked to-day in regard to the San Jose Scale, is: What solution is the most effective, the easiest to apply, and the cheapest. We have learned the most effective solution. The home-made Lime Sulphur wash has been thoroughly established as an efficient remedy for this pest; but the question confronting the farmers and fruit growers of to-day is to get a solution that is effective, is also easy to apply, and cheap.

The conditions governing the application of spray materials are of considerable importance in emphasizing the ease of application. The labor problem is presented to every farmer; and if he can get a remedy which he can have easily applied, and more satisfactorily applied by his laborers, he is after that solution. The manufacturing people appreciate that condition, and have been constantly putting on the market various solutions looking towards the control of this pest. They finally learned that the growers wanted to use Lime Sulphur, and they have now put on the market several brands of Lime Sulphur Solution. I would say my remarks upon the different solutions are based upon my experiments conducted during the past two years in orchards. I wanted to know, first, whether a concentrated lime sulphur solution would be as effective as a home-made one; and in order to learn that it was necessary to test it on the trees. I have done this for two years,—the past year more extensively than the previous one; and from the results of the past year, so far as we could observe from careful examination on Peach and Apple, sprayed in fall and spring, it seems that some of the concentrated solutions have compared favorably with the home-made wash. They have done all that is to be expected of them, both on Apple and Peach. I'll have to admit that the past season has been a very easy one, so to speak, for the solutions to control the scale. We had an exceedingly dry season in this part of the world, and, as you know, the Lime Sulphur remedy controls the scale, by virtue of its lasting qualities on the trees,—rather than the immediate effect when applied,—and by having less rain, the wash remained on the trees, and thereby cleaned up the little tiny crawling young reproduced in June and July. So, I would preface my remarks by saying that this is simply one season's work; and as fruit growers, you will not put your dependence in any one season's work in anything; but so far as we know by the past season's experience, I believe the concentrated washes will compare favorably with the home-made; and it is a question that the individual grower must decide—whether he wishes to use the concentrated wash. Personally I have

always been a crank on Lime Sulphur. I recognize in Lime Sulphur that we are applying something that cannot hurt your trees, no matter who does the spraying, or how it is done. I also recognize that it does not spread quite as readily as the oil; and that's the only point in favor of the oils that makes them advantageous on Apples; and in my experience, covering ten year's of experiments, I have been able to get just as good results from Lime Sulphur on Apples as from the oil; but I grant you it requires more thorough work. The San Jose Scale is harder to control on the apple than on the peach.

Several Brands of Lime Sulphur Were Used In Our Tests.

Practically speaking, they are about on the same basis, and practically speaking, it is up to the individual whether he wishes to use the commercial compounds or to make his own Lime Sulphur. If he has gone to the expense of buying a boiler, the latter is decidedly the cheaper wash. It is in my opinion the best wash when you make it properly; but in considering the labor, the trouble in making it, the commercial solutions offer quite an inducement to use them; and my advice to the fruit growers is to simply put it on a financial basis. If you have a man that will handle and make the home-made, and you have everything for making it, I should certainly use it. If, on the other hand, you do not wish to go to that trouble, you have the concentrated wash from which you certainly can reasonably expect the same results.

Member. What dilution, Professor?

Prof. Symons. I would recommend 1 to 9; in bad cases 1 to 8.

E. C. Tyson. Do you not think that the matter of time, being able to spray promptly when the winds are favorable, would be very much in favor of the concentrated solution?

Prof. Symons. You mean that it would take time to make the solution? Yes, there is that advantage. Furthermore, I think that people who have been spraying for years, have yet much to learn. None of us know it all; and the man or woman who thinks he or she knows it all, might as well quit. We think we know something about spraying. I believe we have a lot to learn, even at this time. Certainly a great many of us do it in the hardest and most disagreeable way. It reminds me of a story I heard last week down in Baltimore. Mr. Shemberger, of Baltimore County, is trying to get the Baltimore Countians together, working on the Good Roads Movement. He said a good many of the backwoods farmers were a great deal like the old man and his son that kept quite a number of cattle. In the arrangement of the stable, they had the bull in the first stall as you came into the stable. This bull had the peculiarly pernicious habit of kicking as you passed by him—every time you went by him, he kicked. One day a visitor came, and they wanted to show him the cattle,—the cattle were kept at the other end of the stable. On entering the stable the injunction he received was: "Look out for that bull; that animal will kick you; we always have to be very careful in going by here." "Look here, my friend," said the visitor, "would it be any trouble to move that bull down into the last stall, and put the cows up here?" "Well, I declare," said

the man, "I never thought of that; father always kept him in the first stall, and I did not like to change him."

It's just these little things that we have to learn. And in spraying it's all foolishness to have your men and teams all covered up with spray material; it's up to the growers to work out this problem. Study it, and always work to advantage. And that brings in the time of application. We have done considerable work in spraying—spring and fall. I think you can spray just as well in the fall as in the spring.

Member. Have your results been better?

Prof. Symons. Our results have shown no appreciable difference. Have always advised spraying in spring, merely because I think the wash remains on the trees a longer time in summer. Furthermore, in treating with Lime Sulphur wash, I think you are getting more fungicide effect than you would in the fall. I believe there is some difference there. In spraying tests it is mighty hard to tell the difference.

A word in regard to oil sprays. I have nothing against oils, save the fact that I do not believe they are good for the Peach Trees. I am very much like the old darkey in regard to oil. A darkey congregation was holding services in an old church; a storm struck it, and put the church in a pretty rickety condition. The following Sunday, the congregation assembled. The preacher gathered his flock about him, and was about to begin services when he discovered Maria standing outside under a tree. "Why, Maria, come in to service," said he. "No, sir; no, sir; boss," said Maria, "I trustes the Lord, I do; but I never fools with Him." So, I do not like to use oils on Peach trees. Understand me; I agree, you can spray with pure kerosene oil, and do it without injury, if you are careful and do the work yourself; but if left to your men to do, there is the possibility of injury. I know of one man, who I had thought would soon be the Peach King of the Eastern shore. The last time I was at his place he had about eight thousand peach trees. Happening to meet him a year or two later, I asked him about his orchard during our conversation, and his surprising remark was, "I haven't a peach tree on the farm." "What's the matter?" said I. "What in the world have you done?" "You know," he said, "when things don't go right, I pull them out." "Yes, I know," I replied. "Had scale," said he, "and sprayed with Target Brand."

There are lots of people who have sprayed with oils and gotten no injury; but we are running somewhat of a chance on peaches.

Mr. Adams. Does the damage show itself around the collar?

Prof. Symons. No; usually by killing the smaller twigs inside. I know of a man who lost half of his crop in this manner. Oils can no doubt be used on apples with satisfaction. We have gotten just as good results from oils—soluble oil—"Scalecide," this past season, as we did with the Lime Sulphur. To show you the condition,—that the people are in doubt as to what they should use, I received a letter from some fruit growers in Virginia the other day, asking what I thought of San-U-Zay; that they had not received good results from the concentrated Lime Sulphur Solution on Apples; and that they had about made up their minds to spray with oil. They

especially wished to know about San-U-Zay. Knowing that I had tested many of the oils, they asked my opinion.

I wrote something as follows: "Last year we tested San-U-Zay, and it was absolutely worthless. Last fall we sprayed with San-U-Zay, and also in the spring. The fall treatment killed the scale and did no injury to the trees; the spring treatment killed the scale, but did injury to the trees." I wrote them that the evidence had led us to believe that the San-U-Zay could be used on apples, as in our test the fall treatment did not do any injury.

Member. That is not a miscible oil, is it?

Prof. Symons. The San-U-Zay is not exactly a miscible oil, because you have to use Sal Soda in mixing it. In the first year they did not tell us to use Sal Soda, and we went ahead with the regular directions, and did not get results. I wrote to Mr. F. G. Street the other day, and asked him for another sample of oil. He said he had decided to discontinue sending out five-gallon samples to experiment stations; that he did not consider it a fair test; and having such a great business, did not desire to do any more work in that line. I simply acknowledged the letter and gave him my views in the matter.

Member. I had a little experience with that company. I read their circulars, and thinks I, it's all right, sent for a barrel. When the barrel came, I saw the directions to put some Sal Soda in. I had expected a material ready to put on the trees. I was disappointed, and asked that they take the barrel back. They did not want to do it; but I told them I did not want to bother mixing oils, and would pay the freight both ways. They then took the barrel off my hands.

Prof. Symons. The sooner the farmer appreciates the fact that he should not believe everyone that comes along with a silver tongue, the better it will be for him. It is absolutely useless for men to try on an extended plan a solution that they know nothing about. That is the value of the experiment station. The five-gallon experiment is a small one; but everything is on an equal basis, and is made as nearly perfect as can be under the circumstances. It does give me a better opportunity to answer a man's question with partial intelligence at least. If a man writes in to me and says, "What do you know of San-U-Zay?" and I write back to him, "Do not know anything about it," he gets my letter and says, "I'll try it." If I can tell him that I have tried it, and had good or bad results, I do give him a fact to go by. That's the reason I test these solutions. It is very tedious at times. We have learned, however, that what the farmers want to know is—What is effective along with ease of application?

Geo. Fohl. If you boil Lime Sulphur, what proportions do you use?

Prof. Symons. Twenty pounds lime; 15 pounds sulphur.

Geo. Fohl. How long do you boil it?

Prof. Symons. Three-quarters of an hour, or until it has produced an amber colored solution.

H. M. Anderson. Does not the color of the solution depend on the lime you use?

Prof. Symons. No; usually on time of boiling.

H. M. Anderson. Are you sure?

Prof. Symons. Yes; if you get a good quality of lime, it gives less sediment, that's all.

Geo. Fohl. Is the amount given right for fifty gallons of water?

Prof. Symons. Yes.

Member. How do you boil it?

Prof. Symons. Get a small boiler, or steam engine, or anything of the kind. If you have an orchard of a thousand trees, a vat, costing five dollars, can be made out of wood, with tin bottom, that will serve. Make a hole in the ground and set it over. Boil twenty gallons of water; pour in part of the lime, then add the sulphur—mixed into a paste—then the balance of the lime. After it has been boiled for three-quarters of an hour, add sufficient water to make fifty gallons.

L. M. Myers. Have you ever had any injury from Scalecide on peach trees at the recommended strength of application in your experiments?

Prof. Symons. No, not in my experiments; but I have had reports of such injury.

L. M. Myers. At the recommended strength?

Prof. Symons. Yes. I heard of two or three cases year before last—the injury was slight. I do not know whether it was due to the season or not. Scalecide is one of the best oils on the market; but I hesitate to recommend the use of oil at all on peach trees.

L. M. Myers. In your experiments, do you find that you can kill a larger per cent of scale with Lime Sulphur than with oil?

Prof. Symons. In our tests, yes; but I know of a great many people who have had a different experience from that. Now, for instance, as a striking illustration, I know of a prominent orchardist near Hagerstown, who sprayed his apples with Thomsen Chemical Company's Lime Sulphur Solution, and did not secure good results. I have learned, however, that he had this Lime Sulphur put on by laborers on the farm, and that it was a very inefficient and poor job of spraying, and did not give good results. You have got to spray more thoroughly with Lime Sulphur than with oils. We picked out an awful orchard for our test this past year, and got good results.

W. H. Black. Does the commercial Lime Sulphur spread any better than the home-made?

Prof. Symons. I hardly think so. In using the concentrated I always like to add a little lime. I usually add a little over two pounds of lime in the form of milk of lime, to one barrel of the Lime Sulphur. It enables you to see what you have done. Before I added the extra lime I could not see where I had started or where I had left off; and that's the reason I advocated the use of milk of lime.

Mr. Eldon. Is there any other advantage to be obtained from the use of milk of lime?

Prof. Symons. There is no advantage, except in seeing where you have sprayed, and it may aid in prolonging the effect of the Lime Sulphur.

Mr. Eldon. If it stays on, it is that much of a deterrent?

Prof. Symons. Yes, sir. You are killing scale by the causticity of the solution. It kills not only the dormant scale; but the

crawling scale that comes later, is also killed by this prolonged action. We looked at the trees in June and found them badly infested; we looked at the same trees late in the summer and found ninety per cent of the scale killed.

A. I. Weidner. Will Lime Sulphur not have a tendency to drive the young crawling scale onto the fruit?

Prof. Symons. I would not think so, Mr. Chairman. I would not think so. Of course, there may be a point in that. I would much rather take chances on a twig effectively sprayed with Lime Sulphur, than on a twig with nothing on it whatever, because the scale that has come out, is hunting for an easy place to put its beak. They will crawl for twenty-five hours looking for a convenient place to insert their beaks. Of course, if the fruit is near, they will infest that.

A. I. Weidner. I have not made a careful examination; but late in the season, just before picking time, the scale developed considerably on the fruit. I do not know how it is on the limb—I have not examined that, I have been sick, and was not able to do it.

Osage Orange Hedge.

Prof. Symons. Another thing I want to call your attention to, is the fact of the Osage Hedge being a common breeding place for the San Jose Scale. I believe you do not have much of this Hedge in this county. Maryland has large quantities of it. The Osage Orange Hedge is a dear one to any farmer. It is a nuisance. It is a make-shift fence at the best, and cannot be counted upon to turn cattle. It is expensive to keep in shape, and certainly the work of trimming it is very disagreeable work. The expense of keeping it in shape will be more than that of replacing it with a good wire fence. It draws on the land ten to fifteen feet for food and moisture. Finally, I have made careful observations of the Osage Hedge in Maryland, and have not seen one that was not infested; and they simply serve as distributing points to other places. I certainly urge men to eliminate this form of hedge from their farms. Washington County has considerable of it.

Peach Lecanium.

The Peach Lecanium, or Terrapin Scale, is a pest we have known for the past half a dozen years, but one that we had not looked upon as being a serious pest, or which we had entertained any doubts of being able to control. The past season, however, has changed our opinion on it. It has spread rapidly in Maryland. I know of one case, from responsible hearsay, that it occurs in Pennsylvania. I understand that Mr. Wertz has an infestation in his orchard. I do not know as to other conditions in the State. I know, however, that in our State it has caused considerable loss to the smaller growers this past season, and I ask you all to look out for it. You will observe that it is a tiny scale, but much larger than the San Jose, belonging to a larger class of scale insects. San Jose is a hard scale, the Lecanium is a soft scale. In 1907 we observed this pest in Maryland, and in one orchard at Smithsburg it was starting on a few trees. So I had one of my assistants take up some work on it.

We had previously had infestation at College Park on plum trees. It was not until 1908 that it was found to be indigenous to Pennsylvania, New York, and some of the Western States, and most of the States east of the Mississippi. It seems to have a general range of distribution, and has not been of any marked importance except during the last year. It was found to affect the plum and peach tree primarily, but will also be found in others, as, for instance, the sycamore and oak. In the plum orchard at the college, it was found that there was a fungus there that cleaned it out; and that started our work in the orchard at Smithsburg. I will cite briefly the manner of injury by this pest. It does not do its injury as does the San Jose Scale. The San Jose Scale does its injury by devitalizing the tree, sucking the juices of the tree, and killing it. This insect, though sucking the juices of the tree and leaves, does not seem to kill the trees outright to the extent that the San Jose Scale does. It seems to attack only the outer twigs, leaving the larger limbs free, and therefore, does not kill the tree; but the injury is due to the fact that the scale insect secretes a honey dew, which gives rise to a dark fungus that lives on the honey dew, and affects the fruit. This fungus spreads all over the fruit on the tree, making it dark, unrepresentable, and unsalable, and the loss has been due to the fact that the fungus scarred the fruit, so as to make it unsalable at the proper prices. So, it is a question of considerable importance, and the spread of it this year leads us to believe that we have certainly got to get after it; and the question is, how should we get after it. In our tests with the Lime Sulphur and the miscible oils in 1907, we secured fairly good results. Thinking that the Lime Sulphur would be sufficient, and that the orchards that had been sprayed with Lime Sulphur for the San Jose would be protected, we felt secure. We found, however, that the Lime Sulphur made no difference. It spread through the whole orchard. We are up against it as to what to do at the present time. There are several other parties around Smithsburg that have it more or less, but not to the extent of the orchards referred to.

This insect winters as an immature female. Early in the spring it begins to grow, and reaches maturity about the first of May. Later it begins laying eggs, and itself dries up, like the oyster shell scale. The eggs hatch out about the first of June. The young ones crawl out. Instead of inserting their beaks on the limbs, as does the San Jose, these insects go out on the leaves, up and down the ribs on the under side of the leaves. If you examine the peach trees the first of June, you will find a soft, flat little scale out on the under side of the leaves, up and down the mid rib. They stay there six weeks, secreting their honey dew, and the fungus drops down and gets all over the peaches. In about six weeks they return from the leaves to the twigs, and remain there, developing over winter as an immature female. This scale is unique in its habits, in that it infests both the twigs and the foliage. We had thought that spraying the trees just as the eggs are hatched, or when they are going out on the leaves, with kerosene emulsion, would kill them; but this did not prove to be the case. The emulsion should be applied just as the eggs are hatched. I cannot at this moment give you any advice as to the controlling of this pest; but experiments are under way, and

we do know that so far the oils seem to be effective. I was in an orchard about the 10th of December, where the oils had been applied a week previous, and quite a number of the scale had been killed.

Member. Do they infest the apple?

Prof. Symons. They do not infest the apple.

Prof. Symons. You had better look over your orchards and see if you can find the Lecanium; and if you find it, you had better spray with oil now, because the fact of losing a crop of fruit would be nothing in comparison with having that scale spread in your orchard. I would suggest now, the use of the oils 1 to 15 for this scale; and if you find this Lecanium, I would use the oil right now, —the sooner, the better.

Mr. Newcomer. What color is the fruit of an infested tree?

Prof. Symons. The fruit looks just as if you had taken soot out of the chimney and thrown on them.

Mr. Newcomer. Some of the leaves, also?

Prof. Symons. Yes. And the fruit has this fungus all over it.

Member. What would be the effect of self-boiled Lime and Sulphur as a fungicide for that condition?

Prof. Symons. We have not had the experience. It would probably help it.

Member. Have you any points on it?

Prof. Symons. Well, no sir; I would not express an opinion; but my advice would be to consult the pathologists and Mr. Fulton, of Sleepy Creek, as I understand he had fine results the past season.

Prof. Whetzel. Did you say you used the Niagara Brand in some of your experiments?

Prof. Symons. Yes.

Prof. Whetzel. Did you use it with sediment in it, or clear?

Prof. Symons. I think it was the clear grade.

Prof. Whetzel. In your opinion, what substance in the Lime Sulphur is effective in killing the scale?

Prof. Symons. I would appreciate it if you would ask me something easier. I do not believe anybody in the world knows. The real chemical action that take place on a tree after poly-sulphides are applied, is a mystery. So far as I know, the scale is killed by the caustic effect of the solution. Oxydizing takes place, giving forth free sulphur and several other combinations; but as I say, I do not know. It is a very nice problem to work out.

Mr. Baugher. Would there be any advantage in using the prepared Lime Sulphur one to five?

Prof. Symons. I would consider that a little too strong. It would not hurt the apples; but it is going to the extreme; one to seven or eight would be the strongest I would care to use.

Finally, as to the Peach Lecanium, I simply offer this to the growers. I urge them to look into their orchards for the pest, and suggest that oil is the possible remedy. If we cannot control scale by Lime Sulphur, we must conduct some experiments with oils. We shall have to try them in the fall; if they do not have the desired effect then, we shall have to try them in the spring. We may have to use whale oil soap, which cannot be applied in the fall, while in the spring, just about the time the bud comes into leaf, it can be used with satisfaction.

Codling Moth.

In regard to spraying for codling moth, I have here a number of photographs, prepared for use at the Maryland Horticultural Society Meeting, which I shall be glad to have you examine. The figures illustrate the work of our department during the past season, along the same lines as the work done by Professor Surface in Pennsylvania.

The best means of disseminating information is to show the people the results to be obtained. Our policy is to conduct the experiments on the poor house farms of the counties. Being public property nothing can be said against any money expended by the State on these farms. The people of the county can go to these farms, and see up-to-date methods applied.

This (shows picture) illustrates the benefit of one spraying on apple trees with Bordeaux Mixture and Paris Green. I was able only to make one spraying, on account of the conditions; and it indicates what can be accomplished by simply one spraying.

As you all know, the Codling Moth is an insect that does its injury by eating into the apple and making the fruit wormy. You cannot sell wormy fruit; you want to grow perfect fruit, and get good money for it. We can easily control this pest.

W. C. Tyson. Do you prefer Paris Green to Arsenate of Lead?

Prof. Symons. I have a very high opinion of Arsenate of Lead; and in our experiments have secured slightly better results

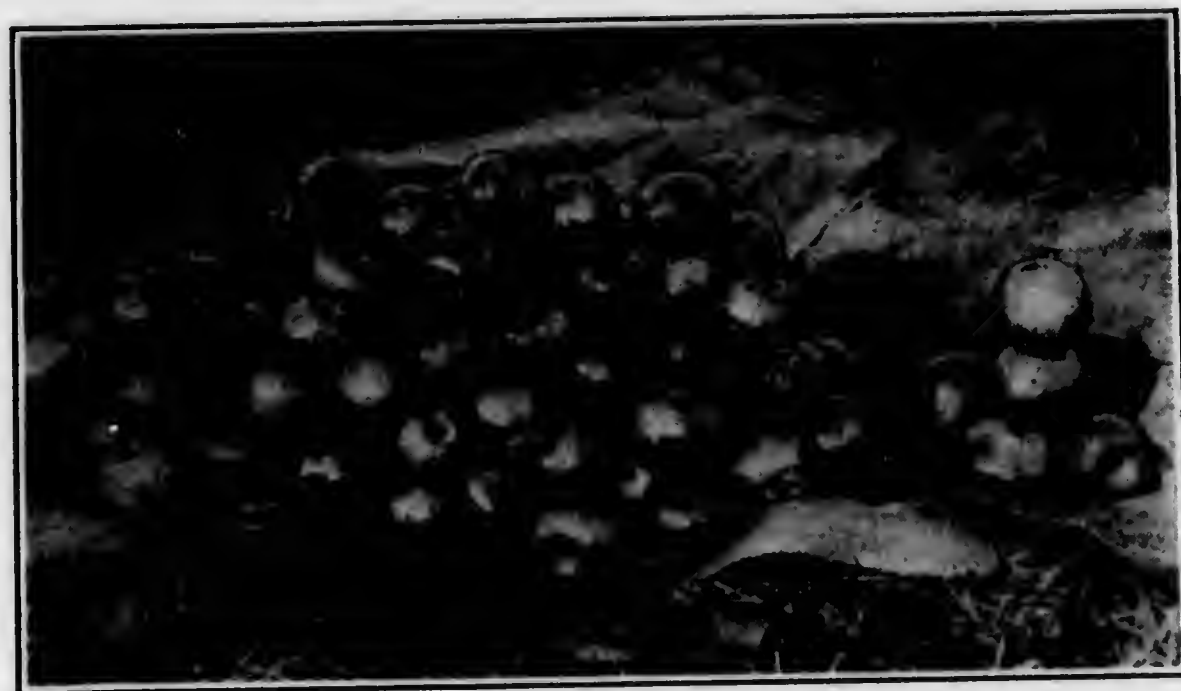


Fig. 7. Apples from Unsprayed Trees. Large Pile, Culls. Small Pile on the Right, Saleable Fruit. (Photo by Peairs.)

after using Arsenate of Lead then when Paris Green was used (See Fig. 7 and 8); but with Bordeaux Mixture there is not the difference. In these experiments I have used Paris Green; it is considerably cheaper.

W. C. Tyson. Does it stick as well?

Prof. Symons. It does not; but when applied with Bordeaux, you have the Bordeaux to make it stick.

W. C. Tyson. Is there any danger of burning?

Prof. Symons. No, sir; not with the Bordeaux Mixture.

Member. What per cent of Paris Green do you use with the Bordeaux Mixture?

Prof. Symons. One-third of a pound to 50 gallons.

Member. What formula of Bordeaux?

Prof. Symons. I think it was 4-4-50 or 4-5-50.

Member. Have you used "Pyrox"?

Prof. Symons.—No, sir.

Member. Did you make your own Bordeaux Mixture?

Prof. Symons. Yes, sir; we made our Bordeaux Mixture. I have shown you what we secured from one spraying. I urge



Fig. 8. Sprayed Once with Arsenate of Lead and Bordeaux Mixture. Large Pile not Wormy (Saleable), Small Pile Wormy. (Photo by Peairs.)

that every one of you who is trying to become an orchardist, consider the fact that you have got to raise good fruit, and that you cannot raise it without controlling the Codling Moth. I would therefore urge one spraying, and preferably two sprayings.

Member. When do you spray the second time?

Prof. Symons. Two weeks after the first. Spray just after the blossoms have fallen, and then ten days later.

Member. Is that late enough to catch that second brood?

Prof. Symons. No; the second brood does not appear until July; a third spraying is necessary to control this, but is more likely to russet the fruit at that time. The second spraying is important, however, to take care of the late-appearing moths from first brood.

Member. The first spraying would not take care of the later-emerging moths?

Prof. Symons. No, sir; except that it would reduce the number of moths for a subsequent generation.

Mr. Dunlap. Is there any chance of catching the moth?

Prof. Symons. No, sir; it is very tiny.

Mr. Dunlap. Are not bands sometimes used to catch the moths?

Prof. Symons. Yes; that is one means of catching them. If you have not sprayed thoroughly, reaching every calyx, the banding is of value in catching the escaped larvæ. These larvæ emerge from the calyx, crawl down the tree, and enter any available crevice. If you have a band around a large limb, or around the trunk, usually the larvæ will go in under this band, and can thus be readily captured and destroyed, thus preventing a second generation. We have

sometimes in this way captured thousands of them. There is a fungus that works on them. If you spray thoroughly there should not be over five or six per cent of the moths for a second generation.

Member. If you spray thoroughly, and spray only once; is that sufficient; or do you advocate second and third spraying?

Prof. Symons. I believe in being just as practical as possible. If I were in the orchard business I would spray more times than that; if I were a farmer, and found that other duties would not permit more than one spraying, I would insist only upon one spraying.

In closing, I urge that we all try to raise better fruit. "Better fruit makes better men; better men make better communities; better communities better their environments; better environments demand better roads; better roads make better counties; better counties demand better schools; better schools make better children; and better children will make a better state."

The Chairman: We are glad to welcome into membership any fruit growers, whether resident of this county or not. If any who desire to join, will give their names to some member of the association, they will be presented at the opening of the next session.

President Eldon. I want to say that a hearty welcome will be extended to anyone who desires to become a member of our association. I know you have all been welcomed here, individually and collectively; but I want to add my say-so; you know, being up here, I am in position to say the last word, and that counts for a great deal. I want to extend my welcome to you all, and a cordial welcome to anyone who wishes to meet with us. We certainly appreciate the intentions of those who, while comparative strangers, join us. It is a very high compliment. We want to feel that we are progressing somewhat year by year; and the only way we can do this is to interest those who are in our own business. The presence of you here shows that you are interested; and we thank you for your coming. If you are members of our association, we feel sure you will stay, being a unit. And thus we grow year by year.

PRACTICAL PRINCIPLES FOR PROFITABLE PEACH PRODUCTION.

CHARLES E. BASSETT, *Fennville, Michigan.*

Being a commercial peach grower in the Michigan fruit belt, I shall only attempt to give you briefly the common principles and practices of the leading growers of our section. We attempt no fancy methods—every dollar expended and every hour's work devoted to the business is looked upon as an investment. With most of us, peach production is a "bread and butter" affair. Your own experience with local conditions will enable you to judge just how far our methods can be followed successfully in your several orchards.

Soil and Location.

While a good loam is our ideal soil, we have good orchards on nearly all kinds of soil. We do demand, however, that all peach lands shall be well drained, both as to air and water, and, as moderate elevations tend to furnish both a good air circulation and water drainage, high or elevated lands are preferred.

Preparation of Soil.

The ground to receive our baby trees must be well stocked in advance with suitable food to give them a vigorous start. Plowing under clover or other nitrogenous crops, before setting the trees, furnishes humus, which is especially valuable in making the ground spongy—capable of holding large quantities of water.

Varieties.

The choice of varieties is largely a local matter. Select those which do best in your locality and which supply the demands of your market. The large plantings of peach in Georgia, Texas, etc., have caused us to discard the early varieties, especially the clings. In our section the best commercial orchards include such kinds as the Yellow St. John, Engle's Mammoth, Conklin, Fitzgerald, Elberta, Kalamazoo, New Prolific, Smock and Salway—all yellow varieties. The Champion is one of the leading white kinds, but our market calls for large, high colored, yellow peaches. Such kinds as the Barnard, Crosby and Gold Drop are excellent in quality, but are too small, under ordinary cultivation, to be wanted by our buyers. Despite its poor quality, the size color and shipping ability of the Elberta makes it the leading market peach.

Cultivation.

Our main object being quick and large cash returns, we do our utmost to force a strong, sound growth from the start by intensive cultivation EARLY in the season. Corn has been commonly grown the first two seasons between the trees, it being thought that the loss of fertility occasioned by the feeding of the corn being partly balanced by the corn's shade to the trees from the scalding rays of the sun. Later and better practice seems to omit all crops and give all the land to the peach trees. The trees are headed low—not over 18 inches from the ground—and this calls for special tools in cultivating. The extension disc harrow and the extension fine tooth drag are some of the best tools after the second year, when the trees are given the whole of the ground. Cultivation must be kept up each week to save soil moisture and make more plant food available, by bringing the small particles of soil in contact with the air.

Pruning and Thinning.

Just as a fond parent corrects in his infant child any faults that may appear, so the true lover of trees, from the very first season, rubs off any buds that appear where a limb or twig is not desired,

and he thus forms a correct head. A common mistake is to leave the forming of the head of the tree until it is three or four years old, when good-sized limbs must be cut off, leaving large scars that are hard to heal and which often leave a weakness. Allowing unnecessary limbs to grow is also a great waste of plant energy. In fact, our former methods of horticulture seem to have been based upon the principles of forestry rather than upon those of fruit production. The engineer who would attempt to run a ten horse-power engine with a five horse-power boiler would be no more lacking in judgment than is the fruit grower who permits his tree to over-balance the root system that is called upon to sustain it. Build up that root system by continuous and intelligent feeding and then restrict the labor of the tree by severe and annual pruning and thinning. Prune so as to open the tops, so that God's free sunshine may reach all of the fruit and so paint upon their cheeks those beautiful colors, which are so eagerly sought after by the purchasers of our products. We prune our bearing orchards during the dormant period, preferably in March, after the hardest freezes are over. Many get good results by spring or even summer pruning, and one of the most profitable orchards I have ever seen has always been pruned in the fall. However, I am inclined to attribute the fine results in the latter case to the severity of the pruning, rather than to the time when it was done. Much of the thinning can be done by severe pruning, but even after that has been done the expense of picking off the surplus peaches by hand will often be considerable. This thinning is essential and must be done before the pit hardens. The production of seed is a most exhaustive process and the trees must be given all possible relief by reducing the number of fruits. Stronger and longer lived trees, larger sized fruits and doubled profits will thereby result.

Diseases and Insects.

Curl leaf develops during cool, moist weather, but a thorough spraying of the dormant trees in March with a solution of two pounds of copper sulphate (blue vitriol) to fifty gallons of water is a sure preventive. Since we have been using Lime Sulphur to destroy the San Jose scale on our trees, we find that it is equally as effective in controlling the leaf curl. "Yellows" and "Little Peach" are deadly diseases of unknown origin. There is no known cure and the only safe course is to cut down and destroy by fire all diseased trees as soon as discovered. These diseases can only in that way be held in check, but "experimenting" with these diseases has cost many a grower his entire orchard. The annual "grubbing" of the base of the trees, to destroy the borer, is also necessary—sometimes twice in the season. Many a sick looking peach tree will upon examination be found to be nearly girdled by the peach borer, whose work can be discovered by the gummy substance that exudes from the injured roots. Mounding the earth up around the base of the tree and then removing the earth after the period of egg laying has passed, is a method of some value and many report good results from applying gas tar to the base of the tree, thus shutting out the borer. The plum curculio is often quite destructive to the peach, but clean cultivation will generally destroy the pupa.

Fertilizers.

Stable manure is all right to secure rapid wood growth, but it continued use in large quantities produces wood that is soft and tender—easily injured by the cold winters. However, in our exclusive fruit section, we do not have enough stable manure on our farms to make it possible for us to do much of this kind of "damage." Fertilizers that are rich in potash and phosphoric acid are most valuable, such as unleached hardwood ashes and ground bone. We find great profit from the use of commercial fertilizers, the foundation of which is usually muriate of potash and ground bone from the packing houses.

Cover Crops.

About the middle or last of August we sow some cover crop in the orchards. Oats and barley have been very good, but the sand vetch is now most popular, as it makes a mammoth growth and also adds considerable nitrogen to the soil, it belonging to the class of legumes. When it first begins to grow, this cover crop acts as a "robber" crop—taking up the soil moisture and available fertility at a time when we want the trees to stop growing and to ripen their new wood. Later this cover crop acts as a blanket, to hold the leaves and snow, preventing bare spots on exposed knolls and the consequent deep freezing and root injury. In the spring this cover crop furnishes considerable humus to be turned under and thus improve the mechanical condition of the soil. Clovers would be even better for this purpose, as they furnish considerable plant food, but they have to be left too late in the spring if they get much growth, and they are then robbing the trees of food and moisture at the time when the trees should be making their best growth. We also find it difficult to get a catch of clover under large bearing trees.

Finally, adopt the most intensive methods, to produce the largest and handsomest specimens, pick and pack them carefully and as near ripe as your market will permit; pack honestly, so that you can guarantee every package; market through some co-operative system that will eliminate as many middle men as possible and, above all things, be "in love with your job" and "Johnny on the spot," and you will be safe in looking for a neat balance on the right side of the ledger at the end of each season.

Member. Kindly give symptoms of the Peach Yellows.

Mr. Bassett. Yellows is a disease that generally makes its appearance by a fine yellow growth; the fruit itself becomes mottled on the outside, and when it is broken open, shows red streaks running to the pit.

Member. How do you work the Vetch in?

Mr. Bassett. Cut it up with a disk and plow it under.

Member. It is pretty hard, is it not, to plow in an orchard of three years' growth?

Mr. Bassett. Yes; but on sandy soil, with a good disc harrow, you can chop it up pretty fine and turn under. There are two or three kinds of extension tools that might be used for this purpose,—or, you might get a grape hoe.

Member. What does a grape hoe cost?

Mr. Bassett. Mine cost \$18 or \$19.

Member. Where do you buy them?

Mr. Bassett. I bought mine in Syracuse; I do not know where you can buy them.

Member. They make them at Northeast.

E. C. Tyson. Mr. Hiester uses the Grape Hoe.

Member. Is it a small plow?

Mr. Bassett. No; it has a little cultivator attachment. It simply slides along. The Disc is on the handle part, so it can wind in and out. One horse draws it along. With it you can get around close to the tree, and plow the soil.

Member. Did you ever use the Acme?

Mr. Bassett. No, sir; I do not like it as well as the full Disc.

Member. I would like to ask Mr. Bassett how much he would cut back the peach tree at the first year's growth.

Mr. Bassett. Well, sir; we watch our young trees, and when the buds begin to start, we select four buds, being careful to not get them together,—four buds that will eventually become the head of the tree,—and rub off the rest. These four buds are watched. If one is destroyed, we can find another, and produce a limb in its place. That new growth is the next year cut off about one-half. That will strengthen the tree and give it form and size. It is a great deal easier to rub the buds off with the fingers than it is to go out and saw them off when they have become limbs. You will find, however, that where a bud is rubbed off, its place will be taken by others, tending to produce a brushy section. You must be careful, and continue to rub these off, keeping the growth in subjection. What we want to remember is, that in bearing wood, we want root system, not a big top. Most growers seem anxious to get a big top—a forest tree,—when in reality he should aim to get a big root system.

Member. I think, if our friend will take a branch and cut it off at the crotch, he will never have another single sprouting.

Member. What are the first symptoms of the Little Peach?

Mr. Bassett. It resembles the yellows. It does not have so much wiry growth. At a distance the tree looks as if it is dying; it makes new growth out on the limbs. With the yellows the growth would be from the trunk. There is less wiry growth from the trunk in the Little Peach. The fruit remains small and is delayed in ripening.

Member. How many years do you continue cutting back one-half?

Mr. Bassett. Until the tree comes into bearing; and then watch the tree, and if it makes more growth than you want, do more cutting. Have an idea how you want the tree to be, and cut according to the amount of growth the tree makes, and according to the amount of food received.

Member. Do you spray for Black Rot?

Mr. Bassett. Yes, sir; we sprayed this year with Lime Sulphur, and had pretty good results. We used a very weak solution; we were afraid of burning the foliage. Our Elbertas are quite inclined to having the rot, and we succeeded in cleaning it out pretty nicely.

Member. What kind of Lime Sulphur did you use?

Mr. Bassett. Commercial—manufactured by one of the companies—Grasselli. We also used the self-slaked. The trouble in this self-slaked, or self-boiled, made by simply slaking the lime and the sulphur coming into combination with it, but not in chemical combination,—is that the slaking is often allowed to progress too far, forming a chemical combination of the lime and sulphur, which will burn the foliage. To avoid such a combination, you must be careful to halt the slaking before chemical action is reached, by the addition of cold water.

Chester J. Tyson. Mr. President: I move that the chair be authorized to extend the unanimous thanks of the Association to the gentlemen who have met with us as instructors. (Carried.)

Mr. Eldon. It is my pleasure to extend to you the sincere thanks of the Association for the valued service you have rendered during this convention. I regret that I was not able to be here until to-day. I appreciate all I have heard. As Mr. Tyson has said, we cannot say all we feel in this matter. It is something that is too deep for words. I can simply say, for myself, and for the organization, that we have been very much helped. I hope that you will accept in that spirit, and that you will come again to assist and help us.

E. C. Tyson. Mr. President: There are two bills which will claim the attention of Congress this winter that should interest us very much. One is the National Pure Insecticide Law, the object of which is to prevent the manufacture, sale or transportation of adulterated or misbranded Paris Greens, Lead Arsenates, and other insecticides, and also fungicides, and for regulating traffic therein, and for other purposes.

This measure resembles the Pure Food and Drug Act, making it a misdemeanor, punishable by fine, to transport impure insecticides over State lines. It of course has no effect on intra-state affairs, its object being entirely the protection of inter-state commerce.

The matter was taken up last winter and threshed over to some extent, but nothing definite accomplished. It is hoped that at this session of Congress final and favorable action will be taken. I would like to ask Mr. Bassett if he is familiar with the provisions of this bill.

Mr. Bassett. I believe I am one of the members of the committee. I did not draft the bill; I was simply invited, as a member of the Michigan State Horticulture Association, to become a member of the Board. The agricultural chemists, the manufacturers of these goods, and our horticultural and experiment stations organized to co-operate in getting pure insecticides of known value, and to prevent the manufacture of Arsenate of Lead below 12½ per cent Arsenic Oxide.

The intent of the bill is to standardize our insecticides, so that no one shall have the right to manufacture and sell a poison,—an Arsenate of Lead, a London Purple, or Paris Green, not up to a certain standard. It is not an unattainably high standard, but a standard all can meet. It is to show up the fellows who are trying to put upon the market articles of poor quality, and corresponds in its nature to the Pure Food Laws of the different States. It works on the principle that a man in buying a thing, is entitled to the

thing he buys. Just as with Fertilizer. A man must first be able to guarantee a certain amount of essential elements, and this percentage of essential elements must be printed on the outside. In our State, before a man can sell Arsenate of Lead, London Purple, or Paris Green, he must first have those goods analyzed by an agricultural station. He must record what he claims is in that article. And if he fails to come up to the requirements, he is subject to a fine. The bill was brought into being perhaps to protect the average unfortunate fruit grower from being swindled by some adventurer. It is certainly worthy of your support. A similar motion has been adopted by our State Association and by our local society; and we are anxious to push it. It is supported by the manufacturers themselves, by the agricultural chemists, by the experiment stations, and all the agricultural stations. There is a lobby against it, and the very fellows who are lobbying against it, are the very ones it is intended to reach.

E. C. Tyson. Mr. Chairman: I am very glad to know that Michigan has taken up the matter of protection *within* the State. This National law will protect us against adulterated spray material being shipped to us from other States. If we can accomplish this, we shall be in line to have a similar law adopted by our own State Legislature for protection against manufacturers *within* the State. I therefore move, Mr. Chairman, that this Association go on record as being in favor of this bill; and that everything possible be done to encourage its passage.

Member. I move to amend the motion by instructing that our corresponding secretary inform the proper persons of our action. (Adopted.)

I would like to ask Mr. Bassett if he is acquainted with the proposed National Legislation for the inspection of nursery stock shipped into this country.

Mr. Bassett. I am not acquainted with the details of that bill. I know that it is a good measure, because backed by the men who have the work in charge. It is a proper measure; we supported it.

E. C. Tyson. Professor Symons called my attention to this matter this morning. He said it was necessary for the State of Maryland to examine over a million specimens that came into the port of Baltimore in the year just past, thus making it necessary for Maryland to bear the expense of the inspection of nursery stock that was going through Maryland for other States. I do not remember his figures; but they found considerable quantities of Brown Tail Moth in these importations. I understand that Mr. Engle, our Nursery Inspector, and his assistant, spent several months in Philadelphia during this past season on that work. Some of that was intended for distribution through this State, of course, but some of it passed into other States. It is not proper for Pennsylvania to bear all the expense of that examination. All who have been reading the fruit papers this summer know what excitement was created through the importation of infected apple seedlings, which were distributed through parts of this State and New York. Fortunately the inspectors were able to follow it up, and quantities of the Brown Tail Moth were found and destroyed. It is a serious question. The New England States can tell us what it means. They are spending

hundreds of thousands of dollars every year, and are as yet unable to control the pest. The National Government should establish quarantine against nursery stock coming from across the water, accompanied by sufficient examination before it is distributed in this country, to guard against dissemination of this and other pests.

Professor Symons was not sure of this matter being before Congress. It will probably come up during this present session. I think it is a very important matter. I would like to see our Association register its views on the subject, and to do what is possible to encourage the adoption of this regulation.

Upon motion it was unanimously agreed that the Association support this measure.

E. C. Tyson. I would like to ask Mr. Bassett if he was in attendance at the International Apple Growers' meeting at Buffalo; and what action was taken in regard to the Lafean Bill—what changes were made?

Mr. Bassett. I cannot do it; I got tired and left. They argued both for and against it. Eventually they made some changes, which were adopted. The Middle States fought it on account of the package; the Western States, like Missouri, even the Hood River Valley, fought it because they did not like to be dictated to in regard to the size and shape of package.

E. C. Tyson. Many of the western growers have received the impression that they will be restricted to a certain shaped box, while it is simply a matter of capacity. The western growers insist that the balance of the United States accept the Winchester bushel as a bushel of apples. As you know, it is customary throughout this part of the United States, and at least as far west as the Mississippi, to heap the measure generously. The western growers pack their fruit in a box and send it East, to be sold on our markets as a bushel of apples, in competition with our heaped measure, which averages about 200 cubic inches more. It is my opinion that we should try to have added to this bill, the requirement that every man who packs a barrel of apples for inter-state or foreign shipment, be required to place his name and address on the head of the barrel. This provision is a part of the present bill in so far as the grower elects to take advantage of the privilege of marking the fruit "standard." If he decides not to take advantage of that privilege, there is no part of the law that touches him. If you require a man to place his name and address on the head of the package, he is going to stop and think a good deal before he puts bad stuff on the inside of it; and it occurs to me that just that one point will do more to correct the bad packing that has become so prevalent all over the East in the last few years, than anything else.

Chairman. Do you wish to take any action in the matter?

C. J. Tyson. Mr. President: I move that this Association go on record as being in favor of the bill as now proposed; and that our continued support be given to it; and if the committee representing the various organizations having the matter in charge, consider it necessary at any time during the winter that representatives of this association go to Washington to assist in the support of the bill, that

they be sent at the expense of this association. (Motion was seconded and carried.)

Mr. Bassett. I desire to express my appreciation of the kindness shown me while here. I came here prepared to have a good time and to meet good people. Mr. Hiester said this was one of the garden spots of the earth, and I believe Mr. Hiester spoke the truth. I knew I was going to have a good time, and I was not disappointed. Though I know Michigan is a long ways off, if any of you ever come to Michigan, I shall try to make it as pleasant for you as possible. We have a good State Association, and are proud of our country; and you should be proud of yours. I was richly repaid for my trip, and shall carry pleasant recollections with me.

The Fruit Committee will now make their report. Will call on Mr. Anderson.

REPORT OF FRUIT COMMITTEE.

Mr. Charles E. Bassett, Secretary of the Michigan State Horticultural Association.

Mr. Albert T. Repp, President New Jersey Horticultural Association.

Joseph W. Anderson, Orchardist, and Director of the York County Agricultural Association.

Mr. Anderson, on behalf of the Committee, made the following report:

I want to say, Mr. Chairman, that I believe this is the first time I was appointed on a committee when the chairman of the committee declined to make the report. I believe they went down gently from the top of the list to the bottom of it, and I came right in at the bottom of the list. The chairman has placed me in a position that he observed himself was a critical and difficult one to get through with without offending a New York man, an Oregon man, or some other man; but then, I am safe, I believe; I am near the Mason and Dixon line, and if I should make any statement that offends, I can just steal down across the line into Maryland, and avoid all further difficulties.

Almost anyone, I think, would be better able to make this report than I; but then, in order to get you to accept my report, I suppose I must say that I do know some little about such things, having been connected with the York County Agricultural Association, as Director, for a number of years. York County has always claimed to have the best fruit in the State. Yes, York has good fruit, I must say; but when it comes to butting up against anything like this, York County simply cannot do it. It is safe for me to say this, as I am a little way from York. I hope no one will carry this back; but I honestly think we are completely beaten. As you know no premiums are offered. I should have been glad to have gone over the whole display and pass judgment on the best fruit. The only thing we can do is to make a general report and give premiums to all. I have no report written out. I tried to think of something

during the night; I did succeed in getting some thoughts together; but I have by this time forgotten more than half of them. Out in the West they talk of their beautiful sunsets, just as if they could see the sunsets out there better than we. Now, while it is perfectly natural and right for us to see our own possessions in a rosy light, yet I certainly wished I had my old goose quill pen with which I used to write in days gone by, so that I could pen some fitting tribute to this beautiful fruit display of Adams County.

Some of the apples I see here are just as good as the Hood River Valley apples,—the kind I often take home with me to show the folks the kind they raise out in the Hood River Valley and the West; the kind for which I often pay 25 cents when I get three apples.

If I were away from here and anyone brought some of these apples to me for apples from that section of the West, I should not know the difference. I certainly congratulate you people on your great success in growing fruit. I do not think I will extend my report any farther than this. I thank you all very much for your attention, and if the report is satisfactory, hope you will accept it.

Chester J. Tyson. I move that the report of the Fruit Committee be accepted, and that a vote of thanks be extended these gentlemen for their services. (Unanimously carried.)

Chester J. Tyson. I did hope that the committee would go a little further into the matter, and criticise the manner of display. We have been trying to get up an exhibit from the County for our State meeting. We have been successful in coming off with awards so far. We understand that we are to come up against more severe competition from time to time. The thing we want to know is, whether the plan we have adopted is the best way to display our fruit to advantage. If the committee could tell us anything about this, we should be glad to hear it.

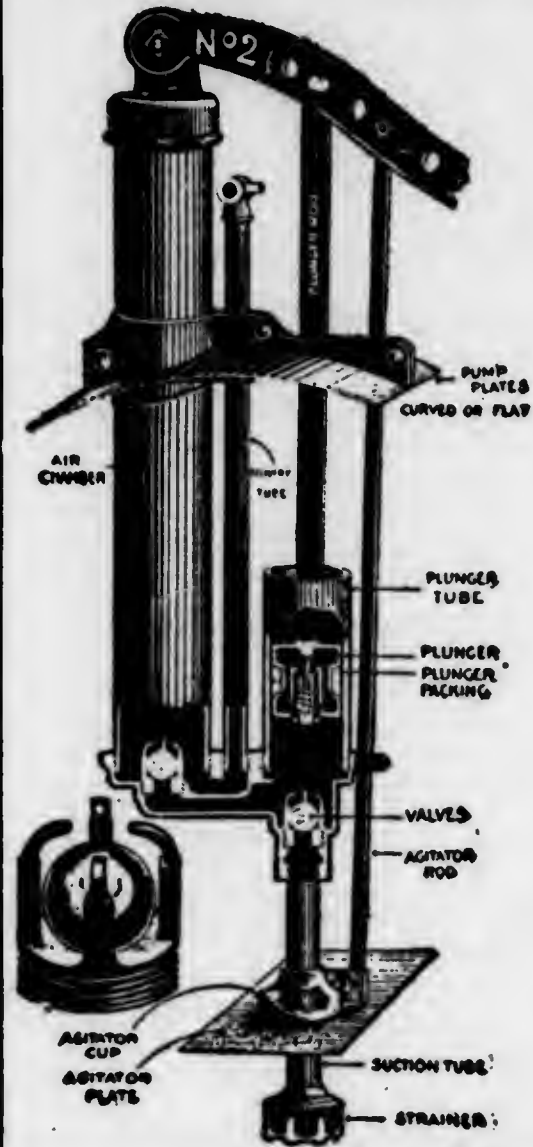
Mr. Anderson. If you had a large hall, and could have this fruit on lower platforms, and people pass around them, it would be very interesting and instructive; but as you have no larger hall, I do not see how you could have done any better than you have. As the community becomes more wealthy, as I have no doubt you soon will, you can have a larger hall, and arrange your fruit in the way suggested.

Member. We shall be pleased to hear from other members of the Committee, if they choose to make any remarks in this regard.

Mr. Bassett. I will say, Mr. Chairman, in the matter of displaying fruit, it depends quite a little whether you are appealing to scientific judges or to the people who are passing by, and the general effect on their minds. If you are appealing to competent judges, it is important that the fruit be perfectly sound. They care little whether the fruit be arranged in stars or crescents; they want to know absolutely that the fruit is perfectly free from all imperfections. Your arrangement would be perfectly satisfactory.

The one thing I do want to criticise, however, is the absence of the stems of some of the fruits—a thing that may appear very small to you; but when you come to apply to the professional judge, if you have lost the stem, he will give you a docking on that. The stem is a part of the apple; and though we do not eat the stem, it is

MR. LEIGH, Superintendent, put on the N. Y. C. Stock Yards, Buffalo, N. Y., 40 tons (80,000 lbs.) of Cold Water Paint with these



WONDERFUL HAND MACHINES

In this event the

SPRAMOTOR

has proven its value.

A demonstration like this is more convincing than a book of arguments, and when we tell you that we received the Gold Medal at the National Horticultural Congress, Council Bluffs, you will be still further convinced. The SPRAMOTOR is guaranteed for a year, in all sizes, for Orchards, Potatoes, Painting, Whitewashing, Vineyard and Weed Destruction. All you have to do is to state what you want it for. If you are interested write us now, as a delay may mean a loss of money to you. For knapsack, barrel, tank, bucket, and also for horse power and gasoline power.

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Sticks to the Leaves And Will Not Burn

Improved Methods Increase Profits

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MERRIMAC CHEMICAL CO.

33 Broad Street, Boston, Mass.

a valuable point of identification. The stem is often the means of telling conclusively the variety that is presented.

Another thing I want to criticise in your exhibit. In your selection of five apples—which should be a plate—you should be very careful to have the apples all of one size, all of one color—true to type—not overgrown. I believe there is a type for every variety; and that where an apple is of the ordinary size—good, fair, ordinary size, of good high color, perfect in all respects, it is always given the preference to apples overgrown and not true to type. We are not exhibiting monstrosities, but specimens of what we expect to produce in our orchards.

In a contest recently opened by a spray pump company, which offered a spray outfit as a premium for the best plate of Northern Spies, the outfit was awarded to a young man who had been in business only three years, simply because he went to the trouble of finding out what in their mind constituted a perfect plate of apples. The first thing that was done when the contest opened, was to eliminate from the twenty-six plates exhibited, twenty plates of monstrosities, devoting their entire attention to six plates of good, fair-sized apples, true to type.

Detailed Report of Fruit Exhibit.

We find in this exhibit, 214 plates, as follows:

Robert Garrettson, 6 plates—

- 3 Plates York Imperial.
- 1 Plate Langford Seedling.
- 2 Plates Smith Cider.

Curtis Peters, 10 plates—

- 4 Plates Winter Paradise.
- 6 Plates York Imperial.

H. G. Baugher,

- 1 Plate Purple Top Globe Turnips of immense size, yielded this year at the rate of 400 bushels per acre.

D. G. Minter, 5 plates—

- 1 Plate Coal.
- 1 Plate York Imperial.
- 2 Plates York Stripe.
- 1 Plate Jonathan.

A uniformly good exhibit.

C. E. Jones, Kearneysville, Va.

- 1 Plate Mammoth Black Twig.

H. M. Keller,

- 2 Plates Winter Banana.

Very fine fruit, attracted considerable attention.

Rufus Lawver, 10 plates—

- 2 Plates Paragon (highly colored).
- 2 Plates Wine Sap.
- 1 Plate New Centennial.
- 2 Plates Gano.

- 2 Plates Seedlings (attractive red fruit, of medium size).
- 1 Plate well-colored fruit, resembling King (said to result from top-working Summer Rambo on natural stock).

Harrison's Nurseries

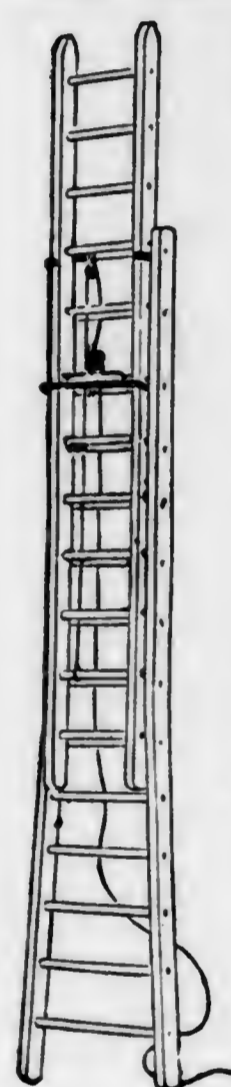
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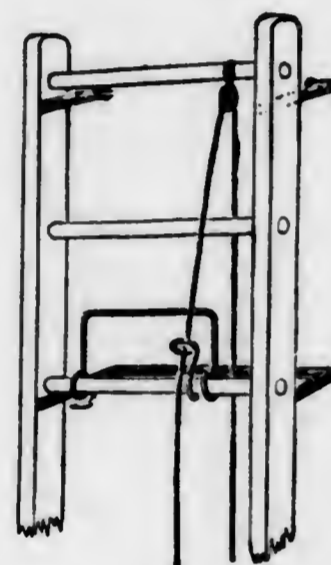
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rigid, strong and broad-
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Sectional Ladders
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ladders, ladder
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Staves a Specialty

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Call, Phone or Write—United Phone

MILLWORK
of all Description, and
Lumber of all kinds

C. E. Raffensperger, 5 plates—

- 4 Plates York Imperial.
 - 1 Plate Grime's Golden.
- All good specimens.

E. P. Garrettson, 31 plates—

- 14 Plates York Imperial.
- 1 Plate Balsley.
- 1 Plate Summer Rambo.
- 2 Plates Domine.
- 1 Plate Fallwater.
- 1 Plate Romanite.
- 2 Plates Smith Cider.
- 2 Plates Cayuga Red Streak.
- 2 Plates Baldwin.
- 5 Plates York County Cheese.

A large, interesting exhibit.

Mrs. W. S. Morrison, 4 plates—

- 1 Plate Belmont.
- 1 Plate Fallwater.
- 2 Plates Wagner.

Tyson Brothers, 14 plates—

- 2 Plates Rhode Island Greenings.
- 2 Plates Stayman.
- 2 Plates York Stripe.
- 1 Plate Wagner.
- 7 Plates York Imperial.

The color of the Stayman in this exhibit indicates that we need not fear on that score.

C. A. Griest, 11 plates—

- 3 Plates Grime's Golden.
- 2 Plates York Imperial.
- 2 Plates Baldwin.
- 3 Plates York Stripe.
- 1 Plate medium sized red fruit, for a name.

R. M. Eldon, 16 plates—

- 5 Plates Ben Davis.
- 3 Plates Baldwin.
- 2 Plates Summer Rambo.
- 2 Plates Smith Cider.
- 2 Plates Grime's Golden.
- 2 Plates Dickinson.

A clean, uniform, well-selected lot of fruit of high color, the Baldwin and Summer Rambo being worthy of special mention.

L. C. Hall, Avonia, Erie Co., Pa.—

- 1 Plate Erie County grown English Walnuts.
- Kernels were found to be large, well-developed, and of fine flavor.

Oscar Rice, 7 plates—

- 2 Plates York Imperial.
- 3 Plates Jonathan (highly colored).
- 1 Plate Baldwin (very large).
- 1 Plate Smokehouse.

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IDAVILLE, PA.

Baugh's 1910 Almanac just out. Ask your dealer for it or write us.

Anthony Deardorff, 6 plates—

- 1 Plate Ben Davis.
- 1 Plate York Imperial.
- 1 Plate Smith Cider.
- 1 Plate Red Doctor.
- 1 Plate York Stripe.
- 1 Plate Willow Twig.

Every specimen perfect and well-colored.

B. F. Wilson, 34 plates—

- 11 Plates York Imperial.
- 2 Plates Rawl's Janet.
- 2 Plates Mann.
- 4 Plates Baldwin.
- 2 Plates Winter Paradise.
- 1 Plate Domine.
- 1 Plate Fallawater.
- 2 Plates English Red Streak.
- 4 Plates Smokehouse.
- 4 Plates Jonathan.
- 1 Plate medium-sized fruit, for name.

A very fine lot of fruit; Jonathan and Smokehouse specially good. Some stems missing.

George Oyler, 18 plates—

- 2 Plates Red Doctor.
- 2 Plates Grime's Golden.
- 1 Plate Rawl's Janet.
- 2 Plates Black Twig.
- 3 Plates York Stripe.
- 2 Plates York Imperial (very good).
- 3 Plates Ben Davis.
- 2 Plates Wine Sap.
- 1 Plate Joanthan.

Wolfe Brothers,

5 Plates York Imperial.

William S. Adams, 18 plates—

- 1 Plate Fallawater.
- 1 Plate Grime's Golden.
- 1 Plate Red Doctor.
- 1 Plate Winter Rambo.
- 1 Plate Baldwin.
- 1 Plate Wagner.
- 1 Plate Sutton Beauty (very large).
- 2 Plates York Imperial.
- 1 Plate Domine.
- 2 Plates Peck's Pleasant.
- 1 Plate York Stripe.
- 2 Plates Stark.
- 1 Plate Smokehouse.
- 1 Plate Hubbardston.
- 1 Plate, for name (wrongly marked Shackelford).

J. Kerr Sterrett, Oakville, Pa.—

- 1 Plate Jonathan. Very highly colored.

J. W. Prickett,—

- 6 Plates Stayman. Very large and well colored.

W. S. ADAMS

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BALTIMORE, MARYLAND

Adams County Fruit Records

Shipments Over Gettysburg & Harrisburg R. R.

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In Bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Gettysburg..... (G. & H. R. R.)	1905	318	333	651	4	1	.....	.....	.....
	1906	28	.....	28	.....	.....	.....	.....	.....
	1907	127	.....	127	1	.....	\$2 25	.....	.....
	1909	12	.....	12	.....	.....	.....	.....	.....
Biglerville.....	1903	8813	987	9800	65	.....	.....	.....	.....
	1905	7932	.....	7932	53	2	.....	.....	.....
	1906	2785	165	2950	20	.....	1 00	\$ 70	.....
	1907	17164	4216	21380	142	12	2 20	1 50	\$ 50
	1908	4956	.....	4956	33	6	1 40	75	65
	1909	10785	137	10922	73	1	2 50	1 50	55
Guernsey.....	1903	2870	2413	5283	35	.....	.....	.....	.....
	1905	1771	1166	2937	20	11	.....	.....	.....
	1906	1414	1329	2743	18	2	.....	.....	.....
	1907	4798	2760	7558	52	15	2 35	1 50	55
	1908	2173	.....	2173	15	7	1 50	.....	65
	1909	7320	.....	7320	49	5	2 50	.....	55
Bendersville.....	1903	4163	.....	4163	28	.....	.....	.....	.....
	1905	4000	2351	6351	42	16	.....	.....	.....
	1906	1109	1561	2670	18	20	.....	.....	.....
	1907	2824	6268	9092	61	22	2 25	1 50	50
	1908	2264	.....	2264	15	21	1 40	.....	65
	1909	3531	1200	4731	32	15	2 50	1 50	50
Gardners.....	1903	997	985	1982	13	.....	.....	.....	.....
	1905	912	5215	6127	41	4	.....	.....	.....
	1906	.....	.....	.....	.....	.....	.....	.....	.....
	1907	6905	5440	12345	82	4	1 75	1 50	50
	1908	433	.....	433	3	1	.....	.....	.....
	1909	2275	4571	6846	46	.....	.....	1 35	.....
Starners.....	1905	682	1016	1698	11	5	.....	.....	.....
	1906	664	133	797	5	4	.....	.....	.....
	1907	1572	219	1791	12	3	.....	.....	.....
	1908	487	.....	487	3	3	1 50	.....	65
	1909	1825	8	1833	12	4	2 50	.....	55
Hunters Run..... (Goodyear)	1903	625	.....	625	4	.....	.....	.....	.....
	1905	160	160	320	2	8	.....	.....	.....
	1906	295	262	557	4	5	1 50	75	50
	1907	1417	514	1931	13	12	1 75	85	50
	1908	1704	.....	1704	11	1	1 50	.....	.....
	1909	1289	510	1799	12	1	2 50	.....	.....
G. & H. R. R..... Total	1903	17468	4385	21853	146	.....	.....	.....	.....
	1905	15617	9908	25525	170	47	.....	.....	.....
	1906	6295	3450	9745	65	35	.....	.....	.....
	1907	34797	19217	54014	360	56	.....	.....	.....
	1908	12017	.....	12017	80	39	1 45	75	65
	1909	27037	6426	33463	223	26	2 50	1 50	55

Gardners—1906, 2 cars pears; 1907, 1 car pears; 1908, 2 cars pears.
Bendersville—1908, 2 cars pears.
Hunters Run—1908, 1 car pears.

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Crates
Grape Baskets
Half Barrel Baskets

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Adams County Fruit Records—(Continued)

Shipments Over Western Maryland R. R.

	Year	No. Bbls. shipped in Bbls.	No. Bbls. shipped In Bulk	No. Bbls. Total	No. Cars Apples (150 bbls. to car)	No. cars potatoes (500 bus. to car)	Av. price paid per Bbl.	Av. price paid per bbl. for bulk	Av. price paid per bus. potatoes
Fairfield.....	1905	1215	809	2024	13	3	.....	.....	.....
	1906	300	.....	300	2	2	.....	.....	.....
	1907	300	.....	300	2	2	.....	.....	.....
	1908	.....	.....	.....	.....	.....	.....	.....	.....
	1909	.....	.....	.....	.....	.....	.....	.....	.....
Virginia Mills.....	1907	320	8800	9120	61	.....	.....	.....	.....
	1908	.....	1620	1620	11	1	.....	.....	.....
	1909	326	1519	1845	12	.....	.....	.....	.....
Orintanna.....	1903	3300	.....	3300	22	.....	.....	.....	.....
	1905	1062	.....	1062	7	.....	.....	.....	.....
	1906	3659	.....	3659	24	.....	.....	.....	.....
	1907	3177	2342	5519	37	1	\$2 00	\$1 50	\$ 50
	1908	2686	1020	3706	25	.....	.....	.....	.....
McKnightstown.....	1909	741	840	1581	10	.....	2 40	1 50	.....
	1903	3438	.....	3438	23	.....	.....	.....	.....
	1905	7895	178	8073	54	1	.....	.....	.....
	1906	2296	254	2550	17	1/6	1 00	1 00	47
	1907	3393	1155	4548	30	3	2 15	1 85	50
Seven Stars.....	1908	1785	251	2036	13	.....	1 75	.....	.....
	1909	7724	2030	9754	65	1/3	2 50	1 50	.....
	1906	28	.....	28	.....	.....	.....	.....	.....
Gettysburg (W. M. R. R.).....	1907	63	.....	63	.....	.....	.....	.....	.....
	1908	42	.....	42	.....	.....	.....	.....	.....
	1909	50	.....	50	.....	.....	.....	.....	.....
	1906	13	.....	13	.....	.....	.....	.....	.....
New Oxford.....	1907	18	.....	18	.....	.....	.....	.....	.....
	1908	23	.....	23	.....	.....	.....	.....	.....
	1909	22	.....	22	.....	.....	.....	.....	.....
Abbottstown.....	1907	.....	1033	1033	7	.....	.....	.....	.....
	1908	.....	276	276	2	.....	.....	.....	.....
	1909	.....	.....	.....	.....	.....	.....	.....	.....
East Berlin.....	1907	382	618	1000	7	.....	.....	.....	.....
	1908	.....	.....	.....	.....	.....	.....	.....	.....
	1909	.....	.....	.....	.....	.....	.....	.....	.....
	1905	50	.....	50	.....	.....	.....	.....	.....
W. M. R. R. Total	1906	1140	1193	2333	15	1/3	1 80	90	70
	1907	49	.....	49	.....	1/2	2 25	2 25	60
	1908	.....	.....	.....	.....	.....	.....	.....	.....
	1909	10	205	215	2	.....	.....	.....	.....
W. M. R. R. Total	1903	6738	.....	6738	45	.....	.....	.....	.....
	1905	10380	1320	11700	78	5	.....	.....	.....
	1906	7447	1447	8894	59	3	.....	.....	.....
	1907	7720	13948	21668	144	7
	1908	4536	2891	7427	49	1	1 75
1909	8873	4870	13743	91	1/3	2 50	1 50	

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 able Goods

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Adams County Fruit Records—(Continued)

Total Fruit Marketed in County.

	Year	No. bbls. shipped in bbls.	No. bbls. shipped in bulk	No. bbls. total	No. cars Apples (150 bbls. to car)	No. cars potatoes 500 bus. to car	Av. price paid per bbl.	Av. price paid per bbl. for bulk	Av. price paid per bus. Potatoes
Total shipped.....	1903	24206	4385	28591	191	...	.....	.....	.....
	1905	25997	11228	37225	248	52	.....	.....	.....
	1906	13742	4897	18639	124	38	.....	.....	.....
	1907	42517	33165	75682	504	63	.....	.....	.....
	1908	16553	2891	19444	129	40	\$1 50	\$ 75	\$ 60
	1909	35910	11296	47206	314	27	2 50	1 50	50
Evaporated.....	1903	.....	6547	6547	44	.....	.....	.....	.....
	1905	.....	10670	10670	71	.....	.....	.....	.....
	1907	.....	8333	8333	56	.....	.....	75	.....
	1908	.....	.....	.....	.....	.....	.....	.....	.....
	1909	.....	4666	4666	31	.....	.....	.....	.....
Canned.....	1905	.....	2400	2400	16	.....	.....	.....	.....
	1907	.....	10000	10000	67	.....	.....	1 00	.....
	1908	.....	1673	1673	11	.....	.....	.....	.....
	1909	.....	12398	12398	82	.....	.....	.....	.....
Cider (1000000 gals.)..	1907	.....	9524	9524	63	.....	.....	.....	.....
	1908	.....	6670	6670	44	.....	.....	.....	.....
	1909	.....	5714	5714	38	.....	.....	.....	.....
Total fruit.....	1903	24206	10932	35138	234	.....	.....	.....	.....
	1905	25997	24298	50295	335	52	.....	.....	.....
	1906	13742	4897	18639	124	38	.....	.....	.....
	1907	42517	61022	103539	690	63	2 25	1 75	55
	1908	16553	11234	27787	185	40	1 50	75	60
	1909	35910	34074	69984	465	27	2 50	1 50	50

Comparison of Percentages

Year	Per cent. barreled	Per cent. sold bulk	Per cent. evaporated	Per cent. canned	Per cent. cider	Per cent. total fruit compared to 1903
1903	70	12	18	100%
1905	52	22	26	143%
1907	41	32	8	10	9	295%
1909	51	16	7	18	8	200%

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**Sixth Annual Convention will be Held
December 14, 15, 16, 1910**

END OF YEAR